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IN THE DISTRICT COURT OF THE SEVENTH JUDICIAL DISTRICT
OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF BINGHAM

JERRY D. BINGHAM and VALERIE H. BINGHAM,

Petitioners,

vs.

IDAHO DEPARTMENT OF WATER RESOURCES,

Respondent,

and

IDAHO GROUND WATER APPROPRIATORS, INC., CITY OF POCATELLO, AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY,

Intervenors.

Case No. CV06-26-1801

SETTLED AGENCY RECORD ON APPEAL

Judicial Review from the Idaho Department of Water Resources
Mathew Weaver, Director

RAÚL R. LABRADOR
ATTORNEY GENERAL

JOY M. VEGA
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
GARRETT F. HENSLEY, ISB No. 12922
Deputy Attorneys General
Idaho Department of Water Resources
PO Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
garrett.hensley@idwr.idaho.gov

Attorneys for Respondent

Reed W. Larsen
COOPER & LARSEN CHARTERED
151 N. 3rd Ave., Suite 200
Pocatello, Idaho 83201
reed@cooper-larsen.com

Bradley R. Cahoon
DENTONS DURHAM JONES PINEGAR P.C.
111 S. Main St., Suite 2400
Salt Lake City, Utah 84111
brad.cahoon@dentons.com

Damien M. Schiff
PACIFIC LEGAL FOUNDATION
555 Capitol Mall, Suite 1290
Sacramento, California 95814
dschiff@pacificlegal.org

Attorneys for Petitioners

Travis L. Thompson
Abby R. Bitzenburg
PARSONS BEHLE & LATIMER
PO Box 63
Twin Falls, Idaho 83303-0063
tthompson@parsonsbehle.com
abitzenburg@parsonsbehle.com

Attorneys for Intervenors A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

Norman M. Semanko
Garrett M. Kitamura
PARSONS BEHLE & LATIMER
800 W. Main St. Suite 1300
Boise, Idaho 83702
nsemanko@parsonsbehle.com
gkitamura@parsonsbehle.com

Attorneys for Intervenors American Falls Reservoir District #2 and Minidoka Irrigation District

Thomas J. Budge
RACINE OLSON, PLLP
PO Box 1391
Pocatello, Idaho 83204
tj@racineolson.com

Attorney for Intervenor Idaho Ground Water Appropriators, Inc. (IGWA)

Sarah A. Klahn
Maximilian C. Bricker
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon Blvd., Suite 110
Boulder, CO 80302
sklahn@somachlaw.com
mbricker@somachlaw.com

Attorneys for Intervenor City of Pocatello

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BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FIFTH AMENDED FINAL ORDER REGARDING METHODOLOGY FOR DETERMINING MATERIAL INJURY TO REASONABLE IN-SEASON DEMAND AND REASONABLE CARRYOVER**

BACKGROUND

On April 19, 2016, the Director ("Director") of the Idaho Department of Water Resources ("Department") issued his *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order"). The Fourth Methodology Order: (1) explained how the Director would determine material injury to storage and natural flow water rights of members of the Surface Water Coalition ("SWC")[1]; (2) established methods for quantifying material injury to SWC storage and natural flow water rights as predictive and actual demand shortfalls; (3) established methods for quantifying mitigation obligations by holders of junior priority ground water rights for shortfalls in predictive and actual SWC water demands; and (4) established a method for determining a priority date for curtailment if mitigation obligations are not satisfied.

The processes established in the Fourth Methodology Order for determining material injury are not carved in stone. Updates to the methodology order based on additional data and analyses were always anticipated:

> Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will review and refine the process of predicting and evaluating material injury. The methodology will be adjusted if the data supports a change.

[1] The SWC is comprised of A&B District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company. Each entity holds separate senior surface natural flow water rights and has separate storage contracts for storage water space in the reservoirs.

Fourth Methodology Order, Conclusion of Law 17; *see also In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irrigation Dist.*, 155 Idaho 640, 645, 315 P.3d 828, 833 (2013) ("[t]he concept of a baseline is that it is adjustable . . . ."). The prediction and determination of rights and obligations of the holders of senior priority and junior priority water rights respectively must: (1) apply the best available science and underlying water data; (2) consider changing climatic and cropping patterns; and (3) adhere to the most recent decisions of the courts related to water administration.

Many of the data sets the Department relied upon in the Fourth Methodology Order have been expanded and now include additional years. Furthermore, the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling to determine a curtailment priority date that would supply adequate water to the senior water right holders. The first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling for calculating the response to curtailment of groundwater use. The purpose of this *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") is to update the Director's methodology for determining material injury to storage and natural flow water rights either held by or committed to members of the SWC consistent with the Director's ongoing obligation to use the best available science and information.

FINDINGS OF FACT

I. Overview of the Methodology for Determining Material Injury to Water Rights by Determining Reasonable In-Season Demand and Reasonable Carryover

1. The methodology for determining material injury to water rights by determining reasonable in-season demand ("RISD") and reasonable carryover should be based on updated data, the best available science, analytical methods, and the Director's professional judgment as manager of the state's water resources. In the future, climate may vary and conditions may change; therefore, the methodology may need to be adjusted to consider a different baseline year or years ("BLY") or changes to other components.

2. In-season demand shortfall ("IDS") will be computed by subtracting RISD from the forecast supply ("FS"). In-season demand shortfall is computed using the following equation:

$$IDS = FS - RISD$$

3. If the FS is greater than the RISD, there is no demand shortfall. If the FS is less that the RISD, the negative difference is the demand shortfall. Initially, RISD is equal to the historic demands associated with a BLY as selected by the Director, but will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

4. Reasonable carryover shortfall will be computed by subtracting reasonable carryover from actual carryover, where reasonable carryover is defined as the difference between a baseline year demand ("BD") and projected typical dry year supply. Reasonable carryover shortfall will be computed using the following equation:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

5. If actual carryover exceeds the reasonable carryover, there is no reasonable carryover shortfall. In contrast, if reasonable carryover exceeds the actual carryover, the negative difference is the reasonable carryover shortfall.

6. The concepts underlying the selection of the BLY, determination of in-season demand shortfall, and reasonable carryover shortfall will be discussed in detail below.

II. In-Season Demand Shortfall

A. Considerations for the Selection of a Baseline Year

7. A BLY is a year or average of years when irrigation demand represents conditions that can predict need in the current year of irrigation at the start of the irrigation season. The purpose of predicting need is to estimate material injury.

8. A BLY is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) irrigation practices. R. Vol. 37 at 7098.[2] To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. *Id*. at 7096.

9. The historic diversion volumes from the BLY and the predicted supply forecast at the start of the irrigation season are inputs to predict the initial ISD, where a demand shortfall is the difference between the BD and the FS. When the difference is a negative number, the ISD is zero. ISD increases with increases in BD, decreases in FS, or both. Assuming constant irrigation practices, crop distributions, and total irrigated acres, demand for irrigation water typically increases in years of higher temperature, higher reference evapotranspiration ("ET"), and lower precipitation. If water demand data is averaged for several years and these averages are the basis to predict demand shortfall at the start of the season, in a high-water demand year, these averages may often under-predict the demand shortfall. In a high-water demand year, under-prediction of IDS might be acceptable if the junior priority ground water right holders and the senior priority surface water right holders shared equally in the risk of water shortages. Equality in sharing the risk will not adequately protect the senior priority surface water right holder from injury. Actual demand shortfalls to a senior surface water right holder resulting from predictions at the start of the irrigation season based on average data unreasonably shifts the risk of shortage to the senior surface water right holder. Therefore, a BLY should represent a

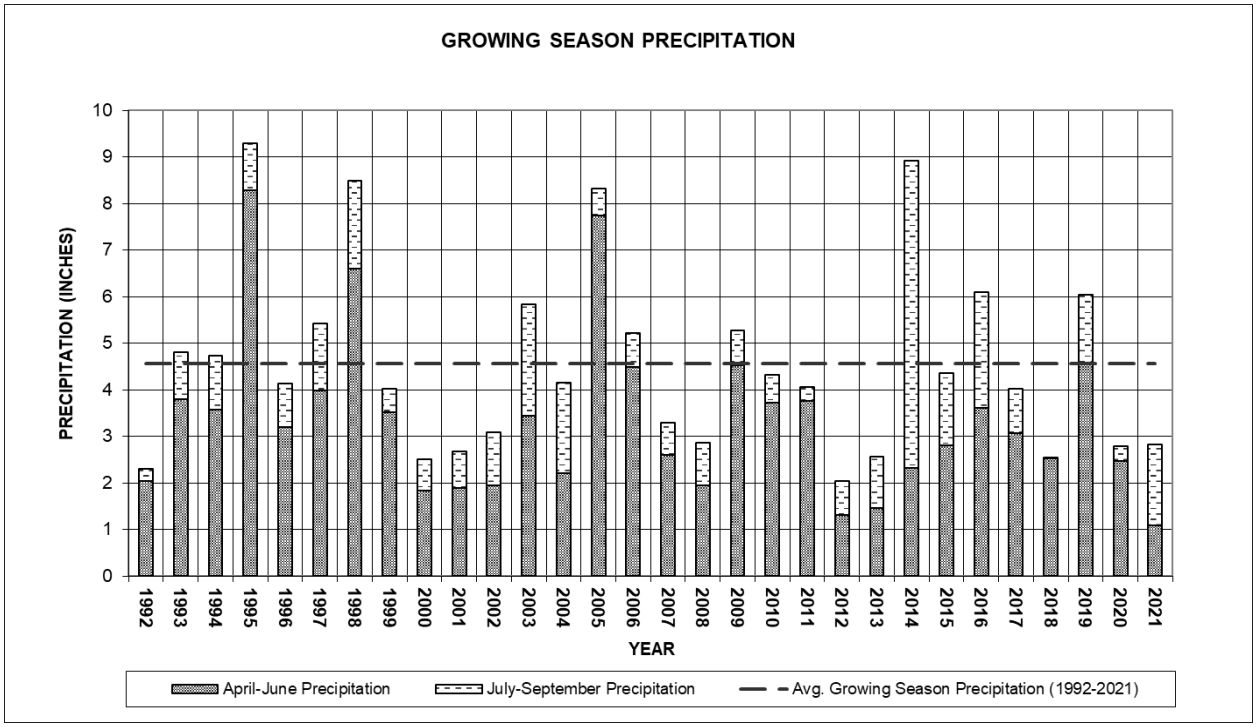
[2] All citations in this Order are to material that was admitted during the original hearing and is part of the final agency record on appeal in Gooding County Case No. CV-2008-551, which was lodged with the Fifth Judicial District Court on February 6, 2009.

year(s) of above average diversions and should not represent a year(s) of average or below average diversions. An above average diversion year(s) selected as the BLY should also represent a year(s) of above average temperatures and reference ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other factors. In addition, actual supply should be analyzed to assure that the BLY is not a year of limited supply.

i. Climate

10. For the methods outlined herein, climate is represented by precipitation, reference ET, and growing degree days.

11. Precipitation. Water, in all phases, introduced to Idaho from the atmosphere is termed precipitation. During the growing season, precipitation reduces the irrigation water needed for growing crops. Ex. 3024 at 19. The figure below shows the precipitation recorded during the growing season at the National Weather Service's Twin Falls weather station.



Growing Season Precipitation at National Weather Service's Twin Falls Weather Station 1992–2021.[3]

[3] The Fourth Methodology Order included data for the period 1990 through 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021. The chart is created from NOAA National Weather Service total precipitation data obtained from the NCDC's Climatological Data Annual Summary Idaho report series for the Twin Falls 6 E and Twin Falls Sun Valley Regional Airport weather stations.

12. Evapotranspiration. ET is a variable representing both the amount of water that transpires from vegetation and the amount of water that evaporates from the underlying soil. ET is an important factor for properly estimating RISD. In its water budget calculations, the SWC proposed the use of ET values from the USBR as part of their Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet. Ex. 8000, Vol. II, Chap. 9; Ex. 8000, Vol. IV, Appdx. AU. The ground water users proposed the use of ET values from Richard G. Allen and Clarence W. Robison 2007, Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, i.e. ETIdaho. Ex. 3007A at 21; Ex. 3024 at 1-58.

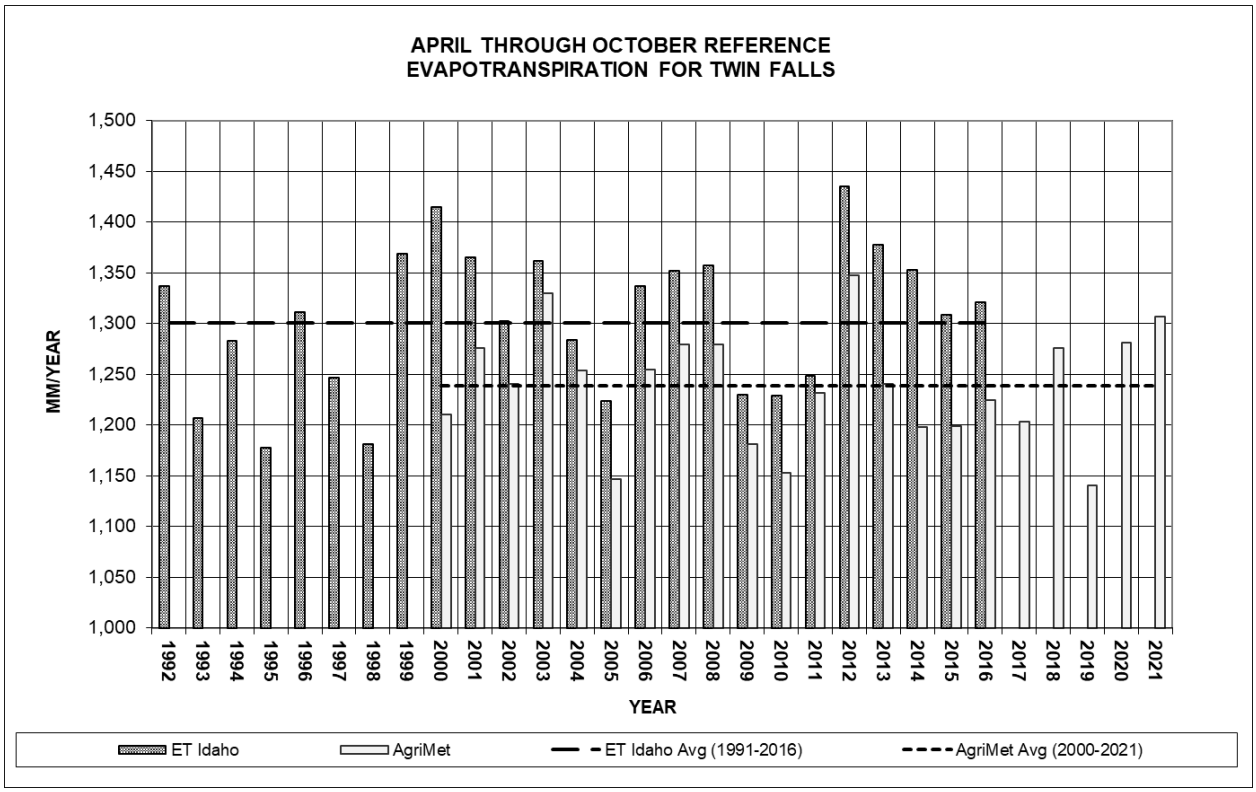
13. Reference ET is a standardized index that approximates the climatic demand for water vapor (i.e. ET). Both ETIdaho and AgriMet calculate and publish reference ET data. The Department will identify potential BLYs by consulting both ETIdaho reference ET and AgriMet reference ET.

14. Neither ETIdaho reference ET data nor AgriMet reference ET data span the entire period of analysis (1992-2021). ETIdaho reference ET data are currently available from 1990 through 2016.[4] AgriMet reference ET data are available from 2000 to 2021.[5] Ideal BLY candidates are years in which reference ET exceeds average reference ET values. The individual year is compared using both AgriMet and ETIdaho reference ET data for those years in which both data are available and only AgriMet data in those years where there is no ETIdaho data.

[4] The Fourth Methodology Order included ETIdaho reference ET data for the period 1991 to 2011. ETIdaho reference ET data is now available through 2016. This Fifth Methodology Order updates this chart with data for the period 1992 to 2016.

[5] The Fourth Methodology Order included AgriMet reference ET data for the period 2000 to 2014. . AgriMet reference ET data is now available through 2021. This Fifth Methodology Order updates this chart with data for the period 2000 to 2021.

15. Years of above average values of reference ET are appropriate BLY candidates.[6] Total April through October reference ET for the period of record from the Twin Falls (Kimberly) AgriMet site is shown below.

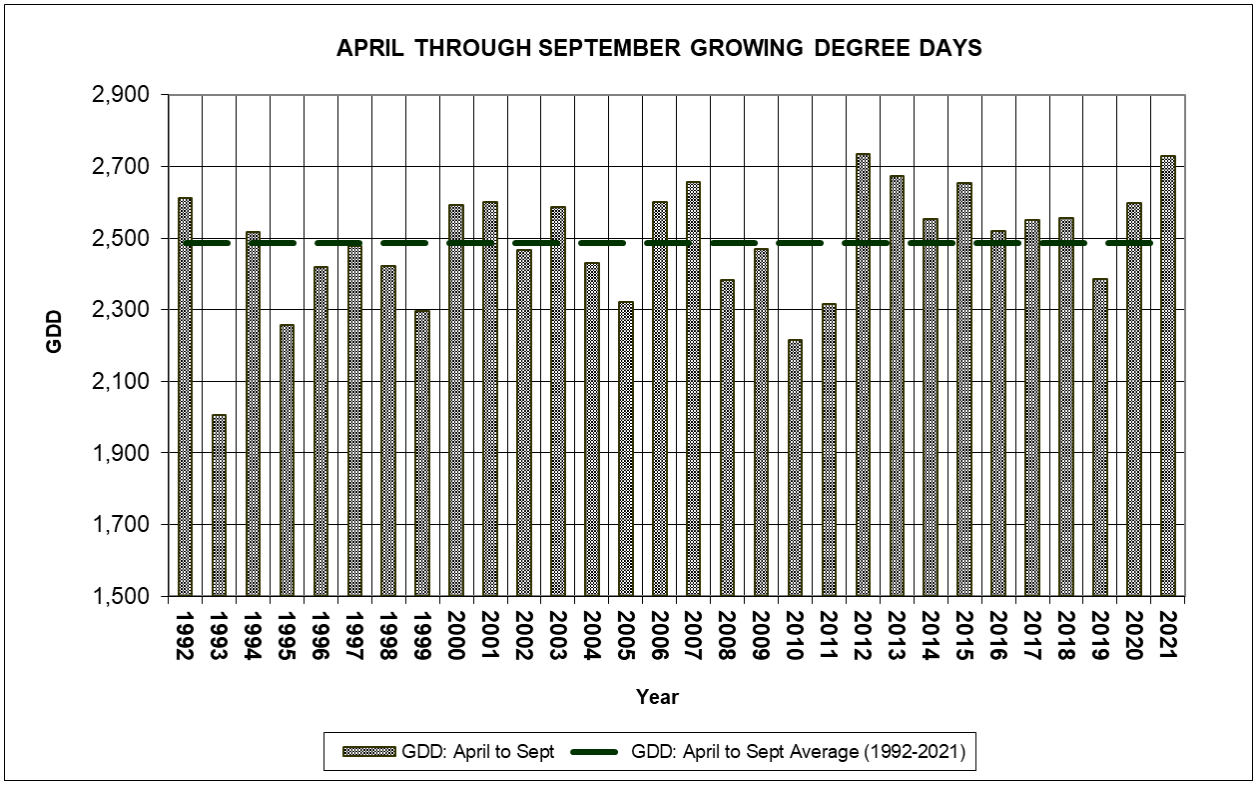


Reference ET for Twin Falls (Kimberly) with both AgriMet and ETIdaho data 1992-2021.[7]

[6] Values for reference ET between ETIdaho and AgriMet do not match because they are derived differently. The relevant information for identifying a potential BLY is the relationship between the year under consideration and the average for the data sets.

[7] The Fourth Methodology Order included data only through 2014. This Fifth Methodology Order updates this chart with combined data for the period 1992 to 2021, establishing a 30-year record which is the professional standard of practice for calculating climatic and hydrologic normals.

16. Growing Degree Days. Growing degree days define the length and type of growing season. Growing degree days are an arithmetic accumulation of daily mean temperature above a certain base temperature. Ex. 3024 at 10; 117-21. These growth units are a simple method of relating plant growth and development to air temperatures. Different plant species have different base temperatures below which they do not grow. At temperatures above this base, the amount of plant growth is approximately proportional to the amount of heat or temperature accumulated. A higher annual growing degree day value correlates to a higher potential rate of plant growth. The table below shows growing degree days accumulated for April through September for the Twin Falls (Kimberly) AgriMet site.

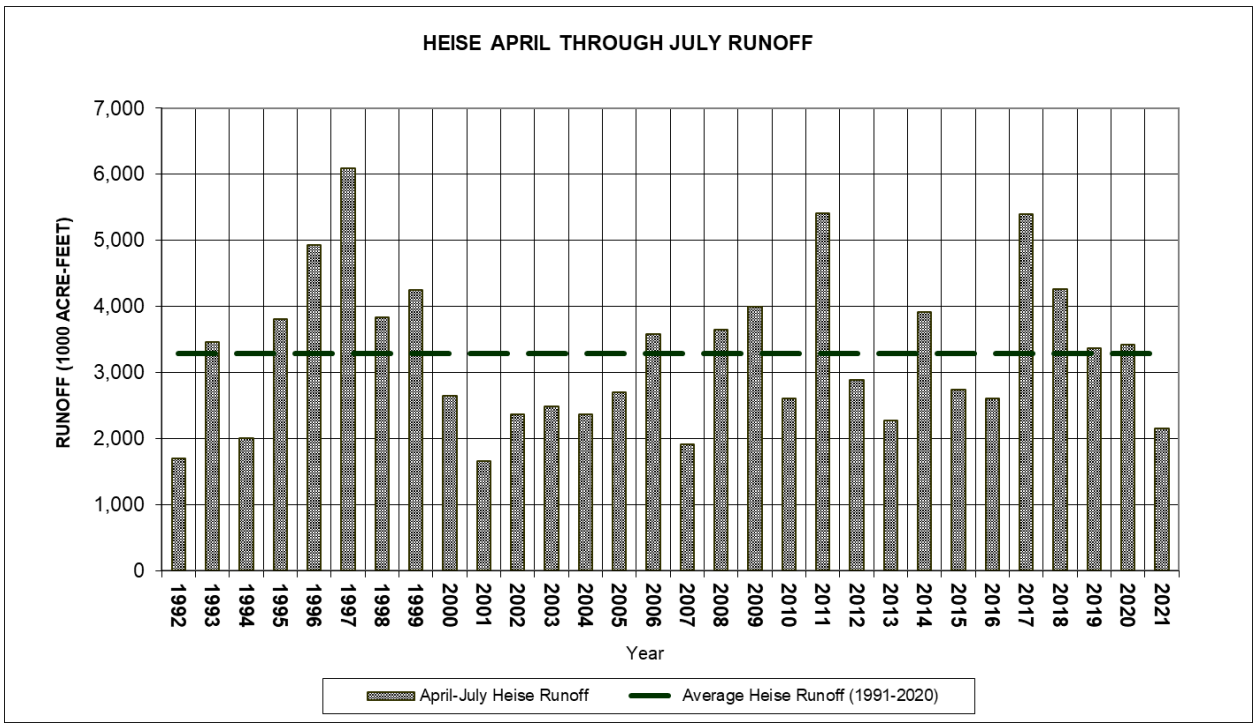


Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1992-2021.[8]

[8] The Fourth Methodology Order included data only through 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

ii. Available Water Supply

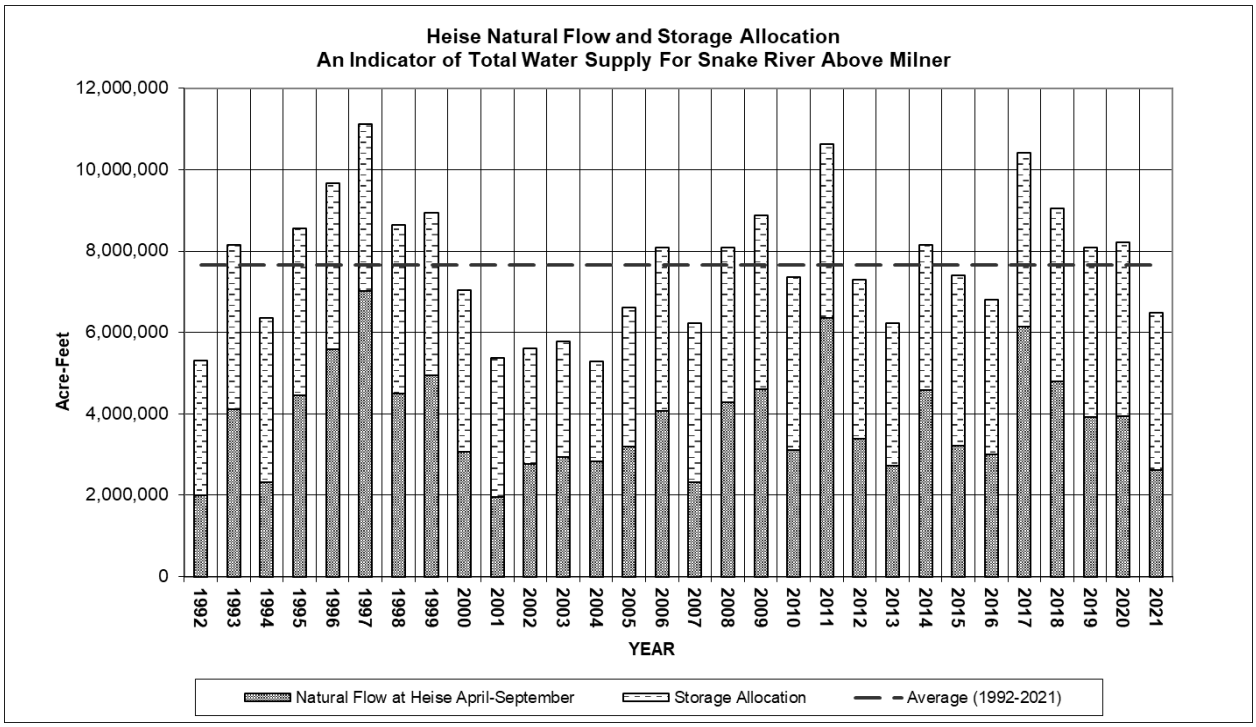
17. The April through July Heise runoff volume represents the volume of water available for diversion into storage reservoirs and is an indicator of natural flow supplies. The graph below shows actual unregulated flow volumes at Heise for 1992 through 2021. The 1992 to 2021 average (3,284,000 acre-feet) is displayed by the dashed line.



April through July Unregulated Flow Volume at Heise, 1992-2021.[9]

[9] The Fourth Methodology Order included data only through 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

18. The sum of the Heise natural flow and the reservoir storage allocations is an indicator of the total supply of the Snake River. The sum of the Heise natural flow and reservoir storage allocations for each year from 1992-2021 is represented in the graph below.



The sum of the Heise natural flow and the storage allocation for the Snake River above Milner 1992-2021.[10]

iii. Irrigation Practices

19. A baseline year ("BLY") must be recent enough to represent current irrigation practices. R. Vol. 37 at 7099-7100. Current conditions should be represented by: (a) the net area of the irrigated crops, (b) farm application methods (flood/furrow or sprinkler irrigation), and (c) the conveyance system from the river to the farm. The type of sprinkler systems should be similar between the BLY and the current year.

20. Sprinkler systems are currently the predominant application system. *Id*. at 7101-02. To ensure that current irrigation practices are captured, selection of a BLY for the SWC should be limited to years subsequent to 1999. *Id*. at 7096; 7099-7100.

[10] The Fourth Methodology Order included data for the period 1990 to 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

21. Estimates of irrigated acres from the hearing show a trend of decreasing irrigated acreage. R. Vol. 28, 5205-15; R. Vol. 37 at 7100. According to the Hearing Officer, beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated. R. Vol. 37 at 7100.

22. The following table summarizes: a) SWC entities; b) shapefile source of reported irrigated acres; c) year shapefile created; d) decreed irrigated acres; (e) number of reported acres in shapefile; and f) irrigated acres used in this methodology order for the 2023 irrigation season. The number of irrigated acres used in this methodology order is the number of reported acres unless that number is larger than the decreed irrigated acres, and if so, then the decreed acres were used. This table will be updated annually based on the reported number of irrigated acres by each SWC entity in Step 1 of the Methodology Order.

Entity	Shapefile Source	Shapefile Year	Partial Decree Acres	Shapefile Acres	Acres Used in Methodology
A&B	PPU[1]	2010	15,924	21,972	15,924
AFRD2	PPU	2010	62,361	69,077	62,361
BID	SWC	2013	47,643	46,035	46,035
Milner	PPU	2010	13,335	13,264	13,264
Minidoka	SWC	2023	75,093	77,176	75,093
NSCC	PPU	2010	154,067	224,463	154,067
TFCC	SWC	2013	196,162	194,732	194,732

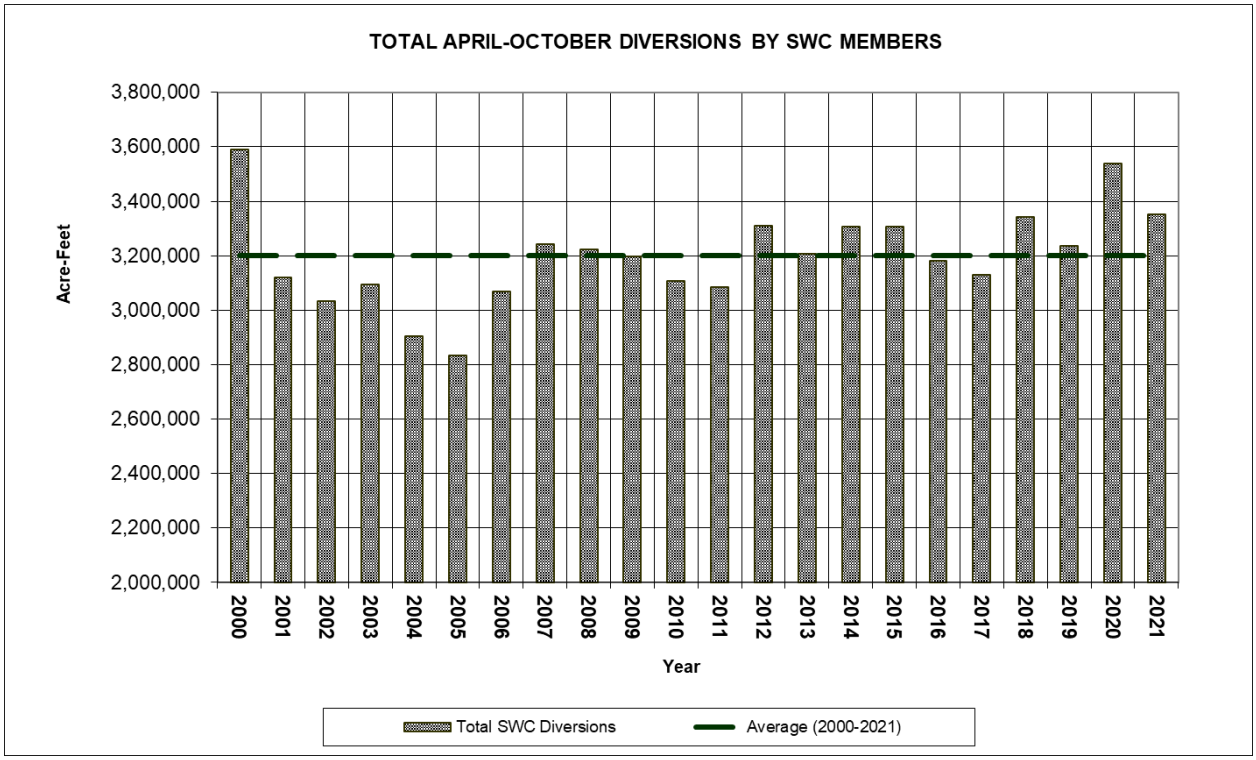
[1] IDWR permissible place of use.

Acres used in the methodology.

23. There are lands within the service areas of SWC entities that are irrigated with supplemental groundwater. Exhibit 3007. Supplemental groundwater is a factor the Director can consider in the context of a delivery call. *Memorandum Decision and Order on Petitions for Judicial Review* ("Methodology Remand Order*"*) in Gooding County Consolidated Case No. CV-2010-382, at 18-19. At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities.

iv. Diversions

24. The following figure summarizes the annual measured diversions by the combined SWC members from 2000-2021. Diversions for a baseline year should exceed the average diversions.



Total April-October Diversions by SWC Members.[11]

B. Selection of the Initial Baseline Year

25. When selecting the BLY the Director must evaluate recent data to determine whether the BLY section criteria are satisfied.

26. In the Fourth Methodology Order, the Department considered the years 2000-2014 when deciding the BLY. Ultimately, the Department chose an average of the years 2006, 2008, and 2012 for the BLY ("BLY 06/08/12"). For this Fifth Methodology Order, the years 2000-2021 were considered for the BLY selection. With the addition of new data from 2014 to 2021, the total diversions by the SWC for the previous BLY 06/08/12 are 100% of the average SWC diversions for the years 2000-2021. As a result of adding the new data, BLY 06/08/12 no longer satisfies the presumption criteria that total diversions in the BLY should exceed the average annual diversions. Mem. Decision & Order on Pets. for Jud. Rev., at 34, *IGWA v. Idaho Dep't of Water Res.*, No. CV-2010-382 (Gooding Cnty. Dist. Ct. Idaho Sept. 26, 2014).

[11] The Fourth Methodology Order did not include this chart. It was added to demonstrate that the baseline year is a year of above average total diversions.

27. Years 2018 and 2020 satisfy all the BLY selection criteria discussed above. Each of these years had (1) total diversions above the average diversions for the years 2000-2021, (2) total growing degree days above the average for the years 1992-2021, and (3) reference ET values above the average for the years 1992-2021. The years 2018 and 2020 also had total precipitation values below the average precipitation for the years 1992-2021 and were not water supply limited years. The Department has reviewed the SWC's diversion data for the 2020 irrigation season. The Department finds that 2020 ranks as the second-highest year of total diversions for the SWC and is more than one standard deviation above the average for the years 2000-2021. In comparison, 2018 ranks as the fourth-highest year of total diversions for the SWC and is less than one standard deviation above the average for the years 2000-2021. Choosing a BLY with above average diversions but within one standard deviation, ensures that a conservative year is selected that protects the senior while excluding extreme years from consideration. The Director concludes that total diversions for 2018 adequately protect senior water rights when predicting the demand shortfall at the start of the irrigation season and selects 2018 as the BLY.

Entity	2000-2021 Avg. Total Diversions (Acre-Feet)	06/08/12 Avg. Total Diversions (Acre-Feet)	06/08/12 % of Avg.	2018 Total Diversions (Acre-Feet)	2018 % of Avg.
A&B	59,474	59,993	101%	64,192	108%
AFRD2	427,978	427,672	100%	453,890	106%
BID	247,049	251,531	102%	262,211	106%
Milner	53,343	47,135	88%	58,417	110%
Minidoka	354,181	369,492	104%	354,851	100%
NSCC	996,267	978,888	98%	1,026,661	103%
TFCC	1,062,098	1,060,011	100%	1,121,717	106%
Total	3,200,389	3,194,722	100%	3,341,939	104%

Average SWC Diversions (acre-feet) for 2000-2021, 2006/2008/2012 BLY, and 2018 BLY.

C. Calculation of Reasonable In-Season Demand

28. Reasonable in-season demand (RISD) is the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the beneficial use of growing crops within the service area of the entity. Given that climate and system operations for the year being evaluated will likely be different from the BLY, the BLY must be adjusted for those differences. As stated by the Hearing Officer, "The concept of a baseline is that it is adjustable as weather conditions or practices change, and that those adjustments will occur in an orderly, understood protocol." R. Vol. 37 at 7098.

i. Project Efficiency

29. Project efficiency ("E_p") is the ratio of total volumetric crop water needs within a SWC entity's boundary and the total volume of water diverted by that entity to satisfy its crop needs. It is the same concept as system efficiency, which was presented at hearing. Ex. 3007 at

28-29. Implicit in this relationship are the components of seepage loss (conveyance loss), on-farm application losses (deep percolation, field runoff), and system operational losses (return flows) for which data is not obtainable by the Department. By utilizing project efficiency and its input parameters of crop water need and total diversions, the influence of the unknown components for which data is not obtainable can be captured and described without quantifying each of the components. Project efficiency is derived by dividing crop water need by total diversions as depicted in the algorithm below:

$$E_p = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,
CWN = crop water need, and
Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

30. Monthly SWC entity diversions ("Q_D") will be obtained from Water District 01's diversion records. Ex. 8000, Vol. II, at 8-4, 8-5. Raw monthly diversion values will then be adjusted to remove any water diversions that can be identified to not directly support the beneficial use of crop development within the irrigation entity. Examples of adjustments include the removal of diversions associated with in-season recharge and diversion of irrigation water on the behalf of another irrigation entity. Adjustments are unique to each SWC member and each irrigation season and will be evaluated each year. Any natural flow or storage water deliveries to entities other than the SWC for purposes unrelated to the original right will not be included as a part of the SWC water supply or carryover volume. Water that is purchased or leased by a SWC member may become part of the shortfall obligation to the extent that member has been found to have been materially injured. *See e.g.* R. Vol. 38 at 7201, n. 11 (Eighth Supplemental Order). Conversely, water supplied to private leases or to the rental pool by a SWC member will be included as a part of the SWC supply for that member because non-inclusion would unjustifiably increase the shortfall obligation.

31. Monthly project efficiencies will be computed for the entire irrigation season. Project efficiency varies from month-to-month during the season and will typically be lower during the beginning and ending of the season. Monthly project efficiencies will be divided into actual monthly crop water need ("CWN") values to determine RISD during the year of evaluation.

32. In the Fourth Methodology Order, project efficiencies for each SWC member were initially averaged over an eight-year period (2007-2014) and project efficiency greater or less than two standard deviations were excluded from the calculation. By including only those values within two standard deviations, extreme values from the data set are removed. Under the Fourth Methodology Order, an updated 8-year rolling average of project efficiencies was calculated each year the methodology was implemented. The Director now finds that averaging over a rolling period of 15 years results in project efficiency values that are more consistent from year-to-year, reducing the impact of short-term trends. The Director finds that it is still

appropriate to remove project efficiencies greater or less than two standard deviations from the average.

The following is a table of efficiency values averaged over the most recent fifteen-year period of record.

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.98	0.33	0.45	0.87	0.43	0.24	0.31	0.51
5	0.47	0.22	0.32	0.39	0.35	0.24	0.30	0.33
6	0.66	0.40	0.49	0.60	0.56	0.41	0.51	0.52
7	0.74	0.44	0.52	0.67	0.63	0.48	0.58	0.58
8	0.58	0.41	0.42	0.55	0.52	0.43	0.46	0.48
9	0.45	0.27	0.32	0.45	0.38	0.32	0.27	0.35
10	0.18	0.16	0.09	0.14	0.11	0.06	0.04	0.11
Season Avg.	0.58	0.32	0.37	0.52	0.43	0.31	0.35	

SWC Member Average Monthly Project Efficiencies from 2007-2021.[12]

ii. Crop Water Need

33. CWN is the volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability. CWN only applies to crops irrigated with surface water. CWN is the difference between the fully realizable consumptive use associated with crop growth, or ET, and effective precipitation (W_e) and is synonymous with the terms irrigation water requirement and precipitation deficit. Ex. 3024. For the purposes of the methodology, CWN is calculated as set forth below:

$$CWN = \sum_{i=1}^{n} (ET_i - W_e) A_i$$

Where,

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = effective precipitation,
A_i = total irrigated area of specific crop type,
i = index variable representing the different specific crop types grown within the irrigation entity, and
n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

[12] In the Fourth Methodology Order, this table summarized average E_p data for the period 2007 to 2014. This Fifth Methodology Order updates this table with average E_p data for the period 2007 to 2021.

iii. Evapotranspiration

34. ET can be estimated with theoretically based equations that calculate ET for an individual crop, necessitating crop distribution maps for each year. Ex. 3007A at 21, Figure 3, Tables 6-12; Ex. 3024 at 1-58; Ex. 8000, Vol. II at Chapter 9; Ex. 8000, Vol. IV, Appdx. AU.

35. At hearing, values of ET were estimated by the SWC from AgriMet, Ex. 8000, Vol. IV, Appdx. AU-1, and by the ground water users from ETIdaho, Ex. 3007A at 21; Ex. 3024 at 1-58. At this time, the Director finds that the use of AgriMet is more appropriate for determining ET than ETIdaho because AgriMet is available to all parties in real-time without the need for advanced programming. Accordingly, the methodology will rely on AgriMet derived ET values in the calculations of project efficiency, CWN, and RISD. In the future, with the development of additional enhancements, ETIdaho may become a more appropriate analytical tool for determining ET.[13]

36. CWN is derived by multiplying crop specific ET values, adjusted for estimated effective precipitation, by the total irrigated area of individual crop types, and summing for all crop types. The areas for individual crop types will be derived from published crop distributions from the United States Department of Agriculture's National Agricultural Statistics Service ("NASS"). Ex. 1005 at 1. NASS annually creates a crop-specific land cover digital dataset from satellite imagery and field checks. The dataset is called the Cropland Data Layer ("CDL"). Each year, the Department will calculate acreage by crop type for each SWC entity using NASS CDL data. In the future, the NASS data may not be the most accurate source of data. The Department prefers to rely on data from the current season if and when it becomes usable.

37. AgriMet ET and precipitation data are gathered at the Rupert and Twin Falls (Kimberly) stations. Both stations are in the vicinity of the SWC entities. A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), and Minidoka Irrigation District ("Minidoka") are nearest to the Rupert AgriMet station. ET data gathered at the Rupert station reasonably represents the climate conditions for A&B, BID, and Minidoka. American Falls Reservoir District No. 2 ("AFRD2"), Milner Irrigation District ("Milner"), North Side Canal Company ("NSCC"), and Twin Falls Canal Company ("TFCC") are nearest to the Twin Falls (Kimberly) AgriMet station. ET data gathered at the Twin Falls (Kimberly) station reasonably represents the climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, Vol. IV at AU-2, AU-8.

iv. Effective Precipitation

38. Effective precipitation ("W_e") is the amount of total precipitation held in the soil horizon available for crop root uptake. Effective precipitation will be estimated from total precipitation (W) employing the methodology presented in the USDA Technical Bulletin 1275. Ex. 8000, Vol. IV, Appdx. AU3, AU8. Total precipitation (W) data is published by the USBR as

[13] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meetings, IDWR discussed alternative methods of determining ET values, such as METRIC. However, the Director finds that the methods considered are not yet ready for incorporation into the administration of the SWC Delivery Call and will continue to rely on AgriMet ET data.

part of its Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet.[14] Ex. 8000, Vol. IV, Appdx. AU3. W_e values derived from AgriMet based precipitation values are independent of crop type.

39. AgriMet precipitation (W) values are easy to understand and regularly used by the farming, water supply, and water management communities. Accordingly, the methodology will rely on AgriMet derived W values in the calculations of CWN and RISD.

40. As with ET data, AgriMet precipitation data are available from the Rupert and Twin Falls (Kimberly) stations. AgriMet data from the Rupert station reasonably represents climate conditions for A&B, BID, and Minidoka. AgriMet data from Twin Falls (Kimberly) reasonably represents climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, Vol. IV at AU-2, AU-8.

v. Summary of Reasonable In-Season Demand Calculation

41. At the start of the irrigation season, RISD is equal to the BD, or total season adjusted diversions for the BLY. When calculated in-season, RISD is calculated below.

$$RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p,j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month j,
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j = index variable, and
m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

42. April RISD Adjustment: In April, the calculated RISD, which is the quotient of CWN and Ep, can underestimate actual canal operation diversions. Under-estimation occurs when the actual CWN value for April is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. Often, CWN in April is small due to precipitation, cool temperatures, and/or the immaturity of the crop. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events in April, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. To account for the conditions affecting the

[14] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meeting, IDWR discussed alternative methods to determine W values, such as PRISM. However, the Director finds that the methods considered are not yet ready for incorporation into the administration of the SWC Delivery Call and will continue to rely on AgriMet precipitation data.

usability of the calculated RISD value for April, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

43. When the calculation of CWN/Ep results in a value for the month of April less than the average April diversion volume over a record of representative years in the recent past, the April RISD is set equal to the average April diversion volume. When the calculation of CWN/Ep results in a value greater than the average April diversion volume, the April RISD is equal to the calculated CWN/Ep volume.

44. October RISD Adjustment: In October, the calculated RISD, which is equal to the CWN divided by Ep, can both under-estimate and over-estimate actual canal operation diversions. The RISD may be underestimated when the actual CWN value for October is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events in October, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. Furthermore, RISD may be underestimated in October when a farmer diverts water at the field head gate for farming practices other than strictly satisfying CWN. Examples of water diversion practices at the field head gate that sometimes occur in October include diverting water for soil salt leaching, diverting water to build up the soil moisture profile for the following irrigation season, and/or diverting water to wet-up bare soil to prevent wind-driven topsoil erosion.

45. Unlike the month of April, RISD can be over-estimated in October. RISD may be over-estimated in years when actual CWN in October is much greater than typical CWN over a record of representative years in the recent past due to low precipitation and/or warm temperatures. To account for the conditions affecting the usability of the RISD value calculated for October, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

46. When the calculation of CWN/Ep results in a value for the month of October greater than the maximum October diversion volume from a record of recent representative years, or less than the minimum October diversion volume from the same record of recent representative years, the October RISD is set equal to the average October diversion volume over the same period of recent representative years. When the calculation of CWN/Ep results in a value between the maximum and minimum October diversion volumes from a record of recent representative years, the October RISD is equal to the calculated CWN/Ep volume.

D. Adjustment of Forecast Supply

47. As stated by the Hearing Officer, "There must be adjustments as conditions develop if any baseline supply concept is to be used." R. Vol. 37 at 7093. A prediction of the upcoming season's supply and demand is calculated at the beginning of the irrigation season and

adjusted at specified milestones during the irrigation season to address changes in water supply and demand conditions in response to actual climatic and water supply conditions.

i. April Forecast Supply

48. The FS is comprised of natural flow and stored water.

49. Typically, within the first week of April, the USBR and the USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage from April 1 to July 31 for the forthcoming year. The joint forecast ("Joint Forecast") issued by the United States Bureau of Reclamation ("USBR") and the United States Army Corp of Engineers ("USACE") for the period April 1 through July 31 "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." R. Vol. 8 at 1379, ¶ 98. Given current forecasting techniques, the earliest the Director can predict material injury "with reasonable certainty" is soon after the Joint Forecast is issued. R. Vol. 2 at 226. With data from 1990 through the irrigation year previous to the current year, a regression equation will be developed for each SWC member.[15] The regression equations for A&B and Milner will be developed by comparing the actual Heise natural flow to the natural flow diverted. *See e.g.* R. Vol. 8 at 1416-22. For AFRD2, BID, Minidoka, NSCC, and TFCC, multi-linear regression equations will be developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted. The regression equations will be used to predict the natural flow diverted for the upcoming irrigation season. *Id*. at 1380. The actual natural flow volume predicted in the Director's April FS for each SWC entity will be one standard error below the regression line, which underestimates the available supply. *Id*.; Tr. p. 65, lns. 6-25; p. 66, lns. 1-2. The purpose of the shift to one standard error below the regression line is to ensure senior water right holders do not bear the risk of under-prediction of supply. The forecasting techniques will be revised based on updated data and the forecasting techniques may be revised when improvements to the forecasting tools occur.

50. The storage allocation for each member of the SWC will be estimated by the Department following issuance of the Joint Forecast. The Department will forecast reservoir fill and storage allocation consistent with the methods established in the *Fifth Supplemental Order Amending Replacement Water Requirements Final 2006 & Estimated 2007.* R. Vol. 23 at 4294-97 as explained below. The Department will evaluate the current reservoir conditions and the current water supply outlook to determine a historical analogous year or years to predict reservoir fill. The Department may identify and use a combination of different analogous years to predict individual reservoir fill. Input variables for determining the individual storage water allocation for each SWC member are: (a) the analogous year's or years' total reservoir fill volume; (b) an estimated evaporation volume; and (c) the previous year's carryover volume. The FS (the combination of the forecast of natural flow supply and the storage allocation) for each SWC member will be determined by the Director shortly after the date of the Joint Forecast.

[15] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meetings, IDWR discussed updating the regression models used to forecast the SWC's water supplies in April. However, the Director finds that the current models still adequately forecast water supplies in April and will continue to rely on the existing regression models.

51. Any time prior to the Director's final determination of the April FS, if the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected shortfall determination.

ii. July Forecast Supply

52. Approximately halfway through the irrigation season, the FS will be adjusted. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the year-to-date natural flow diverted by each member of the SWC. The natural flow diversion for the remainder of the irrigation season will be estimated based on the regression analyses.

53. The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains that occur in the Snake River between the Blackfoot to Milner reach. Many different predictor variables were considered when developing the models used to predict the natural flow supplies for the remainder of the season, including those variables used in the April FS.[16] A step-wise statistical analysis was employed to help select the variables for each model. The following variables were selected to forecast water supplies halfway through the irrigation season: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Ocean Plateau SNOTEL site; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The model predictors were optimized for each SWC member and are summarized in the sections below.

54. Linear regression equations for AFRD2, A&B, and Milner, will be developed by comparing the July 1 snow water equivalent (inches) at the Two Ocean Plateau SNOTEL site to the natural flow diversions. The regression equations for AFRD2, A&B, and Milner will be applied only in those years when the snow water equivalent at the Two Ocean Plateau SNOTEL site is greater than zero (0). Years when the snow water equivalent equals zero, the total natural flow prediction for the period July 1 to October 31 will be zero (0) AF.

55. Multiple linear regression equations for BID, Minidoka, and NSCC will be developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) March depth to water at well 05S 31E 27ABA1 and (3) the snow water equivalent at the Two Ocean Plateau SNOTEL site on June 15.

56. The multiple linear regression model for TFCC will be based on the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) Spring Creek total discharge (January – May) and (3) the snow water equivalent at the Two Ocean Plateau SNOTEL site on June 15.

[16] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. IDWR discussed updating the regression models used to forecast the SWC's water supplies in July. However, the Director finds that the current models still adequately forecast water supplies in July and will continue to rely on the existing regression models.

57. When adjusting the storage component of the FS, the Department must consider whether stored water has been allocated. In normal to dry years, the reservoirs will typically have filled to their peak capacity for the season and the storage water will have been allocated. If the BOR and Water District 01 have allocated stored water to spaceholders, the Department will use the actual preliminary storage allocations to the SWC. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on the storage allocations from an analogous year or years.

iii. Time of Need

58. The FS will again be adjusted shortly before the Time of Need. The Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

59. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the natural flow diverted by each member of the SWC as of the new forecast date. The natural flow diversion for the remainder of the irrigation season will be estimated based on a historical year with similar reach gains in the Blackfoot to Milner reach. The following is an example of estimating reach gains from an analysis of historical years. Reach gains for the years 2000 – 2003 and a portion of year 2004 are graphed below. Considering 2004 as an example of a current year and comparing 2004 to the hydrographs for 2000 – 2003, year 2003 has similar reach gains and is appropriately conservative. Therefore, the natural flow diverted in 2003 would be used to predict the natural flow diversions for the remainder of the 2004 season.



Example Reach Gain Analysis for 2004.

60. When adjusting the storage component of the FS, the Department will use the actual preliminary storage allocations to the SWC.

61. The adjusted FS is the sum of the year-to-date natural flow diversions, the predicted natural flow diversions for the remainder of the season, and the storage allocation.

E. Calculation of In-Season Demand Shortfall

62. The equation below determines the amount of predicted demand shortfall during the irrigation season.

$$IDS = FS - RISD$$

Where:

IDS = demand shortfall for specified evaluation points throughout the season,
FS = forecasted supply adjusted for specified evaluation point during the season, and
RISD = reasonable in-season demand from above.

63. The amount calculated represents the volume that junior ground water users with approved mitigation plans for delivery of water will be required to have available for delivery to members of the SWC found to be materially injured by the Director to avoid curtailment. The amounts will be calculated in April, at the middle of the season, and at the Time of Need.

III. Methodology for Determining Material Injury to Reasonable Carryover

64. Conjunctive Management ("CM") Rule 42.01.g states the following guidance for determining reasonable carryover: "In determining a reasonable amount of carry-over storage water, the Director shall consider average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system." Carryover shortfall will be determined following the completion of the irrigation season.

A. Projected Water Supply

65. CM Rule 42.01.g states that the Director "shall consider . . . the projected water supply for the system." Because it is not possible to adequately forecast the irrigation supply or demand for the following irrigation season at the end of the current irrigation season, the Director must estimate the carryover water needed in future dry years when demand exceeds supply, creating a need for carryover storage. The Director projected the water supply using typical dry years and subtracted it from a projected future demand to determine a projected carryover need.

66. The Heise natural flow is a predictive indicator of total water supply. For the years 2002 and 2004, the Heise natural flows were well below the long term average (1992-2021), but were not the lowest years on record.[17] The average of the 2002 and 2004 supply will be the projected supply, representing a typical dry year. The 2002 and 2004 supply is computed as follows:

- 2002 supply = natural flow diverted + new storage fill
- 2004 supply = natural flow diverted + new storage fill
- Projected supply = average of 2002 supply and 2004 supply

Carryover from previous years is not included in the 2002 and 2004 new storage fill because it was not new water supplied during the 2002 or 2004 irrigation year.

	2002 Natural Flow Diverted	2002 New Storage Fill	2002 Total Supply	2004 Natural Flow Diverted	2004 New Storage Fill	2004 Total Supply	Projected Supply (Average 02/04)
	----------Acre-Feet----------						
A&B	853	45,603	46,456	1	36,535	36,536	41,496
AFRD2	25,749	381,451	407,200	4,562	309,698	314,260	360,730
BID	89,886	174,454	264,340	102,706	152,387	255,093	259,716
Milner	5,058	43,430	48,488	1,027	35,175	36,202	42,345
Minidoka	143,937	256,602	400,539	141,460	229,574	371,034	385,787
NSCC	363,960	667,799	1,031,759	315,942	479,068	795,010	913,385
TFCC	851,970	186,233	1,038,203	881,345	150,218	1,031,563	1,034,883

SWC water supplies 2002, 2004, and 2002/2004 average (acre-feet).

67. Similar to projecting supply, the Director must also project demand. Because it is not possible to adequately forecast the irrigation demand for the following irrigation season at the end of the current irrigation season, the Director must project demand. R. Vol. 37 at 7109. The 2018 BLY will be the projected demand.

[17] The Fourth Methodology Order included data for the period 1991 to 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

68. The maximum projected carryover need is defined as the difference between a BLY demand and projected typical dry year supply. The following equation computes the maximum projected carryover need:

Maximum Projected Carryover Need = Projected Demand (2018 BLY) – Projected Supply (Average 02/04)

	Projected Demand (2018 BLY)	Projected Supply (average 02/04)	Maximum Projected Carryover Need
	----------Acre-Feet----------		
A&B	64,192	41,496	22,696
AFRD2	453,890	360,730	93,160
BID	262,211	259,716	2,495
Milner	58,417	42,345	16,072
Minidoka	354,851	385,787	0
NSCC	1,026,661	913,385	113,277
TFCC	1,121,717	1,034,883	86,834

SWC Projected Demand, Projected Supply and Maximum Projected Carryover Need (acre-feet).[18]

B. Average Annual Rate of Fill

69. CM Rule 42.01.g states that the Director "shall consider the average annual rate of fill of storage reservoirs . . . ." The average annual rate of fill of the storage reservoirs is the average of annual percentages of fill of each entity's reservoir space. The average annual reservoir storage fill is a benchmark that can be compared to projected carryover need. For purposes of the table below, any water contributed to the rental pool from the previous year was added to the next year's fill volume so that it does not artificially lower the percent fill. R. Vol. 37 at 7108. Water that is supplied to the rental pool lowers carryover and could impact the following year's fill. The percent fill does not include water deducted for reservoir evaporation.

[18] This Fifth Methodology Order updates this chart with the new baseline year and calculates new maximum projected carryover need values.

The annual percent fill of storage volume by SWC entity is shown below:

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
1992	96%	100%	98%	93%	75%	76%	86%
1993	100%	100%	100%	100%	100%	93%	92%
1994	100%	100%	100%	100%	99%	99%	99%
1995	100%	100%	100%	100%	100%	100%	100%
1996	100%	100%	100%	100%	100%	100%	100%
1997	100%	100%	100%	100%	100%	100%	100%
1998	100%	100%	100%	100%	100%	100%	100%
1999	100%	100%	100%	96%	98%	98%	99%
2000	100%	99%	99%	98%	100%	97%	97%
2001	100%	100%	100%	100%	100%	91%	87%
2002	41%	100%	100%	79%	92%	84%	88%
2003	43%	100%	99%	66%	92%	94%	99%
2004	34%	82%	97%	48%	94%	78%	63%
2005	58%	100%	100%	76%	98%	100%	100%
2006	98%	100%	99%	98%	100%	99%	99%
2007	89%	100%	97%	92%	94%	95%	97%
2008	100%	100%	100%	100%	100%	99%	100%
2009	100%	100%	100%	100%	100%	100%	100%
2010	100%	100%	100%	100%	100%	100%	100%
2011	100%	100%	100%	100%	100%	100%	100%
2012	88%	100%	97%	91%	94%	94%	96%
2013	80%	100%	97%	90%	90%	97%	100%
2014	93%	100%	100%	100%	95%	100%	100%
2015	100%	100%	100%	100%	100%	100%	100%
2016	100%	100%	100%	100%	95%	100%	100%
2017	100%	100%	100%	100%	100%	100%	100%
2018	100%	100%	100%	100%	100%	100%	100%
2019	96%	100%	99%	97%	98%	98%	99%
2020	100%	100%	100%	100%	100%	100%	100%
2021	100%	100%	100%	100%	98%	100%	100%
Average	91%	99%	99%	94%	97%	96%	97%
Std Dev	19%	3%	1%	12%	5%	6%	8%

Annual Percent Fill of Storage Volume by Entity (1992-2021).[19]

[19] The Fourth Methodology Order included data from 1995 through 2014. This Fifth Methodology Order updates this chart with data from 1992 through 2021.

C. Average Annual Carryover

70. CM Rule 42.01.g states that the Director "shall consider the . . . average annual carry-over for prior comparable water conditions . . .." Actual carryover volumes are from annual storage reports published by Water District 1. Actual carryover from 1992 through 2021 are sorted into two categories – below average (dry) and above average (wet). The categories are based on Heise natural flow volumes from April through September.

The 1992 to 2021 average natural flow volume is 3,827 thousand acre-feet ("KAF").

Cat.	Year	Heise Apr–Sept (KAF)	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
			----------	----------	----------	Acre-Feet	----------	----------	----------
	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1992	2,001	11,966	11,548	31,977	28,896	16,928	19,439	3,590
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	38,686
	2007	2,320	62,739	7,962	32,138	37,761	61,744	66,807	39,999
	2021	2,622	73,688	988	61,327	27,448	65,393	121,946	13,581
	2013	2,721	55,563	21,477	54,350	34,740	55,374	135,658	23,419
Below	2002	2,775	30,192	8,932	74,573	14,662	102,139	133,702	46,825
Avg	2004	2,833	0	18,617	48,809	8,735	99,199	54,141	58,813
(Dry)	2003	2,931	9,401	3,904	52,550	6,944	82,895	169,674	0
	2016	3,012	89,845	58,689	84,302	46,050	108,482	283,728	21,497
	2000	3,059	69,436	20,787	107,425	45,762	161,423	205,510	56,536
	2010	3,108	96,172	113,895	101,620	59,628	184,940	324,712	46,243
	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	68,352
	2015	3,208	88,616	57,344	73,449	47,322	130,942	208,274	44,957
	2012	3,385	68,109	41,395	88,526	42,214	119,361	198,853	72,267
	Avg.	**2,764**	**52,345**	**33,050**	**66,187**	**34,034**	**99,827**	**163,881**	**37,446**
	2019	3,930	88,506	106,833	113,278	48,393	203,434	406,865	94,193
	2020	3,962	95,105	99,782	110,640	52,750	168,213	360,234	66,609
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	78,562
	1993	4,116	102,493	123,508	154,461	60,332	264,713	300,942	104,424
	2008	4,288	91,835	104,219	124,128	62,359	182,722	414,171	70,192
	1995	4,447	103,295	167,451	159,214	75,451	258,028	476,312	68,576
Above	1998	4,498	100,817	144,057	157,265	69,384	227,726	494,385	156,433
Avg	2014	4,594	78,917	96,756	154,382	57,305	207,834	448,682	130,086
(Wet)	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
	2018	4,796	93,754	115,442	92,727	50,776	163,465	351,483	54,285
	1999	4,949	93,354	121,793	168,545	67,147	243,322	453,706	191,501
	1996	5,583	105,209	145,019	150,358	70,250	253,786	522,790	111,459
	2017	6,139	110,348	219,940	168,293	67,754	258,106	528,880	169,862
	2011	6,347	102,139	107,618	104,915	64,487	246,699	504,578	129,757
	1997	7,007	102,539	114,684	134,906	65,307	242,758	464,411	136,926
	Avg.	**4,890**	**97,453**	**128,021**	**134,778**	**62,492**	**220,533**	**434,659**	**110,560**

Actual Carryover Volumes by Entity, Sorted by Heise Natural Flow (1992-2021).[20]

[20] In the Fourth Methodology Order, this table summarized data for the period 1994 to 2014 and adjusted WD 01 carryover values to remove water received for mitigation or water rented by the SWC entity to augment their supplies. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021 and uses raw

71. In considering the principles articulated in CM Rule 42.01.g, the Director will project reasonable carryover shortfalls for members of the SWC. The following table represents the 2018 BLY diversion volumes and total reservoir storage space by entity. By dividing the total reservoir space by the 2018 diversion volume, a metric is established that describes the total number of seasons the entity's reservoir space can supply water.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
	----------Acre-Feet----------						
Projected Demand (2018 BLY)	64,192	453,890	262,211	58,417	354,851	1,026,661	1,121,717
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930
Number of Seasons of Reservoir Space	2.1	0.9	0.9	1.6	1.0	0.8	0.2

Total Reservoir Space[21] in Comparison to Demand.[22]

D. Reasonable Carryover

i. A&B

72. A&B's reservoir space has the lowest average annual rate of fill with the highest variability in fill. *See* Finding of Fact 69. In dry years, the potential exists that A&B's actual carryover will be less than the maximum projected carryover need. *See* Finding of Fact 68 & 70. A&B has an approximate two-year water supply provided by its total available storage space. *See* Finding of Fact 71. Because of its lower rate of fill, it is likely A&B will experience carryover shortfalls in consecutive dry years. Based on the evaluation criteria in CM Rule 42.01.g, A&B's reasonable carryover should be the maximum projected carryover need of 22,700 AF. *See* Finding of Fact 78.

ii. AFRD2

73. AFRD2 has the highest and most consistent reservoir rate of fill of any member of the SWC. AFRD2's storage space fills 99% of the time and has a fill variability of 3%. As

carryover values reported by WD 01. Raw numbers were used because adjusted numbers reduced the SWC's potential entitlement to reasonable carryover.

[21] *See* R. Vol. 8 at 1373-74.

[22] This Fifth Methodology Order updates this chart with the new baseline year and calculates new number of seasons of reservoir space values.

shown in the Annual Percent Fill table in Finding of Fact 69 above, its space only failed to fill in 2004 (82%) and 2000 (99%). AFRD2 has a high likelihood of filling during multi-year droughts and after a dry year. *See* Finding of Fact 69. Therefore, any unfilled space in the fall will most likely fill. AFRD2 has an approximate one-year supply available in storage. *See* Finding of Fact 71. AFRD2's storage space only failed to fill in years when the natural flow volume at Heise was less than 3,100 KAF. In a dry year, AFRD2's historical carryover volume is often less than the maximum projected carryover need using the equation set forth in Finding of Fact 68 and 70. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the reasonable carryover can be adjusted from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The historical average carryover of 16,700 AF in years when the natural flow volume at Heise was less than 3,100 KAF is the reasonable carryover for AFRD2. *See* Finding of Fact 78.

iii. BID & Minidoka

74. Historically, in dry years, BID's and Minidoka's carryover volumes have been well above the maximum projected carryover need and it is unlikely that they will have reasonable carryover shortfalls in the future. *See* Finding of Fact 68 & 70; *see also* R. Vol. 37 at 7105. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the reasonable carryover can be adjusted downward from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The reasonable carryover for BID and Minidoka is 0 AF. *See* Finding of Fact 78; *see also* R. Vol. 37 at 7105.

iv. Milner

75. Similar to A&B, Milner's reservoir space has the second lowest average annual rate of fill of all entities and has a high degree of variability in fill. *See* Finding of Fact 69. In dry years, the potential exists that Milner's actual carryover will be less than the maximum projected carryover need. *See* Finding of Fact 68 & 70. Milner has an approximate one and one half water supply available in storage. *See* Finding of Fact 71. Because of its rate of fill, it is likely Milner will experience carryover shortfalls in consecutive dry years. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the maximum projected carryover need of 16,100 AF is the reasonable carryover for Milner. *See* Finding of Fact 78.

v. NSCC

76. NSCC has a near-average annual rate of fill in comparison to all entities and an approximate one-year water supply available in storage. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its maximum projected carryover need will be less than its actual carryover. *See* Finding of Fact 68 & 70. Based on the evaluation criteria in CM Rule 42.01.g, the reasonable carryover for NSCC is 113,300 AF. *See* Finding of Fact 77.

vi. TFCC

77. TFCC has a near average annual rate of fill in comparison to all entities, but only 20% of a single year's water supply is available in storage. TFCC's storage space fills 97% of

the time and has a fill variability of 8%. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its maximum projected carryover need will be less than its actual carryover. *See* Finding of Fact 68 & 70. Based on the evaluation of the criteria in CM Rule 42.01.g, the reasonable carryover can be adjusted from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The historical average carryover in dry years of 37,400 AF is the reasonable carryover for TFCC. *See* Finding of Fact 78.

78. Reasonable carryover values for the SWC members are as follows:

	Reasonable Carryover (Acre-Feet)
A&B	22,700
AFRD2	16,700
BID	0
Milner	16,100
Minidoka	0
NSCC	113,300
TFCC	37,400

E. Reasonable Carryover Shortfall

79. Reasonable carryover shortfall is the numerical difference between reasonable carryover and actual carryover, calculated at the conclusion of the irrigation season. Actual carryover is defined as the storage allocation minus the total storage use plus or minus any adjustments. Examples of adjustments include SWC water placed in the rental pool and SWC private leases. Adjustments are unique to each irrigation season and will be evaluated each year. Any storage water deliveries to entities other than the SWC for purposes unrelated to the original right will be adjusted so that the water is not included as a part of the SWC carryover volume. Water that is purchased or leased by an SWC member may become part of the carryover shortfall obligation. *See e.g.* R. Vol. 38 at 7201, n. 11 (Eighth Supplemental Order). Conversely, actual carryover must be adjusted to assure that water supplied by a SWC member to private leases or to the rental pool will not increase the reasonable carryover shortfall obligation to the same SWC member.

80. Reasonable carryover shortfall is calculated as follows:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

F. Determination of Curtailment Date

81. The Eastern Snake Plain Aquifer Model ("ESPAM") is the best scientific tool available to simulate aquifer and Snake River responses to stresses applied to the aquifer, such as ground water pumping from a well. Curtailment of junior ground water pumpers in response to the SWC Delivery Call would result in a reduction in the withdrawal of groundwater and a corresponding reduction in aquifer stress. ESPAM simulates the effects of the reduction in

aquifer stress and calculates predicted increases in aquifer discharge to the Snake River resulting from the curtailment of ground water pumping from the ESPA.

82. ESPAM simulations can be either steady-state or transient.

83. Merriam-Webster's Dictionary defines steady-state as "a state or condition of a system or process … that does not change in time." *Steady state*, Merriam-Webster.com, https://www.merriam-webster.com/dictionary/steady-state (April 19, 2023). A steady-state ESPAM simulation can only model increases in aquifer discharge to the Snake River resulting from continuous curtailments of an identical magnitude and location until the impacts of curtailment are fully realized. For example, a steady-state analysis of the curtailment of 1,000 acres, assumes that irrigation of the same 1,000 acres is curtailed every year at the same rate of consumptive use, until the impacts of that curtailment reach a steady state, or no longer change from year to year.

84. Steady-state analysis does not calculate the time to reach steady-state conditions nor describe the seasonal timing of the impacts. For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved. The assumption of continuous curtailment does not reflect reality in the SWC Delivery Call. Curtailments ordered as prescribed in the methodology are neither continuous nor long-term. Irrigation with ground water does not occur at a constant rate throughout the year nor from year to year. It is important to predict what benefits to the river are realized during the irrigation season in which injury has been determined. A steady-state ESPAM simulation cannot predict what benefits are realized during the irrigation season. In contrast, a transient ESPAM simulation will predict the timing of changes in river reach gains.

85. ESPAM was calibrated using one-month stress periods and can simulate a single (or partial) irrigation season of curtailment and predict the resulting increase in aquifer discharge to the Snake River during the same irrigation season using a transient simulation. In the context of this proceeding, the transient approach identifies the junior ground water rights that must be curtailed to produce increases in Snake River flows sufficient to offset material injury in the current irrigation season.

86. Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year.[23] Fifty percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately four years. Ninety percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately 24 years.

87. A curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the full predicted IDS unless the shortfall exceeds the accruals to the near

[23] The near Blackfoot to Minidoka reach is the reach of the Snake River from which the SWC diverts.

Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights.

88. Steady-state simulations are appropriate for evaluating the average annual impact of aquifer stresses that have been, or will be, applied for decades (i.e., ground water pumping year after year, or continuous curtailment to the same date every year). The steady-state simulation of continuous curtailment applied in the Fourth Amended Methodology Order does not simulate the short-term curtailments prescribed in the methodology. The methodology prescribes curtailment only in years with a predicted IDS or carryover shortfall and prescribes the determination of a curtailment priority date that varies with the magnitude of the predicted shortfall.

89. Transient simulations are necessary to evaluate the impacts of aquifer stresses applied for short periods of time (i.e. short-term curtailments with varying priority dates). Transient simulations are necessary to simulate the short-term curtailments prescribed in the methodology.

CONCLUSIONS OF LAW

1. This order contains the methodology by which the Director will determine material injury to RISD and reasonable carryover to members of the SWC.

2. "The agency's experience, technical competence, and specialized knowledge may be utilized in the evaluation of the evidence." Idaho Code § 67-5251(5); IDAPA 37.01.01.600.

3. Idaho Code § 42-602 states that, "The director of the department of water resources shall have discretion and control of the distribution of water from all natural sources . . . . The director of the department of water resources shall distribute water . . . in accordance with the prior appropriation doctrine." According to the Hearing Officer, "It is clear that the Legislature did not intend to grant the Director broad powers to do whatever the Director might think right. However, it is clear also that the Legislature [in Idaho Code § 42-602] did not intend to sum up water law in a single sentence of the Director's authority." R. Vol. 37 at 7085. "Given the nature of the decisions which must be made in determining how to respond to a delivery call, there must be some exercise of discretion by the Director." *American Falls Res. Dist. No. 2 v. Idaho Dept. Water Resources*, 143 Idaho 862, 875, 154 P.3d 433, 446 (2007).

4. "The prior appropriation doctrine is comprised of two bedrock principles—that the first appropriator in time is the first in right and that water must be placed to a beneficial use." *In Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A & B Irrigation Dist.*, 155 Idaho 640, 650, 315 P.3d 828, 838 (2012). "The concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*; *American Falls*, 143 Idaho at 879, 154 P.3d at 450 (stating that while an appropriation for a beneficial use is "a valuable right entitled to protection . . . . Nevertheless, that property right is still subject to other requirements of the prior appropriation doctrine."); *Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 131, 369 P.3d 897, 909

(2016) (explaining the "policy of beneficial use" serves as a "limit on the prior appropriation doctrine.").

5. "Concurrent with the right to use water in Idaho 'first in time,' is the obligation to put that water to beneficial use." *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447) (referring to "'the constitutional requirement that priority over water be extended only to those using the water'"). "'It is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation, and the amount of water necessary for the purpose of irrigation of the lands in question and the condition of the land to be irrigated should be taken into account.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar v. Goodrich*, 27 Idaho 26, 44, 147 P. 1073, 1079 (1915)).

6. "[T]he policy of securing the maximum use and benefit, and least wasteful use of Idaho's water resources, has long been the policy in Idaho." *Idaho Ground Water Assoc.*, 160 Idaho at 131, 369 P.3d at 909 (citing *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 808, 252 P.3d 71, 89 (2011)). The Idaho Constitution enunciates a policy of promoting "optimum development of water resources in the public interest." Idaho Const. Art. XV, § 7; *Baker v. Ore-Ida Foods, Inc.,* 95 Idaho 575, 584, 513 P.2d 627, 636 (1973). "There is no difference between securing the maximum use and benefit and least wasteful use of this State's water resources and the optimum development of water resources in the public interest. Likewise, there is no material difference between 'full economic development' and the 'optimum development of water resources in the public interest.' They are two sides of the same coin. Full economic development is the result of the optimum development of water resources in the public interest." *Clear Springs*, 150 Idaho at 809, 252 P.3d at 90. "The policy of securing the maximum use and benefit, and least wasteful use, of the State's water resources applies to both surface and ground waters, and it requires that they be managed conjunctively." *Id.*

7. "Conjunctive administration 'requires knowledge by the [Department] of the relative priorities of the ground and surface water rights, how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts the water flows in that source and other sources.' . . . . That is precisely the reason for the CM Rules and the need for analysis and administration by the Director." *American Falls,* 143 Idaho at 877, 154 P.3d at 448.

8. The CM Rules incorporate all principles of the prior appropriation doctrine as established by Idaho law. *American Falls*, 143 Idaho at 873, 154 P.3d at 444; CM Rule 20.02, 10.12.

9. While the presumption under Idaho law is that an appropriator is entitled to his decreed water right and the CM Rules may not be applied to require a senior appropriator to demonstrate an entitlement to the water in the first place, there may be post-adjudication factors relevant to the determination of how much water is actually needed in responding to a delivery call. *American Falls*, 143 Idaho at 877-78, 154 P.3d at 448-49. Under the CM Rules and Idaho law, the Director has the "authority and responsibility to investigate claims when delivery calls

are made," and the "authority to evaluate the issue of beneficial use in the administration context." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840. As the Idaho Supreme Court stated, "'[w]hile the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception . . . the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost.'" *Idaho Ground Water Assoc.*, 160 Idaho at 131, 369 P.3d at 909 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 433). "[T]he Director must have some discretion to balance these countervailing considerations in a delivery call." *Id*. "'If this Court were to rule the Director lacks the power in a delivery call to evaluate whether the senior is putting the water to beneficial use, we would be ignoring the constitutional requirement that priority over water be extended only to those using the water.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447).

10. In responding to a delivery call under the CM Rules, the Director "may employ a baseline methodology as a starting point for considering material injury," provided the baseline methodology otherwise comports with the prior appropriation doctrine as established by Idaho law. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841; *see Methodology Remand Order* at 17.

11. Once the Director determines "that material injury is occurring or will occur," junior appropriators subject to the delivery call bear "the burden of proving that the call would be futile or to challenge, in some other constitutionally permissible way, the senior's call." *American Falls*, 143 Idaho at 878, 154 P.3d at 449; *Methodology Remand Order* at 31. Junior appropriators have the burden of proving by clear and convincing evidence that the delivery call is futile or otherwise unfounded. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841.

12. "This case illustrates the tension between the first in time and beneficial use aspects of the prior appropriation doctrine." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838. The Idaho Supreme Court has in this case "recognized the critical role of the Director in managing the water resources to accommodate both first in time and beneficial use aspects: 'Somewhere between the absolute right to use a decreed water right and an obligation not to waste it and to protect the public's interest in this valuable commodity, lies an area for the exercise of discretion by the Director.'" *Id.* at 651, 315 P.3d at 839 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 451). Thus, in this case the Director may use "a baseline methodology, both as a starting point for consideration of the Coalition's call and in determining the issue of material injury." *Id.* at 650-51, 315 P.3d at 838-39. However, "[i]f changing conditions establish that material injury is greater than originally determined pursuant to the baseline analysis, then adjustments to the mitigation obligation of the juniors must be made when the Director undertakes his mid-season calculations." *Methodology Remand Order* at 18.

13. In the context of conjunctive administration, the Director's methodology for projecting material injury does not impose an obligation upon members of the SWC to reprove

their water rights. To the extent water is available, members of the SWC are authorized to divert and store water in accordance with the terms of their licenses or decrees. Nothing established herein reduces that authorization. The question that the CM Rules require the Director to answer in this proceeding is, when water is not available to fill the water rights of the SWC, how much water is reasonably necessary for the SWC to accomplish the beneficial purpose of raising crops; because what is needed to irrigate crops may be less than the decreed or licensed quantities. *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar*, 27 Idaho at 44, 147 P. at 1079) ("'[i]t is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation"). Again, "[t]he concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*

14. Holders of senior-priority water rights may receive less than their licensed or decreed quantities and not suffer material injury within the meaning of the CM Rules. As a result, in-season demand should be viewed in light of reasonableness and optimum development of water resources in the public interest. CM Rules 20 and 42; *American Falls*, 143 Idaho at 876-80, 154 P.3d at 447-51; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650-652, 315 P.3d at 838-40.

15. Here, the Director has established a methodology for determining material injury to members of the SWC. The methodology predicts material injury to RISD by taking the difference between RISD and the FS. The years 2000 through 2021 were analyzed to select the BLY because the period of years captured current irrigation practices in a dry climate. Based upon evaluation of the record, members of the SWC were exercising more reasonable efficiencies during this time period than during the 1990s when supplies were more plentiful. During periods of drought when junior ground water users are subject to curtailment, members of the SWC should exercise reasonable efficiencies to promote the optimum utilization of the State's water resources. CM Rules 20 and 42; *American Falls,* 143 Idaho at 876-80, 154 P.3d at 447-51; *Clear Springs*, 150 Idaho at 807-10; 252 P.3d at 88-91; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650-652, 315 P.3d at 838-40.

16. At this time, with the recognition that the methodology is subject to adjustment and refinement, RISD will be equal to the historic demands associated with the BLY (2018) and will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

17. Recognizing that climate and surface water supplies (natural flow and storage) are inherently variable, the Director's predictions of material injury to RISD and reasonable carryover are based upon the best available information and the best available science, in conjunction with the Director's professional judgment as the manager of the State's water resources. Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will continue to

review and refine the process of predicting and evaluating material injury. The methodology will continue to be adjusted if the data supports a change.

18. If the Director predicts that the SWC will be materially injured because of a demand shortfall prediction, either in the preseason or in the midseason, the demand shortfall represents a mitigation obligation that must be borne by junior ground water users. If mitigation water in the amount of the projected RISD shortfall cannot be secured or optioned by junior ground water users to the satisfaction of the Director, the Director will curtail junior ground water users to make up any deficit. *See* Order on Pet. for Jud. Rev., at 19, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009),

19. In previous years, the Director used steady-state modeling when determining the curtailment priority date. The Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling to determine a curtailment priority date that would supply adequate water to the senior water right holders. While the first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling, the current version was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling for calculating the response to curtailment of groundwater use. As part of the Director's ongoing obligation to evaluate the methodology, the Director must evaluate whether the use of steady-state continues to be supportable.

20. In surface water administration, uses by holders of junior priority surface water rights are curtailed until the senior surface water rights are fully satisfied, absent a futile call and if the senior surface water users need the water to accomplish a beneficial use. In other words, under surface water administration, junior surface water rights are generally curtailed unless the senior gets water in the quantity and at the time and place required.

21. Rule 43 of the CM Rules mandates that when the Director evaluates a mitigation plan, the mitigation plan must ensure that water is delivered to holders of senior priority surface water rights in both the quantity and at the time and place required by the senior. In considering a proposed mitigation plan pursuant to Rule 43, the Director must evaluate:

> **b.** Whether the mitigation plan will provide replacement water, *at the time and place required by the senior-priority water right*, sufficient to offset the depletive effect of ground water withdrawal on the water available in the surface or ground water source *at such time and place as necessary* to satisfy the rights of diversion from the surface or ground water source. Consideration will be given to the history and seasonal availability of water for diversion so as not to require replacement water at times when the surface right historically has not received a full supply, such as during annual low-flow periods and extended drought periods.
> **c.** Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right *when needed during a time of shortage* even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for

> multi-season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior-priority right in the event the mitigation water source becomes unavailable.

IDAPA 37.01.03.11.043.b-c (emphasis added). In other words, there is an assumption that senior water right holders calling for delivery of water under the CM Rules will receive, by curtailment or by mitigation, "replacement water at the time and place required by the senior-priority water right, sufficient to offset the depletive effect of ground water withdrawal . . . ." Only in a mitigation plan can "multi-season accounting of ground water withdrawals" be employed, and even then, the plan must "assure protection of the senior-priority right in the event the mitigation water source becomes unavailable."

22. The Director has an obligation to address a mitigation deficiency in the year it occurs. Mem. Decision & Order on Pet. for Jud. Rev., at 10, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-2446 (Twin Falls Cnty. Dist. Ct. Idaho Dec. 3, 2014); Mem. Decision & Order, at 8–9, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-4970 (Twin Falls Cnty. Dist. Ct. Idaho June 1, 2015).

23. As described in Finding of Fact 87, curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the *full* predicted IDS unless the shortfall exceeds the accruals to the near Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights. This methodology order depends on an annual evaluation of material injury and should also employ curtailment and or mitigation that supplies replacement water at the time and place required by the senior-priority water right in a quantity sufficient to offset the depletive effect of ground water withdrawal and to assure protection of the senior-priority right. Curtailment dates, periodically determined at time of recalculating in-season demand shortfall (IDS), should be calculated by a transient model simulation that will return the full quantity of water to the senior priority rights at the time and place required.

24. As described in Conclusion of Law 18, junior ground water users with approved mitigation plans to deliver storage water as mitigation must, to the satisfaction of the Director, secure or option mitigation water to avoid curtailment. By requiring that junior ground water users secure mitigation water or have options to acquire water in place during the season of need, the Director ensures that the SWC does not carry the risk of shortage to their supply. By not requiring junior ground water users to deliver or assign mitigation water until the Time of Need, the Director ensures that junior ground water users supply only the amount of mitigation water necessary to satisfy the RISD. All approved methods of mitigation shall be considered in the Director's review of projected RISD shortfall.

25. Unless there is reasonable certainty that junior ground water users can secure the predicted volume of water and provide that water at the Time of Need, the protection afforded to the senior water right holders is compromised. The risk of shortage is then impermissibly shouldered by the SWC. Members of the SWC should have certainty entering the irrigation

season and at midseason that mitigation water will be delivered or assigned at the Time of Need, or curtailment of junior ground water rights will be ordered.

26. Because climate and the supply that the SWC appropriated (natural flow and storage) are inherently variable, the Director cannot and should not insulate the SWC against all shortages. The Director can, however, protect the SWC against reasonably predicted shortages to RISD.

27. Currently, the USBR and USACE's Joint Forecast is an indispensable predictive tool at the Director's disposal for predicting material injury to RISD. Given current forecasting techniques, the earliest the Director can predict material injury to RISD with reasonable certainty is soon after the Joint Forecast is issued in early April. The pre-irrigation season supply forecast for A&B and Milner can be predicted solely from the Joint Forecast. To improve the accuracy of prediction, the pre-irrigation season supply forecast for AFRD2, BID, Minidoka, NSCC, and TFCC will currently be predicted from both the Joint Forecast and from flow data at Box Canyon.[24]

28. By shifting the April Forecast Supply prediction curve down one standard error of estimate, the Director purposely underestimates the water supply that is predicted. The Director further guards against RISD shortage by using the 2018 BLY, which has above average diversions, above average ET, below average in-season precipitation, and above average growing degree days. The 2018 BLY represents a year in which water supply did not limit diversions. The Director's prediction of material injury to RISD is purposely conservative. While it may ultimately be determined after final accounting that less mitigation water was owed than was provided, this is an appropriate burden for junior appropriators to carry. Idaho Cost. Art. XV, § 3; Idaho Code § 42-106. Shifting the prediction curve down one standard error of estimate and adoption of a BLY that uses above average diversions, above average temperatures and ET and below average precipitation is necessary to protect senior rights if the Director administers to an amount less than the full decreed quantity of the SWC's rights. *Methodology Remand Order* at 33, 35.

29. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water provided by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

30. "Storage water is water held in a reservoir and is intended to assist the holder of the water right in meeting their decreed needs." *American Falls*, 143 Idaho at 878, 154 P.3d at 449. "Carryover is the unused water in a reservoir at the end of the irrigation year which is retained or stored for future use in years of drought or low-water." *Id.* Under Idaho Code, "[o]ne may acquire storage water rights and receive a vested priority date and quantity, just as with any other water right," but "[t]here is no statutory provision for obtaining a decreed right to 'carryover' water." *Id.* Rather, carryover is a "component of the storage right." Order on Pet. for Jud. Rev., at 20, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-

[24] The method for predicting the natural flow supply may be subject change based upon improved predictive models.

0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009). Storage carryover is "permissible . . . absent abuse." *American Falls*, 143 Idaho at 880, 154 P.3d at 451.

31. The storage reservoirs implicated in this proceeding were intended to provide supplemental supplies of water "to create a buffer against the uncertainty of the weather." *Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation* (April 29, 2008) at 6. "The history of the development of the reservoir system, most recently Palisades, makes it clear that storage of water was a primary purpose to prevent disaster during periods of shortage as have been experienced in the recent past." *Id*. at 60. The purpose of carryover also is "insurance against the risk of future shortage." Order on Pet. for Jud. Rev., at 20, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009).

32. CM Rule 42.01 sets forth factors the Director "may consider in determining whether the holders of water rights are suffering material injury and using water efficiently and without waste." CM Rule 42.01 does not limit the Director's determination of reasonable carryover to consideration of the factors enumerated in CM Rule 42.01g, but only requires that the Director consider those enumerated factors. One such factor is "[t]he extent to which the requirements of the holder of a senior priority water right could be met with the user's existing facilities and water supplies." CM Rule 42.01g. This factor is qualified, however, by the provision that "the holder of a surface water storage right shall be entitled to maintain a reasonable amount of carry-over storage to assure water supplies for future dry years." CM Rule 42.01g. Thus, CM Rule 42.01g does not require water right holders to exhaust their storage water supplies prior to making a delivery call under the CM Rules. This is consistent with the purposes of the storage reservoirs and the carryover components of the storage water rights.

33. In considering CM Rule 42.01g in *American Falls*, the Idaho Supreme Court framed the SWC's challenge to the "reasonable carryover" provision as presenting the question of whether the holders of storage water rights are "entitled to insist on all available water to carryover for future years in order to assure that their full storage water is met (regardless of need)," *American Falls,* 143 Idaho at 879, 154 P.3d at 450, and answered this question in the negative:

> At oral argument, one of the irrigation district attorneys candidly admitted that their position was that they should be permitted to fill their entire storage water right, regardless of whether there was any indication that it was necessary to fulfill current or future needs and even though the irrigation districts routinely sell or lease the water for uses unrelated to the original rights. This is simply not the law of Idaho. While the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception. As previously discussed, the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost. Supra, paragraph 11.

Id. at 880, 154 P.3d at 451.

34. As discussed in the Findings of Fact, reasonable carryover is determined by projecting the water supply for the system. This is accomplished by projecting the 2002/2004 natural flow and average annual storage fill and the 2018 demand. Next, the Director examines the average annual rate of fill of each SWC entity's reservoir space to determine each entity's relative probability of fill. Finally, the Director examines the average annual carryover for prior comparable water conditions by reviewing Heise natural flow.

35. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of the SWC. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

36. Recognizing that reservoir space held by members of the SWC may fill, and to prevent the waste of water, junior ground water users are not required to deliver or assign the volume of reasonable carryover until after the Day of Allocation (defined in footnote 27, *infra*). Junior ground water users are obligated to hold the secured or optioned mitigation water until reservoir space held by the SWC fills. If the reservoir space does not fill, junior ground water right holders must deliver or assign the secured or optioned mitigation water to the senior water right holders up to the amount of storage space that did not fill.

ORDER

Consistent with the forgoing, the Director HEREBY ORDERS that, for purposes of determining material injury to RISD and reasonable carryover, the following steps will be taken:

1. Step 1: By April 1, members of the SWC will submit electronic shape files to the Department delineating the total anticipated irrigated acres for the upcoming year within their water delivery boundary or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent. Department staff will review submitted shapefiles and modify them as necessary to ensure that: (1) the total acreage count does not exceed the decreed number of acres; (2) all of the irrigated land is located within the decreed place of use; and (3) acres are not counted more than once due to overlapping polygons within a shape file or between shape files submitted by different SWC members. Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department. If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery. If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season. The Department will electronically post

electronic shape files for each member of the SWC for the current water year for review by the parties. In determining the total irrigated acreage, the Department may account for supplemental ground water use. The Department currently does not have sufficient information to accurately determine the contribution of supplemental ground water to lands irrigated with surface water by the SWC. If and when reliable data is available to the Department, the methodology will be amended to account for the supplemental ground water use.

2. If the acreage count is under reported by more than five percent of the irrigated acreage limit of the water right, then the Department will assess the impact of this reduction in use of the water right on any mitigation requirement.

3. Step 2: Typically within the first two weeks of April, the USBR and USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage for the period April 1 through July 31. Within fourteen (14) days after issuance of the Joint Forecast, the Director will issue a final order predicting the April FS for the water year for each SWC entity. The Director will compare the April FS for each SWC entity to the BD for each SWC entity to determine if an in-season demand shortfall ("IDS") is anticipated for the upcoming irrigation season. The April FS for each SWC entity is the sum of the forecasted natural flow supply and the forecasted storage allocation for each SWC entity. The forecasted natural flow supply will be computed with regression algorithms. The forecasted storage allocation will be determined by comparing storage accruals in an analogous year(s). A transient ESPAM simulation will be run to calculate the curtailment priority date predicted to produce a volume of water equal to the IDS in the near Blackfoot to Minidoka reach between May 1 and September 30 of the current year. Curtailment will be simulated within the area of common ground water supply as described by CM Rule 50.01.

4. Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April IDS unless the April IDS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

5. Step 4: As soon as practical after the deadline for junior ground water users with approved mitigation plans to provide notice of secured water, the Director will issue an order curtailing junior ground water users who: (1) do not have approved mitigation plans; (2) fail to secure the required water consistent with their approved mitigation plans; or (3) otherwise fail to comply with their approved mitigation plans.[25]

[25] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

6. If, at any time prior to the Director's final determination of the April FS, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected demand shortfall determination.

7. Step 5: If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall. If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report, which typically occurs soon after the Day of Allocation,[26] the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC. The amount of reasonable carryover to be provided shall not exceed the empty storage space on the Day of Allocation for that entity. If water is owed in addition to the reasonable carryover shortfall volume, this water shall be delivered or assigned to members of the SWC at the Time of Need, described below. The Time of Need will be no earlier than the Day of Allocation.

8. Step 6: Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS and (3) estimate the Time of Need date.[27]

9. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The cumulative CWN volume will be calculated for all land irrigated with surface water within the boundaries of each member of the SWC. Volumetric values of CWN will be calculated using ET and precipitation values from the USBR's AgriMet program, irrigated areas provided by each entity, and crop distributions based on NASS data.

10. The FS for each SWC is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on regression analysis. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on an analogous year(s).

11. The calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

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[26] The Day of Allocation is the time in the irrigation season when the Water District 01 watermaster can issue allocations to storage space holders after the reservoir system has achieved its maximum physical fill, maximum water right accrual, and any excess spill past Milner Dam has ceased. Tr. p. 902, lns. 7-25; p. 903, lns. 1-10.

[27] At the earliest established Time of Need for any member of the SWC, junior ground water users are required to provide remaining mitigation to all materially injured members of the SWC.

12. This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. The Director will then issue revised RISD and DS values. Any increase to the projected IDS for each SWC entity is an additional mitigation obligation of the junior ground water users.

13. Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water or to conduct other approved activities pursuant to an approved mitigation plan that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users.[28] A transient ESPAM simulation will be run to determine the priority date to produce the necessary additional mitigation obligation volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

14. Step 7: Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS; and (3) establish the Time of Need. The revised FS for each SWC entity is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on analogous year(s) with similar Blackfoot to Milner reach gains. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01.

15. This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The Director will then issue revised RISD and IDS values.

16. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the demand shortfall volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

17. Step 8: At the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised IDS calculated at the Time of Need. Alternatively, any additional mitigation obligation calculated in Step 6 and Step 7 can be satisfied from each SWC member's reasonable carryover if (a) the reasonable carryover exceeds the additional mitigation obligation, and (b) the junior ground water users secure sufficient water to replace the reasonable carryover pursuant to an approved mitigation plan.

[28] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

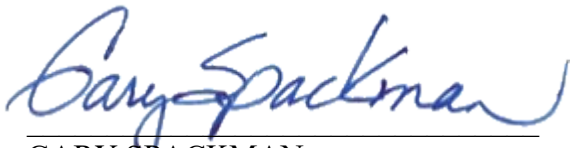
18. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water delivered by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

19. Step 9: Following the end of the irrigation season (on or before November 30), the Department will determine the total actual volumetric demand and total actual CWN for the entire irrigation season. This information will be used for the analysis of reasonable carryover shortfall, selection of future BLY, and for the refinement and continuing improvement of the method for future use.

20. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of SWC. These estimates will be based on, but not limited to, the consideration of the best available water diversion and storage data from Water District 01, return flow monitoring, comparative years, and RISD. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the reasonable carryover shortfall volume by September 30 of the following year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

IT IS FURTHER ORDERED that this Fifth Methodology Order supersedes all previously issued methodology orders in this matter.

Dated this _21st_ day of April 2023.



GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of April 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email

Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Megan Jenkins
Administrative Assistant II

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER REGARDING APRIL 2023 FORECAST SUPPLY** **(METHODOLOGY STEPS 1–3)**

FINDINGS OF FACT

1. On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"). The Methodology Order established nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies steps 1, 2, and 3 of the Methodology Order.

A. Step 1

2. By April 1 of each year, Step 1 requires members of the SWC to submit to the Department electronic shapefiles delineating the total anticipated irrigated acres for the upcoming year "or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent." *Methodology Order* ¶ 1 at 39.

3. On February 6, 2023, the Department received a letter from American Falls Reservoir District #2 ("AFRD2"), stating that its total number of irrigated acres has not varied by more than five percent.

4. On March 2, 2023, Minidoka Irrigation District ("Minidoka") submitted its electronic shapefile delineating its total irrigated acres to the Department.

5. On March 10, 2023, the Department received a letter from A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), Milner Irrigation District ("Milner"), North Side Canal Company ("NSCC") and Twin Falls Canal Company ("TFCC"), stating that their total number of irrigated acres for 2023 will not vary by more than five percent from the electronic shapefiles submitted in prior years.

6. Based on the information submitted by the SWC, the Department will use the following total irrigated acres:

	Total Irrigated Acres[1]	Data Source
A&B	15,924	SRBA Partial Decree
AFRD2	62,361	SRBA Partial Decree
BID	46,035	2013 shapefile submitted by BID, reduced by Department for overlapping acres and acres outside of service area.
Milner	13,264	2010 service area shapefile, reduced by Department for overlapping acres and acres outside of service area.
Minidoka	75,093	SRBA Partial Decree
NSCC	154,067	SRBA Partial Decree
TFCC	194,732	2013 shapefile submitted by TFCC, reduced by Department for overlapping acres and acres outside of service area.

B. Step 2

7. Step 2 states that, within fourteen days of the issuance of the joint forecast prepared by the United States Bureau of Reclamation and the United States Army Corp of Engineers, the Director "will issue a final order predicting the April [Forecast Supply] for the water year for each SWC entity. The Director will compare the April [Forecast Supply] for each SWC entity to the [Baseline Demand] for each SWC entity to determine if a in-season demand shortfall ("IDS") is anticipated for the upcoming irrigation season." *Methodology Order* ¶ 3 at 40.

8. On April 7, 2023, the joint forecast ("Joint Forecast") was announced, predicting an unregulated inflow 3,700,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 112% percent of average.[2] The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Id.* ¶ 49 at 18 (citation omitted).

9. The Heise natural flow data from years 1990–2022 were data inputs for development of regression equations for A&B and Milner to predict the natural flow supply.[3] Data greater or less than two standard deviations from average were excluded from the regression development.

10. The April–July Heise natural flow data from the years 1990–2022 and Box Canyon November–March total discharge data for the period 1989–2022, were data inputs for development of multiple linear regression equations to predict the natural flow supplies for

[1] The number of irrigated acres used in this methodology order is the number of reported acres unless that number is larger than the decreed irrigated acres, and if so, then the decreed acres were used.

[2] The average is based on the years 1991-2020. The Joint Forecast relies on a "30-Year Climate Normal" to calculate an Average April through July runoff volume.

[3] Attached hereto, as Attachment A, are the regression analyses for each SWC entity used to predict natural flow supply.

AFRD2, BID, Minidoka, NSCC, and TFCC. *Methodology Order* ¶ 49 at 18. The U.S. Geological Survey measures and monitors the flow at the Box Canyon stream flow measurement gage. The Box Canyon November–March total discharge used by the Director in the regression models for 2023 totaled 91,898 acre-feet.

11. The storage allocations were predicted for each SWC member. As of April 11, 2023, preliminary water right accounting for the 2023 irrigation year had not been completed. Storage allocations were calculated using an average of actual storage allocations of analogous years. The Surface Water Supply Index (SWSI)[4], produced by the Natural Resources Conservation Service (NRCS), is calculated by summing reservoir carryover and the forecasted spring and summer streamflow runoff. The April 1 SWSI indicates the water supply in 1993 and 2016 are analogous to the water supply in 2023. Based on the analogous years, the Director anticipates SWC members will receive 95–100% of their allocation. The storage allocations are based on the anticipated allocations minus evaporation charges.

12. Based on the above, the Director projects as follows:

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	BLY 2018	Shortfall
A&B	14,833	135,411		150,244	64,192	0
AFRD2	115,223	387,853	1,000	504,076	453,890	0
BID	109,313	221,713	5,130	336,156	262,211	0
Milner	18,347	88,047		106,393	58,417	0
Minidoka	156,468	342,620	8,370	507,458	354,851	0
NSCC	457,802	819,773	-7,750	1,269,825	1,026,661	0
TFCC	820,663	232,606	-6,750	1,046,519	1,121,717	75,200
				Total Projected Demand Shortfall (AF)		75,200

C. Step 3

13. Step 3 requires the following:

> Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April IDS unless the April IDS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the

[4] SWSI is a predictive indicator of the surface water available in a basin compared to historic supply. The SWSI is produced monthly by the Natural Resources Conservation Service (NRCS). *See* Nat. Res. Conserv'n Serv., U.S. Dep't of Agric., *Surface Water Supply Index (SWSI)*, https://www.nrcs.usda.gov/wps/portal/nrcs/detail/id/snow/waterproducts/?cid=stelprdb1240689 (last visited Apr. 20, 2022).

individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

Methodology Order ¶ 4 at 40.

14. The predicted April DS for TFCC is 75,200 acre-feet. The total predicted DS is 75,200 acre-feet.

15. The Eastern Snake Plain Aquifer Model ("ESPAM") is used to predict the junior priority water rights that must be curtailed to produce the volume of water equal to the predicted April DS in the near Blackfoot to Minidoka reach. The ESPAM is updated periodically as new field measurements and advancements in modeling technology become available. ESPAM Version 2.2 ("ESPAM2.2") is the current version. ESPAM2.2 model documentation reports (including a model calibration report, a predictive uncertainty analysis, a superposition model scenario, and a curtailment scenario) were finalized on May 27, 2021. *See* Idaho Dep't of Water Res., *ESPAM2.2 Reports* (2021), https:// research.idwr.idaho.gov/files/projects/espam/ browse/ESPAM22_Reports/.

16. The Department ran ESPAM2.2 to predict the junior priority water rights within the area of common ground water supply that must be curtailed to produce the volume of water equal to the predicted April DS between the May 1 and September 30 of this irrigation season pursuant to the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*. Ground water rights bearing priority dates later than December 30, 1953, must be curtailed to produce the volume of water equal to the predicted April DS in the near Blackfoot to Minidoka reach.

CONCLUSIONS OF LAW

1. The Fifth Judicial District Court, in and for the County of Minidoka, held that the evidentiary standard of proof to apply in conjunctive administration of hydraulically connected water rights is clear and convincing. *See* Mem. Decision & Order on Pets. for Jud. Rev., *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho May 4, 2010); Mem. Decision & Order on Pets. for Reh'g, *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho Nov. 2, 2010).

2. "Clear and convincing evidence refers to a degree of proof greater than a mere preponderance." *Idaho State Bar v. Topp*, 129 Idaho 414, 416, 925 P.2d 1113, 1115 (1996) (internal quotations removed). "Clear and convincing evidence is generally understood to be '[e]vidence indicating that the thing to be proved is highly probable or reasonably certain.'" *State v. Kimball*, 145 Idaho 542, 546, 181 P.3d 468, 472 (2008) (citing *In re Adoption of Doe*, 143 Idaho 188, 191, 141 P.3d 1057, 1060 (2006)); *see also Idaho Dep't of Health & Welfare v. Doe*, 150 Idaho 36, 41, 244 P.3d 180, 185 (2010).

3. The Director must utilize the best available technology for determining the impact of junior ground water diversions. *See Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 814,

252 P.3d 71, 95 (2011). ESPAM 1.1 and 2.1 are the model versions utilized previously in SWC delivery call proceedings. The Director determined that ESPAM 2.1 is the best available scientific tool for predicting the effects of ground water pumping. *See Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 124, 369 P.3d 897, 902 (2016). ESPAM 2.2 is the latest version of the ESPAM model. The improvements incorporated into ESPAM 2.2, as discussed in Finding of Fact 15, make it the best available scientific tool for predicting the effects of ground water pumping in this proceeding.

4. In 2023, the Director has sufficient information to quantify irrigated areas for each of the SWC members as required by Step 1.

5. The Joint Forecast predicts an unregulated inflow of 3,700,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 112% of average.

6. The April predicted DS is 75,200 acre-feet. Junior ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply must mitigate for their proportionate share of the predicted DS in accordance with an approved mitigation plan.[5] Junior ground water users mitigating for their proportionate share of the predicted DS with a secured volume of water pursuant to an approved mitigation plan must, to the satisfaction of the Director, secure their proportionate share for delivery to the injured members of the SWC on or before May 5, 2023. There was a reasonable carryover shortfall of 49,309 acre-feet in the fall of 2022. However, because junior ground water users did not secure any mitigation water for a carryover shortfall, there is no adjustment to the mitigation obligation.

7. If, on or before May 5 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply fail to establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user. Junior ground water users who are mitigating with a secured volume of water are not required to assign the secured volume of water until after the Director issues a subsequent order requiring assignment of the water.

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[5] There are seven approved mitigation plans in place responding to the SWC delivery call filed by: 1) A&B Irrigation District, 2) Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID"), 3) the Idaho Ground Water Appropriators, Inc. ("IGWA"), 4) certain cities commonly referred to as the "Coalition of Cities", and 5) certain entities commonly referred to as the "Water Mitigation Coalition." A&B Irrigation District's proportionate share of the predicted DS of 75,200 acre-feet is 458 acre-feet. Due to the nature of the mitigation plans for SWID, the Coalition of Cities and the Water Mitigation Coalition, these entities do not need to establish that they can mitigate for their proportionate share of the predicted DS. IGWA has two approved mitigation plans. If IGWA is in compliance with mitigation plan CM-MP-2016-001, IGWA does not need to establish that it can mitigate for its proportionate share of the predicted DS. If IGWA seeks to provide mitigation by delivery of storage water as approved in mitigation plan CM-MP-2009-007, IGWA's proportionate share of the predicted DS of 75,198 acre-feet is 63,645 acre-feet.

8. If, at any time prior to the Director's final determination of the April Forecast Supply, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, predicted DS determination.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED as follows:

The Director predicts an in-season DS of 75,200 acre-feet. On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

Dated this 21st day of April 2023.

GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of April 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

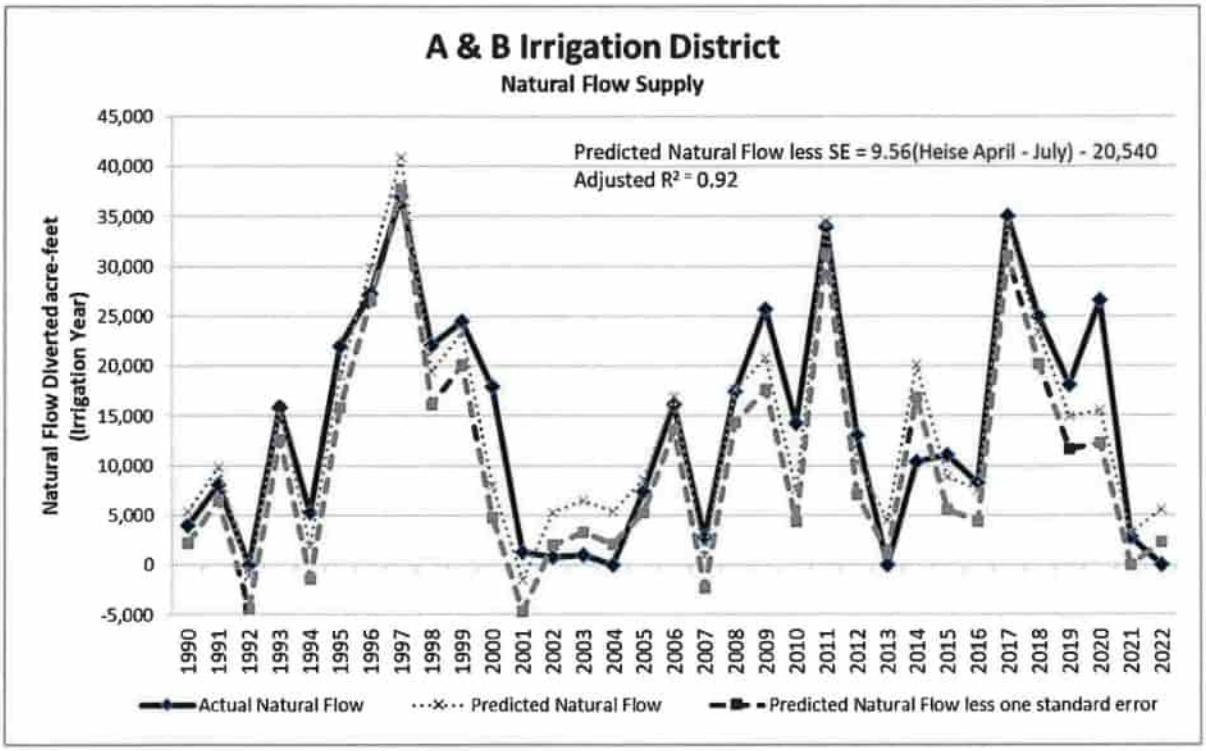
John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email

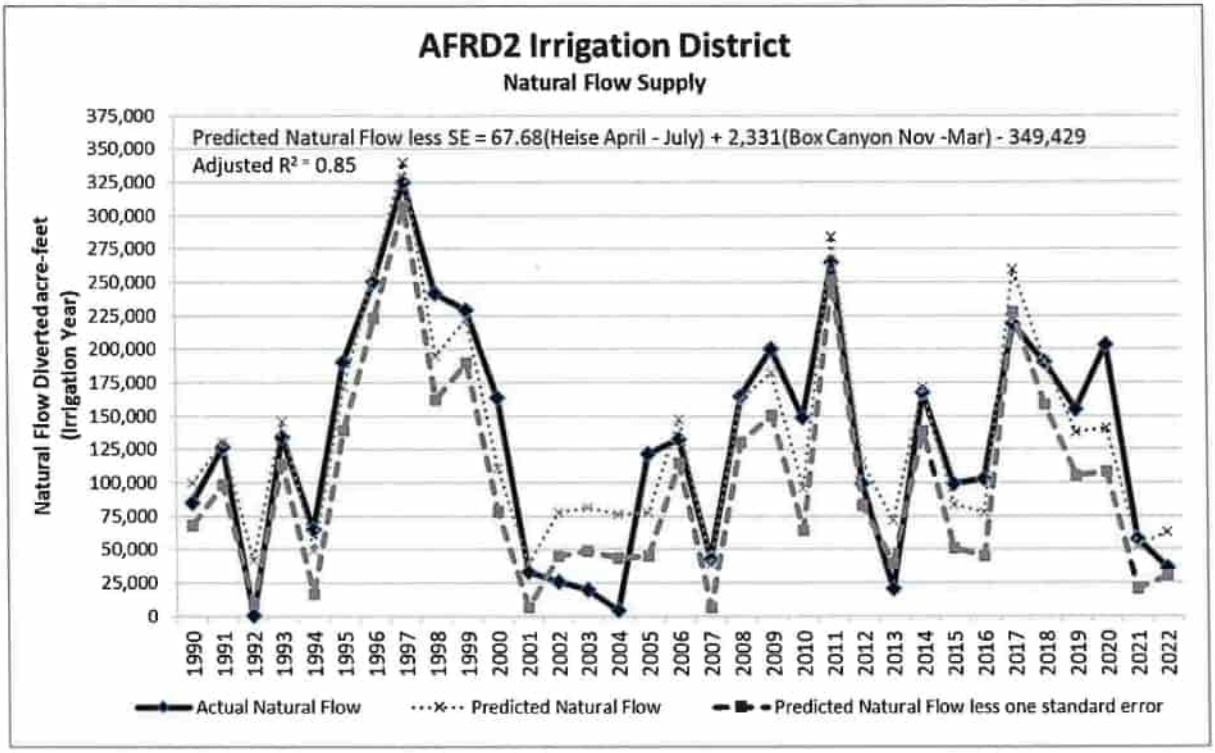
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

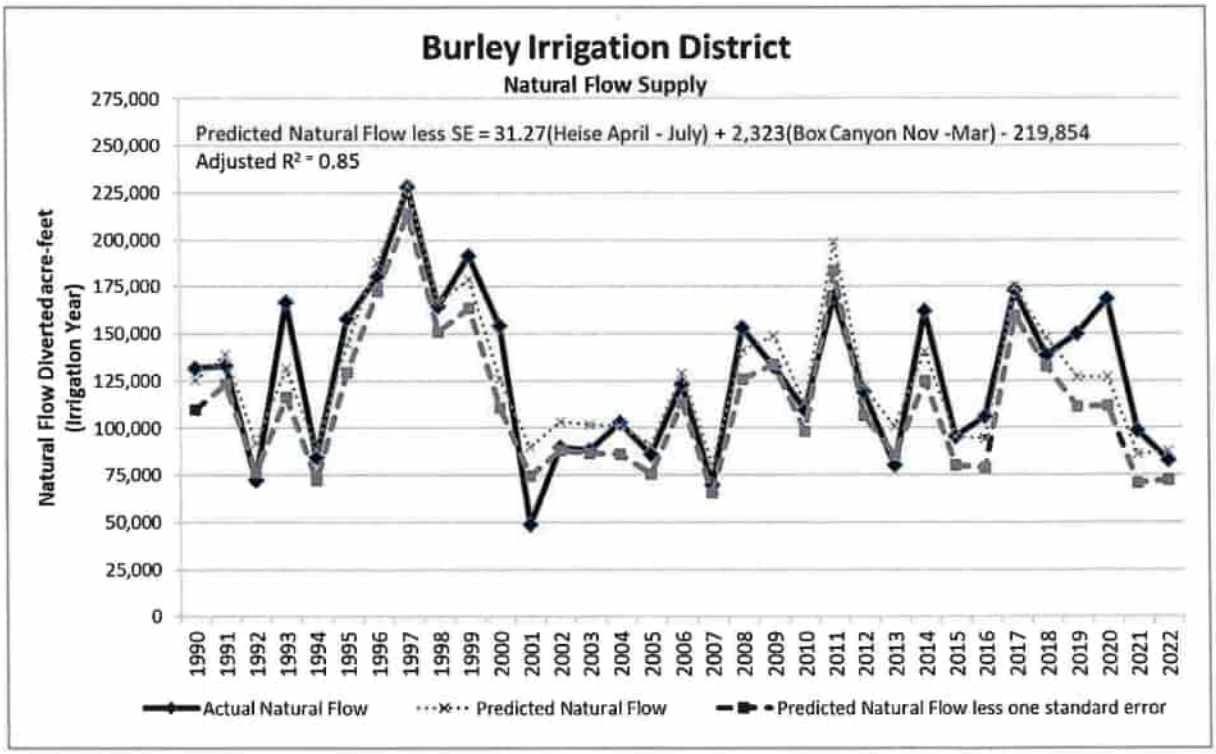
Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

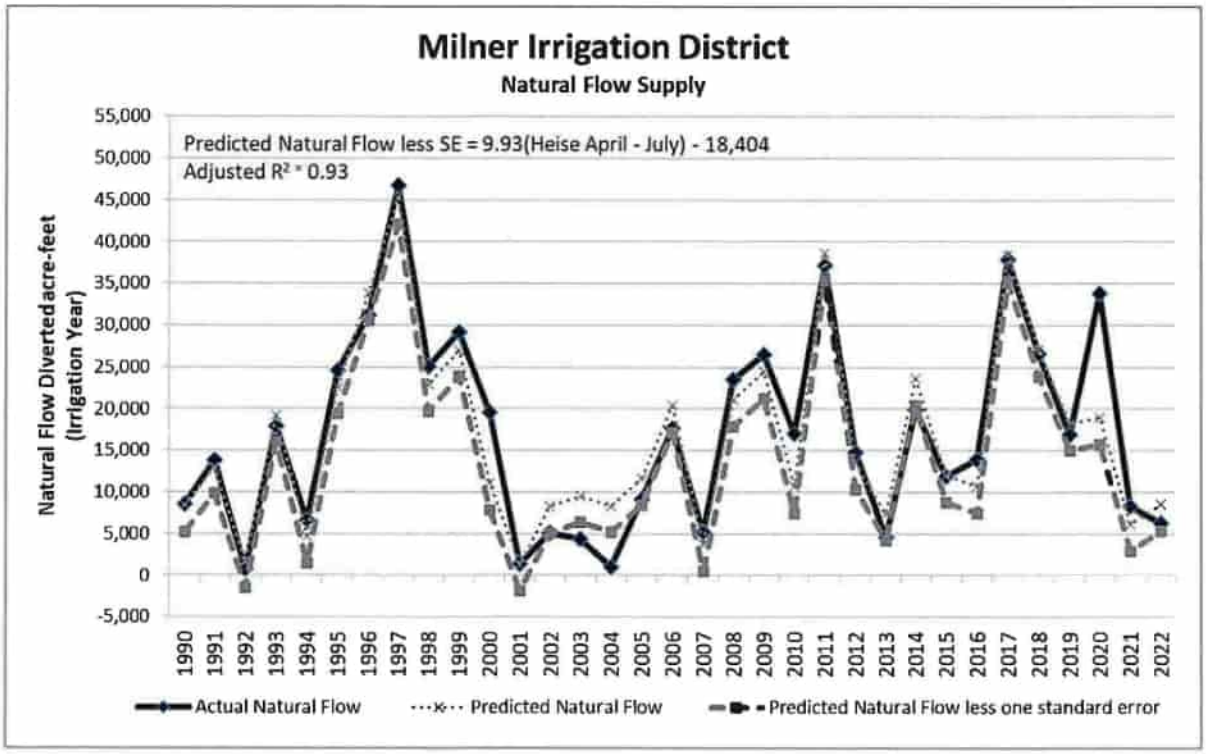
Megan Jenkins
Administrative Assistant II

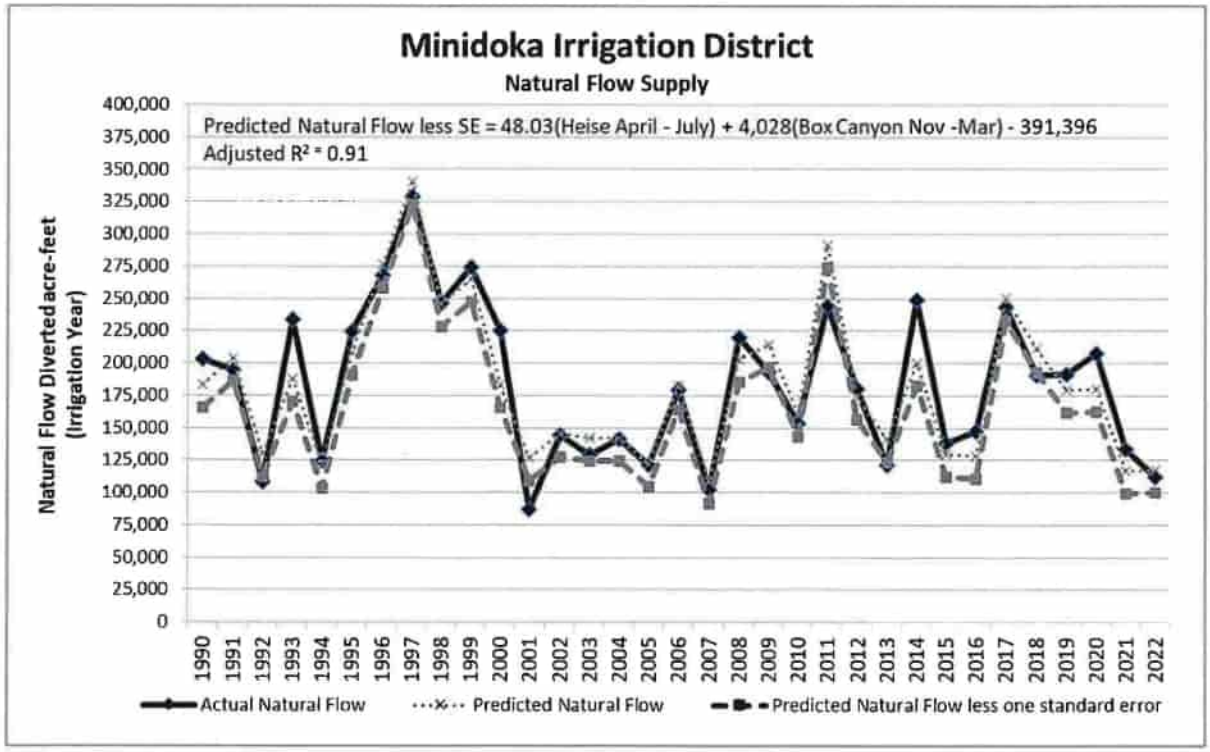
ATTACHMENT A

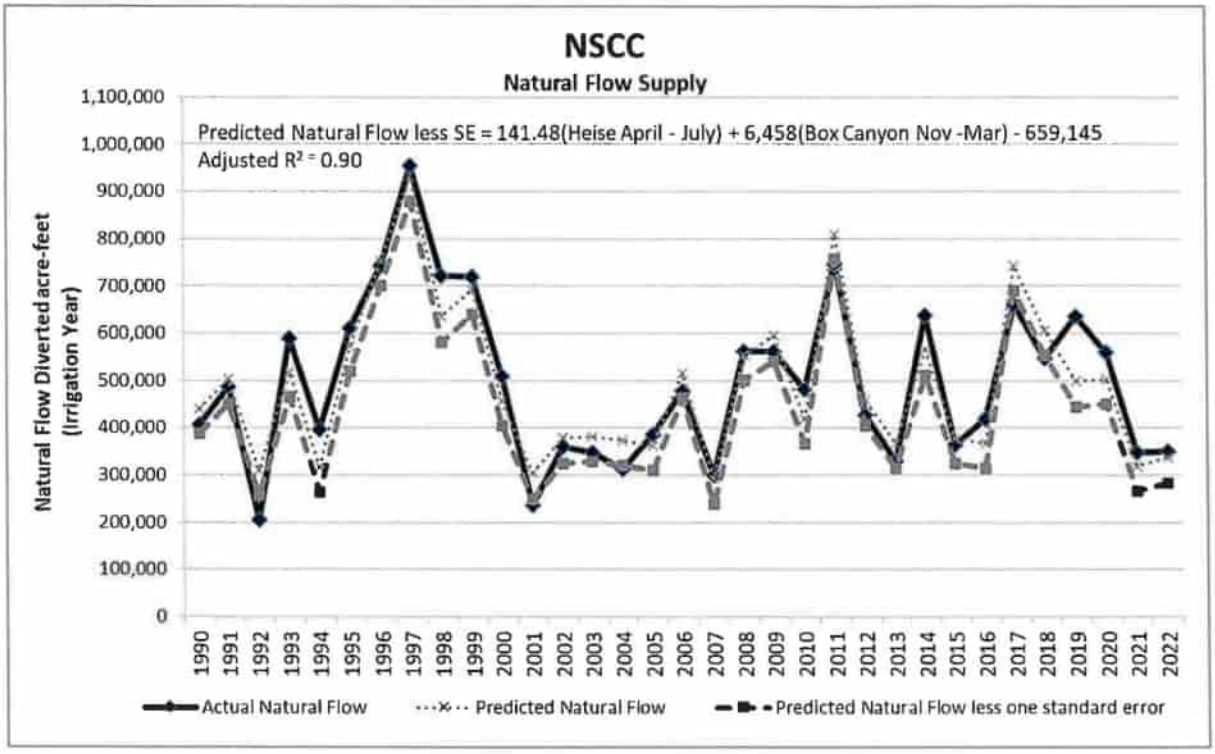


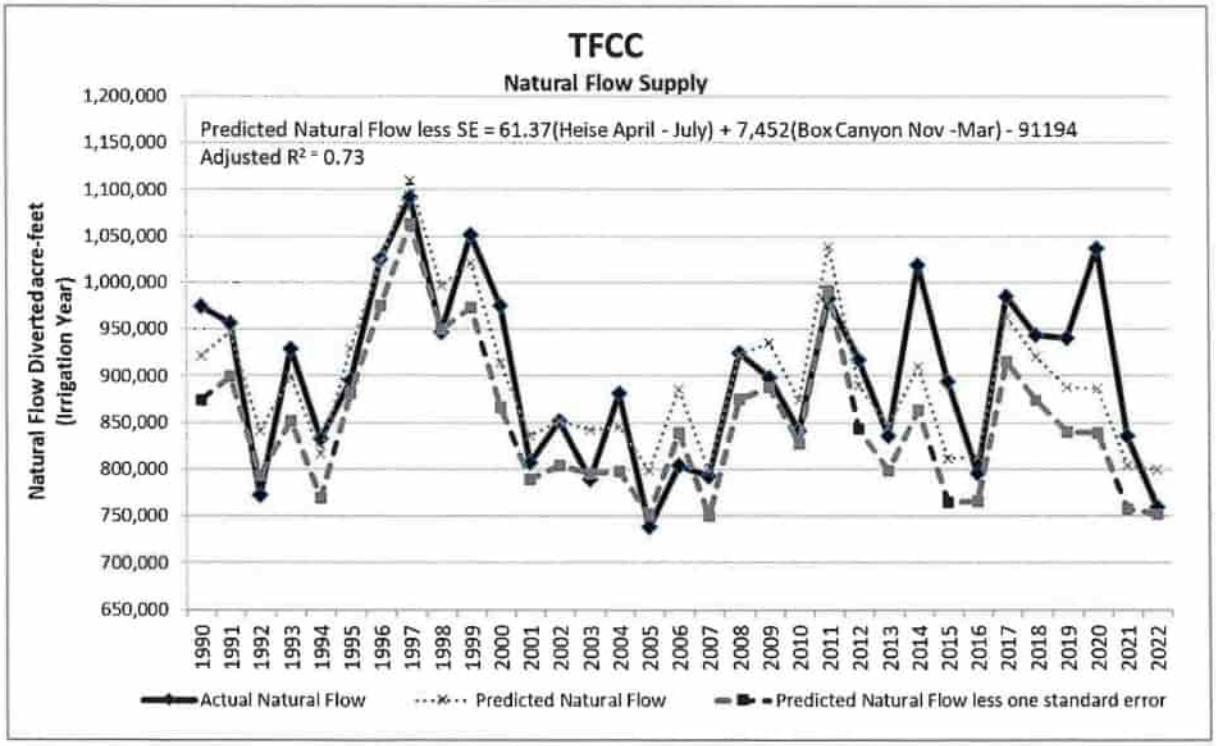

AFRD2 Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 67.68(Heise April - July) + 2,331(Box Canyon Nov -Mar) - 349,429
Adjusted R² = 0.85
Natural Flow Diverted acre-feet (Irrigation Year)
375,000
350,000
325,000
300,000
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Burley Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 31.27(Heise April - July) + 2,323(Box Canyon Nov -Mar) - 219,854
Adjusted R² = 0.85
Natural Flow Diverted acre-feet (Irrigation Year)
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Milner Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 9.93(Heise April - July) - 18,404
Adjusted R² = 0.93
Natural Flow Diverted acre-feet (Irrigation Year)
55,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Minidoka Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 48.03(Heise April - July) + 4,028(Box Canyon Nov -Mar) - 391,396
Adjusted R² = 0.91
Natural Flow Diverted acre-feet (Irrigation Year)
400,000
375,000
350,000
325,000
300,000
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


NSCC
Natural Flow Supply
Predicted Natural Flow less SE = 141.48(Heise April - July) + 6,458(Box Canyon Nov -Mar) - 659,145
Adjusted R² = 0.90
Natural Flow Diverted acre-feet (Irrigation Year)
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


TFCC
Natural Flow Supply
Predicted Natural Flow less SE = 61.37(Heise April - July) + 7,452(Box Canyon Nov -Mar) - 91194
Adjusted R² = 0.73
Natural Flow Diverted acre-feet (Irrigation Year)
1,200,000
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
750,000
700,000
650,000
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a **"Final Order"** issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **NOTICE OF HEARING, NOTICE OF PREHEARING CONFERENCE, AND ORDER AUTHORIZING DISCOVERY**

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") as well as his *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order"). The Methodology Order revises the nine steps used to determine material injury to members of the Surface Water Coalition ("SWC"). The As-Applied Order predicts a shortfall for the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to December 30, 1953.

The Director anticipates that one or more parties will request a hearing pursuant to Idaho Code § 42-1701A(3) in response to one or both of the orders. Normally, a party has 15 days to request a hearing. However, time is of the essence because the irrigation season has commenced for many water users. Idaho's Constitutional Convention intended that there be no unnecessary delays in the delivery of water pursuant to a valid water right. *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, 143 Idaho 862, 874, 154 P.3d 433, 445 (2007). "Clearly, a timely response is required when a delivery call is made and water is necessary to respond to that call." *Id*. Accordingly, the Director, consistent with the obligation to timely administer water rights, will take the proactive step of setting the matter for hearing, will set a prehearing conference, and will authorize discovery. Should the parties mutually agree that a hearing is unwarranted, the parties may file a stipulated motion to vacate.

NOTICE OF HEARING

NOTICE IS HEREBY GIVEN that the Department will hold a hearing on the Methodology Order and As-Applied Order on **June 6–10, 2023. The hearing will begin on June 6 at 9:00 a.m. (MST).** Subsequent starting and ending times will be scheduled during the hearing. The last day of the hearing, June 10, is a Saturday. The day is reserved if needed to complete the hearing.

The hearing will take place at the Department's State Office, located at **322 E. Front Street, 6th Floor, Conference Rooms 602A–D, Boise, Idaho**.

All parties wishing to participate in the hearing shall be present in person. Remote participation will be allowed for those who wish to observe the hearing. To request remote participation information, contact Sarah Tschohl at the phone number or email listed below.

The hearing will be held in accordance with the provisions of Chapters 2 and 17, Title 42 and Chapter 52, Title 67, Idaho Code, as well as the Department's Rules of Procedure, IDAPA 37.01.01. A copy of the Rules of Procedure may be obtained from the Department upon request or at: https://adminrules.idaho.gov/rules/current/37/370101.pdf.

The hearing will be conducted in a facility that meets the accessibility requirements of the Americans with Disabilities Act. If you require special accommodation to attend, participate in, or understand the hearing, please advise the Department no later than five (5) days prior to the hearing. Inquiries for special accommodations should be directed to Sarah Tschohl, Idaho Department of Water Resources, P.O. Box 83720, Boise, Idaho 83720-0098, telephone: (208) 287-4815, email sarah.tschohl@idwr.idaho.gov.

NOTICE OF PREHEARING CONFERENCE

NOTICE IS HEREBY GIVEN that the Department will hold a prehearing conference on the Methodology Order and As-Applied Order on **April 28, 2023, at 1:30 p.m. (MST)**. The conference will take place at the Department's State Office, located at **322 E. Front Street, 6th Floor, Conference Rooms 602B–D, Boise, Idaho**. All parties wishing to participate in the prehearing conference must appear in person or by video conferencing. The parties shall come prepared to identify the issues to be addressed at the hearing.

To attend the conference via computer or smartphone, please click the following Webex link, follow the prompts, and wait to be admitted by the meeting host: https://idahogov.webex.com/idahogov/j.php?MTID=mb39d4fed7de1bfefe8462aaefafd3dbb.

To join the conference via telephone, please dial 1(415) 655-0001 (US Toll) and enter the following meeting access code when prompted: 2450 253 0090.

The prehearing conference will be held in accordance with the provisions of Chapter 17, Title 42, and Chapter 52, Title 67, Idaho Code, and the Department's Rules of Procedure, IDAPA 37.01.01. A copy of the Rules of Procedure may be obtained from the Department upon request or at https://adminrules.idaho.gov/rules/current/37/370101.pdf.

The conference will be conducted in a facility that meets the accessibility requirements of the Americans with Disabilities Act. If you require special accommodation to attend, participate in, or understand the conference, please advise the Department no later than one (1) day before the conference. Inquiries for special accommodations should be directed to Sarah Tschohl, Idaho Department of Water Resources, P.O. Box 83720, Boise, Idaho 83720-0098, telephone: (208) 287-4815, email sarah.tschohl@idwr.idaho.gov.

ORDER AUTHORIZING DISCOVERY

IT IS HEREBY ORDERED that the parties are authorized to immediately conduct and engage in discovery pursuant to IDAPA 37.01.01.521.

IT IS FURTHER ORDERED that, pursuant to IDAPA 37.01.01.053, documents filed in this proceeding may be served on the parties and the Department via email. Service on the Department shall be made by email to file@idwr.idaho.gov. Service on the parties shall be made by email to the email addresses listed in the Certificate of Service below.

Dated this 21st day of April 2023.



GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of April 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email

Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
Apr 28, 2023
DEPARTMENT OF
WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
(208) 287-0864 (facsimile)
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **COALITION OF CITIES' REQUEST FOR HEARING**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, McHugh Bromley, PLLC and files this Request for Hearing in the above captioned matter.

REQUEST FOR HEARING

Pursuant to Idaho Code § 42-1701(A)(3), the Coalition of Cities requests a hearing on the Department's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover*, issued April 14, 2023. Among the issues the Coalition of Cities has identified for hearing:

a) IDWR's new reliance on transient modeling;

b) IDWR's failure to properly identify the Surface Water Coalition's ("SWC") irrigated acreage used in the determination of reasonable in-season demand;

c) IDWR's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years;

d) IDWR's failure to consider changes in the efficiency of the SWC'soperations;

e) IDWR's failure to consider all sources of supply available to the SWC;

f) IDWR's use of 2018 as the new baseline year;

g) IDWR's failure to apply Conjunctive Management Rule 20.03 and principles of reasonableness generally; and

h) IDWR's violation of due process rights of all interested water users by:

i) by engaging in an apparently sham public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order and then largely ignoring that group's recommendations; and

ii) by a continued abuse of process, authority and power in setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants and reflecting bias against junior water right uses.

Submitted this 28th day of April, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for Coalition of Cities

/s/ *Chris M. Bromley*
Chris M. Bromley
Attorney for Coalition of Cities

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 28th day of April, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.

file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, &
LOTHSPEICH, LLP P.O. Box 168 Jerome,
ID 83338 rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID
83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID
83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
Apr 28, 2023
DEPARTMENT OF
WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Sarah A. Klahn, ISB # 7928
SOMACH SIMMONS & DUNN
2033 11th St., Ste. 5
Boulder, CO 80302
(303) 449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris, ISB # 7018
HOLDEN KIDWELL HAHN & CRAPO
100 Riverwalk Dr., Ste. 200
PO Box 50130
Idaho Falls, ID 83405
(208) 523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **MOTION FOR APPOINTMENT OF INDEPENDENT HEARING OFFICER**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"),

pursuant to I.C. § 42-1701A(2) and IDAPA 37.01.01.410, and hereby moves the Director to appoint an independent hearing officer.

On April 21, 2023, the Director issued a series of orders regarding the Surface Water Coalition ("SWC") delivery call: *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"); *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"); and *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Hearing Order").

The *Methodology Order* is a detailed, technical order, stating it is using the "best available science" to revise the Director's predictive tools for determining material injury to the SWC pursuant to the CM Rules. A material change in this *Methodology Order* from all prior decisions of the Director in the SWC delivery call is his decision to use the Eastern Snake Plain Aquifer Model ("ESPAM") in transient as opposed to steady-state. *See Methodology Order* at 35, ¶ 19. The significance of this policy change cannot be overstated, is unprecedented, and not understood.

The *As-Applied Order* uses the information from the *Methodology Order* and applies it to the first half of the 2023 irrigation season, to compute a "Demand Shortfall" of 75,200 acre-feet to Twin Falls Canal Company for the period April – July. Using a transient modeling run, ESPAM predicts that ground water rights that are junior to December 30, 1953 will need to be curtailed to satisfy the predicted injury. The predicted shortfall to TFCC in a year when the Upper Snake Reservoir systems is expected to fill and with the mountains of eastern Idaho currently containing more than 100% snow water equivalent, *see*

the *Motion for Continuance* filed contemporaneously by the Cities, results in an unprecedented quantification of material injury that defies logic.

Associated with the *As-Applied Order* is a link with files containing *April Background Information*. The *April Background Information* contains: historical diversion data for the SWC members; historical Heise flow data; analyses to estimate the 2023 shortages to the SWC members; transient ground water modeling files and results; irrigated area shape files for Minidoka Irrigation District.

The *Hearing Order* authorizes discovery, establishes that a prehearing conference will take place on April 28, 2023, and that the hearing in the contested case will commence on June 6, 2023. The *Hearing Order* does not specify if the Director will serve as the hearing officer.

Idaho Code § 42-1701A(2) provides that, "The director, in his discretion, may direct that a hearing be conducted by a hearing officer appointed by the director." IDAPA 37.01.01.410 allows for the appointment of a hearing officer who may be an "employee[] of the agency or [an] independent contractor[]."

If the Director elects to serve as the Hearing Officer, the Cities respectfully move him to appoint an independent hearing officer for the following reasons:

1. Since the 2005 delivery call was filed by the Surface Water Coalition ("SWC"), the only evidentiary hearing of any magnitude occurred in 2008, when former Chief Justice Gerald F. Schroeder served as the independent hearing officer and issued his April 29, 2008 Recommended Order. *A&B Irr. Dist. v. Spackman*, 155 Idaho 640, 645, 315 P.3d 828, 833 (2013). Former Chief Justice Schroeder's

Recommended Order lead former Director David R. Tuthill, Jr. to issue the first *Methodology Order* on April 7, 2010. *Id*. at 647, 315 P.3d 835. The first *Methodology Order* and orders implementing the same were addressed by the Court in its 2013 decision in *A&B v. Spackman*.

2. Since then, Director Spackman has issued updates to the *Methodology Order*, with the methodology now in its fifth iteration.

3. The *Methodology Order* that was issued on April 21, 2023, represents a sea-change in the use of predictive tools, updated data, and use of the Eastern Snake Plain Aquifer Model in a transient function, as opposed to steady-state, to quantify material injury and choose a priority date for curtailment. Despite this, the *Methodology Order* fails to update data as to SWC irrigation efficiencies, irrigation practices, irrigated area, among other topics that will need to be addressed at an evidentiary hearing with a fully developed record.

4. Former Chief Justice Schroeder was named as the hearing officer in response to the SWC's *Request for Independent Hearing Offficer; Disqualification of the Director as a Matter of Right* (June 4, 2007).[1] When former Chief Justice Schroeder was named as the hearing officer, former Director Tuthill issued an order not only appointing former Chief Justice Schroeder to serve, but he also stating that he would continue to administer water rights in response to the SWC delivery call: "The Director maintains jurisdiction over the ongoing administration of water rights related to this matter." *Order Appointing Hearing*

[1] SWC Request for Independent Hearing Officer; Disqualification of the Director as the Hearing Officer as a Matter of Right | June 4, 2007 | SWC (idaho.gov).

Officer (Aug. 1, 2007) (emphasis added).[2]

5. What was decided in 2007 holds true today. The Director has the tools by which to administer junior-priority ground water rights for the benefit of the SWC, with mitigation plans in place to protect most ground water users from curtailment while the hearing process plays out.
6. It has been eighteen years since the original SWC delivery call. It has been fifteen years since the evidentiary hearing before former Chief Justice Schroeder, meaning it has been fifteen years since an evidentiary hearing of any consequence has taken place. In those intervening fifteen years, many irrigation practices have likely changed, all of which deserve a hearing, based on a fully developed record, to be heard by an independent hearing officer for consideration by the Director.

Based on the foregoing, IDWR's practice is to appoint an independent hearing officer to preside over evidentiary hearings in the SWC delivery call. Cities agree with past practice respectfully move the Director to appoint an independent hearing officer.

Respectfully submitted this 28th day of April, 2023.

/s/ *Robert L. Harris*
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ *Candice M. McHugh*
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Chris M. Bromley*
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Sarah A. Klahn*
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

[2] Order Appointing Hearing Officer | August 1, 2007 | SWC (idaho.gov).

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 28th day of April, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.
PO Box 83720
Boise, ID 83720-0098
file@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

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WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Robert L. Harris, ISB # 7018
HOLDEN KIDWELL HAHN & CRAPO
100 Riverwalk Dr., Ste. 200
PO Box 50130
Idaho Falls, ID 83405
(208) 523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Sarah A. Klahn, ISB # 7928
SOMACH SIMMONS & DUNN
2033 11th St., Ste. 5
Boulder, CO 80302
(303) 449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **MOTION FOR CONTINUANCE**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello, by and through its attorney of record, Sarah A. Klahn (collectively the "Cities"),

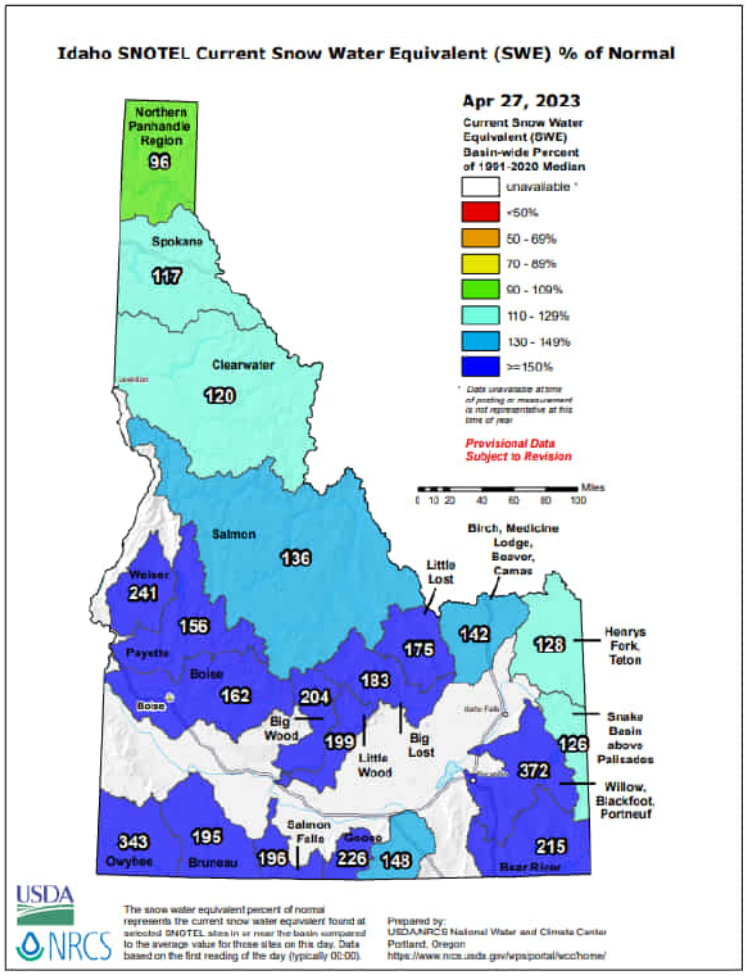
pursuant to IDAPA 37.01.01.220 and IDAPA 37.01.01.560, and hereby move for continuance of the hearing scheduled for June 6-10, 2023, in the above-captioned matter.

On April 21, 2023, the Director issued a series of orders regarding the Surface Water Coalition ("SWC") delivery call: *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"); *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"); and *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Hearing Order"). While the Cities are in full compliance with their approved mitigation plan, the Cities nevertheless remain subject to the *Methodology Order* and its significant analytical departure from the Fourth Methodology Order.

The *Methodology Order* is a detailed, technical order, stating it is using the "best available science" to revise the Director's predictive tools for determining material injury to the SWC pursuant to the CM Rules. The Director decided in this *Methodology Order* to make a material departure from all prior decisions in the SWC delivery call to use the Eastern Snake Plain Aquifer Model ("ESPAM") in transient as opposed to steady-state to predict the priority date for curtailment needed to satisfy that injury. *See Methodology Order* at 35, ¶ 19. The significance of this policy change cannot be overstated and is unprecedented.

The *As-Applied Order* uses the information from the *Methodology Order* and applies it to the first half of the 2023 irrigation season, to compute a "Demand Shortfall" of 75,200 acre-feet to Twin Falls Canal Company ("TFCC") for the period April – July. Using a transient modeling run, ESPAM predicts that ground water rights that are junior to

December 30, 1953 will need to be curtailed to satisfy the predicted injury. The predicted shortfall to TFCC in a year when the Upper Snake Reservoir systems is expected to fill and with the mountains of eastern Idaho currently containing more than 100% snow water equivalent, which is shown on the following page, results in an unprecedented quantification of material injury that defies logic:



https://www.wcc.nrcs.usda.gov/ftpref/data/water/wcs/gis/maps/id_swepctnormal_update.pdf

Associated with the *As-Applied Order* is a link with files containing *April Background Information*. The *April Background Information* contains: historical diversion data for the SWC members; historical Heise flow data; analyses to estimate the 2023

shortages to the SWC members; transient ground water modeling files and results; irrigated area shape files for Minidoka Irrigation District.

The *Hearing Order* authorizes discovery, establishes that a prehearing conference will take place on April 28, 2023, and that the hearing in the contested case will commence on June 6, 2023.

IDAPA 560 states: "The presiding officer may continue proceedings for further hearing." The Cities request that the hearing be continued until December 2023 or January 2024 for the following reasons:

1. The need for completion of adequate discovery by the parties. The Idaho Rules of Civil Procedure allows thirty (30) days for a party to respond to written discovery. If discovery is served on or after the prehearing conference, which is scheduled for April 28, 2023, answers would not be due until at least May 30, 2023, which is seven (7) days before the hearing is scheduled to commence. Additionally, compounding the already compressed schedule is the fact that Memorial Day is May 29, 2023. It is customary to have responses to written discovery before noticing depositions. Since written responses to discovery will not be available until after Memorial Day, it is simply not possible to have depositions before the June 6, 2023 hearing date.

2. The need for completion of expert reports and rebuttal reports. In order to properly formulate expert opinions and reports, the Cities require discovery from the parties as well as information from IDWR. Without discovery and information from IDWR, and based on what is understood now, issues that may be raised as expert opinions in expert reports include but are not limited to the following:

    a) IDWR's new reliance on transient modeling.

    b) IDWR's reliance on new data. IDWR has added seven (7) years of additional, voluminous hydrologic and water use data to the datasets used in the *Methodology Order* and *As-Applied Order*. There is insufficient time available to properly review and vet these data and how they were used in the revised calculations;

    c) IDWR's failure to properly identify the SWC's irrigated acreage used in the determination of reasonable in-season demand;

    d) IDWR's failure to consider TFCC's increase in diversions over the last twenty

years;

e) IDWR's failure to consider changes in the efficiency of SWC operations;

f) IDWR's failure to apply CM Rule 20.03 and principles of reasonableness generally; and

g) IDWR's violation of due process rights of all interested water users:

i. By engaging in an apparently sham public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order; and

ii. By setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives, and consultants.

3. The allotted schedule leaves no time for necessary site investigations, let alone the ability for expert and lay witnesses to be deposed as to their opinions when it comes to water use and current practices. The original delivery call was filed eighteen (18) years ago in 2005 with various proceedings and an administrative hearing occurring in 2008. Water use, irrigation practices, and irrigated area have likely materially changed in the intervening fifteen (15) years since the hearing. If IDWR is using the "best available science" to administer junior-priority water rights, juniors, who have due process rights in delivery calls, must be afforded the same opportunity to use the best available science to evaluate the SWC's current water use.

4. Evaluation of the factual and legal issues that the Director has addressed in the *Methodology Order* and *As-Applied Order* will be complex and require significantly more time from the Cities' attorneys, consultants, and expert witnesses than has been allotted.

5. In prior delivery call hearings, the Director has asked for preparation of staff memoranda. If staff memoranda are prepared, those documents will need to be evaluated in an already compressed time period. With the likelihood that parties will request interviews or depositions of the authors of the staff memoranda and the likely need for expert rebuttal reports to the memoranda and to the expert reports of other parties, the time provided is grossly inadequate.

6. The need for the Director to resolve the Cities' *Motion to Appoint an Independent Hearing Officer*.

7. The Coalition of Cities' attorney, Candice M. McHugh, is unavailable during the dates set for hearing because of a previously scheduled out of state obligation, leaving the Coalition of Cities' other attorney, Chris M. Bromley, as the sole attorney representing

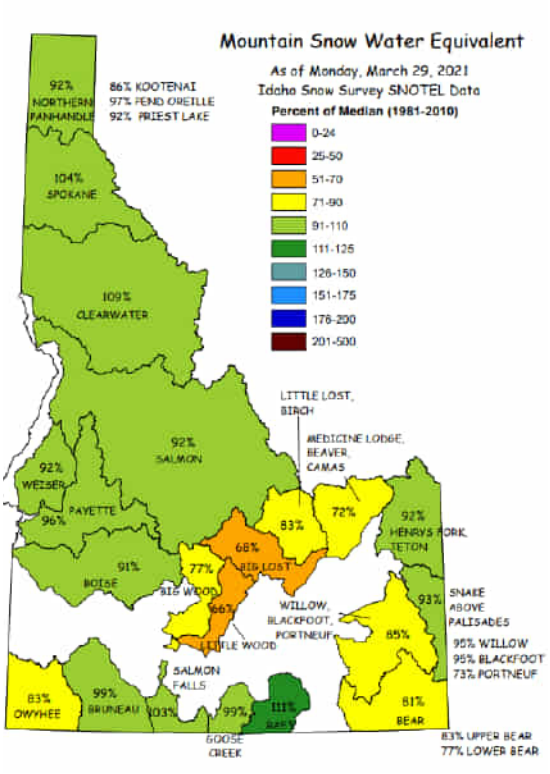
the client and running the office.

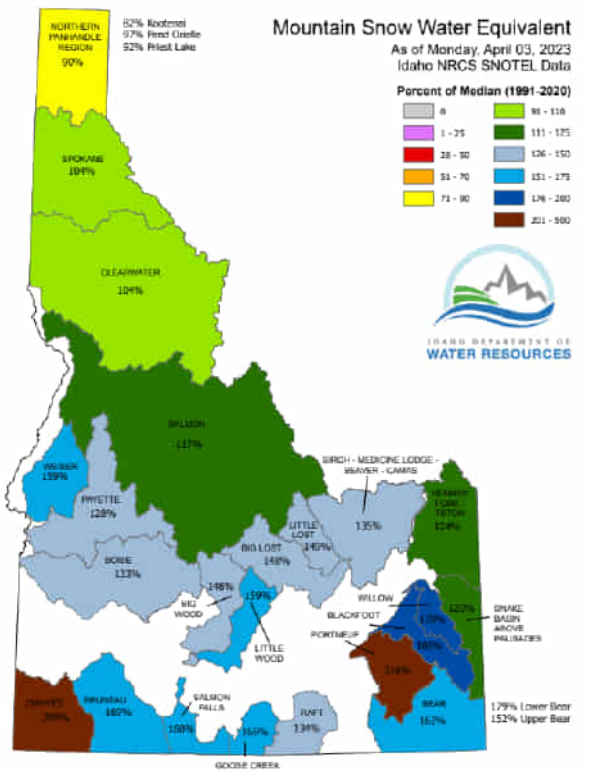
8. Mr. Bromley, as well as other counsel who represent parties in this matter, is set to argue before the Idaho Supreme Court on June 5, 2023 in the Department's appeal of the 2021 curtailment in Basin 37, *South Valley Ground Water Dist. v. Idaho Dept. of Water Res.*, Docket No. 49632. Mr. Bromley has a duty to another client in the appeal that will require his full attention in the week leading up to the argument and will be unable to provide the focus that is required to adequately represent the Coalition of Cities with Ms. McHugh's absence. Additionally, Mr. Bromley is scheduled to be out of the country on a previously planned trip with his family for most of the month of July.

9. Greg Sullivan, expert consultant for the Cities, is scheduled to be out of the country from May 17, 2023 through June 3, 2023 and will be unavailable to consult with the Cities' attorneys to assist in developing strategy, prepare expert reports, prepare exhibits, and to attend depositions if the schedule even allows for depositions to occur.

Based on the foregoing, the abbreviated hearing schedule leaves no time for discovery, fact finding, and the ability for the Cities' attorneys and experts to adequately represent their clients' interests.

A continuance is further warranted because, unlike in the Basin 37 delivery call that is referenced above, a "drought is [not] predicted for the 202[3] irrigation season . . . ." *Notice of Administrative Proceeding, Pre-Hearing Conference, and Hearing* at 1 (May 4, 2021). Indeed, "The Joint Forecast predicts an unregulated inflow of 3,700,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 112% of average." *As-Applied Order* at 5. The water supply in eastern Idaho is self-evident when looking at IDWR's snow water equivalency map for the spring of 2021 that was used to predict the drought in Basin 37 and comparing it with the same map for the spring of 2023, as shown on the follow page:





https://idwr.idaho.gov/water-data/water-supply/snow-water-equivalency/

In the Basin 37 delivery call, the Director stated he had to act with exigency because of a historically poor water supply and because he lacked a framework for determining material injury to senior-priority surface water rights. Here, material injury has already been determined in the current *Methodology Order* and those that preceded it, allowing the Director to administer water rights. Additionally, many of the junior-priority ground water users who pump from the Eastern Snake Plain Aquifer ("ESPA") are allowed to do so based on previously approved CM Rule 43 mitigation plans. On April 24, 2023, the Director issued an order in the companion matter, CM-MP-2016-001, related to IGWA's obligations for 2023; these obligations are also referenced in footnote 5 of the Final Order Regarding April 2023 Forecast Supply Methodology Steps 1-3. The ESPA Cities, of which the Cities are part, is one group that is allowed to pump in the 2023 irrigation season because they are in compliance with their mitigation plan. *As-Applied Order* at 5, fn. 5. Therefore, the

Director has all of the tools at his disposal to administer junior-priority ground water rights for the benefit of senior-priority surface water rights, with mitigation plans in place to address material injury, and no exigency to warrant a complex, technical hearing in such a compressed schedule.

As explained by the Supreme Court, expediency in conjunctive administration is important, however, "It is vastly more important that the Director have the necessary pertinent information and the time to make a reasoned decision based on the available facts." *American Falls Res. Dist. No. 2 v. Idaho Dept. of Water Res.*, 143 Idaho 862, 875, 154 P.3d 433, 446 (2007) (emphasis added). Because there is no exigency, the schedule that the Director established does not allow time for the parties to present their information for consideration. Therefore, the Cities move to continue the hearing until a date in December 2023 or January 2024, which respects the schedules of the parties and will allow the Director sufficient time to evaluate the evidence and issue an order prior to the 2024 irrigation season.

Respectfully submitted this 28th day of April, 2023.

/s/ *Robert L. Harris*
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ *Candice M. McHugh*
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Chris M. Bromley*
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Sarah A. Klahn*
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

CERTIFICATE OF SERVICE

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Idaho Dept. of Water Res.
PO Box 83720
Boise, ID 83720-0098
file@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

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MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
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mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

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Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
Apr 28, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for McCain Foods USA, Inc.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **MCCAIN FOODS USA, INC.'S REQUEST FOR HEARING AND OBJECTION**

REQUEST FOR HEARING

Pursuant to Idaho Code § 42-1701(A)(3), McCain Foods USA, Inc.'s ("McCain") requests a hearing on the Department's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover* and *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") both issued April 21, 2023. McCain objects to the *Fifth Amended Order* and the 2023 As-Applied Order's implementation this upcoming season for the reasons set forth below

which it also identifies as issues for hearing. McCain reserves the right to revise the issues as more information becomes available.

Among the issues the McCain has identified for hearing are:

a) IDWR's new reliance on transient modeling;

b) IDWR's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years;

d) IDWR's failure to consider changes in the efficiency of the SWC's operations;

e) IDWR's failure to consider all sources of supply available to the SWC;

f) IDWR's use of 2018 as the new baseline year; and

g) IDWR's violation of McCain's due process rights by giving less than 10 business days to provide a mitigation solution after a wholesale change in methodology and in a non-drought year, by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants.

Submitted this 28th day of April, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for McCain

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 28th day of April, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
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MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
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jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

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Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
(208) 287-0864 (facsimile)
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

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COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, McHugh Bromley, PLLC and files this Request for Hearing in the above captioned matter.

REQUEST FOR HEARING

Pursuant to Idaho Code § 42-1701(A)(3), the Coalition of Cities requests a hearing on the Department's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover*, and *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") both issued April 21, 2023. Among the issues the Coalition of Cities has identified for hearing:

a) IDWR's new reliance on transient modeling;

b) IDWR's failure to properly identify the Surface Water Coalition's ("SWC") irrigated acreage used in the determination of reasonable in-season demand;

c) IDWR's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years;

d) IDWR's failure to consider changes in the efficiency of the SWC's operations;

e) IDWR's failure to consider all sources of supply available to the SWC;

f) IDWR's use of 2018 as the new baseline year;

g) IDWR's failure to apply Conjunctive Management Rule 20.03 and principles of reasonableness generally; and

h) IDWR's violation of due process rights of all interested water users by:

i) by engaging in an apparently sham public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order and then largely ignoring that group's recommendations; and

ii) by a continued abuse of process, authority and power in setting the hearing without regard to the time required for discovery and without consideration of the existing

obligations of the parties, their legal representatives and consultants and reflecting bias against junior water right uses.

Submitted this 28th day of April, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for Coalition of Cities

/s/ *Chris M. Bromley*
Chris M. Bromley
Attorney for Coalition of Cities

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 28th day of April, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.

file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, &
LOTHSPEICH, LLP P.O. Box 168 Jerome,
ID 83338 rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID
83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID
83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
Apr 28, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB # 7928
Somach Simmons & Dunn, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com

ATTORNEYS FOR THE CITY OF POCATELLO

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **POCATELLO'S REQUEST FOR HEARING**

COMES NOW the City of Pocatello (Pocatello), by and through its attorneys of record, Somach Simmons & Dunn, to request a hearing in the captioned matter and to seek an order authorizing discovery. As reflected in the contemporaneously filed Motion for Continuance, Pocatello joins in the request to delay the trial in this matter currently set for June 2-6, 2023.

A. Request for Hearing

Pursuant to Idaho Code § 42-1701(A)(3), Pocatello requests a hearing on the Department's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover*, issued

April 21, 2023 ("Fifth Methodology Order"). Among the issues Pocatello has identified for hearing:

a) Whether changes to how IDWR computes curtailment dates (using transient groundwater modeling) are reasonable;

b) Whether the ESPAM has been shown to be sufficiently accurate to support the proposed transient groundwater modeling to determine curtailment dates;

c) Whether the Surface Water Coalition's ("SWC") actual irrigated acreage was properly determined for use in determining reasonable in-season demand;

d) Whether a baseline demand that incorporates increases in SWC member diversions in recent years is valid basis for conjunctive administration;

e) The reasonableness of Project efficiencies of the SWC members, trends in said efficiencies in recent years, and how the efficiency values are used in determining reasonable in-season demands;

f) IDWR's failure to consider all sources of supply to the SWC;

g) Whether 2018 is a reasonable new baseline year;

h) Whether changes to determination of the reasonable in-season demand for the SWC members are reasonable and appropriate;

i) Whether the level of conservatism employed in the methodology order is reasonable;

j) Whether contingencies other than curtailment are available to protect senior-priority rights in the event that mitigation water becomes unavailable.

k) Whether changes to how the reasonable carryover for the SWC members is computed are reasonable;

l) Whether other analytical methods or modeling would reasonably improve the process for predicting and evaluating material injury;

m) IDWR's failure to apply Conjunctive Management Rule 20.03 (IDAPA 37.03.11.20.03) and principles of reasonableness generally;

n) IDWR's violation of due process rights of all interested water users:

i. by engaging in an ineffective public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order;

ii. by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants.

Respectfully submitted this 28th day of April 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

ATTORNEYS FOR CITY OF POCATELLO

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 28th day of April, 2023, the foregoing document was served via email to the following:

Idaho Dept. of Water Resources file@idwr.idaho.gov	Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov
John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com

Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
Randall D. Fife City Attorney City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

IDAHO DEPARTMENT OF
WATER RESOURCES

322 E Front Street, Suite 648, Boise ID 83702 • PO Box 83720, Boise ID 83720-0098
Phone: 208-287-4800 • Fax: 208-287-6700 • Email: idwrinfo@idwr.idaho.gov • Website: idwr.idaho.gov

Governor Brad Little

Director Gary Spackman

May 1, 2023

RE: Notice of Possible Curtailment of Ground Water Rights with Priority Dates Junior to December 30, 1953 - Surface Water Coalition Delivery Call

Dear Water Right Holder,

You are receiving this letter because, according to the records of the Idaho Department of Water Resources ("Department"), you are the holder of one or more water rights authorizing diversion of ground water from the Eastern Snake Plain Aquifer Area of Common Ground Water Supply ("ESPA") that are not covered by an approved and effectively operating mitigation plan. Because your water right(s) are not currently covered by an approved and effectively operating mitigation plan, **your water right(s) *may* be subject to curtailment this 2023 irrigation season.**

On April 21, 2023, the Director of the Department issued the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"). The As-Applied Order predicts a shortfall in the water supply for senior priority Snake River water rights during the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to (later than) **December 30, 1953**.

The Department scheduled a hearing for the parties to the As-Applied Order on **June 6–10, 2023.** After the hearing the Director will decide whether to issue a curtailment order. If the Director issues a curtailment order, ground water rights junior to December 30, 1953, could be subject to curtailment unless the holders of junior priority ground water rights mitigate for ground water diverted pursuant to an approved mitigation plan.

Holders of ground water rights affected by a curtailment order may participate in an approved mitigation plan. See Idaho Code § 42-5259. If you are already a member of a ground water district, please contact and work with the district to ensure the district's records are up to date. If you are not a member of a ground water district, you may want to contact the nearest ground water district to inquire if the district will allow you to join.

Holders of ground water rights potentially subject to curtailment may also submit a proposed mitigation plan to the Director in accordance with Conjunctive Management Rule 43.[1] See IDAPA 37.03.11.043. However, please be aware the approval process for a mitigation plan is time-consuming. A proposed mitigation plan submitted now may not be approved in time for the 2023 irrigation season. Upon receipt of a proposed mitigation plan, the Director will publish notice for two successive weeks, after which ten days will be allowed for the filing of protests. The Director may hold a hearing if necessary to determine whether a proposed mitigation plan will mitigate injury to the SWC caused by diversions of ground water authorized by junior priority ground water rights. If the proposed mitigation plan is protested, the Director will hold a hearing. Please be advised that a curtailment order is not stayed pending evaluation of a mitigation plan.

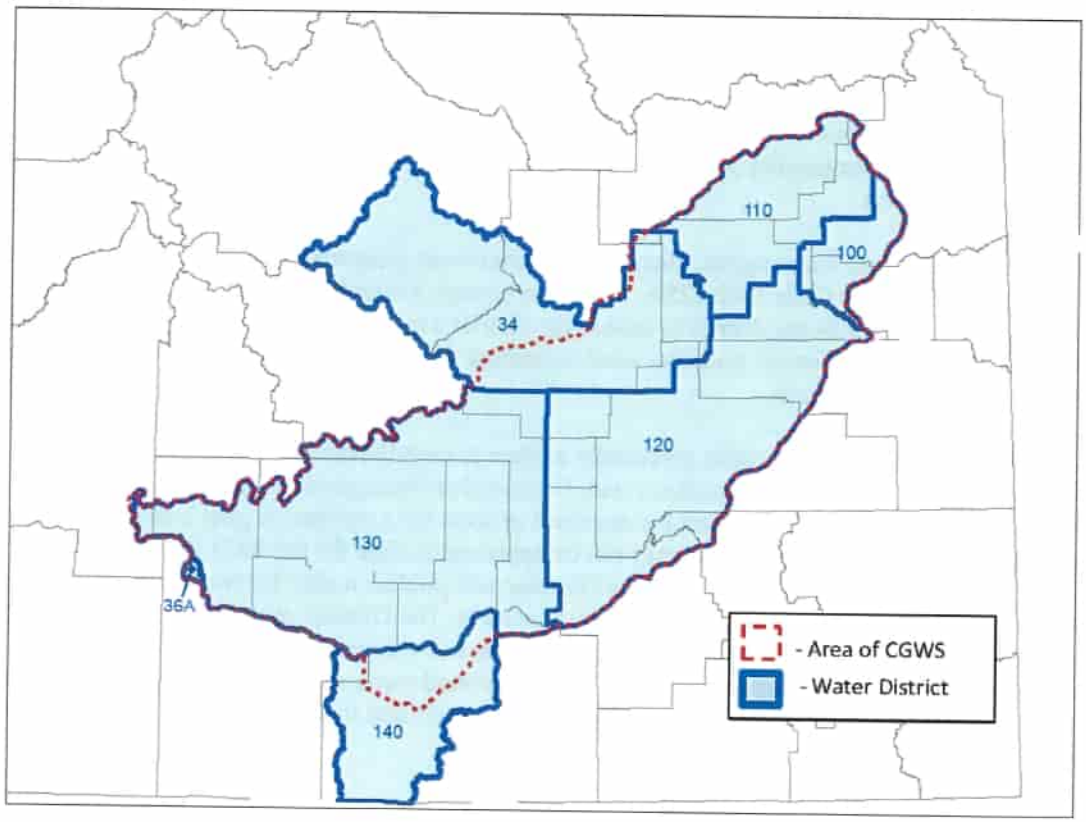
[1] For example, a copy of the proposed mitigation plan submitted by the SWC & IGWA can be found here: https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-MP-2016-001/CM-MP-2016-001-20160309-SWCs-and-IGWAs-Stipulated-Mitigation-Plan-and-Request-for-Order.pdf

Information regarding the ongoing status of this matter may be found under the Current Topics section of the Department's website at: https://idwr.idaho.gov/ If you have questions concerning this notice, please contact the Department's State Office in Boise at 208-287-4800, or the water district watermaster in your area who regulates ground water within the ESPA and copied below. Water district boundaries can be found on the web at https://idwr.idaho.gov/water-rights/water-districts/map/, and Watermaster contact information can be found on the web at https://research.idwr.idaho.gov/files/ExternalReports/wdcontactsrpt.pdf

Respectfully,

GARY SPACKMAN
Director

c. Blake Jordan, Watermaster, Water Districts 100, 110 and 120
Brian Ragan, Watermaster, Water District 130
Jaxon Higgs, Watermaster, Water District 140
Greg Shenton, Watermaster, Water District 31
Preston Marcroft, Watermaster, Water District 34



Attachment A
List of Ground Water Rights Junior to 12/30/1953
Sorted by Owner

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate	Total Acres	Enlargement
1523 LLC	35-14566	Decreed	11/3/1972	IRRIGATION	0.05	2.6	
2 K FARMS	35-8766	License	6/1/1989	COMMERCIAL, DOMESTIC	0.02		
288S 500W LLC	36-17158	Decreed	2/1/1961	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
2B LEGACY LLC	31-7043A	Decreed	11/12/1970	COMMERCIAL, STOCKWATER	0.28		
2-K FARMS	35-8767	License	6/9/1989	COMMERCIAL	0.01		
3 STRING CATTLE OF IDAHO LLC	37-23203	Decreed	7/24/1973	COMMERCIAL, STOCKWATER	0.16		
4 BROS DAIRY INC	37-2622	Decreed	10/6/1959	IRRIGATION	1.39	80.0	
A & B IRRIGATION DISTRICT	36-16749	Decreed	4/1/1956	IRRIGATION	0.45	26.0	
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15127A	Decreed	4/1/1962	IRRIGATION	31.12		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15192	Decreed	4/1/1962	IRRIGATION	0.60		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15193A	Decreed	4/1/1962	IRRIGATION	0.21		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15194A	Decreed	4/1/1962	IRRIGATION	0.23		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15195A	Decreed	4/1/1962	IRRIGATION	0.87		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15196A	Decreed	4/1/1962	IRRIGATION	0.29		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15193B	Decreed	4/1/1965	IRRIGATION	0.31		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15194B	Decreed	4/1/1968	IRRIGATION	2.51		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15195B	Decreed	4/1/1978	IRRIGATION	2.24		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15196B	Decreed	4/1/1981	IRRIGATION	0.08		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15127B	Decreed	4/1/1984	IRRIGATION	28.89		Yes
ABERDEEN SPRINGFIELD CANAL CO	35-2543	Decreed	8/7/1958	IRRIGATION	6.00		
ADAMS, CHERYL L; ADAMS, H LYLE; ADAMS, RODDY L	37-7078	Decreed	10/12/1970	COMMERCIAL, DOMESTIC, STOCKWATER	0.08		
AEI CORP	29-8037	License	11/13/1990	DOMESTIC, INDUSTRIAL	0.06		
AGEQUITY HOLDINGS LLC	36-17208	Decreed	4/13/1976	IRRIGATION	0.20	10.0	
AGRI BEEF CO	29-7104	Decreed	10/25/1972	STOCKWATER	0.67		
AGRICULTURAL SERVICES INC	35-8857	License	9/6/1989	COMMERCIAL	0.04		
AKL PROPERTIES LLC	36-8416	License	3/30/1989	COMMERCIAL	0.04		
ALLEN, CECIL; ALLEN, FLORENCE I	31-7398	Decreed	6/16/1983	COMMERCIAL, DOMESTIC	0.06		
AMALGAMATED SUGAR CO LLC	36-4178	Decreed	6/1/1959	COMMERCIAL	0.01		
AMERICAN FALLS RESERVOIR DISTRICT #2	36-11120	Decreed	11/27/1962	DOMESTIC, IRRIGATION	0.07	1.5	
ANDERLAND LLC	45-14554	Decreed	9/27/1972	IRRIGATION, STOCKWATER	0.43	33.0	
ANDERSON, CHAD ALLEN; ANDERSON, JASHELLE HEATHER	45-7650	License	6/21/1989	DOMESTIC, IRRIGATION	0.06	1.0	
ANDERSON, SAM; ANDERSON, STACIE	25-7490	License	3/15/1989	COMMERCIAL	0.04		
ANGIELEN LLC	32-13351	Decreed	11/12/1974	STOCKWATER	0.06		
ARD, CHARLES BRUCE	22-7555	License	8/24/1988	COMMERCIAL, DOMESTIC	0.04		
ARLENCO INC	22-7423	Decreed	2/24/1983	COMMERCIAL	0.01		
ARROWSMITH, JOSEPH GLENN	25-7073D	Decreed	8/1/1975	IRRIGATION	0.25	12.3	
ARTCO INC	22-7473	License	12/23/1983	INDUSTRIAL, IRRIGATION	0.84	17.0	
ATKINSON, ANDREW ; ATKINSON, MARY	29-13736	License	2/21/2006	DOMESTIC	0.08		
B & F DISTRIBUTING CO	25-7555	License	10/12/1989	COMMERCIAL	0.04		
BABEL, PAUL; HAMPTON, WALLACE; PARKS, FRED A	25-7083	License	1/28/1976	DOMESTIC	0.06		
BAH REXBURG AC PROPERTY LLC	22-11451	Decreed	8/31/1960	IRRIGATION	0.04	2.0	
BAILEY OIL CO INC	36-13218	Decreed	1/1/1960	COMMERCIAL	0.05		
BAISCH, ROBERT L	35-7481	License	2/21/1975	DOMESTIC	0.08		
BARBEN, GORDON E; SAMPSON, KEN	27-7025	License	4/2/1973	DOMESTIC	0.08		
BARBER, BETH; BARBER, KENT	25-7017B	Decreed	3/20/1972	IRRIGATION	0.92	45.3	
BARBER, BETH; BARBER, KENT	25-7073A	Decreed	8/1/1975	IRRIGATION	1.50	75.0	

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List of Ground Water Rights Junior to 12/30/1953
Sorted by Owner

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate	Total Acres	Enlargement
BARRUS, KEITH; MINKS, ROY; PLOCK, STEPHEN R; SCHNEIDER, SCOT L	25-7080	Decreed	1/28/1976	DOMESTIC	0.11		
BARTLETT, ERWIN; BARTLETT, JANICE	45-7653	License	6/6/1989	COMMERCIAL	0.04	0.0	
BASIC AMERICAN POTATO CO INC	35-12062	Decreed	12/31/1957	COMMERCIAL	1.00		
BATES, ROBERT W; BATES, SHARON H; WILKINS, ELMA; WILKINS, LLOYD	25-7357	Decreed	6/16/1983	DOMESTIC	0.06		
BEAR CREST LTD LLC	22-14439	Decreed	4/22/1979	IRRIGATION, COMMERCIAL	0.04	1.8	
BEAR CREST LTD LLC	22-14440		12/6/2021	COMMERCIAL	1.22		
BEAR ISLAND WATER ASSN INC	35-8672	License	9/6/1988	DOMESTIC	0.20		
BECK, DAVID; BECK, SUSAN K	45-11122	Decreed	1/9/1975	DOMESTIC, STOCKWATER	0.07	0.0	
BENNETT, UDO	29-13940	Decreed	10/3/1977	IRRIGATION	0.13	7.5	
BENSON, CLIFFORD; BENSON, LADAWN C	35-8124		3/25/1983	IRRIGATION	6.40	320.0	
BERGMANN, LARRY	35-14739	Decreed	4/22/1979	DIVERSION TO STORAGE, IRRIGATION, RECREATION STORAGE	0.09	2.0	
BEVAN, DONNA; BEVAN, THOMAS	35-14773	Decreed	4/27/1964	IRRIGATION	0.08	2.0	
BEYER, PATRICK	25-7313	Decreed	4/11/1983	DOMESTIC, IRRIGATION	0.05	0.7	
BIG FIVE WATER ASSN	25-7199	Decreed	7/24/1980	DOMESTIC	0.11		
BIG SKY DAIRY	37-20858	Decreed	1/1/1971	STOCKWATER	0.04		
BIG SKY DAIRY	37-20859	Decreed	1/1/1974	STOCKWATER	0.04		
BIG SKY DAIRY	37-20860	Decreed	1/1/1975	STOCKWATER	0.04		
BIG SKY DAIRY	37-12833	Decreed	1/1/1977	DOMESTIC, STOCKWATER	0.17		
BIGGS, DONALD; BIGGS, HELEN ; BUSH, ROBERT; OCKERMAN, JOY ; WINGERT, JEAN M	25-7082	Decreed	1/28/1976	DOMESTIC	0.16		
BILLINGTON, ROBERT D; PUGH, CAROL; PUGH, HOYT; RILEY, KATHERINE; RILEY, RODNEY	37-4373	Decreed	12/21/1955	DOMESTIC, STOCKWATER	0.04		
BINGHAM INVESTMENTS	29-14017	Decreed	12/31/1953	IRRIGATION	0.55	42.1	
BINGHAM INVESTMENTS	29-14018	Decreed	12/31/1953	INDUSTRIAL	0.11		
BINGHAM, BOYD A; BINGHAM, SHERRY R	36-8425	License	6/23/1989	IRRIGATION	0.88	105.0	
BINGHAM, JENNIFER; BINGHAM, JOSEPH	37-23385	Decreed	11/30/1965	IRRIGATION	0.31	30.0	
BINGHAM, JENNIFER; BINGHAM, JOSEPH	37-23384	Decreed	2/4/1976	IRRIGATION	0.24	30.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-12226	Decreed	4/1/1987	IRRIGATION	0.59	285.0	Yes
BIRD, WARREN A; FARNES, LYLE R; RICKS, RICHARD; TOMCHAK, TYE	25-7375	Decreed	6/29/1983	DOMESTIC	0.10		
BLACK, KENNETH S; BLACK, NINA E	45-12776	Decreed	10/30/1960	DOMESTIC, STOCKWATER	0.23	0.0	
BLACKER, LOVEL L; BLACKER, MARVIN L	45-14141	Decreed	7/19/1954	IRRIGATION	0.07	3.7	
BLAINE COUNTY SCHOOL DISTRICT #61	37-22205	Decreed	7/21/1961	MITIGATION	0.30		
BLAINE COUNTY SCHOOL DISTRICT #61	37-22931	Decreed	11/25/1962	IRRIGATION	0.05	2.3	
BLEDSOE, HELEN M; HACKMAN, ERNEST A	35-7916	License	9/16/1980	DOMESTIC	0.08		
BLUE SAGE PROPERTIES LLC	36-14759	Decreed	7/15/1955	DOMESTIC, STOCKWATER	0.04		
BLUE SAGE PROPERTIES LLC	36-17171	Decreed	8/10/1973	IRRIGATION	0.07	5.3	
BOISE PACKAGING & NEWSPRINT LLC	45-2568	Decreed	4/1/1958	DOMESTIC, FIRE PROTECTION FROM STORAGE, FIRE PROTECTION STORAGE, FIRE PROTECTION	0.09	0.0	
BOLINDER, CATHERINE L	27-7322	License	6/8/1982	DOMESTIC	0.06		
BONNEVILLE ACRES WATER USERS ASSN INC	25-2135	Decreed	7/28/1961	COMMERCIAL, DOMESTIC	0.81		
BONNEVILLE ACRES WATER USERS ASSN INC	25-2150	Decreed	12/24/1965	COMMERCIAL, DOMESTIC	0.28		
BORAN , MICHAEL J	35-8635B	Decreed	12/17/1986	FISH PROPAGATION	0.72		
BORAN , MICHAEL J	35-8782	License	5/23/1989	FISH PROPAGATION	4.64		

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List of Ground Water Rights Junior to 12/30/1953
Sorted by Owner

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate	Total Acres	Enlargement
BORDEAUX, DARREN	35-14702	Decreed	1/26/1962	IRRIGATION	0.03	2.5	
BOWEN PETROLEUM	22-7464	License	6/29/1983	COMMERCIAL	0.04		
BRADY, LANCE; BRADY, SHANNON; HAGAN, DANNY D; HAGAN, MARILYNN J ; HOLMES, BILL; HOLMES, LINDA	25-7330	Decreed	6/14/1983	DOMESTIC, IRRIGATION	0.08	0.4	
BRAGA, ROBERT; VAUGHAN, LONNIE	34-14685	Decreed	12/31/1955	DOMESTIC, IRRIGATION	0.04	2.0	
BRAY VALLEY RANCH LLC	37-7942	Decreed	9/22/1981	DOMESTIC, IRRIGATION, STOCKWATER	1.11	141.0	
BRIGGS, DAVID L; BRIGGS, JEANIE K	25-7466	License	11/17/1988	COMMERCIAL	0.04		
BRIGGS, JOYCE; BRIGGS, VAN W	22-7656	License	11/21/1989	COMMERCIAL	0.04		
BRINKMANN, GEORGE	35-8893	License	3/29/1990	COMMERCIAL	0.01		
BROADHEAD, LYNN	35-8765	License	5/23/1989	COMMERCIAL	0.05		
BROWN, HAROLD	31-7513	License	11/23/1988	COMMERCIAL, DOMESTIC	0.07		
BROWN, HEATHER; BROWN, WAYNE W	36-14878	Decreed	12/31/1956	DOMESTIC, STOCKWATER	0.06		
BROWN, JAN A; BROWN, SID E; MOMBERGER, JESSE C	31-7510	License	11/14/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.11	2.0	
BRP INC	25-7622	License	9/23/1998	DOMESTIC	0.23		
BRP INC	25-14504		10/12/2021	DOMESTIC	0.26		
BRUMFIELD, DALE	35-13320	License	8/7/2001	DOMESTIC	0.10		
BURDETTE INC	25-7532	License	9/20/1989	COMMERCIAL	0.04		
BURGESS SUBDIVISION WATER ASSN INC	25-7457	License	10/27/1988	DOMESTIC	0.11		
BURNS CONCRETE INC	25-13982	License	12/18/2002	COMMERCIAL	3.53		
BURNS, KIRK E; SZIMHARDT, LINDA J	25-7426	License	6/6/1988	IRRIGATION	0.08	5.6	
BURRELL, GEORGE W; BURRELL, LURANA J; KEETCH, SHYANN; KEETCH, STETSON	29-13900	License	4/3/2009	DOMESTIC	0.08		
BURRUP, JOHN R; BURRUP, JON R	25-13085	Decreed	7/6/1958	COMMERCIAL, STOCKWATER	0.12		
C7 FARMS LLC	36-7460AG	Decreed	3/25/1974	COMMERCIAL, STOCKWATER	0.18		
CAMPBELL, ALTA	25-4136	Decreed	6/1/1955	IRRIGATION	0.02	0.3	
CANNERS SEED CORP	25-7449	License	10/13/1988	COMMERCIAL, DOMESTIC	0.04		
CARLSON, LESA J	29-13829	Decreed	6/27/1966	IRRIGATION	0.05	2.4	
CARPENTER, BARBARA; CARPENTER, MAURICE	25-7193B	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	
CARRENO, OSCAR	36-15669	Decreed	2/18/1971	COMMERCIAL, STOCKWATER	0.02		
CARRENO, OSCAR	36-16240	Decreed	1/7/1974	COMMERCIAL, STOCKWATER	0.01		
CARSTENS, JULIUS M J	25-7481	License	12/22/1988	IRRIGATION	0.04	1.4	
CASA DEL NORTE LP	37-7081	Decreed	12/8/1970	IRRIGATION	1.67	840.0	
CASSIDY, FRANCIS J; HOFFMAN, RICHARD P; MEYER, DAVID DANIEL; MEYER, JENNY CLUFF; TANNER, TOMMY C	25-7638	License	4/25/1995	DOMESTIC	0.10		
CEYNAR, MARCENE; FANN, LAVEDA A; FANN, R E; FARNSWORTH, BETH; FARNSWORTH, JAY; PICKERING, CRAIG; PICKERING, VICKY	25-7272	Decreed	2/4/1982	DOMESTIC	0.10		
CHALLENGER PALLET & SUPPLY	25-7451	License	12/1/1988	COMMERCIAL	0.04		
CHAMBERS, BOYD; HARRIS, JAMES; HARRIS, MARI; LOREN, RICHAN; STUEVE, KENNETH; SWEARINGER, ALDON; WADE, BILL	25-4210	Decreed	3/21/1960	DOMESTIC, IRRIGATION	0.19	2.4	
CHAMBERS, RALEIGH R	25-7343	License	6/27/1983	DOMESTIC	0.06		
CHAPMAN, GARY RAY; CHAPMAN, REBECCA LYNN	22-14405	Decreed	4/22/1979	IRRIGATION	0.04	2.0	
CHERRY, MARY ANN; CHERRY, ROBERT	25-14402	Decreed	7/19/1973	IRRIGATION	0.02	1.2	
CHEVRON PIPE LINE CO	29-2488	Decreed	1/28/1964	DOMESTIC, FIRE PROTECTION	1.00		
CHRISTENSEN, ADAM W; NELSON, DIANE K	37-23133	Decreed	9/20/1974	IRRIGATION	0.02	0.8	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	25-12186	Decreed	4/1/1962	IRRIGATION	0.17	8.5	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	22-13745	License	7/23/2007	DOMESTIC	0.11		

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CITY OF BUTTE CITY	34-4027	Decreed	6/20/1960	FIRE PROTECTION, MUNICIPAL	0.23	0.0	
CITY OF DUBOIS	31-7011	Decreed	5/29/1968	MUNICIPAL	1.35		
CITY OF EDEN	36-4212	Decreed	1/1/1956	MUNICIPAL	0.07		
CITY OF MUD LAKE	31-10379	Decreed	2/7/1956	MUNICIPAL	1.00		
CITY OF MUD LAKE	31-7146	Decreed	11/15/1974	FIRE PROTECTION, MUNICIPAL	2.23		
CLARK, COLE	35-14758	Decreed	7/2/1965	IRRIGATION	3.03	192.0	
CLAYSON, CASEY; CLAYSON, SHANE	45-7496	Decreed	1/27/1982	DOMESTIC, IRRIGATION	0.06	0.7	
CLOSE, ROBERT; CLOSE, SALLY	25-11547	Decreed	1/31/1959	DOMESTIC, IRRIGATION	0.07	1.0	
COMMUNITY WELL PROJECT; VAUGHN, BILL	25-4103	Decreed	12/31/1958	DOMESTIC	0.11		
COOK, CLYDE A; COOK, LA RAE L; LOVELL, RONALD L; LOVELL, TAMMY	25-14064	Decreed	5/20/1955	IRRIGATION	3.76	1120.1	
COOK, CLYDE A; COOK, LA RAE L; LOVELL, RONALD L; LOVELL, TAMMY	25-14066	Decreed	4/1/1961	IRRIGATION	7.56	1120.1	
COOK, CLYDE A; COOK, LA RAE L; LOVELL, RONALD L; LOVELL, TAMMY	25-14060	Decreed	12/22/1971	IRRIGATION	1.78	1120.1	
COOK, DANNY; COOK, DARRELL L	35-7979	License	5/5/1981	DOMESTIC	0.06		
COOK, DONALD J	35-7362	License	12/27/1973	DOMESTIC, STOCKWATER	0.05		
CORDES, RONALD A	25-7488	License	2/14/1989	DOMESTIC, IRRIGATION	0.10	3.0	
CORDON TRAILER COURT	25-10195	Decreed	3/11/1960	COMMERCIAL	0.13		
COUNTRY CLUB ESTATES WATER ASSN INC	36-8607	License	11/18/1991	DOMESTIC, FIRE PROTECTION, STOCKWATER	0.50		
COUNTRY CLUB WATER	25-14447	Decreed	1/27/1976	IRRIGATION	0.03	18.7	
COUNTRY CLUB WATER	25-14448	Decreed	10/31/1986	IRRIGATION	0.01	18.7	Yes
COUNTRY LIFE ESTATES WATER USERS ASSN	25-7033	Decreed	3/27/1973	DOMESTIC	0.20		
COUNTRY LIFE ESTATES WATER USERS ASSN	25-7046	Decreed	3/8/1974	DOMESTIC	0.73		
COUNTY OF JEFFERSON	25-13985	License	5/13/2003	RECREATION STORAGE			
COUNTY OF JEROME AIRPORT	36-14477	Decreed	1/13/1954	COMMERCIAL, DOMESTIC	0.08		
COUNTY OF MINIDOKA	36-13721	Decreed	10/2/1962	COMMERCIAL, DOMESTIC	0.12		
CRANDALL, JEFF; CRANDALL, SUSAN	35-8658	License	11/2/1985	DOMESTIC	0.06		
CRANE, CALVIN C	45-7303	Decreed	5/10/1977	IRRIGATION, STOCKWATER	1.28	62.0	
CRANE, KARI L; CRANE, TROY W	45-4067B	Decreed	8/1/1962	IRRIGATION	1.46	73.0	
CRANER, DAVID A; CRANER, HELEN B	45-7442	Decreed	4/4/1980	IRRIGATION	0.12	4.0	
CREG & LETA HANSEN FAMILY LTD PARTNERSHIP	37-23353	Decreed	6/7/1977	IRRIGATION	0.73	37.0	
CRESPO TRUCKING INC	37-8355	License	8/9/1988	COMMERCIAL, DOMESTIC	0.04		
CRESTVIEW CALVES LLC	36-17207	License	12/11/1973	COMMERCIAL, STOCKWATER	0.12		
CRM CO	25-7554	License	9/8/1989	COMMERCIAL	0.04		
CROMWELL, VERNAL D	25-7446	License	10/21/1988	DOMESTIC	0.06		
CROP PRODUCTION SERVICES	25-4250	Decreed	3/8/1963	COMMERCIAL	0.10		
CROP PRODUCTION SERVICES	27-7371	Decreed	6/29/1983	COMMERCIAL	0.04		
CROP PRODUCTION SERVICES	35-8627	Decreed	4/4/1989	COMMERCIAL	0.16		
CROWN OF LIFE LUTHERAN CHURCH	25-7434	License	8/30/1988	COMMERCIAL	0.04		
CRUMRINE, ERIC R; CRUMRINE, SAMANTHA MARIE	36-11149	Decreed	5/20/1965	DOMESTIC, STOCKWATER	0.04		
CRYSTAL POND ANGLERS ASSN INC	22-7577	License	8/24/1988	RECREATION STORAGE			
CURT & SUSAN DANIGER FAMILY REVOCABLE TRUST	25-14339	Decreed	2/18/1958	IRRIGATION	0.27	9.5	
CVRH FARM LLC	27-12324	Decreed	5/14/1970	IRRIGATION	0.10	41.0	
D & M WATER ASSN	29-7281	Decreed	8/4/1975	DOMESTIC	0.26		
D & M WATER ASSN	29-7367	Decreed	2/7/1977	DOMESTIC	0.40		

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DALTON, DOUG	29-7858	License	2/22/1989	COMMERCIAL	0.08		
DANCE, DAVID P; DANCE, KARAN D	35-8822	License	7/3/1989	COMMERCIAL	0.01		
DANCING DRAGONFLY LLC	25-4165	Decreed	6/19/1959	DOMESTIC, IRRIGATION	0.16	2.0	
DANIEL, BRENDA	25-7447	License	10/25/1988	IRRIGATION	0.02	1.0	
DANIEL, BRENDA; DANIEL, DAVID S	25-7261	Decreed	10/8/1981	DOMESTIC, IRRIGATION, STOCKWATER	0.04	2.0	
DANIEL, MELVIN R JR	25-7538	License	9/19/1989	COMMERCIAL	0.07		
DANSIE, CAROL L; DANSIE, CHARLES N	27-12318	Decreed	5/18/1982	IRRIGATION	3.45	215.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14589	Decreed	9/28/1981	IRRIGATION	0.01	15.0	
DAVIS, ERNIE; DAVIS, RHONDA	35-8814	License	9/5/1989	COMMERCIAL	0.04		
DAVISON, NANCY; DAVISON, RANDY LEE	25-7017A	Decreed	3/20/1972	IRRIGATION	0.42	21.0	
DE MOSS, GARY A; DE MOSS, HELEN	37-22168	Decreed	9/20/1974	IRRIGATION, STOCKWATER	1.61	802.0	
DE MOTT, WILLIAM J; GROVER, LA VAR; RIGBY, WILLIAM F	25-7537	License	9/20/1989	COMMERCIAL	0.08		
DEES, ELDON G; DEES, KATHALINE; DEES, RONALD K; DEES, SHIRLEY	25-7351	Decreed	6/24/1983	DOMESTIC, STOCKWATER	0.06		
DERBYHAWK LLC	25-7553	License	9/27/1989	DOMESTIC	0.11		
DIAMOND A LIVESTOCK INC	37-21492	Decreed	6/1/1971	COMMERCIAL	0.04		
DIXON, ANNIE; JAHN, ROBERT	35-7823	License	11/22/1978	DOMESTIC, STOCKWATER	0.05		
DOMINICK, TERESA	25-7073F	Decreed	8/1/1975	IRRIGATION	0.20	10.0	
DOUBLE V LLC	36-10509	Decreed	1/1/1974	STOCKWATER	0.12		
DOUGLASS, RAND; KILLIAN, TERRIE	25-4124	Decreed	7/3/1959	COMMERCIAL	0.04		
DREW, STAN	29-8237	License	4/17/2000	DOMESTIC	0.11		
DRISCOLL BROTHERS PARTNERSHIP	35-14823	Decreed	2/4/1972	IRRIGATION	0.10	5.5	
DUFFY & CONNIE ENTERPRISES LLC	22-7605	License	10/19/1988	COMMERCIAL	0.02		
E Z LIVIN TRAILER COURT	45-10479	Decreed	12/31/1958	COMMERCIAL	0.20	0.0	
EAGLE CREEK NORTHWEST LLC	32-13237	Decreed	4/2/1964	IRRIGATION	1.96	134.0	
EAGLE CREEK NORTHWEST LLC	32-13277	Decreed	7/27/1979	IRRIGATION	2.25	132.0	
EAGLE CREEK NORTHWEST LLC	32-13279	Decreed	7/27/1979	IRRIGATION	2.25	132.0	
EAMES, LINDA J	25-7643	License	12/4/1995	DOMESTIC	0.18		
EAST FAIRVIEW WATER WELL CO	25-12791	Decreed	4/1/1961	DOMESTIC	0.11		
EAST RIVER COMMONS HOME OWNER ASSN	25-7143	Decreed	3/12/1978	DOMESTIC	0.16		
EGANS GREEN HOUSE	25-7433	License	7/25/1988	COMMERCIAL	0.04		
EL RANCHO NO 3 LLC	25-7077	Decreed	11/4/1975	IRRIGATION	1.39	78.0	
ESKELSON, BRANDON	35-14508	Decreed	5/1/1959	DOMESTIC, IRRIGATION	0.05	2.0	
EVANS GRAIN & ELEVATOR CO	35-8848	License	11/6/1989	COMMERCIAL	0.04		
FALL RIVER TRADING POST	21-7412	License	3/1/1989	COMMERCIAL, DOMESTIC	0.04		
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-11167	Decreed	4/1/1954	IRRIGATION	1.46		
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-11168	Decreed	4/1/1954	IRRIGATION	0.58		
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-11169	Decreed	5/16/1962	IRRIGATION	0.59		
FALLS WATER CO INC	25-14482	Decreed	7/11/1960	IRRIGATION	0.53	6965.7	
FALLS WATER CO INC	25-14287	Decreed	8/10/1966	IRRIGATION	0.02	77.5	
FALLS WATER CO INC	25-14304	Decreed	8/10/1966	IRRIGATION	0.02	77.5	
FALLS WATER CO INC	25-14313	Decreed	8/10/1966	IRRIGATION	0.04	77.5	
FALLS WATER CO INC	25-14327	Decreed	1/27/1976	MUNICIPAL	4.57		
FALLS WATER CO INC	25-7086	Decreed	3/10/1976	DOMESTIC	0.36		
FANNING, DAWN; FANNING, JAMES	29-2344D	Decreed	12/31/1953	IRRIGATION	0.04	3.0	
FARFAN-CEJA, CASTULO; JUAREZ, ARTEMIO; JUAREZ, GUADALUPE	36-15565	License	2/5/2001	DOMESTIC	0.08		
FARMERS MERCHANT INC	35-7723	Decreed	7/4/1977	DOMESTIC, INDUSTRIAL	0.04		

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FARMLAND RESERVE INC	35-14654	Decreed	9/8/1980	IRRIGATION	0.58	46.7	
FARMLAND RESERVE INC	35-14655	License	2/8/2012	IRRIGATION	0.15	415.8	
FARMS LLC	35-14705	Decreed	5/14/1954	IRRIGATION	0.07	68.0	
FARMS LLC	35-14710	Decreed	5/14/1954	IRRIGATION	0.05	68.0	
FARMS LLC	35-14711	Decreed	5/14/1954	IRRIGATION	0.10	68.0	
FARMS LLC	35-14759	Decreed	5/14/1954	IRRIGATION	0.02	428.0	
FARMS LLC	35-14712	Decreed	3/13/1957	IRRIGATION	0.06	68.0	
FARMS LLC	35-14713	Decreed	3/31/1960	IRRIGATION	0.04	68.0	
FARMS LLC	35-14708	Decreed	6/22/1961	IRRIGATION	0.05	68.0	
FARMS LLC	35-14714	Decreed	7/18/1964	IRRIGATION	0.08	68.0	
FARMS LLC	35-14718	Decreed	3/11/1966	IRRIGATION	0.08	68.0	
FARMS LLC	35-14764	Decreed	3/11/1966	IRRIGATION	0.10	428.0	
FARMS LLC	35-14709	Decreed	5/15/1967	IRRIGATION	0.14	68.0	
FARMS LLC	35-14715	Decreed	6/4/1969	IRRIGATION	0.07	68.0	
FARMS LLC	35-14761	Decreed	6/4/1969	IRRIGATION	0.01	428.0	
FARMS LLC	35-14706	Decreed	6/1/1975	IRRIGATION	0.03	68.0	Yes
FARMS LLC	35-14760	Decreed	6/1/1975	IRRIGATION	0.01	428.0	Yes
FARMS LLC	35-14719	Decreed	10/1/1976	IRRIGATION	0.01	68.0	Yes
FARMS LLC	35-14765	Decreed	10/1/1976	IRRIGATION	0.01	428.0	Yes
FEHRINGER, MARTIN	29-14051	Decreed	2/23/1966	IRRIGATION	0.02	1.5	
FELD, TODD	35-13284	Decreed	2/23/1972	COMMERCIAL, STOCKWATER	0.30		
FERGUSON, DANNY G; FERGUSON, MARCENE M	25-7599	License	9/25/1991	IRRIGATION	2.28	118.0	
FERGUSON, ROGER N	21-7385	License	9/30/1988	COMMERCIAL	0.04		
FIELDS, KAREN C; FIELDS, VIRGIL	37-7699	Decreed	2/23/1978	DOMESTIC, STOCKWATER	0.20		
FOSTER FAMILY FARMS INC	35-8773	License	6/7/1989	COMMERCIAL, DOMESTIC	0.04		
FOSTER FAMILY FARMS INC	35-8774	License	6/20/1989	COMMERCIAL	0.04		
FOUR SEASONS WATER CO	27-7351	License	4/20/1983	DOMESTIC	0.29		
FOUR SQUARE WATER WELL CORP	25-7327	Decreed	2/4/1985	DOMESTIC, IRRIGATION	0.16	3.0	
FOWLER, GARY L; SOMSEN, DIANNE L; SOMSEN, G FRANK; SOMSEN, KRISTINE P; SOMSEN-FOWLER, SARA D	45-13574	Decreed	4/28/1954	IRRIGATION	0.49	321.0	
FOWLER, GARY L; SOMSEN, DIANNE L; SOMSEN, G FRANK; SOMSEN, KRISTINE P; SOMSEN-FOWLER, SARA D	45-2491	Decreed	3/25/1955	IRRIGATION	3.14	321.0	
FOWLER, GARY L; SOMSEN, KRISTINE P; SOMSEN-FOWLER, SARA D	45-2743	Decreed	4/14/1966	IRRIGATION	0.78	39.0	
FOWLER, GARY; SOMSEN, G FRANK; SOMSEN, KRISTINE P	45-7192	Decreed	10/7/1974	IRRIGATION, STOCKWATER	0.36	18.0	
FOX WAREHOUSE LLC	25-7424	License	4/1/1988	IRRIGATION	0.09	3.0	
FREMONT COUNTY	22-4015	Decreed	4/1/1962	INDUSTRIAL	0.33		
FULLMER, APRIL; FULLMER, NICHOLAS	25-4106	Decreed	4/1/1959	IRRIGATION	0.05	1.7	
FUNK, CAROLENE; FUNK, MONTY	35-14814	Decreed	5/10/1974	IRRIGATION	3.16	158.0	
FUNK, LANCE; FUNK, LISA	29-13959	Decreed	3/24/1982	INDUSTRIAL	0.02		
FUNK, LEROY; FUNK, RONDA	45-2672	Decreed	10/26/1961	IRRIGATION	1.00	71.0	
GARNER, KAY R; GARNER, LESLIE	35-14288	License	11/13/2012	COOLING, HEATING	0.04		
GARY & PAMELA ROGERS FAMILY TRUST	34-7118B	Decreed	11/24/1975	IRRIGATION	8.81	440.0	
GAVIN, JOAN; JACK C SHERRILL LIVING TRUST; NOTHWANG, DIXIE	45-10950	Decreed	1/30/1961	DOMESTIC, IRRIGATION	0.15	2.0	
GENERAL MILLS OPERATIONS INC	35-2857B	Decreed	1/16/1967	INDUSTRIAL	0.23		
GERRATT, LARRY	45-11613	Decreed	7/22/1955	IRRIGATION	0.60	151.0	
GERRATT, LARRY; GERRATT, REX	45-11441	Decreed	4/1/1960	COMMERCIAL, DOMESTIC, STOCKWATER	0.07	0.0	

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GILLEN, NORMAN	27-7585	License	4/20/1999	DOMESTIC	0.14		
GLASER, KRISTIN A; GLASER, MICHAEL E	35-14604	Decreed	3/20/1959	IRRIGATION	0.01	1.0	
GLEN CAPPS INC	36-8176	Decreed	3/31/1983	COMMERCIAL, DOMESTIC	0.04		
GOLDEN VALLEY DEVELOPMENTS	22-7805	License	2/16/1999	DOMESTIC	0.39		
GOLDEN VALLEY MEAT LLC	35-7642	Decreed	10/1/1976	COMMERCIAL	0.05		
GOLDEN VALLEY MEAT LLC	35-8710	License	3/8/1989	COMMERCIAL	0.94		
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7238	Decreed	10/31/1974	DOMESTIC, IRRIGATION	0.11	8.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7984	Decreed	4/23/1990	IRRIGATION	0.03	8.0	
GONZALEZ, LAURA; ORTIZ, JULIO	29-14346	Decreed	12/16/1963	IRRIGATION	0.03	2.0	
GOOCH, BEATRICE; GOOCH, ELLIS	37-21156	Decreed	2/18/1971	COMMERCIAL, STOCKWATER	0.02		
GOODWIN EXCAVATING LLC; POCATELLO READY MIX	35-14326	Decreed	5/2/1977	INDUSTRIAL	0.10		
GOUGH, SHAUN	37-23373	License	8/22/1988	IRRIGATION	0.03	1.5	
GRAVES, FRANCES M; GRAVES, RICHARD L	37-7371		7/31/1974	DOMESTIC, IRRIGATION, STOCKWATER	6.49	320.0	
GRAYBEAL, EMILY; GRAYBEAL, JASON	37-4052	Decreed	4/1/1962	DOMESTIC, IRRIGATION	0.08	1.4	
GRISENTI, CHEYANNA; GRISENTI, TYSON	36-17209	Decreed	6/21/1960	IRRIGATION	0.08	4.0	
GROVER, ALICE MAE; GROVER, MELVIN G	25-7480	License	1/9/1989	DOMESTIC, IRRIGATION, STOCKWATER	0.07	3.0	
GUNDERSON, ADEN	35-14178	Decreed	9/28/1981	IRRIGATION	0.01	20.0	
GUNDERSON, BONNIE; GUNDERSON, GARTH	35-14585	Decreed	9/28/1981	IRRIGATION	0.01	3.2	
H & T PROPERTIES LLC	36-8312	License	8/15/1986	STOCKWATER	0.05		
HALL, GORDON; HALL, JERRY G; HALL, RICKI L	25-14234	Decreed	10/9/1961	IRRIGATION	4.38	156.4	
HALL, GORDON; HALL, JERRY G; HALL, RICKI L	25-14235	Decreed	10/9/1961	COMMERCIAL, STOCKWATER	0.32		
HALL, RUSSELL	21-13316	Decreed	4/24/1956	IRRIGATION	0.05	5.0	
HALL, RUSSELL	21-13315	Decreed	4/24/1962	IRRIGATION	0.05	5.0	
HAMMOND, LORNA O; THE SHELTERED TRUST	35-8016	License	1/18/1982	DOMESTIC, STOCKWATER	0.06		
HANCOCK, DEAN	25-14496	Decreed	4/22/1979	IRRIGATION	0.02	1.0	
HANEY SEED CO	45-7639	License	3/30/1989	COMMERCIAL	0.04	0.0	
HANSEN FARMS LAND LLC	36-17225	Decreed	2/20/1976	IRRIGATION	0.04	3.5	
HANSEN FARMS LAND LLC	36-17226	Decreed	2/20/1976	IRRIGATION	0.04	2.0	
HANSEN FARMS LAND LLC	36-17227	Decreed	2/20/1976	IRRIGATION	0.04	2.0	
HANSEN FARMS LAND LLC	36-17228	Decreed	2/20/1976	IRRIGATION	0.04	2.0	
HANSEN FARMS LAND LLC	36-17229	Decreed	2/20/1976	IRRIGATION	0.04	2.0	
HANSEN, BRANDON	27-12312	License	3/30/1984	IRRIGATION	0.02	1.0	
HANSEN, TYLER	27-12313	License	3/30/1984	IRRIGATION	0.02	1.0	
HANSEN, VIRGINIA E	45-4125	Decreed	3/20/1962	DOMESTIC, IRRIGATION	0.04	0.7	
HANSEN, WILLIAM KORBY	25-7458	License	11/8/1988	DOMESTIC, IRRIGATION	0.09	1.7	
HANSENS QUALITY JERSEYS LLC	36-12974	Decreed	6/1/1959	DOMESTIC	0.04		
HANSENS QUALITY JERSEYS LLC	36-17212	Decreed	11/11/1959	COMMERCIAL, STOCKWATER	0.04		
HANSENS QUALITY JERSEYS LLC	36-17216	Decreed	11/11/1959	COMMERCIAL, STOCKWATER	0.03		
HANSENS QUALITY JERSEYS LLC	36-17210	Decreed	9/30/1965	COMMERCIAL, STOCKWATER	0.24		
HANSENS QUALITY JERSEYS LLC	36-17211	Decreed	9/23/1967	COMMERCIAL, STOCKWATER	0.02		Yes
HANSENS QUALITY JERSEYS LLC	36-17213	Decreed	11/15/1970	COMMERCIAL, STOCKWATER	0.06		
HANSENS QUALITY JERSEYS LLC	36-17217	Decreed	11/15/1970	COMMERCIAL, STOCKWATER	0.04		
HANSENS QUALITY JERSEYS LLC	36-17215	Decreed	5/26/1971	COMMERCIAL, STOCKWATER	0.01		Yes
HANSENS QUALITY JERSEYS LLC	36-17220	Decreed	5/26/1971	COMMERCIAL, STOCKWATER	0.01		
HANSENS QUALITY JERSEYS LLC	36-17219	Decreed	5/26/1977	COMMERCIAL, STOCKWATER	0.01		
HANSENS QUALITY JERSEYS LLC	36-17214	Decreed	5/16/1980	COMMERCIAL, STOCKWATER	0.01		

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HANSENS QUALITY JERSEYS LLC	36-17218	Decreed	5/16/1980	COMMERCIAL, STOCKWATER	0.01		
HARDY, ANITA KAY	36-17152	Decreed	11/7/1974	IRRIGATION	0.63	31.5	
HAROLDSEN, G ERIC; HAROLDSEN, GRANT O	25-7300	Decreed	1/5/1983	DOMESTIC, STOCKWATER	0.06		
HARPER, DAVID; HARPER, HEATHER	35-14728	Decreed	9/28/1981	IRRIGATION	0.01	17.2	
HART, BOB; HART, MELANIE	25-7520	License	10/16/1989	COMMERCIAL	0.04		
HART, BOB; HART, NORMA; JOHNSTON, JACOB; JONES, ROBERT I; STIBAL, JOHN	25-7081	Decreed	1/28/1976	DOMESTIC	0.19		
HASLAM, LAVORE	35-8629	License	4/8/1986	DOMESTIC, STOCKWATER	0.06		
HAYES, AMY; HAYES, DESTRY	35-14639	Decreed	9/28/1981	IRRIGATION	0.02	3.3	
HEATH, AFTON M; HEATH, CLEM J	35-8617	Decreed	8/18/1985	COMMERCIAL	0.04		
HELENA CHEMICAL CO	22-7520	Decreed	11/7/1985	COMMERCIAL	0.02		
HELSLEY HENDRIX, JEANINE P; HELSLEY, BRIAN T	36-16561	Decreed	2/8/1971	IRRIGATION	0.03	3.0	
HENRIE, JAREM	25-7302	Decreed	1/25/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.05	2.0	
HENSLEY, FLOYD W; LOCKES, DAROLD; REYNOLDS, LYNN; WESSEL, TERESA	25-7084	Decreed	1/28/1976	DOMESTIC	0.06		
HEPWORTH, CRAIG D	36-17202	License	3/1/1989	IRRIGATION	0.49	247.1	
HERITAGE DEVELOPMENT	29-8173	License	7/19/1996	DOMESTIC	0.27		
HIGHWAY ESTATES WATER USERS INC	25-7038	Decreed	9/20/1973	DOMESTIC	0.20		
HINCKLEY, LA PREAL	25-14005	License	10/12/2003	IRRIGATION	0.06	3.0	
HK CONTRACTORS INC	25-14468	Decreed	3/20/1959	DIVERSION TO STORAGE, INDUSTRIAL STORAGE, INDUSTRIAL	0.02		
HOBBS, LAURA LEE	25-7540	License	8/18/1989	DOMESTIC	0.10		
HOLDAWAY, CHAD	31-4069	Decreed	12/31/1961	DOMESTIC, STOCKWATER	0.16		
HONDO, AKIYE I; HONDO, DANIEL A	45-2664	Decreed	8/30/1961	IRRIGATION	2.00	157.0	
HOOPER, LLOYD C	25-7531	License	10/22/1989	COMMERCIAL	0.04		
HOPE, DENNIS K	22-7764	License	11/3/1993	DOMESTIC	0.15		
HOPE, DENNIS K	22-7784	License	5/24/1995	DOMESTIC	0.11		
HULTS , JOSEPH; HULTS, KAY A	36-17221	Decreed	1/5/1966	IRRIGATION	1.41	100.4	
HULTZ, JEAN ISLAY	35-4187	Decreed	7/1/1962	COMMERCIAL, DOMESTIC	0.06		
HUNSTMANS PROPERTIES	27-7511	License	4/20/1990	COMMERCIAL	0.33		
HUNTER FAMILY PARTNERSHIP	25-2122D	Decreed	4/27/1956	IRRIGATION	1.88	104.8	
HUNTING, AUDREY	25-7453	License	10/28/1988	IRRIGATION	0.03	1.0	
HURST, LOIS E	45-2662	Decreed	7/18/1961	IRRIGATION	1.74	86.8	
HURTADO FARMS LLC	36-17180	License	12/11/1973	COMMERCIAL, STOCKWATER	0.66		
HUTCHISON, JA NEAL; HUTCHISON, WINSTON	45-4218	Decreed	7/1/1958	IRRIGATION	0.05	1.5	
ID DEPARTMENT OF LANDS	37-12535	Decreed	1/1/1962	COMMERCIAL	0.04		
ID DEPARTMENT OF LANDS	37-7372	License	6/30/1999	IRRIGATION, STOCKWATER	6.40	287.0	
ID DEPARTMENT OF PARKS AND RECREATION	29-7511	Decreed	5/27/1969	DOMESTIC	0.07		
ID DEPARTMENT OF PARKS AND RECREATION	29-7357	Decreed	12/24/1969	DOMESTIC, IRRIGATION	0.13	3.0	
ID DEPARTMENT OF PARKS AND RECREATION	36-17147	Decreed	8/7/1973	IRRIGATION	0.06	5.0	
ID DEPARTMENT OF TRANSPORTATION	36-15466	Decreed	10/1/1955	COMMERCIAL	0.04		
ID DEPARTMENT OF TRANSPORTATION	22-7317	Decreed	1/31/1980	COMMERCIAL, DOMESTIC	0.04		
ID DEPARTMENT OF TRANSPORTATION	25-7186	Decreed	1/31/1980	COMMERCIAL, DOMESTIC	0.06		
ID DEPARTMENT OF TRANSPORTATION	31-7372	Decreed	1/28/1982	INDUSTRIAL	0.05	0.0	
ID DEPARTMENT OF TRANSPORTATION	35-8625	License	1/13/1986	DOMESTIC	0.06		
ID DEPT OF JUVENILE CORRECTIONS	21-11971	Decreed	1/1/1956	COMMERCIAL	0.68		

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IDAHO FALLS COUNTRY CLUB INC	25-13372	Decreed	12/31/1961	COMMERCIAL, IRRIGATION	0.67	132.0	
IDAHO FALLS FARMS LLC	35-14667	Decreed	4/24/1959	IRRIGATION	0.66	1570.0	
IDAHO FALLS FARMS LLC	35-14694	Decreed	4/24/1959	IRRIGATION	0.22	512.0	
IDAHO FALLS FARMS LLC	35-14788	Decreed	2/9/1961	IRRIGATION	2.64	1410.0	
IDAHO FALLS FARMS LLC	35-14671	Decreed	1/19/1962	IRRIGATION	5.36	1570.0	
IDAHO FALLS FARMS LLC	35-14698	Decreed	1/19/1962	IRRIGATION	1.75	512.0	
IDAHO FALLS FARMS LLC	35-14670	Decreed	2/23/1962	IRRIGATION	1.72	1570.0	
IDAHO FALLS FARMS LLC	35-14697	Decreed	2/23/1962	IRRIGATION	0.56	512.0	
IDAHO FALLS FARMS LLC	35-14673	Decreed	5/31/1962	IRRIGATION	8.97	1123.1	
IDAHO FALLS FARMS LLC	35-14789	Decreed	3/25/1964	IRRIGATION	3.70	1410.0	
IDAHO FALLS FARMS LLC	35-14674	Decreed	12/19/1966	IRRIGATION	5.38	1123.1	
IDAHO FALLS FARMS LLC	35-14678	Decreed	12/19/1966	IRRIGATION	4.81	1079.5	
IDAHO FALLS FARMS LLC	35-14669	Decreed	1/31/1967	IRRIGATION	1.65	1570.0	
IDAHO FALLS FARMS LLC	35-14696	Decreed	1/31/1967	IRRIGATION	0.54	512.0	
IDAHO FALLS FARMS LLC	35-14769	Decreed	4/27/1967	IRRIGATION	0.61	410.2	
IDAHO FALLS FARMS LLC	35-14681	Decreed	11/29/1971	IRRIGATION	0.28	759.5	
IDAHO FALLS FARMS LLC	35-14682	Decreed	11/29/1971	IRRIGATION	0.03	759.5	
IDAHO FALLS FARMS LLC	35-14676	Decreed	8/28/1973	IRRIGATION	9.47	1079.5	
IDAHO FALLS FARMS LLC	35-14668	Decreed	12/24/1973	IRRIGATION	3.57	1570.0	
IDAHO FALLS FARMS LLC	35-14695	Decreed	12/24/1973	IRRIGATION	1.20	512.0	
IDAHO FALLS FARMS LLC	35-14770	Decreed	4/18/1974	IRRIGATION	1.27	410.2	
IDAHO FALLS FARMS LLC	35-14790	Decreed	7/1/1975	IRRIGATION	5.29	1410.0	
IDAHO FALLS FARMS LLC	35-14791	Decreed	8/15/1975	IRRIGATION	3.70	1410.0	
IDAHO FALLS FARMS LLC	35-14792	Decreed	8/15/1975	IRRIGATION	3.80	1410.0	
IDAHO FALLS FARMS LLC	35-14679	Decreed	12/5/1975	IRRIGATION	2.78	1079.5	
IDAHO FALLS FARMS LLC	35-14675	Decreed	12/15/1975	IRRIGATION	1.24	1123.1	
IDAHO FALLS FARMS LLC	35-14793	Decreed	8/27/1976	IRRIGATION	3.77	1410.0	
IDAHO FALLS FARMS LLC	35-14796	Decreed	8/15/1977	IRRIGATION	0.79	1410.0	
IDAHO PACIFIC CORP	25-2146	Decreed	1/26/1965	IRRIGATION	1.79	228.0	
IDAHO PACIFIC CORP	25-2147	Decreed	1/26/1965	IRRIGATION	1.14	228.0	
IDAHO PACIFIC CORP	25-2148	Decreed	1/26/1965	IRRIGATION	1.14	228.0	
IDAHO PACIFIC CORP	25-7056	Decreed	8/5/1974	INDUSTRIAL	1.20		
IDAHO PACIFIC CORP	25-7475	Decreed	12/6/1988	INDUSTRIAL	0.93		
IDAHO POTATO PACKERS CORP	35-8909	License	8/3/1990	COMMERCIAL	0.01		
IDAHO POWER CO	29-8126	Decreed	1/26/1959	INDUSTRIAL	2.68		
IDAHO POWER CO	37-8484	License	1/17/1989	COMMERCIAL	0.02		
IDAHO POWER CO	45-7669	License	1/9/1990	DOMESTIC	0.06	0.0	
IDAHO POWER COMPANY	36-17169		5/8/2020	IRRIGATION	0.27	7.0	
IDAHO POWER COMPANY	36-17184		4/9/2021	DOMESTIC, FIRE PROTECTION	0.12		
IDAHO WATER COMPANY LLC	35-14701	Decreed	5/27/1974	IRRIGATION	0.07	23.8	
IDAHOAN FOODS INC	25-10794	Decreed	10/1/1960	DOMESTIC, INDUSTRIAL	1.26		
IDAHOAN FOODS INC	25-7002	Decreed	11/21/1968	INDUSTRIAL	0.70		
IDAHOAN FOODS INC	25-7471	License	11/7/1988	IRRIGATION	0.12	4.0	
INTERSTATE MFG	36-8454	License	9/14/1989	COMMERCIAL	0.04		
IRELAND ACRES #2	25-7273	Decreed	2/1/1982	DOMESTIC	0.05		
IRELAND ACRES MOBILE HOME PARK	25-7195	Decreed	6/4/1980	DOMESTIC	0.54		

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ISAEFF, PATRICIA	25-10094	Decreed	10/31/1958	DOMESTIC, IRRIGATION, STOCKWATER	0.06	2.0	
J & D PROPERTIES LLC	31-7511	License	11/30/1988	COMMERCIAL	0.03		
J & K ESTATES WATER CO INC	25-7036	Decreed	6/13/1973	DOMESTIC	1.30		
J & L HOLDINGS LLC	25-14481	Decreed	3/20/1959	IRRIGATION	0.03	2.5	
J & L HOLDINGS LLC	25-14509	Decreed	4/22/1979	IRRIGATION	0.04	2.0	
J & L HOLDINGS LLC	25-14497		2/24/2021	DOMESTIC	0.51		
J & L HOLDINGS LLC	25-14512		1/24/2022	IRRIGATION	0.50	25.0	
J D HEISKELL HOLDINGS LLC	37-22665	Decreed	9/12/1973	COMMERCIAL	0.02		
J K MERRILL & SONS INC	29-7754	License	6/17/1983	COMMERCIAL	0.81		
J R SIMPLOT CO	29-7036	Decreed	9/10/1969	DOMESTIC, INDUSTRIAL	0.03		
J T LAND LLC	36-16301	Decreed	6/11/1957	COMMERCIAL, STOCKWATER	0.02		
J T LAND LLC	36-17123	Decreed	1/1/1958	COMMERCIAL, STOCKWATER	0.02		
J T LAND LLC	36-17163	Decreed	1/2/1958	COMMERCIAL, STOCKWATER	0.02		
J T LAND LLC	36-17114	Decreed	4/1/1960	COMMERCIAL, STOCKWATER	0.06		
J T LAND LLC	36-17151	Decreed	4/1/1960	COMMERCIAL, STOCKWATER	0.04		
J T LAND LLC	36-11081	Decreed	10/1/1984	DOMESTIC, STOCKWATER	0.04		
JACOBS, GEORGE J	25-7321	License	5/9/1983	DOMESTIC, STOCKWATER	0.08		
JANSS FARMS	37-7351	Decreed	4/12/1974	STOCKWATER	0.14		
JANSSEN, KARLEEN A	25-12143	Decreed	2/8/1985	COMMERCIAL	0.04		
JB ENTERPRISE LLC	29-14209	Decreed	2/27/1967	IRRIGATION	0.94	47.0	
JBROC LLC	35-14815	Decreed	2/15/1957	IRRIGATION	1.94	99.0	
JEFFERSON COUNTY	25-14398	Decreed	11/29/1971	IRRIGATION	0.04	68.2	
JEFFERSON COUNTY	25-14399	Decreed	11/29/1971	IRRIGATION	0.00	68.2	
JEFFERSON COUNTY	25-14382	Decreed	7/19/1973	IRRIGATION	0.04	68.2	
JEFFERSON COUNTY	25-14281	License	9/9/2010	COMMERCIAL	0.65		
JEFFERSON GREENS ESTATES HOMEOWNERS ASSOCIATION INC	25-14491	Decreed	4/22/1979	IRRIGATION	0.36	17.8	
JEFFERSON GREENS ESTATES HOMEOWNERS ASSOCIATION INC	25-14490	License	7/29/1991	IRRIGATION	0.06	3.2	
JEFFERSON GREENS HOMEOWNERS ASSN	25-14478	Decreed	1/24/1978	IRRIGATION	0.06	3.1	
JEFFERSON SCHOOL DISTRICT #251	35-8683	License	12/2/1988	INDUSTRIAL	0.02		
JEFFERSON SCHOOL DISTRICT #251	25-7472	License	1/23/1989	DOMESTIC	0.07		
JEFFERSON SCHOOL DISTRICT #251	25-7473	License	1/23/1989	DOMESTIC	0.07		
JENCO ACRES WATER BOARD ASSN	25-7454	License	11/14/1988	DOMESTIC, IRRIGATION	0.50	33.0	
JENKINS, FRANK L	22-11197	Decreed	6/6/1980	COMMERCIAL, DOMESTIC	0.04		
JENSEN, WAYNE A	35-14744	Decreed	7/11/1960	IRRIGATION	2.02	1330.5	
JENSON, KATHRYN; JENSON, MONTE	25-14065	Decreed	5/20/1955	IRRIGATION	0.06	18.9	
JENSON, KATHRYN; JENSON, MONTE	25-14067	Decreed	4/1/1961	IRRIGATION	0.13	18.9	
JENSON, KATHRYN; JENSON, MONTE	25-14061	Decreed	12/22/1971	IRRIGATION	0.03	18.9	
JENSON, RONALD; JENSON, SHARON	25-10156	Decreed	10/1/1959	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.5	
JENTZSCH, RODNEY A	36-13599	Decreed	4/15/1956	COMMERCIAL, DOMESTIC	0.04		
JEROME COUNTY ROD & GUN CLUB	36-8620	License	11/14/1991	COMMERCIAL, IRRIGATION	0.02	0.5	
JOHNSON, DON A; JOHNSON, LAURIE	25-7493	License	3/8/1989	DOMESTIC	0.06		
JOHNSON, GARY; JOHNSON, ROBERT	35-7593B	Decreed	3/22/1976	STOCKWATER	0.23		
JOHNSON, MELISSA	25-7455	License	10/21/1988	DOMESTIC, IRRIGATION	0.07	1.0	
JOHNSON, MICHAEL ORSON	35-14817	License	6/11/1985	IRRIGATION	0.02	1.3	
JOHNSON, RUSSELL STUART	35-14816	License	6/11/1985	IRRIGATION	0.02	1.3	
JOSEPHSON, JEANETTE; JOSEPHSON, JOHN	35-8719	License	4/14/1989	INDUSTRIAL	0.04		

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JOURNEYS END HOMEOWNERS ASSN	35-13612	License	11/24/2003	DOMESTIC	0.40		
JOURNEYS END HOMEOWNERS ASSN	35-13611	License	1/13/2007	COMMERCIAL, DOMESTIC	0.11		
JUNIPER & CEDAR ESTATES WATER ASSN	25-7432	License	7/19/1988	DOMESTIC, IRRIGATION	0.24	5.0	
KAREY LANE WELL ASSN	35-7698	Decreed	8/11/1983	DOMESTIC	0.14		
KAREY LANE WELL ASSN	35-8943	License	5/3/1991	DOMESTIC	0.09		
KAY, JUSTINE; KAY, THOMAS F; LEVESQUE, GLENDA R	34-2484	Decreed	8/12/1966	IRRIGATION	0.01	2.0	
KBC FARMS LLC	35-14736	Decreed	10/16/1974	IRRIGATION	0.39	461.4	
KEITH SKAAR FARMS INC	25-13312	Decreed	5/1/1962	COMMERCIAL	0.04		
KERBS OIL CO INC	45-7643	License	5/19/1989	COMMERCIAL	0.04	0.0	
KERBS OIL CO INC	45-7644	License	5/22/1989	COMMERCIAL	0.04	0.0	
KEYBANK NATIONAL ASSOC	25-7517	License	8/24/1989	COMMERCIAL	0.50		
KING, FERRIL; KING, RENE	36-8440	License	9/7/1989	COMMERCIAL	0.02		
KINGHORN, KARL	25-14338	Decreed	2/18/1958	IRRIGATION	1.37	47.9	
KINGHORN, KAYLYNN; KINGHORN, LORAN; PARSONS, KARLA M; PARSONS, WILLIAM T	35-13441	Decreed	5/1/1960	COMMERCIAL	0.04		
KIRBY, DORIS F; KIRBY, ELWOOD	35-7860	License	6/20/1979	DOMESTIC	0.08		
KIT CIRCLE LLC	22-7296	Decreed	6/19/1979	DOMESTIC	0.16		
KITS FOUNDRY & MACHINE SHOP INC	27-7460	License	5/16/1989	DOMESTIC, INDUSTRIAL	0.05		
KLASSEN, HAROLD J	35-8724	License	4/10/1989	COMMERCIAL	0.02		
KNIFE RIVER CORPORATION MOUNTAIN WEST	25-14351	Decreed	7/19/1973	MITIGATION	0.05		
KNIFE RIVER CORPORATION MOUNTAIN WEST	25-14498	Decreed	4/22/1979	INDUSTRIAL	0.08		
KNIFE RIVER CORPORATION MOUNTAIN WEST	25-14499	License	1/14/1983	INDUSTRIAL	0.07		
KOCH MATERIALS CO	35-12087	Decreed	5/1/1962	COMMERCIAL, FIRE PROTECTION, INDUSTRIAL	0.11		
KOON, JACK E	22-7751	License	9/18/1992	DOMESTIC	0.06		
KOYLE, JOHN DENNIS; KOYLE, SHANNA	37-2663	Decreed	5/31/1961	IRRIGATION	2.12	156.0	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14730	Decreed	9/28/1981	IRRIGATION	0.01	2.4	
KUGLER, DIANE K; KUGLER, JOHN B	35-8359		11/28/1984	IRRIGATION	6.00	313.0	
L & S LAND HOLDINGS LLC	36-17189	Decreed	11/26/1956	COMMERCIAL, STOCKWATER	0.13		
L & S LAND HOLDINGS LLC	36-14863	Decreed	3/1/1960	DOMESTIC, STOCKWATER	0.11		
L & S LAND HOLDINGS LLC	36-15653	Decreed	12/3/1966	COMMERCIAL, STOCKWATER	0.04		
L & S LAND HOLDINGS LLC	36-15651	Decreed	10/18/1968	COMMERCIAL, STOCKWATER	0.05		
L & S LAND HOLDINGS LLC	36-15655	Decreed	2/18/1971	COMMERCIAL, STOCKWATER	0.02		
L & S LAND HOLDINGS LLC	36-17188	Decreed	1/23/1973	COMMERCIAL, STOCKWATER	0.09		
L & S LAND HOLDINGS LLC	36-17190	Decreed	10/27/1973	COMMERCIAL, STOCKWATER	0.08		
L & S LAND HOLDINGS LLC	36-17187	License	9/24/1979	COMMERCIAL, STOCKWATER	0.20		
LACEYS VISTA ACRES WATER CORP	29-7607	License	7/15/1981	DOMESTIC	0.67		
LAMB WESTON INC	35-14786		4/29/2022	INDUSTRIAL	15.00		
LAMBERT, LYLE; LAMBERT, NADINE	29-7640	Decreed	5/17/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.0	
LAMBERT, R J	35-8670	License	9/14/1988	COMMERCIAL	0.04		
LAND VIEW FERTILIZER INC	36-15347	Decreed	1/1/1961	COMMERCIAL	0.08		
LAND VIEW INC	36-11048	Decreed	9/1/1954	COMMERCIAL, DOMESTIC	0.15		
LARSEN, HELEN	35-8127	License	4/28/1983	DOMESTIC, STOCKWATER	0.08		
LARSEN, PEGGY A; LARSEN, RICHARD J	31-7129	License	7/30/1974	DOMESTIC, STOCKWATER	0.08		
LARSON, BECKY J; LARSON, CHARLES W	45-4160	Decreed	3/15/1962	IRRIGATION	1.70	173.0	
LAZY EIGHT ESTATES DIVISION 2 HOMEOWNERS ASSN INC	25-14189	License	10/26/2006	DOMESTIC	0.50		
LCSC ENTERPRISES LLC	35-14646	Decreed	8/28/1961	IRRIGATION	0.21	93.8	

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LCSC ENTERPRISES LLC	35-14647	Decreed	8/28/1961	IRRIGATION	0.20	347.3	
LEE, CAROLYN C; LEE, LARRY O	31-7166A		6/27/1975	IRRIGATION	3.20	160.0	
LEE, MARTIN R	36-8410	License	2/10/1989	COMMERCIAL	0.03		
LEFFLER, JERRY; LEFFLER, PATRICIA	29-7460	Decreed	9/6/1978	DOMESTIC, IRRIGATION	0.20	9.0	
LEISHMAN ELECTRIC	22-7558	License	8/30/1988	COMMERCIAL	0.02		
LEISHMAN, LAURIE; LEISHMAN, STERLING	35-14822	License	6/11/1985	IRRIGATION	0.02	1.1	
LES SCHWAB TIRE CENTERS OF IDAHO	36-11803	Decreed	11/15/1958	COMMERCIAL	0.38		
LEWISVILLE CEMETERY DISTRICT	25-14389	Decreed	5/1/1962	IRRIGATION	0.04	3.3	
LEWISVILLE CEMETERY DISTRICT	25-14394	Decreed	5/1/1962	IRRIGATION	0.04	3.3	
LEZAMIZ, SID	37-10363	Decreed	9/1/1959	COMMERCIAL	0.11		
LIMA, GUADALUPE	36-17128	Decreed	9/20/1973	IRRIGATION	0.02	1.2	
LINCOLN LAND CO LLC	25-2119	Decreed	6/10/1955	DOMESTIC	5.56		
LITTLE BUTTE CEMETERY DISTRICT	25-4048	Decreed	4/18/1956	IRRIGATION	0.28	14.0	
LOOSLI, S LYNN	21-13258	Decreed	7/14/1977	IRRIGATION	6.75	1651.5	
LORDS, DARRELL M	35-8778	License	5/31/1989	IRRIGATION	0.10	4.5	
LOST RIVER FARMS	34-14346	Decreed	8/12/1966	IRRIGATION	0.38	177.0	
LOVELAND, ANN; LOVELAND, KEVIN	29-2372	Decreed	1/5/1956	IRRIGATION	1.10	55.0	
LOVELL, HOPE; LOVELL, JAMES R	25-7598	License	9/25/1991	IRRIGATION	0.03	1.9	
LOVELL, RONALD L; LOVELL, TAMARA	25-2118	Decreed	3/26/1955	IRRIGATION	3.62	496.0	
LOVELL, RONALD L; LOVELL, TAMARA	25-4288	Decreed	5/1/1959	IRRIGATION	1.06	496.0	
LOWDER, JUSTIN; LOWDER, LUCILE	29-7539	Decreed	4/4/1980	DOMESTIC, IRRIGATION	0.07	2.0	
LYNCH, LESLIE R	36-7154	Decreed	1/25/1971	INDUSTRIAL	0.02		
M & B INVESTMENTS LLC	25-14163	License	12/9/2004	DOMESTIC	0.30		
M & B INVESTMENTS LLC	25-14379	License	8/13/2012	DOMESTIC	0.39		
MAD MOOSE PIZZA IDAHO LLC	22-7633	License	3/2/1989	COMMERCIAL	0.04		
MADISON SCHOOL DISTRICT #321	22-14474		5/13/2022	DOMESTIC	0.26		
MAGIC VALLEY GROWERS LTD	37-20612	Decreed	6/1/1956	INDUSTRIAL	0.10		
MAGIC VALLEY PRODUCE INC	36-13763	Decreed	10/1/1955	COMMERCIAL	0.04		
MALONY, CAROL	27-12333	Decreed	9/11/1974	IRRIGATION	0.10	5.0	
MARSHALL, DON W	25-7462	License	11/10/1988	DOMESTIC, IRRIGATION	0.07	1.0	
MARTIAN, ERICA; MARTIAN, PETER	35-7855	Decreed	5/1/1979	COMMERCIAL, HEATING	0.04		
MASON, JOHN D; MASON, VALERIE	29-7294	Decreed	11/4/1975	DOMESTIC, IRRIGATION	0.12	8.0	
MASONER, MRS MERLE	36-11978	Decreed	1/1/1963	COMMERCIAL	0.02		
MASONS	35-8828	License	7/28/1989	COMMERCIAL	0.04		
MAUGHAN, GAYLORD L	31-12220	Decreed	8/22/1955	IRRIGATION	0.07	3.5	
MC CAIN FOODS USA INC	45-13970	Decreed	9/1/1957	INDUSTRIAL	2.66	0.0	
MC CAIN FOODS USA INC	45-2747	Decreed	3/15/1960	INDUSTRIAL	4.00	0.0	
MC CAIN FOODS USA INC	45-2758	Decreed	3/15/1960	COMMERCIAL	2.08	0.0	
MC CAIN FOODS USA INC	45-2748	Decreed	3/6/1961	INDUSTRIAL	0.60	0.0	
MC CAIN FOODS USA INC	45-2749	Decreed	8/13/1965	INDUSTRIAL	2.85	0.0	
MC CAIN FOODS USA INC	45-7137	Decreed	5/24/1973	INDUSTRIAL	3.43	0.0	
MC CAIN FOODS USA INC	45-7241	Decreed	5/27/1975	COMMERCIAL, FIRE PROTECTION	0.25	0.0	
MC CALL OIL & CHEMICAL	25-7045	Decreed	2/25/1974	DOMESTIC, INDUSTRIAL	0.08		
MC COWIN, BRENDA	25-7544	License	8/16/1989	DOMESTIC	0.07		
MC COY, VALERIE	34-10329	Decreed	12/31/1955	IRRIGATION	0.02	1.0	
MC GARRY, BRANDON; MC GARRY, BRITTNI	35-14687	Decreed	1/10/1957	IRRIGATION	0.90	65.0	

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MC GARRY, BRANDON; MC GARRY, BRITTNI	35-14689	Decreed	4/7/1958	IRRIGATION	0.40	65.0	
MC GARRY, KATHLEEN; MC GARRY, TIM R	35-14686	Decreed	1/10/1957	IRRIGATION	1.72	124.0	
MC GARRY, KATHLEEN; MC GARRY, TIM R	35-14688	Decreed	4/7/1958	IRRIGATION	0.77	124.0	
MC GARRY, LOGAN PHILLIPS; MC GARRY, WHITNEY DAWN	21-13309	Decreed	6/25/1960	IRRIGATION	0.03	1.5	
MEADOW LARK COURT LLC	22-10170	Decreed	6/15/1960	COMMERCIAL, STOCKWATER	0.20		
MERRILL, CHRISTOPHER; MERRILL, CINDY	25-13580	Decreed	1/1/1963	DOMESTIC, IRRIGATION	0.14	5.0	
MERRILL, KENT	25-14364	License	2/28/1992	IRRIGATION	0.19	12.2	
MEYERS, M JAY	29-2407	Decreed	3/6/1959	IRRIGATION	2.54	127.0	
MICHAUD CREEK RANCHES INC	29-2515	Decreed	1/5/1966	IRRIGATION	2.00	196.0	
MICHAUD CREEK RANCHES INC	29-7089	Decreed	6/9/1972	IRRIGATION	1.08	196.0	
MICKELSEN, LINDON A; MICKELSEN, LOREEN A	27-10416	Decreed	6/1/1962	COMMERCIAL, DOMESTIC, STOCKWATER	0.09		
MIDNIGHT SUN INC	35-8722	License	4/21/1989	INDUSTRIAL	0.01		
MIKESELL, ELEANOR	31-10268	Decreed	5/1/1957	COMMERCIAL, DOMESTIC	0.04		
MIKKOLA, ARTHUR; MIKKOLA, MARK	25-7389	Decreed	11/2/1983	DOMESTIC, STOCKWATER	0.06		
MILES, BETTY; MILES, KENNETH RICK	25-14502	Decreed	4/22/1979	IRRIGATION	0.05	2.5	
MILLER, CHARLES; MILLER, RACHEL	25-7442	License	9/8/1988	DOMESTIC, IRRIGATION	0.05	1.0	
MILLER, KALVIN W; MILLER, PAMELLA K	36-16655	Decreed	4/1/1961	STOCKWATER	0.03		
MILLER, LYNETTE R; MILLER, MARVIN G	25-4194	Decreed	11/1/1960	IRRIGATION	0.13	7.0	
MINIDOKA IRRIGATION DISTRICT	36-13480	Decreed	5/31/1962	COMMERCIAL	0.04		
MISTY VALLEY LLC	22-14350	Decreed	3/20/1959	AESTHETIC STORAGE, DIVERSION TO STORAGE, FIRE PROTECTION STORAGE	0.01		
MITCHELL, DELL N; MITCHELL, SUSAN L	45-14546	Decreed	10/20/1980	IRRIGATION	0.24	18.8	
MITCHELL, RALPH M	45-7640	License	5/23/1989	DOMESTIC, IRRIGATION	0.07	1.5	
MODEL WATER USERS ASSN INC	35-7986	Decreed	6/1/1981	DOMESTIC	0.10		
MODERN MILLS ROCKFORD INC	35-13014	Decreed	4/1/1960	COMMERCIAL	0.05		
MONK, AUBRIE; MONK, STEVEN	35-14754	Decreed	4/23/1961	IRRIGATION	0.04	6.0	
MORGAN, CODY G; MORGAN, KATHY	36-17092	Decreed	3/11/1954	COMMERCIAL, STOCKWATER	0.04		
MORGAN, CODY G; MORGAN, KATHY	36-17091	Decreed	2/6/1961	COMMERCIAL, STOCKWATER	0.02		
MORGANS PASTURE LAND CO LLC	35-14551	Decreed	1/6/1955	IRRIGATION	4.20	279.0	
MORRISS, JUDITH L; MORRISS, VIRGIL R	25-7483	License	12/22/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.04	3.0	
MOSS, MARY	29-11410	Decreed	5/14/1960	DOMESTIC, IRRIGATION, STOCKWATER	0.08	1.2	
MOUNTAIN RIVER SPORTSMANS RV PARK & CAMP	25-14229	License	9/2/2008	COMMERCIAL	0.20		
MOUNTAIN VIEW COURT LLC	21-7428	License	3/23/1989	COMMERCIAL	0.09		
MOUNTAIN VIEW LAND LLC	36-17192	Decreed	9/24/1976	COMMERCIAL, STOCKWATER	0.20		
MOUNTAIN WEST BARK PRODUCTS INC	22-7573	License	8/8/1988	COMMERCIAL	0.08		
MOYLE, KEVIN A; MOYLE, TAYLOR N	36-17240	License	3/16/1989	COMMERCIAL, DOMESTIC, STOCKWATER	0.33		
MURDOCK, JODDI E; MURDOCK, O BRIAN	35-14811	Decreed	5/9/1956	IRRIGATION	0.06	62.0	
MURDOCK, JODDI E; MURDOCK, O BRIAN	35-14812	Decreed	4/18/1958	IRRIGATION	0.10	62.0	
MURDOCK, JODDI E; MURDOCK, O BRIAN	35-14806	Decreed	9/23/1968	IRRIGATION	0.20	62.0	
MURDOCK, JODDI E; MURDOCK, O BRIAN; MURDOCK, ROBERT A; MURDOCK, TERESA	35-14810	Decreed	6/17/1957	IRRIGATION	0.04	62.0	
MURDOCK, O BRIAN; MURDOCK, ROBERT A	35-14798	Decreed	7/19/1974	IRRIGATION	0.32	18.0	
MURDOCK, O BRIAN; MURDOCK, ROBERT A	35-14799	Decreed	7/19/1974	IRRIGATION	0.11	6.0	
MURDOCK, O BRIAN; MURDOCK, ROBERT A	35-14800	Decreed	7/19/1974	IRRIGATION	0.08	4.4	
MURDOCK, O BRIAN; MURDOCK, ROBERT A	35-14801	Decreed	7/19/1974	IRRIGATION	0.21	11.6	
MURDOCK, O BRIAN; MURDOCK, ROBERT A	35-14802	Decreed	7/19/1974	IRRIGATION	0.09	5.0	

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MURDOCK, O BRIAN; MURDOCK, ROBERT A	35-14803	Decreed	7/19/1974	IRRIGATION	0.21	12.0	
MURDOCK, ROBERT A; MURDOCK, TERESA	35-14797	Decreed	12/9/1955	IRRIGATION	0.26	62.0	
MURDOCK, ROBERT A; MURDOCK, TERESA	35-14807	Decreed	9/16/1960	IRRIGATION	0.16	62.0	
NAPOLI, MARIA; ULIAN, PETER	34-7211	Decreed	1/6/1978	DOMESTIC, IRRIGATION	0.10	4.0	
NATURAL GUARDIAN LLC	35-14731	Decreed	10/28/1965	INDUSTRIAL	5.35		
NEIBAUR, RYAN	25-7561	License	3/2/1990	IRRIGATION	4.00	360.5	
NELSEN DAIRY	36-8745	License	11/7/1995	COMMERCIAL, STOCKWATER	0.11		
NEW PHASE INVESTMENTS LLC	25-14186	License	9/18/2006	COMMERCIAL	0.05		
NICKELSON, DALENE C	25-7193A	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.9	
NOEL, DE ANN B; NOEL, WRIGHT R	22-7372	License	7/14/1981	DOMESTIC, STOCKWATER	0.07		
NORTH HIGHLANDER FARMS INC	25-7438	License	8/8/1988	COMMERCIAL	0.04		
NORTHLAND TERRACE WATER USERS ASSN INC	27-7138	License	5/18/1979	DOMESTIC	0.68		
NORTHSIDE RANCH CO LLC	36-2318B	Decreed	2/28/1957	STOCKWATER	0.05		
NORTHWEST PIPELINE CORP	45-2531	Decreed	7/6/1956	DOMESTIC, INDUSTRIAL	0.04	0.0	
NULPH BROTHERS INC	27-7466	License	5/3/1989	COMMERCIAL	0.04		
NUR WATER CORP INC	25-7035	Decreed	6/13/1973	DOMESTIC	0.62		
NUTTALL, ALIESHA DAWN; NUTTALL, JEFFREY DOUGLAS	25-7275	Decreed	2/8/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
OAK VALLEY LAND CO LLC	45-14533	Decreed	9/6/1967	COMMERCIAL, STOCKWATER	3.01	0.0	
OLSEN, JOHN W	27-7016	Decreed	4/22/1971	IRRIGATION	1.48	74.0	
OLSEN, JOHN W	27-7039	Decreed	4/23/1974	IRRIGATION	0.38	19.0	
ON TIME FINANCIAL LLC	22-14478		7/14/2022	COMMERCIAL, DOMESTIC	0.21		
OSTERHOUT, DANA; OSTERHOUT, GAYLEN; OSTERHOUT, LORRIE; OSTERHOUT, VIRGINIA M	45-10587	Decreed	6/30/1958	COMMERCIAL, DOMESTIC, IRRIGATION	0.08	0.5	
PACIFIC CONTAINER INC	25-7420	License	11/8/1987	COMMERCIAL	0.04		
PACIFICORP	25-14431	License	2/19/2016	WATER QUALITY IMPROVEMENT	0.47		
PACIFICORP AN OREGON CORP	35-2830	Decreed	5/27/1966	COMMERCIAL	0.02		
PACIFICORP AN OREGON CORP	25-7403	License	6/14/1985	WATER QUALITY IMPROVEMENT	0.45		
PARK WATER CO INC	45-10785	Decreed	12/14/1958	DOMESTIC	0.24	0.0	
PARKER, BECKY; PARKER, BRENT; PARKER, KEVIN; PARKER, MILISA	21-13319	License	3/21/1988	IRRIGATION	0.60	33.0	
PARKER, BRENT E; PARKER, KRISTINE	25-7073E	Decreed	8/1/1975	IRRIGATION	0.20	10.0	
PARKINSON FARMS	34-2497	Decreed	9/27/1966	IRRIGATION	0.57	480.0	
PARKINSON FARMS	34-2490	Decreed	10/25/1966	IRRIGATION	2.09	306.0	
PARKINSON FARMS	34-2506	Decreed	3/2/1967	IRRIGATION	1.17	480.0	
PARKINSON FARMS	34-2505	Decreed	3/3/1967	IRRIGATION	1.06	480.0	
PARKINSON FARMS	34-4008	Decreed	4/1/1967	IRRIGATION	2.60	480.0	
PARKINSON FARMS	34-10393	Decreed	5/1/1976	IRRIGATION	0.26	306.0	Yes
PARKWOOD ACRES WATER CO INC	25-7175	Decreed	7/3/1979	DOMESTIC	0.50		
PATTON & LINTON INC	29-10994	Decreed	3/1/1956	INDUSTRIAL	0.13		
PERFORMIX NUTRITION SYSTEMS LLC	36-17196	Decreed	5/27/1974	COMMERCIAL	0.06		
PETERSEN, KIMBERLY ANN; PETERSEN, RYAN CLAIR	34-7219	Decreed	7/4/1978	COMMERCIAL, HEATING, IRRIGATION, MITIGATION	0.92	69.8	
PHILLIPS, ELIZABETH H; PHILLIPS, JOSEPH	35-14742	Decreed	6/11/1958	IRRIGATION	0.05	25.0	
PHILLIPS, ELIZABETH H; PHILLIPS, JOSEPH	35-14743	License	4/10/1998	IRRIGATION	0.02	25.0	
PILKINTON, C R; PILKINTON, THOMAS R	36-7650B	Decreed	7/30/1976	IRRIGATION	0.08	4.0	
PINGREE LAND CO LLC	29-7806	Decreed	12/10/1985	COMMERCIAL	0.01		
PINSON, JANICE	25-14182	License	3/24/2006	COMMERCIAL	0.20		
PIONEER WATER USERS ASSN INC	35-7671	Decreed	2/7/1977	DOMESTIC	0.11		

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POCATELLO SOD	29-2370	Decreed	8/29/1955	IRRIGATION	3.14	157.0	
POLATIS BROTHERS	35-14733	Decreed	10/22/1954	IRRIGATION	0.09	351.0	
POLATIS BROTHERS	35-14735	Decreed	6/16/1961	IRRIGATION	0.09	351.0	
PONY ACRES WATER ASSN	29-7625	Decreed	12/15/1981	DOMESTIC, IRRIGATION	0.16	2.0	
POPE, CAROL C	34-4133	Decreed	5/1/1960	DOMESTIC, IRRIGATION	0.12	6.2	
PORT OF ENTRY TRAVEL CENTER LLC	31-11787	Decreed	9/7/1971	COMMERCIAL	0.12		
PRESCOTT, GWENNA R; PRESCOTT, WADE L	37-2676	Decreed	12/11/1961	IRRIGATION	1.85	450.4	
PRICE, MARJORIE	22-14447		2/16/2022	COMMERCIAL	0.02		
PRINCE, CARI L; PRINCE, JAMES J	36-17191	Decreed	2/20/1964	IRRIGATION	1.94	97.0	
PROW, REBECCA; PROW, SCOTT E	45-13972	Decreed	11/12/1957	IRRIGATION	0.04	2.8	
QUALITY INSULATION & CONSTRUCTION INC	25-7539	License	8/18/1989	COMMERCIAL	0.04		
QUINTON, BERNADENE L; QUINTON, RAY E	25-7536	License	9/18/1989	COMMERCIAL	0.02		
R C WILLEY HOME FURNISHINGS	35-14596		5/25/2018	COMMERCIAL	0.78		
RABURN, JAYNEE N; RABURN, LENARD H	29-7143B	Decreed	7/2/1973	DOMESTIC, IRRIGATION	0.03	1.0	
RANDALL, GLADYS	22-7594	License	8/25/1988	COMMERCIAL	0.04		
RAYMOND, W CRAIG	25-13401	Decreed	6/28/1954	IRRIGATION, STOCKWATER	0.09	3.5	
REED, CHARLES LE ROY	35-12258	Decreed	6/1/1955	COMMERCIAL, DOMESTIC, STOCKWATER	0.09		
REES, CARL C; REES, PATRICIA	29-7240	Decreed	11/29/1974	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.3	
RHODEHOUSE, KEVIN	35-2924	Decreed	7/21/1965	INDUSTRIAL, STOCKWATER	1.11		
RHODEHOUSE, KEVIN	35-8659	License	10/15/1987	COMMERCIAL, STOCKWATER	0.15		
RICE, JOHN; RICE, KATIE	35-14684	Decreed	9/8/1961	IRRIGATION	0.11	2.7	
RICH, DORIS; RICH, GERALD E	36-11369	Decreed	8/20/1959	COMMERCIAL	0.03		
RICHAN, CLYDE L; RICHAN, ELVERA L	36-8486	License	9/19/1989	COMMERCIAL, DOMESTIC	0.03		
RICHARDS, DENICE	27-7343	Decreed	3/2/1983	DOMESTIC, IRRIGATION	0.08	5.0	
RICHARDSON, BRIAN	35-8769	License	5/31/1989	COMMERCIAL, DOMESTIC	0.07		
RICKS, CONNIE	25-7183	Decreed	1/14/1980	DOMESTIC, STOCKWATER	0.06		
RIGBY PIONEER CEMETERY	25-13448	Decreed	4/1/1955	IRRIGATION	0.40	20.0	
RIM ROCK LEASING LLC	36-8512	License	2/27/1990	COMMERCIAL	0.02		
RINDFLEISCH, JAMES A	34-7511		6/12/1989	IRRIGATION	1.85	92.4	
RINGEL, LORI; RINGEL, MERLYN R	35-14630	Decreed	9/28/1981	IRRIGATION	0.01	4.7	
RIRIE SCHOOL DISTRICT #252	25-2122E	Decreed	4/27/1956	IRRIGATION	0.38	24.0	
RIVERBEND ESTATES	29-8015	License	6/22/1990	DOMESTIC	0.25		
RIVERVIEW ACRES #2 WATER CORP	35-11348	Decreed	6/1/1960	DOMESTIC	0.16		
RIVERVIEW TWO LLC	35-8632	Decreed	1/19/1981	COMMERCIAL, INDUSTRIAL	0.04		
ROBINSON, TIMOTHY L	36-17115	Decreed	3/15/1963	IRRIGATION	0.02	1.0	
ROEDER, JAMES L; ROEDER, JOHN	29-7177	License	3/4/1974	DOMESTIC, STOCKWATER	0.08		
ROKER, ELAINE; ROKER, JIM	25-7132	Decreed	8/25/1977	IRRIGATION	1.22	61.0	
ROSS, PAULINE	37-8112	Decreed	6/2/1983	COMMERCIAL, COOLING	0.02		
RUDY, THOMAS A	45-7278	Decreed	12/6/1976	DOMESTIC	0.24	0.0	
RUNHARD LLC	22-7293	Decreed	5/24/1979	COOLING, HEATING	0.15		
RURAL ELECTRIC CO	36-8435	License	8/11/1989	COMMERCIAL	0.04		
RUSSELL, CATHERINE L; RUSSELL, LELAND D	36-16560	Decreed	2/8/1971	IRRIGATION	0.01	2.0	
SCHAEFFER, DIANNE RAE	36-17234	Decreed	1/22/1958	STOCKWATER	0.18		
SCHREINER FARMS IDAHO LLC	35-2488	Decreed	1/10/1957	IRRIGATION	0.02	2.0	
SCHREINER FARMS IDAHO LLC	35-2922	Decreed	4/7/1958	IRRIGATION	0.01	2.0	
SCHREINER FARMS IDAHO LLC	35-8951	License	7/29/1991	IRRIGATION	0.88	44.0	

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SCHRITTER FARM PARTNERSHIP	35-14720	Decreed	8/27/1973	IRRIGATION	0.18	261.0	
SCHRITTER FARM PARTNERSHIP	35-14721	Decreed	8/27/1973	IRRIGATION	0.39	573.5	
SCHROEDER, MICHELLE; SCHROEDER, NATHAN	29-4104	Decreed	7/28/1955	IRRIGATION	3.00	150.0	
SCHWANS SALES ENTERPRISES INC	27-7439	License	8/14/1987	COMMERCIAL	0.04		
SCHWIEDER, KAELYNE; SCHWIEDER, KIRT	35-14732	Decreed	4/11/1972	IRRIGATION	0.10	3345.0	
SCHWIEDER, KAELYNE; SCHWIEDER, KIRT	35-14777	Decreed	8/31/1973	IRRIGATION	0.08	3345.0	
SCHWIEDER, KAELYNE; SCHWIEDER, KIRT	35-14778	Decreed	10/14/1975	IRRIGATION	0.09	3345.0	
SCOTT, LAMOND; SCOTT, RUTH	35-10855	Decreed	1/4/1954	COMMERCIAL, DOMESTIC	0.04		
SCOTT, STANLEY K	31-7512	License	11/30/1988	DOMESTIC, STOCKWATER	0.19		
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13986	Decreed	11/11/1959	COMMERCIAL, STOCKWATER	0.08	0.0	
SELENSKY, CATHY; SELENSKY, CLARENCE J	25-7392B	License	12/16/1983	IRRIGATION	0.15	5.0	
SHELLEY, ELTON C; SHELLEY, WANDA B	29-2486D	Decreed	12/16/1963	IRRIGATION	0.26	16.0	
SHELLEY, ELTON C; SHELLEY, WANDA B	29-7725	License	6/6/1983	IRRIGATION	0.28	14.0	
SHOSHONE BANNOCK TRIBES	27-7000		7/27/1967	MUNICIPAL	0.5		
SHOSHONE BANNOCK TRIBES	29-7326	Decreed	4/28/1976	IRRIGATION	2.53	160.0	
SHOSHONE BANNOCK TRIBES	29-13941	Decreed	10/3/1977	IRRIGATION	0.18	10.5	
SHURTLIFF, ALICE R; SHURTLIFF, REX S	25-13026	Decreed	12/31/1957	COMMERCIAL	0.04		
SHURTLIFF, MERLENE; SHURTLIFF, RODNEY	35-8855	License	9/7/1989	DOMESTIC, STOCKWATER	0.08		
SILVER CREEK DISTILLERS INC	25-7194	License	12/1/1988	INDUSTRIAL	0.11		
SIMPSON, DANNY V; SIMPSON, JULIE M	37-22930	Decreed	11/25/1962	IRRIGATION	0.05	2.3	
SIX S RANCH LLC	45-14472	Decreed	12/1/1967	IRRIGATION	0.04	263.3	
SIX S RANCH LLC	45-14471	Decreed	8/25/1969	IRRIGATION	0.96	263.3	
SLUDER, GILBERT T; SLUDER, GONDA O; SLUDER, RONALD E	37-8108	Decreed	6/1/1983	DOMESTIC	0.08		
SMITH CATTLE COMPANY LLC	25-13990	Decreed	9/25/1973	COMMERCIAL	0.39		
SMITH CATTLE COMPANY LLC	25-13991	Decreed	9/25/1973	COMMERCIAL	0.39		
SMITH CATTLE COMPANY LLC	25-13992	Decreed	4/18/1974	COMMERCIAL	0.05		
SMITH CATTLE COMPANY LLC	25-13993	Decreed	4/8/1975	COMMERCIAL	0.39		
SMITH CATTLE COMPANY LLC	25-13994	Decreed	5/23/1975	COMMERCIAL	0.20		
SMITH, ANTON	29-7403	Decreed	5/23/1977	IRRIGATION	0.32	16.0	
SMITH, BLAINE; SMITH, GARRY	22-7554	License	8/8/1988	COMMERCIAL	0.02		
SMITH, EDWARD A	29-2551	Decreed	2/27/1967	IRRIGATION	3.00	149.7	
SMITH, JOAN; SMITH, SCOTT	34-14313	License	7/8/1992	IRRIGATION	0.01	1.0	
SMITH, NORBERT DARRELL	29-7171	Decreed	2/4/1974	DOMESTIC	0.16		
SNAKE RIVER BUSINESS PARK BLDG #1 LLC	35-14787		8/19/2022	COMMERCIAL	0.20		
SNAKE RIVER SCHOOL DISTRICT #52	35-14693	Decreed	5/27/1974	IRRIGATION	0.03	6.0	
SNELL, MARK	29-7696	License	3/16/1983	DOMESTIC, IRRIGATION	0.08	2.0	
SOHN, EDNA G; SOHN, HERBERT F; SOHNS INC	35-8333	Decreed	12/12/1983	COMMERCIAL, DOMESTIC	0.08		
SOMSEN, DIANNE L; SOMSEN, G FRANK	45-2485	Decreed	11/8/1954	IRRIGATION	2.68	432.0	
SOMSEN, DIANNE L; SOMSEN, G FRANK	45-4242	Decreed	6/1/1956	IRRIGATION	1.84	432.0	
SOUTH FORK POTATO HOLDING LLC	25-11143	Decreed	6/1/1956	INDUSTRIAL	0.20		
SOUTH INTERCHANGE PROPERTIES	35-14266	Decreed	8/5/1969	IRRIGATION	0.02	23.8	
SOUTH PARK ESTATES WATER & SEWER INC	27-7052	Decreed	3/12/1975	DOMESTIC, FIRE PROTECTION	0.33		
SOUTH PARK ESTATES WATER & SEWER INC	27-7581	License	10/21/1997	DOMESTIC, FIRE PROTECTION	0.69		
SOUTH, BARRY; SOUTH, ELINOR	35-14618	Decreed	9/28/1981	IRRIGATION	0.01	3.3	
SPACE ACRES WATER USERS	29-7142	Decreed	9/6/1973	DOMESTIC	0.25		
SPENCER, DAVID R; SPENCER, MICHELLE	31-11942	Decreed	7/25/1955	COMMERCIAL, STOCKWATER	0.03		

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SPENCER, DAVID R; SPENCER, MICHELLE	31-11944	Decreed	7/26/1961	COMMERCIAL, STOCKWATER	0.02		
STANGER, KARA; STANGER, SPENCER	35-14729	Decreed	9/28/1981	IRRIGATION	0.01	5.2	
STANGER, MARILYN	25-7541	License	7/12/1989	COMMERCIAL	0.02		
STARMARC LLC	36-12462	Decreed	12/31/1958	COMMERCIAL	0.07		
STEEL, EVAN; STEEL, KIRSTIE	27-12332	Decreed	9/25/1974	IRRIGATION	0.11	8.9	
STEEL, KEVIN J	35-8756	License	5/11/1989	COMMERCIAL, DOMESTIC	0.02		
STEELE LAND HOLDINGS LLC	25-4304	Decreed	1/1/1963	STOCKWATER	0.23		
STORER, BETTY; STORER, GALE	25-7530	License	8/28/1989	COMMERCIAL	0.04		
STROMBERG REPAIR INC	25-7445	License	10/18/1988	COMMERCIAL	0.04		
STUBBS, AVIS B; STUBBS, ROSS A	35-8210	License	6/16/1983	DOMESTIC	0.06		
SULLIVAN HOLDINGS LLC	35-8775	License	5/26/1989	COMMERCIAL	0.01		
SUMMERS, RICHARD K; SUMMERS, STELLA F	25-7518	License	8/24/1989	COMMERCIAL, DOMESTIC	0.08		
SUNROC PARK WATER ASSN INC	25-14170	License	6/20/2005	DOMESTIC	0.05		
SUNSET FARM & RANCH LLC	34-2480B	Decreed	9/11/1966	IRRIGATION	2.00	612.0	
SUNSET SUBDIVISION WATER USERS ASSN	35-10715	Decreed	9/21/1959	DOMESTIC	0.15		
SWENDSEN, BRENT; SWENDSEN, NANCY	25-7464	License	11/30/1988	COMMERCIAL	0.04		
SWENSON, HANS	37-23303	Decreed	9/20/1974	IRRIGATION	0.12	6.0	
T VILLE AG	29-12898	Decreed	2/23/1957	IRRIGATION	1.58	79.0	
T VILLE AG	29-7050	Decreed	3/24/1970	IRRIGATION	0.70	35.0	
T VILLE AG	29-7613	Decreed	8/19/1981	IRRIGATION	1.30	79.0	
TABER, DONALD E	37-10161	Decreed	4/1/1955	COMMERCIAL	0.04		
TANNER LANE RANCH LLLP	27-12320	Decreed	9/6/1982	IRRIGATION	0.05	180.0	
TANNER, BLAINE; TANNER, TORI	25-10634	Decreed	4/1/1958	DOMESTIC, IRRIGATION, STOCKWATER	0.10	2.0	
TANNER, KATHY; TANNER, REYNOLD	25-2139	Decreed	10/30/1961	IRRIGATION	1.54	38.0	
TAYLOR, CHRISTY; TAYLOR, MICHAEL	29-14369	Decreed	5/27/1974	IRRIGATION	0.03	6.0	
TAYLOR, LOIS; TAYLOR, LYLE D	25-7110	Decreed	5/9/1977	IRRIGATION	1.30	65.0	
TAYLORS QUIK STOP INC	25-7450	License	10/25/1988	COMMERCIAL	0.04		
TED BAAR HOLDINGS LLC	36-17236	Decreed	1/28/1972	DOMESTIC, STOCKWATER	0.05		
TED BAAR HOLDINGS LLC	36-17235	License	11/7/1989	DOMESTIC, STOCKWATER	0.05		
TED MILLER DAIRY	36-16189	Decreed	8/10/1973	IRRIGATION	0.04	3.0	
TELFORD, MARK; TELFORD, PAIGE	34-4132	Decreed	6/1/1955	IRRIGATION	2.00	480.0	
TELFORD, MARK; TELFORD, PAIGE	34-10058	Decreed	7/7/1955	IRRIGATION	1.67	480.0	
TELFORD, MICHAEL S; TELFORD, ROBERT	37-8212	Decreed	5/11/1983	COMMERCIAL, STOCKWATER	0.01		
TELFORD, MICHAEL S; TELFORD, SHANNON J	34-2401A	Decreed	9/1/1961	IRRIGATION	3.70	2223.8	
TELFORD, MICHAEL S; TELFORD, SHANNON J	34-4015	Decreed	9/1/1961	IRRIGATION	1.64	2223.8	
TERRETON PUMP NO 2	31-7515	License	1/7/1989	COMMERCIAL, DOMESTIC	0.10		
TERRETON TRACTOR INC	31-7346	Decreed	12/2/1980	COMMERCIAL, DOMESTIC	0.04		
TETON WATER WORKS LLC	27-7359C	License	6/3/1983	COMMERCIAL, DOMESTIC	0.03		
TFT LLC	21-7419	License	3/9/1989	COMMERCIAL, DOMESTIC	0.02		
THATCHER SUMMIT INC	22-7626	License	4/8/1989	COMMERCIAL	0.04		
THE ADVOCATE COMMUNITY	29-2486B	Decreed	12/16/1963	IRRIGATION	0.64	40.0	
THE DAVID JAY BROWN & DEBRA L BROWN LTD PARTNERSHIP	37-2670	Decreed	7/24/1961	IRRIGATION	3.00	155.0	
THE LOVELAND FAMILY TRUST	27-7069	Decreed	12/3/1976	IRRIGATION	3.42	171.0	
THOMPSON BROTHERS LLC	35-14658	Decreed	6/16/1966	IRRIGATION	0.05	468.5	
THOMPSON BROTHERS LLC	35-14659	Decreed	7/22/1969	IRRIGATION	0.29	468.5	
THOMPSON, BETTY L; THOMPSON, LYNN	29-7075A	Decreed	2/4/1972	IRRIGATION	0.10	5.6	

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THOMPSON, HOWARD M	25-7508	License	6/19/1989	DOMESTIC, STOCKWATER	0.11		
THOMPSON, KURT; THOMPSON, LINDA B	36-15254	Decreed	10/20/1967	DOMESTIC, STOCKWATER	0.04		
TIRRELL WATER USERS INC	29-7917	License	5/27/2022	DOMESTIC, IRRIGATION, STOCKWATER	0.17	5.0	
TLC DEVELOPMENT LLC	25-14494		6/4/2021	DOMESTIC	0.23		
TOMLIN, STEPHEN	29-13730	License	6/7/1983	IRRIGATION	0.01	0.5	
TOWN & COUNTRY MOBILE HOME PARK LLC	35-4258	Decreed	6/1/1962	DOMESTIC	0.22		
TRAINOR, LISA; TRAINOR, MARK	25-7392A	License	12/16/1983	IRRIGATION	0.14	7.0	
TRUE WEST BEEF LLC	36-17173	Decreed	5/10/1955	INDUSTRIAL	3.50		
TRUE WEST BEEF LLC	36-17231	Decreed	5/10/1955	INDUSTRIAL	0.83		
TRUE WEST BEEF LLC	36-17232	Decreed	10/19/1962	IRRIGATION	1.47	946.0	
TRUE WEST BEEF LLC	36-17230	Decreed	5/1/1982	INDUSTRIAL	0.15		Yes
TYLER, ALDON	25-7542	License	7/14/1989	DOMESTIC	0.06		
UNION PACIFIC RAILROAD CO	36-4203	Decreed	9/13/1957	COMMERCIAL, DOMESTIC, MUNICIPAL	0.22		
UNITED ALLIANCE & FIDELITY CORP	25-7387	Decreed	12/4/1983	IRRIGATION	0.10	5.0	
US BUREAU OF INDIAN AFFAIRS	29-12559	Decreed	8/23/1954	IRRIGATION	2.06	102.6	
US BUREAU OF INDIAN AFFAIRS	29-12560	Decreed	8/23/1954	IRRIGATION	3.75	187.9	
US BUREAU OF INDIAN AFFAIRS	29-12565	Decreed	8/23/1954	COOLING	0.04		
US BUREAU OF LAND MANAGEMENT	35-4073A	Decreed	6/25/1960	IRRIGATION	3.25	169.0	
US BUREAU OF LAND MANAGEMENT	35-7031	Decreed	7/22/1968	IRRIGATION	1.66	83.0	
US BUREAU OF LAND MANAGEMENT	37-20839	Decreed	2/6/1974	IRRIGATION	0.19	64.0	
US BUREAU OF LAND MANAGEMENT	36-7466	Decreed	4/10/1974	STOCKWATER, WILDLIFE	0.10		
US BUREAU OF LAND MANAGEMENT	36-7497	Decreed	8/21/1974	STOCKWATER, WILDLIFE	0.05		
US BUREAU OF LAND MANAGEMENT	35-7685	Decreed	3/22/1977	IRRIGATION	2.48	124.0	
US BUREAU OF LAND MANAGEMENT	35-7750	Decreed	10/20/1977	IRRIGATION	1.32	66.0	
US BUREAU OF LAND MANAGEMENT	35-14179	Decreed	9/28/1981	IRRIGATION	0.03	44.0	
US BUREAU OF LAND MANAGEMENT	21-7517	License	2/27/1992	STOCKWATER, WILDLIFE	0.07		
US BUREAU OF LAND MANAGEMENT	36-8726		4/28/1994	STOCKWATER, WILDLIFE	0.12		
US BUREAU OF LAND MANAGEMENT	21-13032	License	2/24/2006	STOCKWATER, WILDLIFE	0.02		
US BUREAU OF LAND MANAGEMENT	34-14459		8/26/2014	STOCKWATER, WILDLIFE	0.15	0.0	
US BUREAU OF RECLAMATION	29-2380	Decreed	6/11/1956	IRRIGATION	46.60		
US DEPT OF ENERGY / BONNEVILLE POWER	35-7097	Decreed	9/30/1969	DOMESTIC, FISH PROPAGATION	4.00		
US FISH & WILDLIFE SERVICE	31-4016	Decreed	6/15/1955	IRRIGATION	1.60	80.0	
US FISH & WILDLIFE SERVICE	31-2350	Decreed	10/20/1955	WILDLIFE	11.06		
US FISH & WILDLIFE SERVICE	31-2362	Decreed	5/13/1957	WILDLIFE	10.60		
US FISH & WILDLIFE SERVICE	31-2363	Decreed	5/13/1957	WILDLIFE	39.00		
US FISH & WILDLIFE SERVICE	31-11229	Decreed	11/5/1957	WILDLIFE	7.12		
US FISH & WILDLIFE SERVICE	31-11230	Decreed	3/20/1962	WILDLIFE	11.06		
US FISH & WILDLIFE SERVICE	31-11231	Decreed	5/7/1962	WILDLIFE	15.70		
US FISH & WILDLIFE SERVICE	31-11232	Decreed	5/7/1962	WILDLIFE	43.30		
US FISH & WILDLIFE SERVICE	31-7301	Decreed	6/2/1978	WILDLIFE	8.78		
USDA ARS SHEEP EXPERIMENT STATION	34-7546	Decreed	6/29/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.25	2.8	
VALLEY MOBILE HOME COURT	25-12489	Decreed	3/31/1958	DOMESTIC	0.23		
VALLEY READY MIX INC	25-7167	License	1/29/1979	INDUSTRIAL	0.36		
VALLEY SCHOOL DISTRICT #262	36-15190	Decreed	9/1/1954	DOMESTIC, IRRIGATION	0.15	0.2	
VALLEY SCHOOL DISTRICT #262	36-16299	License	9/22/2004	DOMESTIC, FIRE PROTECTION	1.52		
VALLEY VIEW DAIRY LLC	36-17182	Decreed	4/27/1954	COMMERCIAL, STOCKWATER	0.13		

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VALLEY WIDE COOP INC	22-7622	License	12/30/1988	COMMERCIAL, DOMESTIC	0.03		
VAN DYKE, VIRGINIA	37-10019	Decreed	2/1/1961	COMMERCIAL, STOCKWATER	0.06		
VAN ORDEN, JAY; VAN ORDEN, SHELLI	35-8713	License	4/1/1989	COMMERCIAL	0.02		
VEENSTRA FAMILY LIMITED PARTNERSHIP	37-4051	Decreed	9/1/1961	IRRIGATION, STOCKWATER	1.34	235.0	
VEENSTRA, FRANK W	36-17233	Decreed	1/31/1961	STOCKWATER	0.38		
VERBREE LAND HOLDINGS LLC	36-10147	Decreed	1/2/1975	DOMESTIC, STOCKWATER	0.04		
VERBREE LAND HOLDINGS LLC	36-8609	License	10/21/1991	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	
WADE, NANCY; WADE, RONALD	25-7425	License	6/6/1988	DOMESTIC, IRRIGATION	0.05	1.0	
WAGNER JR, EDWARD P; WAGNER, KRISTIE L	35-8856	Decreed	8/11/1989	DOMESTIC, STOCKWATER	0.10		
WALKER, ROLAND L	25-11825	Decreed	11/18/1955	COMMERCIAL	0.30		
WALKER, ROLAND L	25-11821	Decreed	6/19/1962	DOMESTIC, STOCKWATER	1.32		
WALKER, YOUNG HARVEY	34-2440	Decreed	10/10/1961	IRRIGATION, STOCKWATER	1.55	190.0	
WALKER, YOUNG HARVEY	34-10473	Decreed	8/10/1977	IRRIGATION	0.36	190.0	Yes
WALL, DIANA R; WALL, LARRY G	36-8451	License	9/28/1989	COMMERCIAL	0.02		
WALTERS, BRUCE A; WALTERS, MARCEY L	25-7596	License	6/26/1991	DOMESTIC, IRRIGATION	0.15	10.0	
WANSTROM, JOSEPH SCOTT	34-2339A	Decreed	6/3/1957	IRRIGATION	0.17	18.0	
WANSTROM, JOSEPH SCOTT	34-7172	Decreed	3/13/1977	IRRIGATION	0.94	47.0	
WARD, HOLLY; WARD, PERRY	35-14691	License	1/15/1992	IRRIGATION	0.16	38.9	
WARD, OPAL M; WARD, OWEN K	35-8892	License	3/28/1990	DOMESTIC	0.18		
WAYNE PROPERTIES LLC	35-14779	Decreed	2/9/1961	IRRIGATION	0.68	364.0	
WAYNE PROPERTIES LLC	35-14780	Decreed	3/25/1964	IRRIGATION	0.95	364.0	
WAYNE PROPERTIES LLC	35-14781	Decreed	7/1/1975	IRRIGATION	1.36	364.0	
WAYNE PROPERTIES LLC	35-14782	Decreed	8/15/1975	IRRIGATION	0.95	364.0	
WAYNE PROPERTIES LLC	35-14783	Decreed	8/15/1975	IRRIGATION	0.98	364.0	
WAYNE PROPERTIES LLC	35-14784	Decreed	8/27/1976	IRRIGATION	0.97	364.0	
WAYNE PROPERTIES LLC	35-14785	Decreed	8/15/1977	IRRIGATION	0.20	364.0	
WELLS, DELOS H	35-8220	License	8/4/1983	DOMESTIC, IRRIGATION	0.11	9.5	
WELLS, DELOS H; WELLS, LUELLA	35-10874	Decreed	10/1/1962	DOMESTIC, IRRIGATION	0.20	8.0	
WESTERN SLOPE LLC	35-14617	Decreed	9/28/1981	IRRIGATION	0.05	83.0	
WESTOVER RANCH CORP	22-7543	License	12/14/1988	DOMESTIC	0.10		
WHEELER, DEE RAY; WHEELER, LINDA	36-8488	License	10/10/1989	COMMERCIAL	0.03		
WHITWORTH, BOYD	45-7638	License	3/10/1989	INDUSTRIAL	0.06	0.0	
WILLMORE, JUDY	31-7551	License	8/26/1991	COMMERCIAL	0.04		
WILSON, JOHN CHARLES	29-7916	License	3/20/1990	IRRIGATION	0.09	4.5	
WOOD, HOWARD; WOOD, SHEILA	34-2478	Decreed	6/16/1966	IRRIGATION	0.76	38.0	
WOOD, KENT; WOOD, MELANIE	45-14177	Decreed	4/29/1954	IRRIGATION	0.08	6.4	
WOODLAND HEIGHTS SUBDIVISION NO 2	35-7640	Decreed	9/9/1976	DOMESTIC	0.32		
WOODLAND HEIGHTS WATER USERS ASSN	35-7576	Decreed	1/28/1976	DOMESTIC	0.38		
WRIDE FARMS	35-8949		8/26/1991	IRRIGATION	3.00	150.0	
WRIGHT, DEE; WRIGHT, RUBY	25-7256	Decreed	5/12/1981	IRRIGATION	0.10	1.4	
WRIGHT, LISA; WRIGHT, SCOTT	25-7461	License	1/21/1989	IRRIGATION	0.09	3.0	
YANCEY, CLEM R	35-7955	License	3/10/1981	DOMESTIC, STOCKWATER	0.06		
YERION, GEORGE A; YERION, SUSAN F	37-23372		1/28/2022	DOMESTIC	0.08		
YOUNG, DE VONA; YOUNG, WILLIAM N	25-7437	License	8/26/1988	DOMESTIC, STOCKWATER	0.07		
YOUNG, JUDY D; YOUNG, KENNETH A	25-7436	License	9/14/1988	IRRIGATION	0.03	1.5	
ZUNDEL, JACOB; ZUNDEL, SHALIECE	25-14457	License	2/28/1992	IRRIGATION	0.02	1.1	

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ZWEIFEL PROPERTIES LLC	32-10031	Decreed	5/1/1968	DOMESTIC, STOCKWATER	0.12		

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SCHEDULING ORDER AND ORDER AUTHORIZING REMOTE APPEARANCE AT HEARING**

BACKGROUND

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") as well as his *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order"). The Methodology Order revises the nine steps used to determine material injury to members of the Surface Water Coalition ("SWC"). The As-Applied Order predicts a shortfall for the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to December 30, 1953.

The Director, anticipating that one or more parties would request a hearing pursuant to Idaho Code § 42-1701A(3) in response to one or both of the orders, issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Notice of Hearing") on April 21, 2023. In addition to scheduling an in-person hearing on the Methodology Order and As-Applied Order for June 6–10, 2023, the Notice of Hearing authorized the parties to begin conducting discovery immediately and scheduled a prehearing conference, which the Director held on April 28, 2023.

During the prehearing conference, the Director identified two Department witnesses who will be made available to the parties for deposition and will testify at the hearing—Jennifer Sukow, Engineer, Technical 2, and Matthew Anders, Technical Services Bureau Chief. The Director stated he did not intend to request a technical staff memorandum in advance of the hearing. Some counsel expressed concern about having enough time to respond to discovery given the compressed period for the hearing. The Director agreed to limit the scope and timing of discovery to address the concerns. Counsel for the Coalition of Cities[1] and McCain Foods USA, Inc., Candice McHugh, notified the Director of an out-of-state conflict with the hearing dates and requested that the Director allow her to formally appear virtually instead of in-person on June 6–10, 2023. No parties objected to attorney McHugh's remote participation request

[1] In this matter, the Coalition of Cities refers to the Idaho cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell.

during the prehearing. Further, the Director and the parties discussed and agreed upon a discovery and hearing schedule. The order below memorializes the various schedules and deadlines articulated during the prehearing conference on April 28, 2023.

ORDER

IT IS HEREBY ORDERED that discovery will be limited as follows: (1) The parties shall not engage in interrogatories or requests for admissions; (2) The parties may request production of documents. The party upon whom a request for production of documents is served shall respond to the request within 10 days from the date the request is served.

IT IS FURTHER ORDERED that the following schedule is ADOPTED:

May 5, 2023	1) Deadline for the Department to identify materials Ms. Sukow and Mr. Anders may rely upon at the hearing. 2) Deadline for the Department to summarize topics Ms. Sukow and Mr. Anders will testify about at the hearing. 3) Deadline for the parties to submit to the Department a written statement of proposed issues for the hearing.
May 10, 2023	Deadline for the Department to augment its above-mentioned list of materials Ms. Sukow and Mr. Anders may rely on at the hearing, if needed.
7 Days Prior to Hearing Day 1[2]	1) Deadline for the parties to complete all discovery. 2) Deadline for the parties to deliver copies of their expert reports to the other parties. 3) Deadline for the parties to exchange and file with the Department their proposed lay and expert witness lists. The parties should include a general summary of each witness' anticipated testimony.

[2] During the hearing one of the parties astutely suggested that the discovery deadline should be pinned to the hearing date, rather than an agreed upon calendar date, in the event the hearing date was moved.

4) Deadline for the parties to exchange and file with the Department their proposed exhibit lists. The parties shall also exchange and submit to the Department an electronic copy (via e-file email, USB thumb drive, or disc(s)) of their pre-marked exhibits using the following reserved exhibit numbers:

Exhibit Numbers	Assigned Party
1–99	Surface Water Coalition
100–199	Idaho Ground Water Appropriators
200–299	Coalition of Cities
300–399	City of Pocatello
400–499	City of Idaho Falls
500–599	Bonneville-Jefferson Ground Water District
600–699	McCain Foods USA, Inc.

Any future parties who have yet to appear and wish to submit exhibits at the hearing shall request a set of designated exhibit numbers from the Department by emailing sarah.tschohl@idwr.idaho.gov at least two business days prior to this deadline.

Hearing Day 1 Prior to the start of the hearing, the parties shall submit to the Department three physical copies of their pre-marked and numbered, proposed hearing exhibits.

IT IS FURTHER ORDERED that in accordance with IDAPA 37.01.01.552 and for good cause shown, counsel for the Coalition of Cities and McCain Foods USA, Inc., Candice McHugh, may appear virtually by video link on June 6–10, 2023. Sarah Tschohl, on behalf of the Department, will email the remote participation link to Candice McHugh no later than May 30, 2023.

DATED this 2nd day of May 2023.

Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 2nd day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email
Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email

COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
May 02, 2023
DEPARTMENT OF
WATER RESOURCES

Dylan Anderson (ISB# 9676)
Dylan Anderson Law PLLC
P.O. Box 35
Rexburg, Idaho 83440

Phone - (208) 684-7701
Email - dylan@dylanandersonlaw.com

Attorney for Bingham Groundwater District. (BGWD)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 Docket No. CM-MP-2016-001 **NOTICE OF SUBSTITUTION OF COUNSEL FOR BINGHAM GROUND WATER DISTRICT**

Pursuant to IDAPA 37.01.01.204, Dylan Anderson of Dylan Anderson Law, provides notice of substitution of counsel on behalf of Bingham Groundwater District. Bingham Ground Water District currently participates in this proceeding through Idaho Ground Water Appropriators, Inc. (IGWA). Pursuant to this substitution of counsel, Bingham Ground Water District will forthwith be represented independently of IGWA. This substitution will not cause any delay or enlarge the issues involved in this proceeding.

DATED this 1st day of May, 2023.

Dylan Anderson Law, PLLC

Dylan Anderson,
Attorney for Bingham Groundwater District

RACINE OLSON, PLLP

Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 2 day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370 Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

Dylan Anderson Law, PLLC

By:_____
Dylan Anderson

RECEIVED
May 02, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Petition for Reconsideration and Request for Hearing**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting for and on behalf of North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, Aberdeen-American Falls Area Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, submit this Petition for Reconsideration and Request for Hearing pursuant to Idaho Code § 42-1701(A)(3), Idaho Code § 67-5246(4), and Rule 740.02.b. of the Rules of Procedure of the Idaho Department of Water Resources, requesting a hearing on the Department's *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") and *Final Order Regarding April 2023 Forecast Supply* ("April 2023 As-Applied Order") issued April 21, 2023.

IGWA has not completed a thorough review of the Fifth Methodology Order or the April 2023 As-Applied Order, but preliminarily IGWA wishes to address the issues identified *Coalitions of Cities' Amended Request for Hearing* and *Pocatello's Request for Hearing* filed April 28, 2023. IGWA reserves the right to identify additional ground for contesting the Director's action once it completes a thorough review of the Fifth Methodology Order and the As-Applied Order.

Dated this 2nd day of May, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 2nd day of May, 2023, I served the foregoing document on the persons below via email as indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for Amalgamated Sugar Company

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **AMALGAMATED SUGAR COMPANY'S REQUEST FOR HEARING, OBJECTION, IDENTIFICATION OF ISSUES AND NOTICE OF MITIGATION**

REQUEST FOR HEARING

Pursuant to Idaho Code § 42-1701(A)(3), Amalgamated Sugar Company ("Amalgamated") through its undersigned attorney, requests a hearing on the Department's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover* and *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") both issued April 21, 2023.

OBJECTION TO ORDER

Amalgamated objects to the *Fifth Amended Order* and the 2023 As-Applied Order's implementation this upcoming season for the reasons set forth below which it also identifies as issues for hearing. Amalgamated reserves the right to revise the issues as more information becomes available.

STATEMENT OF ISSUES FOR HEARING

Among the issues the Amalgamated has identified for hearing are:

a) IDWR's new reliance on transient modeling;

b) IDWR's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years;

d) IDWR's failure to consider changes in the efficiency of the SWC's operations;

e) IDWR's failure to consider all sources of supply available to the SWC;

f) IDWR's use of 2018 as the new baseline year; and

g) IDWR's violation of Amalgamated's due process rights by not providing it actual notice of the order and requisite deadlines, and even if it was deemed that it was given "notice" because it shared an attorney with the Coalition of Cities, by giving it less than 10 business days to provide a mitigation solution after a wholesale change in methodology, by depriving it of the ability to develop its own mitigation plan to protect its water rights, by requiring compliance with a deadline to avoid curtailment without actual notice of the deadline and in a non-drought year, by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants.

NOTICE OF MITIGATION

Pursuant to the *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") issued April 21, 2023 demand that:

> On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan.

Amalgamated submits this *Notice of Mitigation*. Amalgamated owns and uses water rights junior to the December 30, 1953, date. On Tuesday, May 2, 2023 Amalgamated petitioned Magic Valley Ground Water District ("MVGWD") to become a member of MVGWD and to be covered by its approved mitigation plan. Counsel for Amalgamated was informed by the Chairman of MVGWD, Dean Stevenson, that the letter had been received, that he had spoken to the board members and that they will take up Amalgamated petition at its Tuesday, May 9, 2023 meeting. Chairman Stevenson also indicated to counsel for Amalgamated that he expected the petition to be approved on Tuesday and that MVGWD would send a letter to IDWR and Amalgamated' s counsel to that effect next week. Aff. of McHugh filed herewith.

Amalgamated requests an order, or some other applicable document, from IDWR that it has met the May 5, 2023 deadline and established to the "satisfaction of the Director, that they can mitigation for their proportionate share … with an approved mitigation plan" by becoming members of MVGWD.

Submitted this 4th day of May, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for Amalgamated

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

Candice McHugh, ISB No. 5908
McHugh Bromley, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cbromley@mchughbromley.com

Attorney for Amalgamated Sugar Company

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **DECLARATION OF CANDICE M. MCHUGH IN SUPPORT OF NOTICE OF MITIGAITON**

I, Candice McHugh hereby declare and state as follows:

1. I am over the age of 18 and state the following based upon my own personal knowledge.
2. I am an attorney for Amalgamated Sugar Company ("Company") and represent the Company on its water rights and water right matters.
3. On Tuesday, May 2, 2023, I petitioned Magic Valley Ground Water District (MVGWD) on the Company's behalf to join MVGWD for mitigation of the Company's water rights located within Basin 36.

4. On Thursday, May 4, 2023, I spoke with Dean Stevenson, Chairman of the MVGWD. He indicated that the petition was received, that he spoke with all the board members and he expects the petition to be approved at the Tuesday, May 9, 2023 meeting. He indicated that I was authorized to express this to IDWR in order to allow the Company to meet the deadline set forth in the Dated this 4th, day of May, 2023. He also told me that MVGWD would inform IDWR of its decision next week.

I declare under penalty of perjury under the laws of the State of Idaho that the foregoing is true and correct.

DATED May 4, 2023

MCHUGH BROMLEY, PLLC

Candice M. McHugh
Attorney Amalgamated Sugar Company

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for McCain Foods USA, Inc.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **MCCAIN FOODS USA, INC.'S NOTICE OF MITIGATION**

REQUEST FOR HEARING

Pursuant to the *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") issued April 21, 2023 demand that:

> On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of75,200 acre-feet in accordance with an approved mitigation plan.

McCain Foods USA, Inc., ("McCain") by and through its attorney of record, submits this *Notice of Mitigation*. McCain owns and uses water rights junior to the December 30, 1953,

date. On Tuesday, May 2, 2023 McCain petitioned Southwest Irrigation District ("SWID") to become a member of SWID and to be covered by its approved mitigation plan. Counsel for McCain was informed by letter on May 3, 2023, that McCain has been approved to join SWID as a member and that McCain will be covered under its mitigation plan. A copy of the letter is attached hereto as Exhibit A and incorporated herein. SWID also indicated that a letter was sent to IDWR informing IDWR of this fact.

McCain requests an order, or some other applicable document, from IDWR that it has established to the "satisfaction of the Director, that they can mitigation for their proportionate share … with an approved mitigation plan" by becoming members of SWID.

Submitted this 4th day of May, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for McCain

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of April, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

EXHIBIT A

PARSONS, LOVELAND,
SHIRLEY & LINDSTROM
LLP
ATTORNEYS AT LAW
137 WEST 13TH STREET
P.O. BOX 910
BURLEY, IDAHO 83318
TELEPHONE (208) 878-8382
www.psslslaw.com

WILLIAM A. PARSONS
LANCE A. LOVELAND
DAVID F. SHIRLEY

SCOTT B. LINDSTROM
RHETT M. MILLER

May 3, 2023

Candice M. McHugh
380 S. 4th Street, Ste 103
Boise, Idaho 83702
cmchugh@mchughbromley.com

RE: Petition to Join Southwest Irrigation District for Mitigation

Dear Candice:

Pursuant to your request of May 2, 2023, the Board approved the mitigation for the following water rights:

WaterRight	Priority Date	Owner	CFS	Volume	Combined Limit	WaterUse	Condition
45-2747	3/15/1960	McCain Foods*	4.00	2062.80	-	Industrial	-
45-2748	3/6/1961	McCain Foods	0.60	309.40	-	Industrial	-
45-2758	3/15/1960	McCain Foods	2.08	1072.70	-	Commercial	-
45-13970	9/1/1957	McCain Foods	2.66	1371.80	-	Industrial	-
		Totals:	9.34	4816.70			

* McCain Foods USA Inc.

Southwest charges $900 per CFS per year billed in arrears.

It is the policy of Southwest Irrigation District to charge new participants in mitigation for the previous three years. In keeping with that procedure, the back fees for McCains would be $25,218.00. It may be paid over three years if necessary.

The 2023 assessment will be billed in the spring of 2024.

We have forwarded a letter to the Idaho Department of Water Resources indicating the

WAP/ar

approval of McCain Foods USA Inc. for mitigation.

I have sent a copy of this letter to you by email and I placed one in regular mail to your office.

Very truly yours,

PARSONS, LOVELAND, SHIRLEY & LINDSTROM, LLP



William A. Parsons
wparsons@pmt.org

WAP/ar

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

Robert L. Harris (ISB No. 7018)
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.
P.O. Box 50130
1000 Riverwalk Drive, Suite 200
Idaho Falls, ID 83405
Telephone: (208) 523-0620
Facsimile: (208) 523-9518
Email: rharris@holdenlegal.com

Attorneys for the City of Idaho Falls

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**CITY OF IDAHO FALLS CHALLENGE AND REQUEST FOR HEARING**

The City of Idaho Falls ("Idaho Falls" or "City"), by and through its counsel, Holden, Kidwell, Hahn & Crapo, P.L.L.C., petitions for a hearing pursuant to Idaho Code § 42-1701A(3) in the above-captioned matter.

On Aril 21, 2023, the Director of the Idaho Department of Water Resources ("IDWR" or "Department") issued a *Fifth Amended Methodology Order Regarding Methodology for Determining material Injury to Reasonable In-Season Demand And Reasonable Carryover* (the "*Methodology Order*") and a *Final Order Regarding April 2023 Forecast Supply* ("*2023 As-Applied Order*"). The City objects to the *Methodology Order* and the *2023 As-Applied Order*, and

because the only relief allowed for in the *Methodology Order* and the *2023 As-Applied Order* is to contest this action by requesting a hearing, the City hereby requests a hearing in this matter pursuant to Idaho Code § 42-1701A(3). The City reserves the right to supplement this filing with a list of issues when so directed in this contested case.

Dated this 4th day of May, 2023.

/s/ Robert L. Harris
Robert L. Harris, Esq.
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.

CERTIFICATE OF SERVICE

I hereby certify that on this 4th day of May, 2023, I served a true and correct copy of the following described pleading or document on the attorneys and/or individuals listed below by the method(s) indicated.

DOCUMENT SERVED: **CITY OF IDAHO FALLS CHALLENGE AND REQUEST FOR HEARING**

ATTORNEYS AND/OR INDIVIDUALS SERVED:

Idaho Department of Water Resources PO Box 83720 Boise, ID 83720 file@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
John K. Simpson Marten Law LLP P O Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Travis L. Thompson Marten Law LLP P O Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jneilsen@martenlaw.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
W. Kent Fletcher Fletcher Law Office PO Box 248 Burley, ID 83318 wkf@pmt.org	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Thomas J. Budge Elisheva M. Patterson Racine Olson PLLP PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 David.gehlert@usdoj.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Sarah A. Klahn Somach Simmons & Dunn 1155 Canyon Blvd., Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Rich Diehl City of Pocatello P O Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Candice McHugh Chris Bromley McHugh Bromley, PLLC 380 S. 4th St., Ste. 103 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Robert E. Williams Williams, Meservy & Lothspeich, LLP P O Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P O Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email

Skyler C. Johns Nathan M. Olsen Steven L. Taggart Olsen Taggart PLLC P O Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 Corey.skinner@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
William A. Parsons Parsons Smith & Stone P O Box 910 Burley, ID 83318 wparsons@pmt.org	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Garrick Baxter Deputy Attorney General Idaho Department of Water Resources P O Box 83720 Boise, ID 83720-0098 Garrick.baxter@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email

/s/ Robert L. Harris
Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB. No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BONNEVILLE-JEFFERSON GROUND WATER DISTRICT'S REQUEST FOR HEARING**

The Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson"), acting for and on behalf of its respective members, through counsel, submits this Request for Hearing pursuant to Idaho Code § 42-1701(A)(3), Idaho Code § 67-5246(4), and Rule 740.02.b. of the Rules of Procedure of the Idaho Department of Water Resources, requesting a hearing on the Department's *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order")

and *Final Order Regarding April 2023 Forecast Supply* ("April 2023 As-Applied Order") issued April 21, 2023.

Bonneville-Jefferson is in the process of reviewing the Fifth Methodology Order and the April 2023 As-Applied Order, but plans to address the issues identified in the Coalitions of Cities' *Amended Request for Hearing* and Pocatello's *Request for Hearing* filed April 28, 2023. In addition, Bonneville-Jefferson identifies the following issues for the hearing so far:

1) The procedures and process used by the Department in issuing the Methodology Order.
2) The technical rational for the Methodology Order.
3) The policy behind changing to transient state modeling in the Methodology Order.
4) The analysis and factual basis used in the Methodology Order.
5) The Department's new reliance on transient modeling.
6) The Department's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years.
7) The Department's failure to consider changes in the efficiency of the SWC's operations.
8) The Department's failure to consider all sources of supply available to the SWC
9) The Department's rational and factual basis for using 2018 as the new baseline year.
10) The definition of futile call, including waste, reasonable time, and efficiency.
11) Whether the Methodology Order results in the optimum development of water resources in the public interest.
12) Whether the Methodology Order is contrary to the State's interest in securing the maximum use and benefit, and least wasteful use, of its water resources

13) Whether the Methodology Order permits SWC to command the entirety of large volumes of water in a surface or ground water source to support its appropriation contrary to the public policy of reasonable use of water as described in the Rules for Conjunctive Management of Surface and Ground Water Resources, IDAPA 37.03.11.

14) Whether the Department provided due process to water users in issuing the Methodology Order.

15) Bonneville-Jefferson reserves the right to present additional issues that may be revealed through the discovery process.

Bonneville-Jefferson reserves the right to identify additional ground for contesting the Director's action once it completes a thorough review of the Fifth Methodology Order and the As-Applied Order.

Respectfully submitted this the 4th day of May 2023.

DATED: May 4, 2023

OLSEN TAGGART PLLC

/s/ *Skyler C. Johns*
SKYLER C. JOHNS

CERTIFICATE OF SERVICE

I hereby certify that on this 4th day of May 2023, I served the foregoing document on the persons below via email as indicated:

/s/ Michelle J. Castro
Michelle J. Castro
Legal Assistant

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org
Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB #7928)
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391 Pocatello,
Idaho 83204
208-232-6101
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
208-552-6442
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com
Attorney for Bingham Groundwater District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **JOINT NOTICE OF DEPOSITION DUCES TECUM OF JENNIFER SUKOW, P.E., P.G.**

TO: Jennifer Sukow and all counsel of record.

PLEASE TAKE NOTICE that on **May 10, 2023, from 8:00 a.m. – 3:30 p.m.**, counsel for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell (collectively, the "Coalition"), City of Pocatello, City of Idaho Falls, Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Ground Water District, and Bingham Groundwater District in the above-entitled action will take the deposition of JENNIFER SUKOW, P.E., P.G., in accordance with the Order Authorizing Discovery issued April 21, 2023, in this matter, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and Idaho Rules of Civil Procedure 26, 30(a), and 34, and continue from day to day thereafter until completion, at the offices of the **Idaho Department of Water Resources, 322 E. Front Street, Boise, Idaho 83702**. The deposition will be "hybrid," with the witness, court reporter, and some attorneys present at the Idaho Department of Water Resources ("IDWR" or "Department"), and others present via the Zoom video platform, hosted by M&M Court Reporting. Participants will receive a Zoom link via email from M&M the day before the deposition.

DOCUMENTS REQUESTED

The words used in these requests for identification of documents for copying and inspection are to be interpreted according to their plain meanings. The following definitions are provided in the spirit of good faith and cooperation to assist the Responding Party in preparing responses to each of the following demands below.

A. "Announcement(s)" means any document or electronic communication that is not merely a publication or news release and that advises ground water users within the Eastern Snake Plain Aquifer of a particular action to be taken by IDWR.

B. "Document(s)" shall mean the original, all copies and drafts of papers and writings of every kind, description and form, whether handwritten or typed, and all mechanical, magnetic media and electronic recordings, records and data of every kind, description and form, and all photographs of every kind, and including, without limiting the generality of the foregoing, the following: correspondence, letters, notes, e-mails, computer files, memoranda, reports, notebooks, binders, drawings, studies, analyses, drafts, diaries, calendars, datebooks, appointment books, day-timers, intra- or inter-office communications, canceled checks, minutes, bulletins, circulars, pamphlets, telegrams, instructions, work assignments, messages (including reports, notes and memoranda of telephone conversations and conferences), telephone statements, calendar and diary entries, desk calendars, job or transaction files, books of account, ledgers, bank statements, promissory notes, invoices, charge slips, working papers, graphs, charts, lab books, lab notes, lab journals or notebooks, evaluation or appraisal reports, pleadings, transcripts of testimony or other documents filed or prepared in connection with any court or agency or other proceeding, deeds, mortgages, deeds of trust, contracts, agreements, assignments, instruments, charges, opinions, official statements, prospectuses, appraisals, feasibility studies, trusts, releases of claims, charters, certificates, licenses, leases, invoices, computer printouts or programs, summaries, audio, video or sound recordings, cassette tapes, video recorded, electronic or laser recorded, or photographed information. "Document(s)" are to be taken as including all attachments, enclosures and other documents that are attached to, relate to or refer to such documents.

C. "External Communications" include, but are not limited to, emails, text messages, letters, notes, phone calls, voicemails, and any voice and audio recordings between

IDWR employees, including, but not limited to managers, directors, or board members and persons that are not employed by the Department.

D. "Internal Communications" include, but are not limited to, emails, text messages, letters, notes, phone calls, voicemails, and any voice and audio recordings between IDWR employees, including, but not limited to managers, directors, or board members.

E. "Notice" means any publication or news release advising ground water users within the Eastern Snake Plain Aquifer of a particular action to be taken by IDWR.

The Deponent is required to produce the following to the deposition:

1. Any and all documents reflecting the Deponent's involvement in the issuance of the Fifth Amended Methodology Order.
2. Any and all documents the Deponent is aware of, whether or not authored by her, that reflect Department employees' input on the Department's decision to move from steady state to transient modeling in the Fifth Methodology Order.
3. Any memoranda or reports authored by the Deponent or others that report to her that describe the change in the number of water rights likely to be curtailed as a result of the Department's reliance on transient modeling in the Fifth Methodology Order.
4. All model files, including input files, output files, post-processing analyses, documentation, communications, and notes associated with the Eastern Snake Plain Aquifer Model ("ESPAM") transient curtailment run used to support the proposed December 10, 1953 curtailment date that were not already provided.
5. All model files, including input files, output files, post-processing analyses, documentation, communications, and notes associated with any and all

ESPAM transient curtailment runs used to evaluate curtailment dates other than the December 10, 1953 curtailment date.

6. All model files, including input files, output files, post-processing analyses, documentation, communications, and notes for any and all ESPAM steady-state curtailment runs used to evaluate potential curtailment dates for the 2023 Methodology Order.

7. Any and all documents relied upon by the Department to support the technical rationale for the original use of Steady State.

8. Any and all internal and external communications regarding or pertaining to the information provided pursuant to paragraph 1 above.

9. Any and all Department notices or announcements regarding the Department's transition from Steady State to Transient State.

10. Any and all internal and external communications pertaining to the information provided pursuant to paragraph 3 above.

11. Any and all documents pertaining to the Department's decision to transition from Steady State to Transient State.

12. Any and all internal and external communications pertaining to the information provided pursuant to paragraph 5 above.

13. Any and all documents and electronic or recorded communications or discussions pertaining to credits for accruals to non-target reaches and non-target time periods.

14. Any and all internal and external communications regarding or pertaining to the information provided pursuant to paragraph 7 above.

15. Any and all documents pertaining to modeling stress file for the model run that produced the 1953 curtailment date in the *April 2023 As-applied Order* issued on April 21, 2023, in a format readable by ESRI software, a text reader, or a spreadsheet program (e.g., a Well File from Item C on page 7 of the IWRRI curtailment scenario).

16. Any and all internal and external electronic or recorded communications regarding or pertaining to the information provided pursuant to paragraph 9 above.

17. All documents, analyses, reports, data, and other materials evaluated, examined, or developed in connection with, or related to, model uncertainty, the futile call doctrine, or implementation of a trim line.

18. All model files, including input files, output files, post-processing analyses, documentation, communications, and notes for any model evaluation applying the transient modeling as a hindcast to previous years to 2023 where the Methodology Order applied.

19. All documents, analyses, reports, data, and other materials evaluated, examined, or developed in connection with, or related to, the differences between the ESPAM2.1 and ESPAM2.2 curtailment scenarios.

20. All documents, analyses, reports, data, and other materials evaluated, examined, or developed in connection with, or related to, the differences between the modeled project efficiencies for SWC irritation entities in ESPAM2.1 and ESPAM2.2.

21. All documents, analyses, reports, data, and other materials evaluated, examined, or developed in connection with, or related to, the Department's determination and reasoning to use steady state modeling in the previous as applied orders.

22. Any and all internal and external electronic or recorded communications regarding or pertaining to the information provided pursuant to paragraph 18 above.

23. Any and all internal and external electronic or recorded communications regarding or pertaining to the information provided pursuant to paragraph 19 above.

24. Any and all internal and external electronic or recorded communications regarding or pertaining to the information provided pursuant to paragraph 20 above.

25. Any and all internal and external electronic or recorded communications regarding or pertaining to the information provided pursuant to paragraph 21 above.

DATED May 4, 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

RACINE OLSON, PLLP

By /s/ Thomas J. Budge
Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)

Attorneys for Idaho Ground Water Appropriators, Inc.

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

OLSEN TAGGART PLLC

By /s/ Skyler C. Johns
Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)

Attorneys for Bonneville-Jefferson Ground Water District

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

DYLAN ANDERSON LAW

By /s/ Dylan Anderson
Dylan Anderson (ISB# 9676)

Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB #7928)
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391 Pocatello,
Idaho 83204
208-232-6101
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
208-552-6442
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com
Attorney for Bingham Groundwater District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **JOINT NOTICE OF DEPOSITION DUCES TECUM OF MATTHEW ANDERS, P.G.**

TO: Matthew Anders and all counsel of record.

PLEASE TAKE NOTICE that on **May 12, 2023, from 9:00 a.m. – 5:00 p.m.**, counsel for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell (collectively, the "Coalition"), City of Pocatello, City of Idaho Falls, Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Ground Water District, and Bingham Groundwater District in the above-entitled action will take the deposition of MATTHEW ANDERS, P.E., in accordance with the Order Authorizing Discovery issued April 21, 2023, in this matter, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and Idaho Rules of Civil Procedure 26, 30(a), and 34, and continue from day to day thereafter until completion, at the offices of the **Idaho Department of Water Resources, 322 E. Front Street, Boise, Idaho 83702**. This deposition will be "hybrid", with the witness, court reporter, and some attorneys present at the Idaho Department of Water Resources ("IDWR" or "Department"), and others present via the Zoom video platform, hosted by M&M Court Reporting. Participants will receive a Zoom link via email from M&M the day before the deposition.

DOCUMENTS REQUESTED

The words used in these requests for identification of documents for copying and inspection are to be interpreted according to their plain meanings. The following definitions are provided in the spirit of good faith and cooperation to assist the Responding Party in preparing responses to each of the following demands below.

A. "Announcement(s)" means any document or electronic communication that is not merely a publication or news release and that advise ground water users within the Eastern Snake Plain Aquifer of a particular action to be taken by IDWR.

B. "Document(s)" shall mean the original, all copies and drafts of papers and writings of every kind, description and form, whether handwritten or typed, and all mechanical, magnetic media and electronic recordings, records and data of every kind, description and form, and all photographs of every kind, and including, without limiting the generality of the foregoing, the following: correspondence, letters, notes, e-mails, computer files, memoranda, reports, notebooks, binders, drawings, studies, analyses, drafts, diaries, calendars, datebooks, appointment books, day-timers, intra- or inter-office communications, canceled checks, minutes, bulletins, circulars, pamphlets, telegrams, instructions, work assignments, messages (including reports, notes and memoranda of telephone conversations and conferences), telephone statements, calendar and diary entries, desk calendars, job or transaction files, books of account, ledgers, bank statements, promissory notes, invoices, charge slips, working papers, graphs, charts, lab books, lab notes, lab journals or notebooks, evaluation or appraisal reports, pleadings, transcripts of testimony or other documents filed or prepared in connection with any court or agency or other proceeding, deeds, mortgages, deeds of trust, contracts, agreements, assignments, instruments, charges, opinions, official statements, prospectuses, appraisals, feasibility studies, trusts, releases of claims, charters, certificates, licenses, leases, invoices, computer printouts or programs, summaries, audio, video or sound recordings, cassette tapes, video recorded, electronic or laser recorded, or photographed information. "Document(s)" are to be taken as including all attachments, enclosures and other documents that are attached to, relate to or refer to such documents.

C. "External Communications" include, but are not limited to, emails, text messages, letters, notes, phone calls, voicemails, and any voice and audio recordings between

IDWR employees, including, but not limited to managers, directors, or board members and persons that are not employed by the Department.

D. "Internal Communications" include, but are not limited to, emails, text messages, letters, notes, phone calls, voicemails, and any voice and audio recordings between IDWR employees, including, but not limited to managers, directors, or board members.

E. "Notice" means any publication or news release advising ground water users within the Eastern Snake Plain Aquifer of a particular action to be taken by IDWR.

The Deponent is required to produce the following to the deposition:

1. All documents, memoranda, reports, analyses or notes relied on by the Department to prepare the December 23, 2022 *Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition*.
2. All documents, memoranda, reports, analyses or notes related to the Department's decision to exclude from the Fifth Methodology Order:
    a. Near Real Time METRIC for determining Crop Water Need;
    b. April and July Regressions used to predict natural flow water supply.
3. All documents, memoranda, reports, analyses or notes related to the Department's decision to *include* in the Fifth Methodology Order:
    a. Transient modeling simulations for determining curtailment priority dates.
4. All documents, memoranda, reports, analyses, or notes related to the Department's review of information submitted by Greg Sullivan and/or Spronk

Water Engineers to IDWR and the Methodology Technical Work Group ("TWG") on December 12, 2022, December 21, 2022, and January 16, 2023, on behalf of the Eastern Snake Plain Aquifer ("ESPA") Cities.

5. All documents, memoranda, reports, analyses, or notes related to the Department's review of information submitted by Sophia Sigstedt to IDWR on January 16, 2023, on behalf of IGWA.

6. All documents, memoranda, reports, analyses or notes related to analyses of other potential Baseline Year(s) for use in the Fifth Methodology Order other than the 2018 BLY that was selected.

7. All documents, memoranda, reports, analyses, or notes related to the authorized and actual irrigated area of the Surface Water Coalition ("SWC") members.

8. All documents, memoranda, reports, analyses, or notes related to SWC member groundwater pumping and other sources of water available to the SWC members.

9. All documents, memoranda, reports, analyses, or notes related to the analysis of reasonable carryover for the SWC members.

10. All materials presented at the technical meetings, and all analyses, reports, data sets, and other materials evaluated, examined, or developed in connection therewith.

11. All documents, memoranda, reports, analyses or notes related to any analysis of an average of multiple years for consideration on the Base Line Year(s) and associated hindcast in the Base Line Year(s) shortfall.

12. All court filings that discuss, review, analyze, or identify areas of the methodology that require further technical analysis.

13. All documents, memoranda, reports, analyses or notes related to any analysis in the intervening years from the 2015 TWG to the 2022 TWG related to the Fifth Methodology Order.

14. All documents, analyses, reports, data, and other materials evaluated, examined, or developed in connection with, or related to, the Department's determination and reasoning to use steady state modeling in the previous as applied orders.

DATED May 4, 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

RACINE OLSON, PLLP

By /s/ Thomas J. Budge
Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)

Attorneys for Idaho Ground Water Appropriators, Inc.

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

OLSEN TAGGART PLLC

By /s/ Skyler C. Johns
Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)

Attorneys for Bonneville-Jefferson Ground Water District

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

DYLAN ANDERSON LAW

By /s/ Dylan Anderson
Dylan Anderson (ISB# 9676)

Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB # 7928
Somach Simmons & Dunn, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com

ATTORNEYS FOR THE CITY OF POCATELLO

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **POCATELLO'S STATEMENT OF ISSUES**

Pursuant to the Director's May 2, 2023 Scheduling Order in the captioned matter,,the City of Pocatello (Pocatello), by and through its attorneys of record, Somach Simmons & Dunn, hereby submits this Statement of Issues:.

a) Whether changes to how IDWR computes curtailment dates (using transient groundwater modeling) are reasonable;

b) Whether the ESPAM has been shown to be sufficiently accurate to support the proposed transient groundwater modeling to determine curtailment dates;

c) Whether the Surface Water Coalition's ("SWC") actual irrigated acreage was properly determined for use in determining reasonable in-season demand;

d) Whether a baseline demand that incorporates increases in SWC member diversions in recent years is valid basis for conjunctive administration;

e) The reasonableness of Project efficiencies of the SWC members, trends in said efficiencies in recent years, and how the efficiency values are used in determining reasonable in-season demands;

f) IDWR's failure to consider all sources of supply to the SWC;

g) Whether 2018 is a reasonable new baseline year;

h) Whether changes to determination of the reasonable in-season demand for the SWC members are reasonable and appropriate;

i) Whether the level of conservatism employed in the methodology order is reasonable;

j) Whether contingencies other than curtailment are available to protect senior-priority rights in the event that mitigation water becomes unavailable.

k) Whether changes to how the reasonable carryover for the SWC members is computed are reasonable;

l) Whether other analytical methods or modeling would reasonably improve the process for predicting and evaluating material injury;

m) IDWR's failure to apply Conjunctive Management Rule 20.03 (IDAPA 37.03.11.20.03) and principles of reasonableness generally;

n) IDWR's violation of due process rights of all interested water users:

i. by engaging in an ineffective public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order;

ii. by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants.

This Statement of Issues is based on Pocatello's current understanding of the issues. Additional issues development of the facts and issues in this case, and additional issues may be identified as discovery and case development proceed.

Respectfully submitted this 4th day of May, 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

ATTORNEYS FOR CITY OF POCATELLO

CERTIFICATE OF SERVICE

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Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **COALITION OF CITIES' STATEMENT OF ISSUES**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, and pursuant to the Director's May 2, 2023, *Scheduling Order and Order Authorizing Remote Appearance at Hearing*, files this Statement of Issues in the above captioned matter.

Based on what is known now, and without the benefit of discovery, including the ability to conduct depositions, the Coalition of Cities identify the following issues for the hearing:

1. IDWR's new reliance on transient modeling;
2. IDWR's failure to properly identify the Surface Water Coalition's ("SWC") actual irrigated acreage used in the determination of reasonable in-season demand;
3. IDWR's failure to properly consider the SWC's changes in diversions over the last twenty years;
4. IDWR's failure to consider changes and reasonableness of the project efficiencies of the SWC's operations;
5. IDWR's failure to consider all sources of supply available to the SWC;
6. IDWR's use of 2018 as the new baseline year;
7. IDWR's failure to fully evaluate potential changes to the methodology used to determine the crop water needs of the SWC members;
8. IDWR's failure to fully evaluate potential changes to the methodology for forecasting the irrigation supplies of the SWC members;
9. IDWR's failure to fully evaluate changes to the methodology for determining reasonable carryover for the SWC members;
10. IDWR's failure to fully evaluate changes to the timing and procedures for updating the forecast shortages to the SWC members after the initial determination in April;

11. IDWR's failure to investigate whether the SWC members are using the water they divert efficiently and without waste, and in compliance with the terms of their decreed water rights;

12. IDWR's failure to standardize and make transparent the procedures for updating the SWC Methodology;

13. IDWR's failure to consider the comments received from members of the SWC Technical Working Group;

14. IDWR's failure to apply all factors in the Department's Rules for Conjunctive Management of Surface and Ground Water Resources, IDAPA 37.03.11, including but not limited to CM Rule 20.03 and principles of reasonableness generally; and

15. IDWR's violation of due process rights of all interested water users by:

a. by engaging in an apparently sham public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order and then largely ignoring that group's recommendations; and

b. by a continued abuse of process, authority and power in setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants and reflecting bias against junior water right uses.

The Coalition of Cities reserves the right to supplement this list of issues as information is learned through the discovery process.

Submitted this 5th day of May, 2023.

/s/ *Chris M. Bromley*
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Candice M. McHugh*
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May, 2023, the above and foregoing, was served by electronic filing, and addressed to the following:

Idaho Dept. of Water Res.
322 E. Front St., Ste. 648
Boise, ID 83702
file@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

Travis L. Thompson
John K. Simpson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
jsimpson@martenlaw.com
tthompson@martenlaw.com
jnielsen@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318 wkf@pmt.org

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110
Boulder, CO 80302
sklahn@somachlaw.com
dthompson@somachlaw.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Rich Diehl
City of Pocatello
P.O. Box 4169
Pocatello, ID 83205
rdiehl@pocatello.us

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife, City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak
IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

/s/ *Chris M. Bromley*
Chris M. Bromley

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Statement of Issues**

Idaho Ground Water Appropriators, Inc. (IGWA), acting for and on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Area Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, files this statement of issues pursuant to the *Scheduling Order and Order Authorizing Remote Appearance at Hearing* issued May 2, 2023, in this matter.

This proceeding involves the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") issued only three weeks ago, on April 21-2023. It was issued without a prior hearing and is based on evidence that is not in the record of this contested case. Consequently, it is impossible at this stage for IGWA to identify all issues it wishes to address at the hearing in this matter. IGWA is still in the process of retaining technical experts needed to

analyze certain components of the Fifth Methodology Order. IGWA cannot provide a definitive list of issues it wishes to address until discovery has been completed and IGWA's technical experts complete their review of the facts and analyses utilized by the Department in developing the Fifth Methodology Order.

Until then, IGWA preliminary identifies as issues for hearing all issues listed in *Pocatello's Statement of Issues* filed May 4, 2023, and *Coalition of Cities Statement of Issues* filed May 5, 2023. IGWA reserves the right to address issues identified by any other party to this proceeding, and any additional issues that IGWA identifies during discovery and develops in preparation for hearing in this matter.

As counsel for IGWA represented to the Director at the pre-hearing conference held April 28, 2023, the hearing currently scheduled for June 6-10, 2023, does not afford adequate time for IGWA to complete discovery, conduct a thorough review of all components of the Fifth Methodology Order, perform site investigations, develop expert reports, develop and organize evidence for presentation at the hearing, and otherwise fairly prepare for the hearing. Therefore, if the hearing is not continued until at least October, IGWA will be deprived of due process, and will not be able to address all issues raised by the Fifth Methodology Order.

DATED this 5th day of May, 2023.

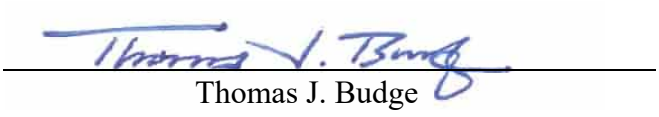
RACINE OLSON, PLLP

By: 

Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for McCain Foods USA, Inc.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **MCCAIN FOODS USA, INC.'S STATEMENT OF ISSUES**

Pursuant to the oral order at the Prehearing conference in this matter held on April 28, 2023, by and through the undersigned attorney, McCain Foods USA, Inc. ("McCain") files this Statement of Issue.

STATEMENT OF ISSUES FOR HEARING

McCain identifies the following issues for hearing:

a) IDWR's new reliance on transient modeling;

b) IDWR's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years;

d) IDWR's failure to consider changes in the efficiency of the SWC's operations;

e) IDWR's failure to consider all sources of supply available to the SWC;

f) IDWR's use of 2018 as the new baseline year; and

g) IDWR's violation of McCain's due process rights by not providing it actual notice of the order and requisite deadlines, and even if it was deemed that it was given "notice" because it shared an attorney with the Coalition of Cities, by giving it less than 10 business days to provide a mitigation solution after a wholesale change in methodology, by depriving it of the ability to develop its own mitigation plan to protect its water rights, by requiring compliance with a deadline to avoid curtailment without actual notice of the deadline and in a non-drought year, by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants.

Submitted this 5th day of May, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for McCain

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
(208) 232-6109 – fax
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **Notice of Ground Water District Mitigation**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District (collectively, the "Districts"), hereby provides notice that the Districts can mitigate for their proportionate share of the demand shortfall predicted in the Final Order Regarding April Forecast Supply (Methodology Steps 1-3) ("April 2023 As-Applied Order") issued April 21, 2023, in this matter.

Background

The April 2023 As-Applied Order applies steps 1-3 of the Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. It predicts that the Surface Water Coalition ("SWC") will experience an in-season demand shortfall of 75,200 acre-feet in the absence of mitigation by junior-priority groundwater users. The order states: "On or before May 5, 2023, ground water users holding consumptive

water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan." (April 2023 As-Applied Order, p. 6.) "IGWA's proportionate share of the predicted DS of 75,200 acre-feet is 63,645 acre-feet." *Id*. at 5, fn 5.

IGWA has three approved mitigation plans. Its "Storage Water Plan" authorizes the Districts to provide mitigation via the delivery of storage water to the SWC. (Order Approving Mitigation Plan, *In the Matter of the Idaho Ground Water Appropriators, Inc.'s Mitigation Plan in Response to the Surface Water Coalition's Water Delivery Call*, IDWR Docket No. CM-MP-2009-007, June 3, 2010, p. 10.) Under this plan, "IGWA must provide proof of rental or an option to rent storage water and of a commitment of the storage water to the SWC within the deadlines provided by the Methodology Order and any order of the Director implementing the Methodology Order for a given year." *Id*.

IGWA's "Aquifer Enhancement Plan" authorizes the Districts to obtain mitigation credit for reach gains that accrue to the SWC as a result of (a) conversions of farmland from groundwater to surface water irrigation; (b) fallowing of groundwater-irrigated acres through the Conservation Reserve Enhancement Program (CREP), Agricultural Water Enhancement Program (AWEP), or other voluntary program; and (c) groundwater recharge." (Order Approving Mitigation Plan, *In the Matter of the Idaho Ground Water Appropriators, Inc.'s Mitigation Plan for Conversions, Dry-Ups, and Recharge*, IDWR Docket No. CM-MP-2009-006, May 14, 2010, p. 1.) Under this plan, "[i]f mitigation credit is sought by IGWA, the Director shall determine the appropriate credit, if any, to provide." *Id*. at 2.

IGWA's "Settlement Agreement Plan" authorizes the Districts to obtain mitigation protection by complying with a settlement agreement entered into between the Districts and the SWC in 2015. (Final Order Approving Stipulated Mitigation Plan, *In the Matter of IGWA's Settlement Agreement Mitigation Plan*, IDWR Docket No. CM-MP-2016-001, May 2, 2016; Final Order Approving Amendment to Stipulated Mitigation Plan, *In the Matter of IGWA's Settlement Agreement Mitigation Plan*, IDWR Docket No. CM-MP-2016-001, May 9, 2017.) Under this plan, the Districts are required to conserve 240,000 acre-feet of water and deliver 50,000 acre-feet of storage annually to the SWC as set forth in the Amended Final Order Regarding Compliance with Approved Plan issued April 24, 2023.

Notice of Mitigation

The Districts identified in the following table will provide mitigation to the SWC under the Storage Water Plan. These districts' proportionate shares of the 63,645 acre-feet demand shortfall predicted in the April 2023 As-Applied Order are as follows:

District	Proportionate Share
Bingham GWD	13,384
Bonneville-Jefferson GWD	8,469
Jefferson-Clark GWD	6,939
Total	28,792

Attached hereto as Appendix A are copies of storage water leases totaling 38,714 acre-feet, submitted on behalf of the above-identified Districts.

The Districts identified in the following table will provide mitigation under the Settlement Agreement Plan. These Districts' proportionate shares of the 240,000 acre-feet of conservation and the 50,000 acre-feet of storage obligations are as follows:

District	240,000 AF	50,000 AF
Aberdeen-American Falls GWD	39,395	8,705
Carey Valley GWD	821	173
Henry's Fork GWD + Madison GWD	6,299	0
Magic Valley GWD	37,931	8,000
North Snake GWD	29,765	6,410
Total	114,211	23,288

Each District's proportionate share of 240,000 is based on the Director's allocation set forth in the *Amended Final Order Regarding Compliance with Approved Mitigation Plan* issued April 24, 2023, in this matter. Each District's proportionate share of 50,000 is based on the allocation IGWA has utilized since the Settlement Agreement Plan was implemented in 2016. The Settlement Agreement Plan does not require that storage water contracts be reported to the SWC or IDWR; it simply requires that storage be "delivered to SWC 21 days after the date of allocation." However, IGWA reports voluntarily that the above-identified Districts have storage leases in place for 23,288 acre-feet.

Dated this 5th day of May, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

APPENDIX A

Storage Leases

Bingham Ground Water District
Bonneville-Jefferson Ground Water District
Jefferson-Clark Ground Water District

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Idaho Irrigation District (lessor) agrees to lease 6,678 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature | Date | Title, Canal Company

5-1-23 | Idaho Irrigation District

Lessee Signature | 5/5/23 | Date

BGWD | Canal Company or Diversion Name

==========

(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Snake River Valley Irrigation District (lessor) agrees to lease 5,009 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
	5-1-23	Manager SRVID
Lessee Signature	Date	Canal Company or Diversion Name
	5-1-23	BGWD Manager

==========

(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

New Sweden Irrigation District (lessor) agrees to lease 5,009 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	Date	Canal Company or Diversion Name

5-1-23 MANAGER NSID

5/5/23 BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Enterprize Canal Company (lessor) agrees to lease 1,670 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lesso ignature

Title C na Comp ny

5/3/23

Lessee Signature Date

Canal Company or Diversion Name

5/5/23 BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Sunnydell Irrigation District (lessor) agrees to lease 334 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Compan
Lessee Signature	Date	Canal Company or Diversion Name

V.P Summydell canal

5/5/23

BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Aberdeen-Springfield Canal Co (lessor) agrees to lease 3,500 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	Date	Canal Company or Diversion Name

5/5/23 General Manager

5/5/23 BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Blackfoot Irrigation Company (lessor) agrees to lease 500 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company	
Lessee Signature	5/5/23 Date	BGWD Canal Company or Diversion Name	

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Corbett Slough Ditch Company (lessor) agrees to lease 750 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	Date	Canal Company or Diversion Name

5-5-2023 Corbett VP

5/5/23 BCWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Parsons Ditch Company (lessor) agrees to lease 100 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
	5/5/23	BGWD
Lessee Signature	Date	Canal Company or Diversion Name

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Peoples Canal & Irrigation Co (lessor) agrees to lease 2,514 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature | Date | Title, Canal Company

5/5/23

Lessee Signature | Date | Canal Company or Diversion Name

BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Riverside Canal Company (lessor) agrees to lease 50 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	5/5/23 Date	BGWD Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

The United Canal Company (lessor) agrees to lease 400 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	5/5/23 Date	BGWD Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Watson Canal Company (lessor) agrees to lease 50 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	Date	Canal Company or Diversion Name
	5/5/23	BGWD

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Wearyrick Ditch Company (lessor) agrees to lease 150 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature Date Title, Canal Company

5/5/23 BGWD

Lessee Signature Date Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Enterprize Canal Co., whose mailing address is PO BOX 583, Ririe, ID 83443, ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease.** Lessor hereby leases to Bonneville Jefferson Ground Water District 4,000 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of $[redacted].

2. **Term.** The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent.** Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before May 1, of 2023, and the final installment on or before November 1, of 2023.

4. **Administrative Fees.** BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water.**
   5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1

and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor.** Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach.** If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment.** This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution.** Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

by a mediator designated by mutual Lease of the parties. The mediation will be held in Bonneville County, Idaho, unless the parties mutually agree to a different location. Mediator costs will be split equally between the parties.

9.3 Litigation. Litigation is allowed between the parties only: (i) if the dispute is not resolved by mediation, (ii) for the purpose of enforcing a settlement Lease entered into between the parties, or (iii) to seek temporary injunctive relief if a party deems such action necessary to avoid irreparable damage. The pursuit or granting of temporary injunctive relief does not excuse the parties from participating in good faith negotiation and mediation as set forth above. The prevailing party in any litigation is entitled to recover reasonable attorney fees and costs.

9.4 Governing Law, Jurisdiction, and Venue. This Lease will be construed and interpreted in accordance with the laws of the State of Idaho. The parties agree that the courts of Idaho shall have exclusive jurisdiction, and agree that Bonneville County is the proper venue.

9.5 Exclusive Procedures. The procedures specified in this section 9 are the exclusive procedures for the resolution of disputes between the parties. All applicable statutes of limitation shall be tolled while the negotiation and mediation procedures specified in section 9.3 are pending.

10. **Notices.** All notices given pursuant to this Lease must be in writing and shall be sent in one of the following manners: (a) by certified mail, return receipt requested, postage prepaid; (b) by recognized overnight courier such as Federal Express; (c) by facsimile transmission; (d) by email if the receiving party acknowledges receipt of the emailed notice. Notices shall be deemed received on the earlier of actual receipt, three days after mailing for certified mail and regular mail, the next business day if given by fax, or the date the receiving party acknowledges receipt of email notice.

ADDRESSES TO BE USED FOR NOTICES AND DELIVERY OF LEASE PAYMENTS SHALL BE AS FOLLOWS:

Lessor: Enterprize Canal Co.
PO BOX 583
Ririe, ID 83443

Lessee: Bonneville Jefferson Ground Water District:
PO Box 51121
Idaho Falls, ID 83405

Either party may change its designated address by providing written notice of such change to the other party.

11. **Binding Effect.** This Lease shall be binding upon the respective heirs, successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

4-21-23

By: Kirt Schwieder
Title: Treasurer Date

LESSOR:

Enterprize Canal Co.
PO BOX 583
Ririe, ID 83443

4/20/23

By: Darrel Kerr Date
Title: Chairman

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Idaho Irrigation District, whose address is 496 E 14th St, Idaho Falls, ID 83404, Idaho Falls, Idaho 83402 ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease.** Lessor hereby leases to Bonneville Jefferson Ground Water District 4,000 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of $[redacted].

2. **Term.** The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent.** Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before ~~May 1~~ JULY 15, of 2023, and the final installment on or before November 1, of 2023.

4. **Administrative Fees.** BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water.**

5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1

and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor.** Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach.** If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment.** This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution.** Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

11. **Binding Effect.** This Lease shall be binding upon the respective heirs, successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

4-21-23

By: Kirt Schwieder

Title: Treasurer Date

LESSOR:

Idaho Irrigation District
496 E 14th St.
Idaho Falls, ID 83404

4-18-2023

By: Alan Kelsch Date

Title: Chairman – Idaho Irrigation District

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Snake River Valley Irrigation District, whose address is 816 N. 700 E., with a mailing address at PO BOX 70, Basalt, ID 83218, ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease**. Lessor hereby leases to Bonneville Jefferson Ground Water District 4,000 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of $[redacted].

2. **Term**. The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent**. Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before May 1, of 2023, and the final installment on or before November 1, of 2023.

4. **Administrative Fees**. BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water**.

   5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1 and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor**. Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach**. If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment**. This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution**. Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

by a mediator designated by mutual Lease of the parties. The mediation will be held in Bonneville County, Idaho, unless the parties mutually agree to a different location. Mediator costs will be split equally between the parties.

9.3 Litigation. Litigation is allowed between the parties only: (i) if the dispute is not resolved by mediation, (ii) for the purpose of enforcing a settlement Lease entered into between the parties, or (iii) to seek temporary injunctive relief if a party deems such action necessary to avoid irreparable damage. The pursuit or granting of temporary injunctive relief does not excuse the parties from participating in good faith negotiation and mediation as set forth above. The prevailing party in any litigation is entitled to recover reasonable attorney fees and costs.

9.4 Governing Law, Jurisdiction, and Venue. This Lease will be construed and interpreted in accordance with the laws of the State of Idaho. The parties agree that the courts of Idaho shall have exclusive jurisdiction, and agree that Bonneville County is the proper venue.

9.5 Exclusive Procedures. The procedures specified in this section 9 are the exclusive procedures for the resolution of disputes between the parties. All applicable statutes of limitation shall be tolled while the negotiation and mediation procedures specified in section 9.3 are pending.

10. **Notices**. All notices given pursuant to this Lease must be in writing and shall be sent in one of the following manners: (a) by certified mail, return receipt requested, postage prepaid; (b) by recognized overnight courier such as Federal Express; (c) by facsimile transmission; (d) by email if the receiving party acknowledges receipt of the emailed notice. Notices shall be deemed received on the earlier of actual receipt, three days after mailing for certified mail and regular mail, the next business day if given by fax, or the date the receiving party acknowledges receipt of email notice.

ADDRESSES TO BE USED FOR NOTICES AND DELIVERY OF LEASE PAYMENTS SHALL BE AS FOLLOWS:

Lessor: Snake River Valley
Irrigation District
816 N. 700 E.
PO Box 70
Basalt, ID 83218

Lessee. Bonneville Jefferson Ground Water District:
PO Box 51121
Idaho Falls, ID 83405

Either party may change its designated address by providing written notice of such change to the other party.

successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

4-21-23

By: Kirt Schwieder
Title: Treasurer Date

LESSOR:

Snake River Valley
Irrigation District
816 N. 700 E.
PO Box 70
Basalt, ID 83218

4-20-23

By:
Title: President Date

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

NOTICE OF GROUND WATER DISTRICT MITIGATION

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB. No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BONNEVILLE-JEFFERSON GROUND WATER DISTRICT'S STATEMENT OF ISSUES**

The Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson"), acting for and on behalf of its respective members, through counsel, submits this *Statement of Issues* pursuant to the Director's May 2, 2023, *Scheduling Order and Order Authorizing Remote Appearance at Hearing*.

As a threshold matter, Bonneville-Jefferson notes that the Orders at issue in this matter were issued a mere three weeks ago on April 21, 2023. Bonneville-Jefferson was not provided notice or an opportunity to be heard prior to these Orders being issued, nor has it been provided

any of the information the Department relied upon in issuing these Orders as of the date of this filing.

During the preliminary hearing before the Department on April 28, 2023, counsel for Bonneville-Jefferson joined in support of the Coalition of Cities' *Motion to Continue* the June 6, 2023, hearing on the Orders, raising concerns that it would not have sufficient time to obtain and review relevant information with its experts. This will impair Bonneville-Jefferson's ability to adequately review relevant information and develop evidence opposing the Orders before the scheduled hearing date. These concerns still abound, and Bonneville-Jefferson maintains that it will be deprived of due process and will not be able to address all issues raised by the Fifth Methodology Order should the Director not continue the hearing.

Without waiving any objection or defense, Bonneville-Jefferson submits the following *Statement of Issues* without the benefit of discovery, including the ability to review information the Department reconduct depositions, and with a limited information:

1) The procedures and process used by the Department in issuing the Methodology Order.
2) The technical rational for the Methodology Order.
3) The policy behind changing to transient state modeling in the Methodology Order.
4) The analysis and factual basis for the Methodology Order.
5) The Department's new reliance on transient modeling.
6) The Department's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years.
7) The Department's failure to consider changes in the efficiency of the SWC's operations.
8) The Department's failure to consider all sources of supply available to the SWC

9) The Department's rational and factual basis for using 2018 as the new baseline year.

10) Issues pertaining to futile call, including waste, reasonable time, and efficiency.

11) Whether the Methodology Order results in the optimum development of water resources in the public interest.

12) Whether the Methodology Order is contrary to the State's interest in securing the maximum use and benefit, and least wasteful use, of its water resources

13) Whether the Methodology Order permits SWC to command the entirety of large volumes of water in a surface or ground water source to support its appropriation contrary to the public policy of reasonable use of water as described in the Rules for Conjunctive Management of Surface and Ground Water Resources, IDAPA 37.03.11.

14) Whether the Department provided due process to water users in issuing the Methodology Order.

15) Bonneville-Jefferson reserves the right to present evidence, argument, and rebuttal as to any issues presented by other parties in this matter.

16) Bonneville-Jefferson further reserves the right to contest additional issues regarding the Fifth Methodology Order and the As-Applied Order that may be revealed through the discovery process.

Respectfully submitted this the 5th day of May 2023.

DATED: May 5, 2023

OLSEN TAGGART PLLC

/s/ *Skyler C. Johns*
SKYLER C. JOHNS

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May 2023, I served the foregoing document on the persons below via email as indicated:

/s/ Michelle J. Castro
Michelle J. Castro
Legal Assistant

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org
Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Dylan Anderson (ISB# 9676)
Dylan Anderson Law PLLC
P.O. Box 35
Rexburg, Idaho 83440

Phone - (208) 684-7701
Email - dylan@dylanandersonlaw.com

Attorney for Bingham Groundwater District. (BGWD)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BINGHAM GROUND WATER DISTRICT'S REQUEST FOR HEARING**

The Bingham Ground Water District (hereafter "Bingham"), acting for and on behalf of its respective members, through counsel, submits this Request for Hearing pursuant to Idaho Code § 42-1701(A)(3), Idaho Code § 67-5246(4), and Rule 740.02.b. of the Rules of Procedure of the Idaho Department of Water Resources, requesting a hearing on the Department's *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order")

and *Final Order Regarding April 2023 Forecast Supply* ("April 2023 As-Applied Order") issued April 21, 2023.

Bingham is in the process of reviewing the Fifth Methodology Order and the April 2023 As-Applied Order, but plans to address the issues identified in the *Coalitions of Cities' Amended Request for Hearing, Pocatello's Request for Hearing* filed April 28, 2023, and *Bonneville-Jefferson Ground Water District's Request for Hearing* filed May 4, 2023. Bingham reserves the right to present additional issues that may be revealed through the discovery process. Bingham reserves the right to identify additional ground for contesting the Director's action once it completes a thorough review of the Fifth Methodology Order and the As- Applied Order.

Respectfully submitted this the 5th day of May 2023.

DATED: May 5, 2023

DYLAN ANDERSON LAW PLLC

/s/
Dylan Anderson

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5 day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370 Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

DATED: May 5, 2023

DYLAN ANDERSON LAW PLLC

/s/
Dylan Anderson

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Robert L. Harris (ISB No. 7018)
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.
P.O. Box 50130
1000 Riverwalk Drive, Suite 200
Idaho Falls, ID 83405
Telephone: (208) 523-0620
Facsimile: (208) 523-9518
Email: rharris@holdenlegal.com

Attorneys for the City of Idaho Falls

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY

CITY OF IDAHO FALLS STATEMENT OF ISSUES

The City of Idaho Falls ("Idaho Falls" or "City"), by and through its counsel, Holden, Kidwell, Hahn & Crapo, P.L.L.C., submits this *City of Idaho Falls Statement of Issues*.

On Aril 21, 2023, the Director of the Idaho Department of Water Resources ("IDWR" or "Department") issued a *Fifth Amended Methodology Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover* (the "*Methodology Order*") and a *Final Order Regarding April 2023 Forecast Supply* ("*2023 As-Applied Order*"). Idaho Falls timely filed a *Challenge and Request for Hearing* on May 4, 2023. Pursuant to the Director's May 2, 2023, *Scheduling Order and Order Authorizing Remote Appearance at Hearing*, Idaho Falls files its statement of issues in the above captioned matter.

Based on what is known now, and without the benefit of discovery, including the ability to conduct depositions, counsel for Idaho Falls identifies the following issues for the hearing:

1. Whether IDWR's new reliance on transient modeling as opposed to steady-state modeling are reasonable;
2. Whether the Eastern Snake Plain Aquifer Model has been shown to be sufficiently accurate to support the proposed transient groundwater modeling to determine curtailment dates;
3. Whether a baseline demand that incorporates increases in SWC member diversions in recent years is a valid basis for conjunctive administration;
4. The reasonableness of Project efficiencies of the SWC members, trends in the efficiencies in recent years, and how the efficiency values are used in determining reasonable in-season demands;
5. Whether IDWR failed to consider all sources of water supply to the SWC;
6. Whether 2018 is a reasonable new baseline year;
7. Whether changes to determination of the reasonable in-season demand for the SWC members are reasonable and appropriate;
8. Whether IDWR's failure to fully evaluate potential changes to the methodology used to determine the crop water needs of the SWC members is reasonable;
9. Whether IDWR's failure to fully evaluate potential changes to the methodology for forecasting the irrigation supplies of the SWC members is reasonable;
10. Whether IDWR's failure to fully evaluate changes to the methodology for determining reasonable carryover for the SWC members is reasonable;

11. Whether IDWR's failure to fully evaluate changes to the timing and procedures for updating the forecast shortages to the SWC members after the initial determination in April is reasonable;
12. Whether IDWR's failure to investigate whether the SWC members are using the water they divert efficiently and without waste, and in compliance with the terms of their decreed water rights;
13. Whether it was lawful and/or appropriate for IDWR to fail to apply all factors in the Department's Rules for Conjunctive Management of Surface and Ground Water Resources, IDAPA 37.03.11, including but not limited to CM Rule 20.03 and principles of reasonableness generally; and
14. IDWR's violation of due process rights of all interested water users:
    a. by engaging in an ineffective public process related to the Department's convening of the "Technical Work Group" to discuss modifications to the Fourth Methodology Order; and
    b. by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives, and consultants.

The above is based upon Idaho Falls' current understanding issues involved in this proceeding, but without the benefit of discovery and other due process. Additional issues may be identified as this matter develops.

Dated this 5th day of May, 2023.

/s/ Robert L. Harris
Robert L. Harris, Esq.
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.

CERTIFICATE OF SERVICE

I hereby certify that on this 4th day of May, 2023, I served a true and correct copy of the following described pleading or document on the attorneys and/or individuals listed below by the method(s) indicated.

DOCUMENT SERVED: **CITY OF IDAHO FALLS STATEMENT OF ISSUES**

ATTORNEYS AND/OR INDIVIDUALS SERVED:

Idaho Department of Water Resources PO Box 83720 Boise, ID 83720 file@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
John K. Simpson Marten Law LLP P O Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Travis L. Thompson Marten Law LLP P O Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jneilsen@martenlaw.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
W. Kent Fletcher Fletcher Law Office PO Box 248 Burley, ID 83318 wkf@pmt.org	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Thomas J. Budge Elisheva M. Patterson Racine Olson PLLP PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 David.gehlert@usdoj.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Sarah A. Klahn Somach Simmons & Dunn 1155 Canyon Blvd., Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Rich Diehl City of Pocatello P O Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Candice McHugh Chris Bromley McHugh Bromley, PLLC 380 S. 4th St., Ste. 103 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Robert E. Williams Williams, Meservy & Lothspeich, LLP P O Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P O Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email

Skyler C. Johns Nathan M. Olsen Steven L. Taggart Olsen Taggart PLLC P O Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 Corey.skinner@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
William A. Parsons Parsons Smith & Stone P O Box 910 Burley, ID 83318 wparsons@pmt.org	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email
Garrick Baxter Deputy Attorney General Idaho Department of Water Resources P O Box 83720 Boise, ID 83720-0098 Garrick.baxter@idwr.idaho.gov	☐ Mail ☐ Hand Delivery ☐ Facsimile ☒ Email

/s/ Robert L. Harris
Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S REQUEST FOR HEARING AND STATEMENT OF ISSUES**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGAITON DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby request a hearing in the above-referenced matter pursuant to I.C. § 42-1701A(3) and submit the following list of issues regarding the Director's *Fifth Amended*

Order Regarding Methodology et al. and the *Final Order Regarding April 2023 Forecast Supply* issued on April 21, 2023.

I. *Fifth Methodology Order*

The Coalition requests a hearing on the following issues:

1) Whether 2018 is the proper baseline year for each Coalition member pursuant to the criteria identified in the methodology order;
2) Whether the reasonable carryover amounts identified for each Coalition member are proper pursuant to the criteria identified in the methodology order;
3) Whether current year project efficiency is recalculated for each year after Cropland Data Layer (CDL) data for this year becomes available and prior to this current year's project efficiency being used in the 15-year rolling average;
4) Whether current year project efficiency is recalculated for each year after CDL updates become available and are included in the 15-year rolling average; and
5) Whether the Coalition members can receive assigned mitigation storage water if they do not participate in the Water District 01 rental pool.

II. *April As Applied Order*

The Coalition requests a hearing on the following issue:

1) Whether the order provides that IGWA has an option to comply with the mitigation plan approved in CM-MP-2016-001 to avoid curtailment by complying with the mitigation plan approved in CM-MP-2009-007 instead;

A&B Irrigation District requests a hearing on the following issues:

1) Whether the order's identified proportionate share (458 acre-feet) of the predicted injury (75,200 acre-feet) to TFCC is calculated correctly based upon A&B's actual diversion

and use of water rights that are subject to the identified curtailment date (junior to December 30, 1953); and

2) Whether the steady-state use of the ESPAM 2.2 in identifying A&B's proportionate share is consistent with the transient use of the model in identifying ground water rights subject to curtailment as outlined in the *Fifth Methodology Order*.

DATED this 5th day of May, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only Tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

and use of water rights that are subject to the identified curtailment date (junior to December 30, 1953); and

2) Whether the steady-state use of the ESPAM 2.2 in identifying A&B's proportionate share is consistent with the transient use of the model in identifying ground water rights subject to curtailment as outlined in the *Fifth Methodology Order*.

DATED this 5th day of May, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
MARTEN LAW LLP
101 S. Capitol Blvd., Suite 305
P.O. Box 2139
Boise, Idaho 83701-2139
Telephone: (208) 336-0700
Facsimile: (208) 344-6034
Email: jsimpson@martenlaw.com

Attorneys for Falls Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FALLS IRRIGATION DISTRICT'S NOTICE OF COMMUNICATION TO WATER DISTRICT 01 WATERMASTER**

COMES NOW, Falls Irrigation District ("Falls" or "District"), by and through counsel of record, and hereby provides notice of its communication to the Water District 01 Watermaster regarding compliance with the Director's *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* wherein the Director required affected junior ground water right holders to establish "that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan" on or before May 5, 2023. *See* April As Applied Order at 6. Counsel mailed and emailed the letter to Watermaster Tony Olenichak on May 5, 2023. *See* Ex. A.

Notwithstanding this notice Falls reserves all rights with respect to the calculated proportionate share of the predicted injury and reserves the right to participate in the hearing on the April As Applied Order on that issue set for June 6-10, 2023.

Dated this 5th day of May, 2023.

MARTEN LAW LLP

/s/ John K. Simpson
John K. Simpson

Attorneys for Falls Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only Tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

and use of water rights that are subject to the identified curtailment date (junior to December 30, 1953); and

2) Whether the steady-state use of the ESPAM 2.2 in identifying A&B's proportionate share is consistent with the transient use of the model in identifying ground water rights subject to curtailment as outlined in the *Fifth Methodology Order*.

DATED this 5th day of May, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

Exhibit
A

MARTEN LAW

May 5, 2023

VIA U.S. MAIL AND EMAIL

Tony Olenichak, Watermaster
Water District 01
900 N. Skyline Dr., Suite A
Idaho Falls, Idaho 83402-1718
Tony.olenickak@idwr.idaho.gov

Re: SWC Delivery Call / Notice of Mitigation Water (*Final Order Regarding April 2023 Forecast Supply (Steps 1-3)*

Dear Tony:

I am writing on behalf of the Falls Irrigation District ("Falls" or "District") in reference to the Director's April 21, 2023 *Final Order Regarding April 2023 Forecast Supply* ("April Order"). In that order the Director noted that affected junior ground water right holders must establish "that they can mitigation for their proportionate share of the predicted demand shortfall of 75,200 acre-feet in accordance with an approved mitigation plan." *See* April Order at 6. To Falls' knowledge, the Director has not yet identified Falls' proportionate share with respect to certain junior priority ground water rights held by Falls.

Falls is reserving the right to participate in the hearing on the Director's calculation of its "proportionate share" of the April forecasted injury and that matter is set to be heard June 6-10, 2023. Falls reserves all rights with respect to this issue and by communicating this notice does not waive any of those rights with respect to the Director's order. Whether the District's proportionate share will change is unknown at this time.

Notwithstanding, Falls hereby provides notice of available mitigation water and requests that you confirm to the Director that the proportionate share of Falls' 2023 storage allocation will be available for assignment and delivery to mitigate injury to TFCC as predicted in the April Order if necessary. As you may be aware Falls carried over 13,722 acre-feet in its Palisades Reservoir space from 2022, and its American Falls Reservoir space is currently filling in 2023.

Regardless of the final allocation, it is believed that Falls has sufficient storage to deliver to injured Coalition members, including TFCC, for mitigation purposes if required.

D - 208 . 999 . 5903 | E - jsimpson@martenlaw. | P.O. Box 2139, Boise, ID 83701-2139

Falls believes this letter satisfies the Director's April Order. If you have any questions please call me at (208) 336-0700.

Sincerely,

/s/ John Simpson

John Simpson
Partner

Direct: (208) 999-5903
Email: jsimpson@martenlaw.com

cc: Sean Tischendorf, Falls Irrigation District

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
MARTEN LAW LLP
101 S. Capitol Blvd., Suite 305
P.O. Box 2139
Boise, Idaho 83701-2139
Telephone: (208) 336-0700
Facsimile: (208) 344-6034
Email: jsimpson@martenlaw.com

Attorneys for Falls Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FALLS IRRIGATION DISTRICT'S NOTICE OF COMMUNICATION TO WATER DISTRICT 01 WATERMASTER**

COMES NOW, Falls Irrigation District ("Falls" or "District"), by and through counsel of record, and hereby provides notice of its communication to the Water District 01 Watermaster regarding compliance with the Director's *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* wherein the Director required affected junior ground water right holders to establish "that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan" on or before May 5, 2023. *See* April As Applied Order at 6. Counsel mailed and emailed the letter to Watermaster Tony Olenichak on May 5, 2023. *See* Ex. A.

Notwithstanding this notice A&B reserves all rights with respect to the calculated proportionate share of the predicted injury, i.e. 458 acre-feet, and has requested a hearing on that issue.

Dated this 5th day of May, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only Tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

and use of water rights that are subject to the identified curtailment date (junior to December 30, 1953); and

2) Whether the steady-state use of the ESPAM 2.2 in identifying A&B's proportionate share is consistent with the transient use of the model in identifying ground water rights subject to curtailment as outlined in the *Fifth Methodology Order*.

DATED this 5th day of May, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

Exhibit
A

MARTEN LAW

May 5, 2023

VIA U.S. MAIL AND EMAIL

Tony Olenichak, Watermaster
Water District 01
900 N. Skyline Dr., Suite A
Idaho Falls, Idaho 83402-1718
Tony.olenichak@idwr.idaho.gov

Re: SWC Delivery Call / Notice of Mitigation Water (*Final Order Regarding April 2023 Forecast Supply (Steps 1-3)*)

Dear Tony:

I am writing on behalf of the A&B Irrigation District ("A&B" or "District") in reference to the Director's April 21, 2023 *Final Order Regarding April 2023 Forecast Supply* ("April Order"). In that order the Director noted that affected junior ground water right holders must establish "that they can mitigation for their proportionate share of the predicted demand shortfall of 75,200 acre-feet in accordance with an approved mitigation plan." *See* April Order at 6. The Director identified A&B's proportionate share as 458 acre-feet with respect to certain junior priority ground water rights held by A&B (36-15127A et al.). *See id.* at 5, n. 5. A&B also has an approved mitigation plan. *See Final Order Approving Mitigation Plan*, CM-MP-2015-003, Dec. 16, 2015.

A&B is requesting a hearing on the Director's calculation of its "proportionate share" of the April forecasted injury and that matter is set to be heard June 6-10, 2023. A&B reserves all rights with respect to this issue and by communicating this notice does not waive any of those rights with respect to the Director's order. Whether the District's proportionate share will change is unknown at this time.

Notwithstanding, A&B hereby provides notice of available mitigation water and requests that you confirm to the Director that 458 acre-feet of A&B's 2023 storage allocation will be available for assignment and delivery to mitigate injury to TFCC as predicted in the April Order if necessary. As you may be aware A&B carried over 58,900 acre-feet in its Palisades Reservoir space from 2022, and its American Falls Reservoir space is currently filling in 2023.

D – 208 . 735 . 2227 | E - tthompson@martenlaw.com | P.O. Box 63, Twin Falls, ID 83303-0063

Regardless of the final allocation, A&B presently has 458 acre-feet to deliver to injured Coalition members, including TFCC, for mitigation purposes if required.

A&B believes this letter satisfies the Director's April Order. If you have any questions please call me at (208) 733-0700.

Sincerely,

Travis Thompson
Partner

Direct: (208) 735-2227
Email: tthompson@martenlaw.com

cc: Justin Temple, A&B Irrigation District

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **MOTION FOR RECONSIDERATION OF DENIAL OF CONTINUANCE**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"), Idaho Ground Water Appropriators ("IGWA") by and through its attorney of record Thomas

J. Budge, Bingham Ground Water District by and through its attorney, Dylan Anderson and Bonneville-Jefferson Ground Water District, by and through its attorney Skyler Jones, (collectively the "Parties') pursuant to IDAPA 37.01.01.711 of the Department's rules of procedure and hereby file this *Motion for Reconsideration of the Denial of the Continuance* ("Motion") and move for reconsideration of the Director's interlocutory order denying a continuance of the hearing scheduled for June 6-10, 2023, in the above-captioned matter. Additional reasons for a continuance have come to light since the pre-hearing conference in addition to the reasons already set forth in the original motion.

On April 21, 2023, the Director issued a series of orders regarding the Surface Water Coalition ("SWC") delivery call: *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"); *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"), (collectively the "2023 Orders"). On April 28, 2023, the Director held a pre-hearing conference on the 2023 Orders. The Cities filed a *Motion for Continuance* which was joined by IGWA, GWDs and McCain. The Director orally denied the *Motion for Continuance*. But, he also left the door slightly open by saying: "if … water users as a whole, whose priority dates are junior to the senior water right holders, are either complying with a mitigation plan or have arranged somehow with the senior water right holders to satisfy the obligation, I'm willing to listen to some reasonable requests for delay." Tr. 24: 21- 25: 1.3. Because there is enough water secured to provide the predicted shortage, a reasonably delay is warranted as discussed below.

ARGUMENT

IDWR's procedural rule 711 allows any party affected by an "interlocutory order" to

petition the presiding officer and ask him to "rescind, alter or amend" such order. After further review of the 2023 Orders, the data and documents provided thus far and after consultation with the Cities and Groundwater Users' clients and experts it is apparent that a continuance is necessary because the expert for the City, Greg Sullivan, is unavailable in the weeks leading up to the hearing and IGWA's two experts are also unavailable to attend the hearing and there is not sufficient time to review and respond to the orders and their underlying data and information, take depositions of key Department personnel or witnesses. (See Declarations of Greg Sullivan, Jaxon Higgs, Sophia Sigstedt, Bryce Contor, and Thane Kindred.) Furthermore, IGWA, the Cities and Groundwater users are providing sufficient mitigation this upcoming season so little to no injury will occur to the senior users.

This Motion is supported by the argument below and Declarations filed by the Parties from: Greg Sullivan, Candice McHugh, Jaxon Higgs, Sophia Sigstedt, Bryce Contor and Thane Kindred.

The Parties to this Motion request that the Director reconsider his order denying the continuance and alter and amend the existing hearing date and schedule for the reasons set forth below.

A. Unavailability of Key Witnesses for Cities and Ground Water Users

1) The long-standing Cities' expert, Greg Sullivan, will be out of the country between May 17 and June 2, 4 days before the scheduled hearing. These dates include the date when expert reports are due, which means Mr. Sullivan will have to prepare his report in the middle of discovery and will have no opportunity to review other expert reports until he returns. The Declaration of Greg Sullivan

filed herewith contains further details as to why a continuance is necessary and are incorporated herein. Mr. Sullivan's absence will prejudice the Cities ability to adequately prepare for hearing.

2) Ms. McHugh will be out of town during the week of the hearing and this compromises her ability to adequately represent her clients causing them prejudice. (Declaration of Candice McHugh)

3) Sophia Sigstedt has been a long-standing expert for the Idaho Ground Water Appropriators and participated in the SWC Technical Working Group. She is IGWA's modelling expert with expertise in surface and ground water interactions, hydrogeology, consumptive use analysis among others. As detailed her in Declaration filed in support of this Motion, she is not able to "perform all of the work required to properly analyze" the orders in this case. Declaration of Sophia Sigstedt at 5. Furthermore, and most significantly, Ms. Sigstedt is not available for the hearing as schedule because of medical reasons. Id. Ms. Sigstedt's testimony and expertise is material to the development of the record and issues raised by IGWA. IGWA will be severely prejudiced if she is not able to attend the hearing.

4) Jaxon Higgs is an expert for the IGWA as a Geologist and Hydrologist and has expertise with issues relevant to this matter including groundwater modelling, the technical working group that was a pre-cursor to the orders in this matter, and water measurement, aquifer recharge and management to name a few. Mr. Higgs is unavailable the week of the hearing, due to an out of country trip already scheduled. Declaration of Jason Higgs. Mr. Higgs' testimony is material to the

development of the record and issues raised by IGWA. IGWA having to hire a different expert to present the testimony is not possible at this late date and replacing his expertise will require significant additional expense for another expert which is not necessary. IGWA will be severely prejudiced if he is not able to attend the hearing.

The availability of these people before and/or during the hearing will cause prejudice to their respective client's real property interests and rights to due process.

B. Insufficient time to obtain, review, and develop evidence and legal argument for Bonneville- Jefferson's experts and legal counsel.

The scheduled hearing date does not provide adequate time for Bonneville-Jefferson's experts to obtain, review, and develop testimony regarding the relevant information in this matter. Bonneville-Jefferson has retained Bryce Contor and Thane Kindred from Rocky Mountain Environmental Associates, Inc., in Idaho Falls, Idaho, to review the technical information pertaining to the Fifth Amended Methodology Order and April 2023 As-Applied Order. Their expertise is critical to Bonneville-Jefferson's opposition to these orders because Bonneville-Jefferson and its retained experts were not involved in the Department meetings or discussions regarding the technical basis for either Order. See Declaration of Skyler C. Johns, Declaration of Bryce Contor, and Declaration of Thane Kindred. Thus, Bonneville-Jefferson and its experts have not received, nor do they have access to any information the Department relied upon in these orders as of the date of this filing. Id. Once all discovery is complete, Bryce Contor and Thane Kindred require at least two months to adequately review the information and prepare their testimony regarding the technical basis of the Orders.

Counsel for Bonneville-Jefferson also cannot adequately develop evidence or legal arguments in opposition to the Orders until Bryce and Thane complete their review. Id. As such, counsel will require an additional one to two months to consult with Bonneville-Jefferson's experts once they have completed their review of all the relevant information. See Declaration of Skyler C. Johns.

Based on the foregoing, not granting additional time for Bonneville-Jefferson to obtain review and evidence and legal arguments will cause prejudice to its members real property interests and rights to due process.

C. Mitigation Has Been Secured for the Upcoming Season, Thereby Causing Little to No Prejudice to the Senior Users

1) At the Pre-Hearing conference, the Director denied the continuance but left the door open, "if … water users as a whole, whose priority dates are junior to the senior water right holders, are either complying with a mitigation plan or have arranged somehow with the senior water right holders to satisfy the obligation, I'm willing to listen to some reasonable requests for delay." Tr. 24: 21- 25: 1.3.
2) IGWA has enough the water to mitigate for its 2021 breach and for the predicted demand shortfall for the upcoming 2023 season. See IGWA's Notice of Mitigation.
3) The Cities are in compliance with their mitigation obligations and will meet their obligations this year.
4) At least two other junior groundwater users, McCain Foods USA, Inc. ("McCain") and Amalgamated Sugar Company ("Amalgmated") are also mitigated for their use. See McCain Notice of Mitigation and Amalgamated's Notice of Mitigation.

5) It is also understood that IDWR is issuing curtailment letters to the remaining, non-mitigated juniors. These other remaining junior users account a fractional percentage of the groundwater depletions which are allegedly causing injury to Twin Falls Canal Company. It is anticipated that some of these users will also provide mitigation, but given the tiny amount of water they are responsible for, the fact that IGWA has enough water for this season to offset the entire injury forecasted to TFCC and the fact that the Cities' have over-mitigated in the past several years, the Director should consider that the junior water users "as a whole" are complying with mitigation plans. Thus, a reasonable continuance is in order.

6) This leaves the final piece—that the Director effectively delegated to the SWC the ability to veto a continuance to a reasonable hearing date. Tr: 24:21-25: l. 3. The Parites are unaware of any statutory authority for this action, and in fact it appears the Director is attempting to set a hearing that will end up with a per se inadequate record for appeal.

In addition, because mitigation water has been secured and the Director has a final Fourth Methodology order administration can occur this year. And, while the Parties to this motion prefer to wait for implementation of the 2023 Orders, they will not object to the Director implementing the 2023 Orders and pursuing curtailment of non-mitigated groundwater users this season.

D. Experts and Counsel Involved Here Are Available For A Hearing in This Matter the Week of October 16, 2023 And the Moratorium Hearing Could be Rescheduled

Over a dozen attorneys and/or experts for the key parties in this matter and twenty-four parties are the same as those in *The Matter of the Big Wood River Ground Water Management Area and In The Matter of Applications for Permit for the Diversion and Sue of Surface and Grud Water Within the Snake Rier Basin* (the "Moratorium Matters"). There is a hearing set for October 16-19, 2023 at the Department in Moratorium Matters. The overlapping parties, counsel and experts in the Moratorium Matters and this action are: 14 cities in the Coalition of Cities and their attorneys Candice McHugh, Chris Bromley, the City of Pocatello and its attorney Sarah Klahn and the City of Idaho Falls and its attorney Rob Harris along with their collective expert Greg Sullivan; Idaho Ground Water Appropriators and its nine groundwater districts and its attorneys Thomas J. Budge, Elisheva Patterson, and its experts Sophia Sigstedt and Jaxon Higgs; Kent Fletcher, Travis Thompson and John Simpson.

The City of Bellevue, the City of Pocatello, the Coalition of Cities, Wellsprings Group and IGWA all agree to move the hearing in this matter to the days set for hearing in the Moratorium Matters. And, because Mr. Fletcher, Mr. Thompson and Mr. Simpson represent parties in the Moratorium Matters that are all in support of the Moratoriums, which is in place, moving that hearing will not prejudice their clients.

Moving this hearing to the proposed October dates or some other week in this coming fall or early winter is a reasonable delay given the detail and evidence needed in this case. Because the key players are all available for the dates set forth in October, this seems like the easiest and fairest resolution, but regardless, delaying the hearing to dates this fall

allows a full and fair development of the record by all parties and it will allow the Director time to issue an order prior to having to determine carry-over storage issues in November and in time for the upcoming 2024 irrigation season.

E. Rescheduling the Hearing Saves All Parties and IDWR Time, Money and Expense and Honors the Civility and Professional Conduct of the Legal Profession

Without moving the hearing, the parties to this Motion will be forced to take action in District Court requiring IDWR and the other parties to the case to respond. It is a much more reasonable and prudent of use of state resources as well as resources of the parties to reschedule this hearing later this fall, especially because there are dates available in October for all the necessary parties, the senior user's forecasted injury will be fully mitigated this season and without a delay the junior users are highly prejudiced.

CONCLUSION

Based on the foregoing, the Parties to this Motion request that the Director grant a continuance to the Moratorium Hearing Dates in October or to some other week this fall; the Parties to this motion and their experts are also available the weeks of November 27 or December 6, 2023.

In addition, the Parties to this Motion recognize that the Surface Water Coalition has a right to respond to this motion but given the compressed hearing schedule, the Parties request that the Director order them to respond by the end of business Tuesday, May 9, 2023 and issue an order on this Motion by Wednesday, May 10, 2023.

Submitted this 5th day of May, 2023.

/s/ Sarah Klahn
_____
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

/s/ Candice M. McHugh
_____
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Robert Harris
_____
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ Chris M. Bromley
_____
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Thomas J. Budge
_____
Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

/s/ Skyler C. Johns
_____
Skyler C. Johns
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

/s/ Dylan Anderson
_____
Dylan Anderson
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.

file@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ Candice McHugh
_____
Candice M. McHugh

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Candice McHugh, ISB No. 5908
McHugh Bromley, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for the Coalition of Cities, Amalgamated Sugar Company and McCain Foods USA, Inc.

BEFORE THE DEPARTMENT OF WATER RESOURCES OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **DECLARATION OF CANDICE M. MCHUGH**

I, Candice McHugh hereby declare and state as follows:

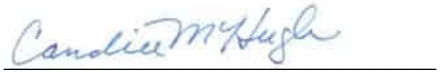
1. I am over the age of 18 and state the following based upon my own personal knowledge.
2. I am one of two owners of McHugh Bromley, PLLC, the law firm that represents the cities that make up the Coalition of Cities as their interests relate to the on-going Surface Water Coalition ("SWC") Delivery Call and mitigation thereof. McHugh Bromley, PLLC also represents Amalgamated Sugar Company ("Amalgamated") and McCain Foods USA, Inc. ("McCain") in this matter.
3. McHugh Bromley, PLLC has two attorneys, Candice McHugh and Chris Bromley. We have one part-time file clerk who works 4-5 hours per week on clerical duties only.
4. I serve as the primary attorney for Amalgamated and McCain.

5. My partner, Chris Bromley, is the primary attorney for Sun Valley Company who is a party to the Supreme Court appeal in *South Valley Ground Water District and Galena Ground Water District v. Idaho Dep't of Water Resources*, Supreme Court Docket No. 49632-2022 ("Supreme Court Matter"). Oral argument in that matter is set for June 5, 2023 with Mr. Bromley set for argument. Mr. Bromley will be preparing for argument during the week of May 29, 2023.
6. I have a previously scheduled out of state obligation in Boone, North Carolina, to assist my son who is a freshman football athlete in college from June 4-8, 2023, wherein I will be travelling by air virtually all day June 4 and all day June 8, 2023.
7. Because our law firm only has two attorneys, requiring Mr. Bromley, alone to prepare for the Supreme Court argument while also having to do the bulk of the preparation for the SWC hearing on behalf of the Coalition of Cities, Amalgamated, and McCain at the same time and then represent our firm's clients in 4 days of hearing is not practical and does not allow us to fully and fairly represent Coalition of Cities, Amalgamated, and McCain.
8. After repeated requests to postpone the hearing to other dates by the junior users, IGWA, GWDs, McCain, Amalgamated, and the Cities, the Director denied their requests.
9. The hearing as currently set will not allow me to assist or attend the hearing in any meaningful manner and prejudices the interest of McHugh Bromley, PLLC's clients.

I declare under penalty of perjury under the laws of the State of Idaho that the foregoing is true and correct.

Dated this 5th, day of May, 2023.

MCHUGH BROMLEY, PLLC



Candice M. McHugh
Attorney for the Coalition of Cities

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING THE CITIES' MOTION FOR APPOINTMENT OF INDEPENDENT HEARING OFFICER AND MOTION FOR CONTINUANCE AND LIMITING SCOPE OF DEPOSITIONS**

BACKGROUND

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") as well as his *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order"). The Methodology Order revises the nine steps used to determine material injury to members of the Surface Water Coalition ("SWC"). The As-Applied Order predicts a shortfall for the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to December 30, 1953.

Anticipating that one or more parties would request a hearing pursuant to Idaho Code § 42-1701A(3) in response to one or both of the orders, the Director also issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Notice of Hearing") on April 21, 2023. The Notice of Hearing scheduled a prehearing conference for April 28, 2023, and an in-person evidentiary hearing on the Methodology Order and As-Applied Order for June 6–10, 2023.

Immediately before the April 28, 2023 prehearing conference, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, and Wendell (collectively the "Cities") filed a *Motion for Appointment of Independent Hearing Officer* ("Motion to Appoint") requesting that the Director appoint an independent hearing officer to preside over the hearing set for June 6–10, 2023. The Cities also filed a *Motion for Continuance*, asking the Director to continue the evidentiary hearing "until a date in December or January 2024 . . . ." Mot. for Continuance at 8.

The prehearing conference was held on April 28, 2023. During the prehearing conference, the Cities presented argument in support of their *Motion for Continuance*. The Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Groundwater District, and McCain Foods orally moved to join the Cities' *Motion for Continuance*. The SWC opposed the Cities' motion, arguing the hearing should remain as scheduled on June 6–10, 2023. The Director orally denied the Cities' request to delay the hearing until December or January 2024

but left open the possibility of moving the hearing dates to another week in June. This order memorializes the Director's oral ruling.

ANALYSIS

A. Motion for Continuance.

The Cities request that the hearing, currently scheduled for June 6–10, 2023, be delayed approximately six months. Mot. for Continuance at 8. The Cities assert additional time is needed to conduct discovery, prepare witnesses, properly evaluate the updated Methodology Order and As-Applied Order, and because one of its attorneys (Ms. Candice McHugh) will be unable to appear in person June 6–10. *Id.* at 4–6. The Cities further assert the Director should grant its request because no exigency exists given the above-average snowfall this year. *Id.* at 6–8.

During the April 28, 2023 prehearing conference, the Director orally denied the Cities' request to move the hearing to December or January 2024 but offered limited flexibility regarding the June hearing dates. The Director stated he was willing to move the hearing anytime within the first three weeks of June 2023 if all the parties agreed to move the hearing. In response to the Cities' claims of being surprised by the changes, the Director observed that last fall the Department conducted multiple presentations regarding possible amendments to the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order"). The Director also reminded the parties he had, multiple times, publicly expressed his intention to revisit the Fourth Methodology Order. In denying the Cities' request, the Director emphasized his court-ordered obligation to timely predict water supplies and issue orders timely to ensure senior water right holders are protected. The Director reaffirms his denial of the Cities' *Motion for Continuance* but remains willing to move the hearing within the first three weeks of June 2023 if the parties file a stipulated motion requesting a change.[1]

B. Motion to Appoint an Independent Hearing Officer.

The Cities move the Director to appoint an independent hearing officer pursuant to Idaho Code § 42-1701A(2), which states in relevant part that "[t]he director, *in his discretion*, may direct that a hearing be conducted by a hearing officer appointed by the director." (Emphasis added). Accordingly, the Director has the discretion to grant or deny the Cities' request.

In support of the Motion, the Cities argue that "the only evidentiary hearing of any magnitude" in the SWC delivery call proceedings occurred in 2008 when former Idaho Supreme Court Chief Justice Gerald Schroeder was appointed to serve as a hearing officer. *Motion to Appoint* at 3–4. The Cities assert that the updated Methodology Order constitutes a "sea-change"

[1] At the April 28, 2023 prehearing conference, Ms. McHugh asked that she be allowed to participate in the hearing remotely if the Director was going to keep the June hearing date. The Director granted Ms. McHugh's request to appear at the hearing remotely in his *Scheduling Order and Order Authorizing Remote Appearance at Hearing* (issued May 2, 2023).

and that "the Methodology Order fails to update data as to SWC irrigation efficiencies, irrigation practices, irrigated area, among other topics that will need to be addressed at an evidentiary hearing with a fully developed record." *Id.* at 4. The Cities argue that it has been 15 years since "an evidentiary hearing of any consequence has taken place," and recommend that an independent hearing officer be appointed to hold this upcoming evidentiary hearing. *Id*. at 5. The Cities suggest the Department has established a "practice" of appointing an independent hearing officer in the SWC delivery call and encourages the Director to continue with this "practice." *Id*.

The Director declines to grant the Cities' request to appoint an independent hearing officer. The Director has held many evidentiary hearings related to conjunctive administration of water rights. For example, the Director held a multi-day evidentiary hearing in the Rangen delivery call matter. *See Rangen, Inc. v. Idaho Dep't of Water Res.*, 159 Idaho 798, 801, 367 P.3d 193, 196 (2016) ("IDWR Director Gary Spackman ('Director') presided over an evidentiary hearing."). The Director held a multi-day evidentiary hearing in the Basin 37 administrative matter. *See* Final Order, *In re Basin 37 Administrative Proceeding*, No. AA-WRA-2021-001 (Idaho Dep't of Water Res. June 28, 2021) (The Director presided over evidentiary hearing held June 7–12, 2021).

The Director has held evidentiary hearings related to mitigation plans in the SWC delivery call matter. *See* Am. Final Order Re. Compliance with Approved Mitigation Plan, *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dep't of Water Res. April 24, 2023). Significantly, the Director has held an evidentiary hearing on previous updates to the methodology order. *See* Am. Final Order Re. Method. for Determ'g Material Injury to Reasonable In-Season Demand & Carryover.

These examples are just a few of the many administrative hearings the Director has held. As these examples illustrate, there is no fixed practice of appointing a hearing officer in this or other contested administrative matters. The Director has presided over many evidentiary hearings related to significant water administration issues and is able to preside over the upcoming evidentiary hearing.

Furthermore, time is of the essence given that the As-Applied Order predicts a shortfall for the 2023 irrigation season resulting in mitigation requirements or curtailment for ground water rights junior to December 30, 1953. The urgency for water administration mandates a timely decision because "[w]hen a junior appropriator wrongfully takes water that a senior appropriator is entitled to use, there is often the need for very prompt action." *Clear Springs Foods, Inc. v. Spackman*, l50 Idaho 790, 815, 252 P.3d 71, 96 (2011); *see also IGWA v. Idaho Dep't of Water Res*., No. CV27-22-00945 (Jerome Cnty. Dist. Ct. Idaho).

The Director is thoroughly familiar with all aspects of the Methodology Order and the As-Applied Order and is the person in the best position to preside over this matter and consider the arguments raised by the parties. Appointing an independent hearing officer would unreasonably delay the proceedings and delay administration of hydraulically connected surface and ground water rights.

C. Scope of Depositions of Department Employees

During the prehearing conference, the Director also identified Matthew Anders and Jennifer Sukow as the witnesses that will testify on behalf of the Department at the hearing to explain the facts and information the Department considered in updating the Methodology Order and As-Applied Order. Questions were raised regarding the appropriate scope of the depositions. As indicated at the prehearing, the deposition process is not an opportunity for parties to question Department employees about the Director's deliberative process related to legal and policy considerations. The Methodology Order clearly explains the Director's views regarding the legal and policy considerations on the issues like why the Director is updating the methodology order and steady-state vs. transient-state modeling. Rule 521 of the Department's Rules of Procedure states: "The presiding officer may limit the type and scope of discovery." IDAPA 37.01.01.521. Accordingly, the Director will limit the scope of the depositions to preclude questions regarding the Director's deliberative process on legal and policy considerations.

ORDER

Based on the forgoing discussion, IT IS HEREBY ORDERED that the Coalition of Cities' *Motion for Continuance* is DENIED. The Director will consider moving the hearing to other dates within the first three weeks of June 2023 if the parties file a stipulated motion requesting the change.

IT IS FURTHER ORDERED that the Coalition of Cities' *Motion for Appointment of Independent Hearing Officer* is DENIED.

IT IS FURTHER ORDERED that the scope of any deposition of a Department employee will preclude questions regarding the Director's deliberative process on legal and policy considerations.

DATED this 5th day of May 2023.



Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **NOTICE OF MATERIALS DEPARTMENT WITNESSES MAY RELY UPON AT HEARING AND INTENT TO TAKE OFFICIAL NOTICE**

On May 2, 2023, the Director issued a *Scheduling Order and Order Authorizing Remote Appearance at Hearing* ("Scheduling Order"). In the Scheduling Order, the identified two Idaho Department of Water Resources ("Department") employees who will testify at the hearing—Jennifer Sukow and Matthew Anders. The Director set a deadline of May 5, 2023, for the Department to provide the materials Ms. Sukow and Mr. Anders may rely upon at the hearing as well as a summary of topics Ms. Sukow and Mr. Anders may testify to. *Scheduling Order* at 2. The Department may augment its list of materials Ms. Sukow and Mr. Anders may rely upon at the hearing, if needed, by May 10, 2023. *Id*.

A. Materials Ms. Sukow and Mr. Anders may rely upon during the June 6-10 hearing.

The materials Ms. Sukow and Mr. Anders may rely upon at the hearing have been divided into four separate folders and are publicly available on the Department's website[1] as a downloadable zipped file labeled "Materials Department Witnesses May Rely Upon at Hearing".

1st Folder: "2022 Technical Working Group ("TWG")". Presentations, agendas, data and communications related to the TWG meetings this fall.

2nd Folder: "2023 5th Amended Methodology Order". Data files and notes related to baseline year, irrigated acres, project efficiency, reasonable carryover.

3rd Folder: "2023 April As-Applied Order". Copies of all files in the April Background Information folder on IDWR's website.

4th Folder: "ESPAM Report". ESPAM documentation reports from Jennifer Sukow.

[1] The webpage for the above-captioned matter can be located at: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

B. Topics Ms. Sukow may testify about at the hearing:

- Steady-state vs. transient modeling / simulations for the Eastern Snake Plain Aquifer Model (ESPAM).
- Calculation of curtailment priority dates for the SWC's delivery call.

C. Topics Mr. Anders may testify about at the hearing:

- Base Line Year (BLY)
- Forecast Supply
- SWC Irrigated Acres
- Crop Water Need
- Near Real Time Mapping Evapo Transpiration at high Resolution with Internalized Calibration (NRT METRIC)
- Project Efficiency
- Reasonable Carryover
- Twin Falls Canal Company's increase in diversions
- The 2023 Technical Working Group meetings

D. Director's intent to take official notice.

Department Rule of Procedure 602 states in pertinent part:

> The [Director] may take official notice of any facts that could be judicially noticed in the courts of Idaho, of generally recognized technical or scientific data or facts within the agency's specialized knowledge and records of the agency. The [Director] may ask agency staff to prepare reports or memoranda to be used in deciding a contested case, and all such reports and memoranda shall be officially noticed by the [Director]. The [Director] shall notify the parties of specific facts or material noticed and the source of the material noticed, including any agency staff memoranda and data. This notice should be provided either before or during the hearing, and must be provided before the issuance of any order that is based in whole or in part on facts or material officially noticed. Parties must be given an opportunity to contest and rebut the facts or material officially noticed.

IDAPA 37.01.01.602.

The Director hereby notifies the parties that he intends to take official notice of the facts and data in the "2022 Technical Working Group ("TWG")" folder, "2023 5th Amended Methodology Order" folder, "2023 April as Applied Order folder", and "ESPAM Report" folder.

Concurrent with this notice, copies of those documents will be posted to the Department's docket for this proceeding. Pursuant to Rule of Procedure 602, any party may file a written objection "to contest and rebut the facts or material to be officially noticed" on or before June 4, 2023. IDAPA 37.01.01.602.

DATED this 5th day of May 2023.

Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **Declaration of Jaxon Higgs**

I, Jaxon Higgs, declare the following:

1. I am over the age of 18 and competent to testify. If called upon to testify, I could testify to the following, all of which are within my own personal knowledge or based upon my professional judgment.

2. I am a licensed professional Geologist in the State of Idaho. I have a bachelor's degree in Geology from Brigham Young University Idaho and a master's degree in Hydrology from the University of Idaho.

3. I am the principal owner and operator of Water Well Consultants ("WWC"), an Idaho corporation with its principal address at 355 W. 500 S., Burley, Idaho 83318. WWC provides a variety of hydrogeologic services in southern Idaho related to aquifer management and water conservation. Contracted duties include, but are not limited to, monitoring of aquifer health, usage measurement and reporting, and management of aquifer recharge programs.

4. I am a consultant for Idaho Ground Water Appropriators, Inc. ("IGWA"). In that capacity I provide technical assistance on a variety of matters, including groundwater modelling and other issues related to the Surface Water Coalition ("SWC") delivery call.

5. From November 16 to December 21, 2022, I participated in several Technical Working Group meetings with the Idaho Department of Water Resources ("Department") staff via virtual meetings, to review the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order") and the Department staff's findings. The information covered during these Technical Working Group meetings was complex and voluminous.

6. I have reviewed and consulted with IGWA concerning the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") issued by the Director on April 21, 2023, and will be involved in reviewing the Fifth Methodology Order, analyzing data, and preparing expert reports.

7. My family has a long-standing road trip vacation to Mexico planned for May 27-June 10, 2023. Therefore, I am unable to participate in the hearing currently scheduled for June 6-10, 2023.

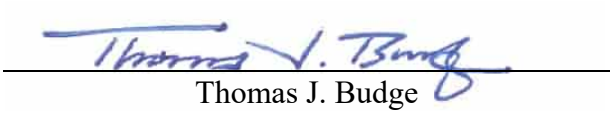
I declare under the penalty of perjury pursuant to the law of the State of Idaho that the foregoing is true and correct.

DATED this 4th day of May, 2023.

By: Jaxon Higgs
Jaxon Higgs

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
(208) 232-6109 – fax
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **Declaration of Sophia Sigstedt**

I, Sophia Sigstedt, declare the following:

1. I am over the age of 18 and competent to testify. If called upon to testify, I could testify to the following, all of which are within my own personal knowledge or based upon my professional judgment.

2. I am an American Institute of Hydrology Professionally Certified (No. 7015) Hydrogeologist with a specialization in groundwater. I have a master's degree in hydrology from the New Mexico Institute of Mining and Technology. My work includes hydrogeology, water resources engineering, and water resources planning and management. I have directed or contributed to several river-basin-scale water management studies that involved analysis of basin hydrology and water uses and the development of computer models to investigate implications of changes in hydrology, system operations, and water uses. My experience includes historical consumptive use analysis, evaluation of surface and ground water interactions, development of

protective terms and conditions for water users, settlement negotiations and expert witness testimony. I am employed by Lynker Technology, 5445 Conestoga Court, Suite 100, Boulder, Colorado.

3. For several years I have worked as a technical consultant for Idaho Ground Water Appropriators, Inc. ("IGWA"). In that capacity I participate on the Eastern Snake Plain Hydrologic Modeling Committee, the Big Lost Modeling Technical Advisory Committee, and the Swan Falls Technical Working Group, and have testified as an expert witness in cases before the Idaho Department of Water Resources ("IDWR" or "Department"). I further provide IGWA with technical assistance on a variety of matters, including the Surface Water Coalition ("SWC") delivery call.

4. From November 16 to December 21, 2022, I participated in several virtual meetings held by Department staff regarding the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order") issued in the SWC delivery call case. Department staff had been reviewing the components of the methodology used to determine material injury to the SWC and related matters. The data shared during these meetings were highly technical, complex and voluminous.

5. On December 23, 2022, I received from Department staff a one-page summary of their "preliminary recommendations on potential technical changes to the methodology." This document requested written comments be submitted by January 16, 2023.

6. I drafted and submitted to Department staff my preliminary comments to the preliminary recommendations, and comments addressing the other material covered during the November and December Technical Working Group meetings, on January 16, 2023.

7. On April 21, 2023, the Director issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order"). Based on my review of the Fifth Methodology Order, it does not appear that the Director took into consideration my written comments submitted on January 16, 2023.

8. Step 1 of the Fifth Methodology Order is the analysis of SWC's total anticipated irrigated acres for the upcoming year. As with prior versions, the Fifth Methodology Order requires the SWC to annually submit either an electronic shapefile delineating total irrigated

acres within their delivery system, or confirm in writing that the acreage submitted previously has not varied by more than five percent. During the technical meetings, Department staff reported that they examined the number of acres irrigated within Twin Falls Canal Company (TFCC) as a check against the acres reported by TFCC. The Department found 179,456 irrigated acres, whereas TFCC reported 194,732 irrigated acres. This is a more than 9% difference, and it exceeds the 5% standard set in the Fifth Methodology Order. A proper evaluation of the Fifth Methodology Order requires consideration of the accuracy of SWC's reported irrigation acreage, which has not been addressed by the Department. In order to properly analyze Step 1 of the Fifth Methodology Order, I want to analyze the most up-to-date real-time METRIC data to audit the number of acres of acres actually irrigated within TFCC and other members of the SWC. The June 6, 2023, hearing date does not allow me sufficient time to perform this analysis.

9. Step 2 of the Fifth Methodology Order requires the Director to compare the April Forecast Supply (FS) to the Baseline Demand (BD) for each SWC entity to determine if an in-season demand shortfall (IDS) is predicted for the upcoming irrigation season. To calculate FS, the Fourth Methodology Order used the Heise natural flow data and in some cases Box Canyon spring discharge from years 1990-2022. IDWR staff reported in a presentation on November 17, 2022, that the R^2 value for the TFCC FS model has degraded continually since the Fourth Methodology Order was issued, which creates significant problems with the reliability of the method used to predict FS. It is also significant that the R^2 value for TFCC, which is often the only SWC entity with a predicted DS, is the lowest R^2 value among the SWC members. In order to properly analyze Step 2 of the Fifth Methodology Order, I want to analyze previously tested FS predictors over the new period of record (POR) 1990-2022, as well as cast a new net of predictor variables that may have higher explanatory power than the current model. The June 6, 2023, hearing date does not allow me sufficient time to properly evaluate and analyze the data.

10. One of the most significant changes to the Fifth Methodology Order is the transition from a three-year composite Base Line Year (BLY) to a single-year BLY. The methodology uses the BLY to calculate Reasonable In-Season Demand (RISD) for each SWC entity in Steps 2, 6, 7 for Demand Shortfall and Step 9 Reasonable Carryover The Fourth Methodology Order used average diversion volumes in 2006, 2008, and 2012 as the BLY. The Fifth Methodology Order uses only 2018 diversions as the BLY. Average diversions in 2006/2008/2012 (06/08/12) ranked between 7th and 8th highest for diversions, or about the 55th percentile (based on a normal

distribution), for the period of record (POR) 2000-2015. For the POR 2000-2021 the diversion demand for 2018 ranks 3rd, or about the 90th percentile (based on a normal distribution) for the POR. When I compared the distribution of SWC total diversion demands for the POR 2000-2015 compared to 2000-2021, it is apparent that they are very similar with mean diversions of 3.16 million acre-feet and 3.2 million acre-feet, respectively. The standard deviation is also very similar for the POR 2000-2015 compared to 2000-2021 at 178,089 acre-feet and 178,587 acre-feet, respectively. Without evidence that the previous BLY created unmitigated shortages to the SWC, there is not an adequate technical basis to support 2018 as an appropriate BLY. In order to properly evaluate the Fifth Methodology Order, I would need to analyze if there are more appropriate BLY alternatives, and further evaluate the unique hydrologic circumstances in 2018 (i.e. precipitation and water operations) to better establish an appropriate BLY recommendation. I am unable to properly evaluate and analyze this data by the June 6, 2023, hearing date.

11. The RISD calculation applied in Steps 6 and 7 is a function of Crop Water Need (CWN) and Project Efficiency (PE). The inaccuracy of reported irrigated acres for TFCC of more than 15,000 acres will result in an inaccurate determination of CWN. I would want to further analyze and quantify the impact the error of including non-irrigated acres in the calculation of CWN has on the RISD calculation. The June 6, 2023, hearing date does not allow me to properly evaluate and analyze this data.

12. In the Fifth Methodology Order, the Director now finds that averaging over a rolling period of 15 years results in project efficiency that is more appropriate than the previous eight-year average. Project efficiency is a complex component of the Fifth Methodology Order to evaluate as it is a function of seepage or conveyance loss, on-farm application losses (deep percolation, field runoff), and system operational losses (return flows). Information reported by Department staff indicated that there is higher uncertainty in the April and October efficiency values which would result in errors in the determination of RISD. Data also showed the project efficiency among SWC entities are almost all flat or declining (6 out 7 entities), which is contrary to what would be expected with technology advancements and constrained water supplies. Data presented to the TWG also included scatter plots by SWC entity comparing Annual Crop Water Need to Annual Diversions that show Crop Water Need is limited as a predictor given the low explanatory power indicated by the low R^2 values in the analysis. I want

evaluate and analyze these apparent contradictions and uncertainties. The June 6, 2023 hearing date does not allow me to properly evaluate and analyze this data.

13. Step 3 of the Fifth Methodology Order uses the Eastern Snake Plain Aquifer Model (ESPAM) to predict the junior priority water rights that must be curtailed to produce the volume of water equal to the predicted April DS in the Blackfoot to Minidoka reach. In the Fifth Methodology Order, the Director now finds that transient simulations are necessary to evaluate the impacts of aquifer stresses. The November 28, 2022, presentation by IDWR staff showed a huge difference in resulting determination of the curtailment priority date if a steady state vs. transient model is applied. Under a transient model application, any DS above ~100,000 acre-feet would result in essentially aquifer-wide curtailment. IDWR staff have understood the difference between a transient model and steady state model at least since my involvement began in this case in 2015, so it is difficult to understand what caused the Director to make this change to methodology at this time, especially given the Department staff did not make a recommendation on this topic. During the technical presentations by IDWR staff in November/December 2022, IDWR staff were unable to explain why the change was being evaluated at this time. In order to properly evaluate this change to the methodology, I want to conduct a hindcast analysis using the transient application of ESPAM over all the preceding years to 2023 the Methodology Order has been applied. The June 6, 2023 hearing date does not allow me to properly evaluate and analyze this data.

14. I am unable to perform all of the work required to properly analyze the Fifth Methodology Order before the hearing scheduled for June 6-10, 2023. I estimated that I would need until October to complete this work.

15. I presently have a medical condition that leaves me unable to leave my home state of Colorado, until July 10, 2022. Therefore, I am not able to travel to Idaho for a hearing June 6-10, 2023. My condition further limits the amount of work I am able to perform during this time.

(Remainder of page intentionally left blank)

I declare under the penalty of perjury pursuant to the law of the State of Idaho that the foregoing is true and correct.

DATED this 4th day of May, 2023.

Sophia C. Sigstedt

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:

Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **MOTION FOR RECONSIDERATION**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"), the Idaho Ground Water Appropriators ("IGWA"), Bingham Ground Water District,

Bonneville-Jefferson Ground Water District (collectively the "Groundwater Users"), and pursuant to IDAPA 37.01.01.711 of the Department's rules of procedure and hereby move for reconsideration of the Director's April 21, 2023 *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand* ("Methodology Order") and *Reasonable Carryover* and *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"), (collectively the "2023 Orders").

INTRODUCTION

On April 21, 2023, at 6:45 p.m., the Director caused to be served on the parties to the Surface Water Coalition ("SWC") delivery call the above-referenced orders.[1] This Motion asks the Director to reconsider his finding of material injury of 75,200 acre-feet to Twin Falls Canal Company ("TFCC") based on the fact that if the irrigated acres for TFCC that was discussed during the Technical Working Group ("TWG") were used in the 2023 Orders, the Director would not have found material injury.

ARGUMENT

According to the Idaho Supreme Court, when the Director uses a baseline methodology for considering and determining material injury:

> the Director has the duty and authority to consider circumstances when the water user is not irrigating the full number of acres decreed under the water right. If this Court were to rule the Director lacks the power in a delivery call to evaluate whether the senior is putting the water to beneficial use, we would be ignoring the constitutional requirement that priority of water be extended only to those using the water.

A&B v. Idaho Dept. of Water Res., 155 Idaho 640, 652, 315 P.3d 828, 840 (2013) (emphasis added).

[1] The 2023 Orders were not served until 6:45 p.m. Because of this the fourteen-day period to file for reconsideration should run until May 8, 2023. In an abundance of caution, the Groundwater Users are filing this *Motion for Reconsideration* on May 5, 2023, which will be timely supplemented with a technical declaration on May 8, 2023.

According to the *Methodology Order*, members of the SWC are required to "submit electronic shape files to the Department delineating the total anticipated irrigated acres for the upcoming year within their water delivery boundary or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent." *Methodology Order* at 39. According to the *As-Applied Order*, on March 10, 2023, "the Department received a letter from . . . Twin Falls Canal Company . . . stating that their total number of acres for 2023 will not vary by more than five percent from the electronic shapefiles submitted in prior years." *As-Applied Order* at 1. The total number of irrigated acres for TFCC was calculated as "194,732." *Id*. at 2. The number of irrigated acres is critical in the *Methodology Order* because acres are used as an input in the Director's quantification of material injury.

As the Director is aware, the SWC delivery call was commenced in 2005. In the intervening eighteen years, the number of irrigated acres has changed. For instance, in 2008, Hearing Officer Gerald Schroeder stated that TFCC claimed it was irrigating "196,162 acres," and that IGWA had identified "at least 6,600 acres claimed by TFCC in its district are not irrigated." *Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation* at 9, 53 (Apr. 29, 2008). The Director acknowledged the same: "Estimates of irrigated acres from the hearing show a trend of decreasing irrigated acres. According to the Hearing Officer, beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated." *Methodology Order* at 8. Despite these findings and statements, the number of irrigated acres asserted by TFCC has changed very little considering population growth and hardening of acres in Twin Falls County.

When questioned at the April 28, 2023 *Pre-Hearing Conference* why he was proceeding

so quickly to curtail junior ground water users with no time given to develop a record that would account for changes over the last eighteen years, the Director stated that factual issues should have been raised with the TWG:

> So again, I understand your arguments, but I have little sympathy for them at this point in time. . . . . And I guess I could present facts about the time period within which the facts that you're talking about and the preparation and presentations to the Department took a period of time, but there's also been a period of time of four months, I think, since the last presentation by Department staff to the technical working group, and within which the experts and the parties anticipating the issuance of a Methodology Order certainly could have been preparing for the inevitable.

Pre-Hearing Conference Transcript p. 25:18-25; p. 26:1-2 (emphasis added).

In fact, the irrigated area for TFCC was discussed during a TWG meeting on December 21, 2022. During that meeting, IDWR provided the participants with the findings that TFCC is irrigating 180,956 acres. The Director should have used the TWG irrigated acres in his determination of injury – certainly that is what the TWG participants were anticipating. If he had done so, the reduction in demand would be as follows:

TFCC Acres	
Methodology:	194,732 acres (Fifth Methodology Order at 10)
NRT Metric:	180,956 acres (12/21/2022 IDWR Presentation to TWG at 19)
Difference:	13,776 acres

TFCC Average CIR: 2.2 AF/ac (IDWR Spreadsheet - DS RISD Calculator_2022_August 15.xslx; Tab: "Crop Water Need)

TFCC Average PE: 35% (Fifth Methodology Order at 14)

Demand Reduction = (13,776 acres x 2.2 AF/ac) / 0.35

Demand Reduction = **86,600 AF**

Declaration of Greg Sullivan.[2]

[2] As stated in footnote 1, and because of when IDWR served the 2023 Orders, the *Declaration of Greg Sullivan* will be filed on May 8, 2023.

The reduction in TFCC's diversion demand of 86,600 acre-feet is computed using the reduction in TFCC acres indicated by IDWR's NRT Metric analysis, which is greater than the predicted 2023 diversion shortage for the TFCC in 2023 of 75,200 acre-feet. In other words, if IDWR's analysis to remove the non-irrigated acres in the TFCC service area is used in the *2023 Orders*, there would be no predicted shortage to the TFCC in 2023.

CONCLUSION

Idaho's prior appropriation doctrine does not condone curtailment for acres that are not irrigated. Because the Director's quantification of material injury was based on flawed data, material injury should not have been predicted. The prediction of material injury has forced the Groundwater Users to secure mitigation that they otherwise would not have been required to obtain. Based on the foregoing, the Groundwater Users request that the Director reconsider his finding of material injury to TFCC based on the fact that if he used the irrigated area that was discussed during the TWG, no injury would have been calculated.

Submitted this 5th day of May, 2023.

/s/ *Sarah A. Klahn*
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

/s/ *Candice M. McHugh*
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Robert L. Harris
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ *Chris M. Bromley*
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ T.J. Budge
Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

/s/ Skyler C. Johns
Skyler C. Johns
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

/s/ Dylan Anderson
Dylan Anderson
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of May, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.
322 E. Front St.
Boise, ID 83702
file@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Chris M. Bromley*
Chris M. Bromley

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DECLARATION OF BRYCE CONTOR IN SUPPORT OF MOTION FOR RECONSIDERATION OF DENIAL OF CONTINUANCE**

I, BRYCE CONTOR, under penalty of perjury, make this *Declaration in Support of Motion for Reconsideration of Denial of Continuance.*

1. I am over the age of eighteen (18) and competent to testify in this matter. I make this declaration based upon my own personal knowledge unless otherwise stated.

2. I am currently a senior hydrologist at Rocky Mountain Environmental Associates Inc. in Idaho Falls, Idaho (hereafter "Rocky Mountain"). I have an associate degree in farm crops management from Brigham Young University – Idaho, a Bachelor of Science degree in

agricultural economics from Bingham Young University – Provo, Utah, and a master's degree in hydrology from the University of Idaho. I am published in the Journal of the American Water Resources Association, in Irrigation and Drainage and as a junior author in the American Journal of Agricultural Economics.

3. I began working in water resources in 1996, with Idaho Department of Water Resources (hereafter "IDWR"). I performed flow measurements, field examinations of beneficial use, GIS mapping of water-right places of use and points of diversion, and prepared water-right recommendations for the Snake River Basin Adjudication.

4. Beginning in 200, I left IDWR for the Idaho Water Resources Research Institute (within University of Idaho) where I worked on water budgets for aquifer modeling, groundwater/surface-water interaction, and some water economics work. In 2010, I transitioned gradually into the private sector, working part-time for the University and part-time for Rocky Mountain Environmental Associates.

5. Currently I work full time at Rocky Mountain after almost three years of limited involvement while working with the Henry's Fork Foundation and Friends of the Teton River.

6. Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson") retained the services of Rocky Mountain to assist the district and its legal counsel with technical matters affecting the litigation in the above-captioned matter. I consult frequently with the district and its legal counsel, and I have personal knowledge of the matters involved in the above-captioned matter.

7. I understand that the Director of the Idaho Department of Water Resources (hereafter "Director") changed the methodology used to calculate injury to the Surface Water Coalition (hereafter "SWC") in his 5th Amended Methodology Order issued on April 21, 2023. I

also understand that the Director issues the April 2023 As-Applied Order on April 21, 2023, and that the new methodology used in the As-Applied Order calculated a material injury of 75,200-acre feet to SWC. I understand that the As-Applied order calculates a curtailment date of 1953 for groundwater users. I further understand that the Director intends to hold an evidentiary hearing on both these orders beginning on June 6, 2023.

8. In my professional opinion, I do not have time to perform an adequate technical review of the technical information requested from IDWR in this litigation in order to properly testify at hearing. The primary reason for this is that I was never invited to deliberations of the technical working group that advises on technical issues related to the SWC/IGWA Settlement Agreement. I have not received any work products or documentations of decisions or recommendations of that group. I presently do not have access to all the documents and data that I would need to do a defensible technical review of the 5th Methodology Order.

9. I understand that there will be depositions of IDWR personnel late in the middle of May 2023, and that documents and data will be requested. If all those documents and data are produced, the earliest I expect to receive them would be around Monday, May 22, 2023. Even assuming that I could continue technical work on the morning of June 6, that would only give 15 days. If there is a delay in providing the materials, the window would be even shorter.

10. As such, I will be unable to perform comprehensive review and consult with and prepare legal counsel for Bonneville-Jefferson prior to the scheduled hearing date. It is my opinion that I would need at least two months to adequately review and prepare myself and counsel for the hearing.

11. Further your declarant saith not.

DATED this the 5th day of May 2023.

/s/ Bryce Conton
BRYCE CONTOR

CERTIFICATE OF SERVICE

I hereby certify that on this the 5th day of May 2023, I served the foregoing document on the persons below via email or as otherwise indicated:

/s/ Skyler C. Johns
Skyler C. JOHNS

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org
Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DECLARATION OF SKYLER C. JOHNS IN SUPPORT OF MOTION FOR RECONSIDERATION OF DENIAL OF CONTINUANCE**

I, SKYLER C. JOHNS, under penalty of perjury, make this *Declaration in Support of Motion for Reconsideration of Denial of Continuance.*

1. I am over the age of eighteen (18) and competent to testify in this matter. I make this declaration based upon my own personal knowledge unless otherwise stated.

2. I am an attorney for the Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson") in the above-captioned matter, and I have personal knowledge of the matters involved in these legal proceedings.

3. Bonneville-Jefferson has retained Rocky Mountain Environmental Associates, Inc. (hereafter "Rocky Mountain"), to review and advise me on technical matters involved in the above-captioned matter, including matters pertaining the Surface Water Coalition (hereafter "SWC") water delivery call against the Idaho Ground Water Appropriators (hereafter "IGWA").

4. On April 21, 2023, the Director of the Idaho Department of Water Resources (hereafter "Director") changed the methodology used to calculate injury to the SWC in his 5th Amended Methodology Order. The Director also the April 2023 As-Applied Order on April 21, 2023, and the new methodology used in the As-Applied Order calculated a material injury of 75,200-acre feet to SWC.

5. Prior to issuing these orders, I never received formal notice from the Idaho Department of Water Resources (hereafter "IDWR") that the Director would transition from Steady State to Transient State analysis as a tool to calculate material injury to SWC. To my knowledge, the Director never conducted a hearing prior to changing the methodology order. Neither myself, nor the experts who advise me from Rocky Mountain, were involved in any work group or discussions pertaining changes in the methodology order.

During the preliminary hearing held on April 28, 2023, I, on behalf of Bonneville-Jefferson, joined in support of the Motion to Continue filed by the Coalition of Cities to continue the evidentiary hearing set for June 6, 2023. I also expressed my concerns that Bonneville-Jefferson would not have sufficient time to obtain and review relevant information with its experts, and that would impair Bonneville-Jefferson's ability to adequately review relevant information and develop evidence opposing the Orders before the scheduled hearing date. The Director, however, did not continue the hearing.

6. In my professional opinion, I do not have time to perform an adequate review of the

information requested from IDWR in this litigation in order to properly prepare for the June 6, 2023, hearing. I further do not have adequate time to consult with my experts from Rocky Mountain regarding their review of the information requested from IDWR, nor do I have adequate time to prepare them to testify at the June 6, 2023, hearing. This will impair my ability to develop evidence and legal arguments in opposition to the Orders if the hearing continues as scheduled.

7. As of the date of this declaration, I have not received any work products or documentations of decisions or recommendations from any technical working group as referenced by the Director during the April 28, 2023, preliminary hearing. I presently do not have access to all the documents and data that I would need to review and prepare a defensible legal argument to the 5th Methodology Order.

8. Given the time limitations specified by the Director in his Scheduling Order, I must prepare for depositions of IDWR staff without having access to any of the documents that were relied upon by IDWR. Depositions will occur on May 10 and 12, 2023. I will be unable to adequately prepare effective questions for the deponents as I likely will not have access to any relevant documents or other information prior to these depositions.

9. As such, I will be unable to perform comprehensive review and consult with and prepare legal counsel for Bonneville-Jefferson prior to the scheduled hearing date. It is my opinion that I would need at least 6 months to adequately review and prepare myself and counsel for the hearing.

10. Based upon my knowledge and experience, not granting additional time for Bonneville-Jefferson to obtain review and evidence and legal arguments will cause prejudice to my client's real property interests and rights to due process.

11. Further your declarant saith not.

DATED this 5th day of May 2023.

OLSEN TAGGART PLLC

/s/ Skyler C. Johns
SKYLER C. JOHNS

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of May 2023, I served the foregoing document on the persons below via email or as otherwise indicated:

/s/ Skyler C. Johns
SKYLER C. JOHNS

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org
Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

RECEIVED
May 05, 2023
DEPARTMENT OF
WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DECLARATION OF THANE KINDRED IN SUPPORT OF MOTION FOR RECONSIDERATION OF DENIAL OF CONTINUANCE**

I, THANE KINDRED, under penalty of perjury, make this *Declaration in Support of Motion for Reconsideration of Denial of Continuance*.

1. I am over the age of eighteen (18) and competent to testify in this matter. I make this declaration based upon my own personal knowledge unless otherwise stated.

2. I am currently a staff geologist at Rocky Mountain Environmental Associates Inc. in Idaho Falls, Idaho (hereafter "Rocky Mountain"). Before starting at Rocky Mountain as a staff geologist, I received my Bachelor of Science degree in geology from Brigham Young University in Provo, Utah, and my master's degree from Idaho State University in Pocatello, Idaho.

3. Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson") retained the services of Rocky Mountain to assist Bonneville-Jefferson and its legal counsel with technical matters affecting the litigation in the above-captioned matter. I consult frequently with the district and its legal counsel, and I have personal knowledge of the matters involved in the above-captioned matter.

4. I understand that the Director of the Idaho Department of Water Resources (hereafter "Director") changed the methodology used to calculate injury to the Surface Water Coalition (hereafter "SWC") in his 5th Amended Methodology Order issued on April 21, 2023. I also understand that the Director issues the April 2023 As-Applied Order on April 21, 2023, and that the new methodology used in the As-Applied Order calculated a material injury of 75,200-acre feet to SWC. I further understand that the Director intends to hold an evidentiary hearing on both these orders beginning on June 6, 2023.

5. In my professional opinion, I will not have time to fully understand the 5th Amended Methodology Order issued by the Director and perform a comprehensive technical review of it to be prepared for June 6th. I was not invited to any sort of Technical Working Group with IDWR concerning the Methodology Order. Similarly, I received no other indication (i.e., letter, email, etc.) that the Methodology Order would change prior to April 21 when it came out. As such, I do not currently have access to many of the documents and data that I would need to perform the analysis.

6. I understand that Depositions so far will be held in the middle of May 2023, but they will likely not produce documents until after the depositions occur, which only provides about two weeks for a technical review of all information before the date of the hearing.

7. As such, I will be unable to perform comprehensive review and consult with and

prepare legal counsel for Bonneville-Jefferson prior to the scheduled hearing date. It is my opinion that I would need at least two months to adequately review and prepare myself and counsel for the hearing.

8. Further your declarant saith not.

DATED this the 5th day of May 2023.

/s/ Thane Kindred
THANE KINDRED

CERTIFICATE OF SERVICE

I hereby certify that on this the 5th day of May 2023, I served the foregoing document on the persons below via email or as otherwise indicated:

/s/ Skyler C. Johns
SKYLER C. JOHNS

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org
Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

RECEIVED
May 08, 2023
DEPARTMENT OF
WATER RESOURCES

Candice McHugh (ISB No. 5908)
Chris Bromley (ISB No. 6530)
McHugh Bromley, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for the Coalition of Cities

Robert L. Harris (ISB No. 7018)
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.
P.O. Box 50130
1000 Riverwalk Drive, Suite 200
Idaho Falls, ID 83405
Telephone: (208) 523-0620
Facsimile: (208) 523-9518
Email: rharris@holdenlegal.com
Attorneys for the City of Idaho Falls

Sarah A. Klahn (ISB # 7928)
Somach Simmons & Dunn 1155
Canyon St., Suite 110 Boulder,
CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com

ATTORNEYS FOR THE CITY OF POCATELLO

IDAHO DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DECLARATION OF GREGORY K. SULLIVAN, P.E.**

I, Gregory K. Sullivan, P.E., being duly sworn do depose and state:

1. I make this affidavit based upon personal knowledge and expertise.

2. My professional resume is provided as **Attachment A** to this Declaration.

3. I have 37 years of experience in water resources engineering, water rights engineering, hydrologic analysis, groundwater and surface water modeling, conjunctive administration of groundwater and surface water, and other related disciplines.

4. I have worked on water resources, water rights, and conjunctive administration issues in the Snake River basin since the early 1990s.

5. My clients in the Snake River basin that are affected by the SWC Delivery Call include the City of Pocatello and the Coalition of Cities.

6. I have been a member of the Eastern Snake Plain Hydrologic Modeling Committee ("ESHMC") since its inception along with other stakeholders in Snake River basin issues. The ESHMC has provided guidance and peer review in the development of the Eastern Snake Plain Aquifer groundwater model ("ESPAM") since approximately 1999.

7. I have been involved in several water right delivery calls in the Snake River basin including the delivery calls by the Surface Water Coalition ("SWC"), the A&B Irrigation District, and the Rangen Fish Hatchery. My involvement has included preparation of expert reports and presentation of expert testimony at several administrative hearings.

8. My involvement in the SWC delivery calls began with the delivery call made in 2005. In response to that delivery call, I compiled extensive data and analyzed the operations of the SWC irrigation systems. This included several weeks in the field observing diversion and conveyance facilities, irrigated farms, and irrigation application methods. In addition, I was present at the depositions of managers and staff of each of the SWC members regarding irrigation system operations, system losses and efficiencies, record keeping, and other related matters. Based on this information, I prepared analyses of the historical irrigation operations of each SWC member over the period from 1990 – 2006. The results of my work were documented in several expert reports and presented at an IDWR hearing in February 2008.

9. Since the 2008 hearing regarding the SWC delivery call, I have reviewed the various amended methodology orders and the various as-applied orders concerning the SWC Methodology that have been issued over the years. In addition, I was involved in a May 2010 hearing on revisions to SWC Methodology proposed by IDWR based on experience in applying the methodology between 2005 and 2010, and based on recommendations from Hearing Officer Schroeder in his 2008 Order. Following the hearing, IDWR issued on June 23, 2010 the *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Second Methodology Order"). The Second Methodology Order contains the framework that forms the basis for the current SWC Methodology procedures.

10. In early 2015, IDWR convened a technical working group ("TWG") of experts to review proposed changes to the Second Methodology Order. I participated in the TWG on behalf of the City of Pocatello. Several meetings of the TWG were held to

solicit input from the TWG members regarding the SWC Methodology. Following the meetings, IDWR issued recommendations for changes in how the water supplies of the SWC members were forecast and how the crop mix of the SWC members was determined for purposes of estimating crop water need. Other proposed changes to the SWC Methodology were discussed but not implemented. These included determination of supplemental groundwater use by the SWC members, improvements in determination of the irrigated areas of the SWC members, and revisions to the Project Efficiencies used in determining the Reasonable In-Season Demand ("RISD") of the SWC members. IDWR's *Third Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Third Methodology Order") was issued on April 16, 2015, shortly after completion of the TWG meetings.

11. On April 16, 2016, IDWR issued the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order") that included some relatively minor revisions to the Third Methodology Order.

12. In late 2022, I actively participated in several meetings of another TWG that was convened by IDWR to consider potential changes to the Fourth Methodology Order. Given the approximate one-month period during which the TWG meetings took place, there was insufficient time to fully review and respond to the materials that IDWR distributed and the issues that were raised during the meetings. Nonetheless, I performed various preliminary analyses of the Baseline Year ("BLY") and the SWC Project Efficiencies that are used in the SWC Methodology. Results from these analyses were presented to the TWG during the meetings and written materials and spreadsheets were submitted to TWG members on December 12 and December 21.

13. On December 23, 2022, IDWR issued a one-page *Summary of Recommended Technical Revisions to the 4th Amended Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition* ("IDWR Recommendation"). The following is a summary of the proposed recommendations:

    a. Update the BLY for Reasonable In-Season Demand and Reasonable Carryover from an average of diversions during 2006, 2008, 2012 to the diversions in 2018.

    b. Update the Project Efficiencies to use average of the computed efficiencies for the SWC members during the previous 15 years instead of the previous 8 years.

14. The IDWR Recommendation document explicitly stated there were no recommendations regarding the following:

    a. Use of near real-time METRIC for determining crop water need.

    b. Use of transient modeling to determine curtailment priority dates.

15. On January 16, 2023, I submitted written comments on the IDWR Recommendation including:

    a. Critique of the proposed changes to the BLY for projecting shortages to the SWC members.

    b. Critique of the updated Project Efficiencies for computing in-season demand shortages.

    c. Recommendation that the irrigated area data for the SWC members be updated to reflect the areas that are actually irrigated.

    d. Recommendation that the crop water needs for the SWC members be adjusted for the supplemental groundwater use on the SWC irrigated lands.

16. There was no acknowledgement and no response from IDWR regarding my comments. Nor was there any further interaction between IDWR and the TWG after receipt of the IDWR Recommendation on December 23, 2022.

17. On April 21, 2023, IDWR issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") and the *Final Order Regarding April 2023 Forecast Supply* ("April As-Applied Order"). There was no apparent consideration of my comments in either of these orders.

18. Also on April 21, 2023, IDWR issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery*. A hearing in the matter is scheduled for June 6-10, 2023.

19. On May 2, 2023, IDWR issued a *Schedule Order and Order Authorizing Remote Appearance at Hearing*. Among the scheduled events are the following:

    a. <u>May 5, 2023</u>

        i. Deadline for the Department to identify materials Ms. Sukow and Mr. Anders may rely upon at the hearing.

        ii. Deadline for the Department to summarize topics Ms. Sukow and Mr. Anders will testify about at the hearing.

        iii. Deadline for the parties to submit to the Department a written statement of proposed issues for the hearing.

    b. <u>May 10, 2023</u>

        i. Deadline for the Department to augment its above-mentioned list of materials Ms. Sukow and Mr. Anders may rely on at the hearing, if needed.

    c. <u>7 Days Prior to Hearing Day 1</u>

        i. Deadline for the parties to complete all discovery.

ii. Deadline for the parties to deliver copies of their expert reports to the other parties.

iii. Deadline for the parties to exchange and file with the Department their proposed lay and expert witness lists. The parties should include a general summary of each witness' anticipated testimony.

20. The proposed schedule leaves less than four weeks before the due date for expert reports and only one week to review the expert reports of others before the hearing. In addition, I, along with some of the other experts, are involved in the consolidated matters of the Big Wood River and Snake River Moratoria for which expert reports are due on June 9, 2023, in the middle of the proposed SWC Methodology hearing. Finally, I have previously scheduled a non-refundable trip to Europe departing on May 17 and returning on June 3, and so, as a practical matter, this leaves less than two weeks for me to complete my expert report.

21. The short time available before my expert report is due is far too little time for me to adequately analyze the Fifth Methodology Order, the April As-Applied Order, review the supporting materials that will be submitted by the IDWR witnesses, assist legal counsel with written discovery and depositions, compile additional data, perform field work, perform the necessary technical analyses, and document my work in an expert report.

22. It has been over 15 years since the 2008 hearing and Hearing Officer Schroeder's ruling that resulted in the Second Methodology Order issued in 2010. This was the last time that the SWC Methodology was significantly scrutinized. We now have 15 years of actual operating experience under the SWC Methodology Orders. Given the substantive changes to the SWC Methodology reflected in the Fifth Methodology Order, now is an appropriate time to fully review those changes, develop a comprehensive record of the 15 years of operating experience under the prior Methodology Orders, and to use this experience to propose and vet potential additional modifications to the SWC Methodology that will protect the SWC members from injury, ensure that the SWC members are operating with efficiently and without waste, protect groundwater users from excessive curtailment and mitigation obligations, and to maximize the beneficial use of the interconnected surface water and groundwater resources of the Snake River and the ESPA.

23. Given sufficient time, I would analyze information and data from the past 15 years of operations under the SWC Methodology Orders to assess changes in the irrigation operations of the SWC members, the improved and expanded availability of hydrologic and water use data, including remote-sensed data. In addition, interviews and/or depositions of IDWR staff and SWC managers and personnel will be necessary to provide context for the past 15 years of operating experience. Thorough review and analysis of this information and data will give me the knowledge that is necessary to recommend and support potential changes to the SWC Methodology.

24. The following is a preliminary high-level overview of the work that should be performed to analyze the operation of the SWC Methodology and the operations of the SWC members during the past 15 years:

a. Compile, summarize, review, and analyze available hydrologic data and operational data related to the availability and use of water by the SWC members.

b. Interview and/or depose managers and staff of the SWC members regarding their irrigation operations, data collection practices, and water use records.

c. Perform site investigations of the SWC member facilities and service areas.

d. Assess the operations of the SWC members to determine whether they are operating with reasonable efficiencies and without excessive waste consistent with industry standards.

e. Review and analyze the elements of the SWC Methodology that involve determination of in-season demand shortfalls.

f. Review and analyze the elements of the SWC Methodology that involve determination of material injury to reasonable carryover.

g. Review and analyze the elements of the SWC Methodology that involve determination of the priority date for curtailment of junior ground water users in response to computed shortages to the in-season demands and reasonable carryover requirements of the SWC members. This includes the radical change in how the ESPAM is used to determine the curtailment date. Under the Fifth Methodology Order, IDWR is using transient runs of the ESPAM to determine the curtailment date rather than the steady-state runs that have been used in all prior methodology orders. This results in a substantially more senior curtailment date that affects many more groundwater users. The curtailment date in the April As-Applied Order is December 30, 1953, based on a projected combined shortage to the SWC members totaling 75,000 AF. Under the steady-state run procedure of the prior methodology order, the curtailment date would have been sometime in the mid-1980s for a 75,000 AF shortage.

25. I estimate that a minimum of 3 to 5 months will be necessary to adequately perform the work described above and to prepare an expert report to summarize the results of this work. In making this time estimate, I am considering the clear and convincing evidentiary standard that reportedly applies to changes in the SWC Methodology and the attendant need to fully develop the necessary evidence to support my opinions.

I hereby certify that the facts set forth above are true and correct to the best of my information and belief.

DATED this 7th day of May 2023.



Gregory K. Sullivan, P.E.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 7th day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

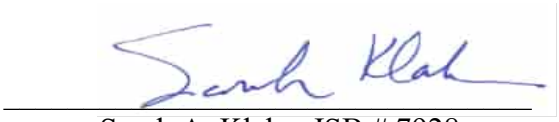
Dylan Anderson
Dylan Anderson Law PLLC
P.O. Box 35
Rexburg, ID 83440
dylan@dylandandersonlaw.com

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

Attachment A

Gregory K. Sullivan, P.E.

President and Senior Water Resources Engineer

Education: M.S., Civil Engineering, 1990, University of Colorado - Denver
B.S., Civil Engineering, 1985, Colorado State University

Professional Registration: Professional Engineer in Colorado, Idaho, and New Mexico

Professional Experience:

1990 - Present: ***Spronk Water Engineers, Inc., President and Senior Water Resources Engineer***

Mr. Sullivan has over thirty-five years of experience completing a wide variety of water resources engineering projects. Mr. Sullivan has extensive experience performing historical consumptive use analyses, stream depletions analyses, and reservoir operations studies. Mr. Sullivan serves as the primary consultant to numerous water providers for water supply planning and water rights engineering. In that role, he has been responsible for technical analyses in supporting applications for adjudication of water rights, changes of water rights, exchanges, augmentation plans, and other water right matters. He has led the development of complex surface water operations models that simulate municipal water demands and how those demands maybe met by available water supplies and water rights. Mr. Sullivan has served on the Eastern Snake Hydrologic Modeling Committee that guides the development and use of a regional ground water model of the Eastern Snake River Plain Aquifer since 1996. Mr. Sullivan has provided expert testimony in the U.S. Supreme Court, Colorado Water Courts, Snake River Basin Adjudication Court (Idaho), and in administrative hearings before the Idaho Department of Water Resources.

Representative Projects:

Water Supply Modeling - Texas v. New Mexico and Colorado – Rio Grande Basin

Mr. Sullivan is the lead modeling expert for the State of New Mexico in an active lawsuit filed by the State of Texas in the U.S. Supreme Court concerning alleged violations of the 1938 Rio Grande Compact. Mr. Sullivan is leading a multidisciplinary team of renowned experts from across the country that is analyzing and modeling the historical operation of the Rio Grande Project and the effects of alleged compact violations asserted in the

claims and counterclaims of the parties. The ongoing work includes compilation and analysis of historical data from before the time of the compact to the present, and development of farm budget models of large irrigation systems in New Mexico, Texas, and Mexico. In addition, Mr. Sullivan is coordinating development and use of a linked surface water (RiverWare) and ground water (MODFLOW) models of the Lower Rio Grande area from Elephant Butte Reservoir in New Mexico to Fort Quitman, Texas. The Integrated Lower Rio Grande Model simulates the essential hydrologic and institutional/management processes associated with irrigation and municipal water systems in the study area, including the allocation, operation, and accounting mechanisms of the Rio Grande Project.

Water Supply Modeling - Kansas v. Colorado – Arkansas River Basin

Mr. Sullivan was involved in the refinement and use of the H-I Model of the Arkansas River system in Colorado that was developed to support claims by the State of Kansas that Colorado was violating the terms of the 1948 Arkansas River Compact. The model simulates daily operation of irrigation water uses under approximately two dozen canal systems along the Arkansas River in Colorado between the City of Pueblo and the Colorado-Kansas from 1950 to the present. In addition, the model simulates the operation of sole-source and supplemental irrigation wells, and the impact of those wells on the flow of the Arkansas River. Mr. Sullivan provided expert testimony before a Special Master appointed by the U.S. Supreme Court regarding the use of the H-I Model to evaluate the effects on state line flows resulting from post-compact well development in Colorado.

Injury Analysis - Kansas v. Colorado – Arkansas River Basin

Mr. Sullivan developed a model that was used as part of an analysis to compute the economic impacts and monetary damages to Kansas resulting from the compact violations by Colorado that were determined in the Kansas v. Colorado lawsuit. The model was used to translate monthly depletions to usable stateline flows over a 45-year period into impacts to (a) surface water users in Kansas, (b) to supplemental pumping demands in Kansas and (c) to recharge of the regional ground water system. Mr. Sullivan testified before the Special Master regarding the model development, operation, and results.

Analysis of Replacement Plans - Kansas v. Colorado – Arkansas River Basin

To continue use of post-compact Arkansas River alluvial wells, the well owners in Colorado were required to develop Replacement Plans to offset the impacts of pumping on senior surface water rights in Colorado and on usable stateline flows to Kansas. Mr. Sullivan analyzed the adequacy of these replacement plans through preparation of historical use analyses, water budgets, and other analyses. In addition, Mr. Sullivan used the H-I Model to simulate the effectiveness of the replacement plans in meeting Colorado's delivery obligations under the Arkansas River Compact. Mr. Sullivan provided expert testimony before the Special Master concerning his analyses of the Colorado Replacement Plans.

Change of Water Rights - City of Loveland, Colorado

Mr. Sullivan was the principal investigator for ditch-wide historical use analyses of the major Big Thompson River irrigation ditches that serve lands in and around the City of Loveland. These analyses served as the basis for successful changes of water rights that were approved by the Division 1 Water Court to allow the City to divert its ditch shares at the City's municipal water intakes to help meet its water supply needs. He also guided development of detailed water rights accounting for the City to Mr. Sullivan provided expert testimony in support of the changes of water rights in a contested trial.

Water Supply Yield Modeling - City of Loveland, Colorado

Mr. Sullivan led the development of a model to simulate the daily water supply and demand of the City of Loveland over a study period from 1950 - 2017. The water supplies that are simulated in the model include the ditch shares that have been changed to municipal use, Colorado-Big Thompson Project units, Windy Gap Project units, and the operation of the City's Green Ridge Glade Reservoir. The model is used by the City to evaluate the firm yield of its water supply, and how that yield can be increased through acquisition of additional supplies, development of additional storage, changes in water supply operations and other actions.

Water Supply Planning – ACWWA, Colorado

Mr. Sullivan has provided water resources and water rights consulting for the Arapahoe County Water and Wastewater Authority for over 30 years. ACWWA serves lands in the Cherry Creek basin south of Denver through a

combination of shallow alluvial wells and deep nontributary Denver Basin wells. Water use from these sources is integrated and optimized through operation of a complex plan for augmentation that provides for replacement of out-of-priority depletions to Cherry Creek to protect downstream senior water users. Mr. Sullivan has performed numerous analyses to evaluate the yield of ACWWA's water supplies, including completion of a raw water master plan in 2018.

Plan for Augmentation - Upper Cherry Creek Water Association, Colorado

Mr. Sullivan was instrumental in the development of an umbrella plan for augmentation for five major water users in the Cherry Creek Basin upstream of Cherry Creek Reservoir. The members have pooled their augmentation sources to replace the combined out-of-priority depletions resulting from alluvial well pumping and out-of-priority storage in Cherry Creek Reservoir. The plan includes an innovative method of computing depletions that considers times when Cherry Creek is dry in the vicinity of the member wells.

Cherry Creek Aquifer Modeling Project – Colorado

Mr. Sullivan led the development of a basin-wide simulation model of the hydrology and water use in the Cherry Creek basin upstream of Cherry Creek Reservoir. The model simulates the water supplies and water rights of all municipal water providers in the study area and optimizes the alluvial pumping of the water users and the use of Denver Basin ground water replacement supplies. The model also simulates the operation of Cherry Creek Reservoir and Rueter-Hess Reservoir. The model is used by the study participants to evaluate changes in water supply operations and acquisition of new water supplies.

Snake River Basin Adjudication - Idaho

Mr. Sullivan assisted the City of Pocatello in filing claims to adjudicate water rights as part of the SRBA. This work included historical research of facilities and water uses to document historical flow rates, volumes, and priority dates to assign to the claimed water rights. Mr. Sullivan provided expert testimony before the SRBA Court to help defend the City's claims that were disputed by others.

Snake River Delivery Calls - Idaho

Mr. Sullivan has provided technical analysis and expert testimony to the City of Pocatello in their participation in complex litigation involving water right delivery calls by senior surface water users on the Snake River in Idaho. Pocatello's water supply is derived primarily from junior priority wells that are tributary to the Snake River, and its water supply is threatened by the delivery calls. Mr. Sullivan analyzed the historical operation of seven major irrigation districts that placed the delivery calls to assess the extent of their claimed irrigation water shortages. The irrigation districts serve a combined area of 560,000 acres with annual diversions averaging 3.2 million acre-feet per year. Mr. Sullivan provide expert testimony is several hearings before the hearing officers in Idaho Depart of Water Resources.

ESPA Cities Mitigation Plan – Snake River Basin, Idaho

Mr. provided technical expertise and analysis in development of a mitigation plan for Pocatello, Idaho Falls, and more than a dozen other cities to mitigate the impacts of municipal groundwater pumping from the Eastern Snake Plain Aquifer in Idaho. The plan relies largely on aquifer recharge to mitigate the impacts of aquifer depletions from pumping that is projected to increase from about 60,000 acre-feet per year to over 120,000 acre-feet per year over the next 50 years.

Division 3 Rules Case - Rio Grande Basin, Colorado

Mr. Sullivan represented a group of surface water right owners that opposed the enactment of administrative rules governing the withdrawal and use of ground water in the Rio Grande Basin in Colorado (Water Division 3). The primary basis for their opposition was that the rules did not provide for mitigation of impacts to a large spring that was the source of their surface water rights and which dried up in conjunction with the large-scale development of ground water irrigation in the area. Mr. Sullivan's work included analysis of the historical irrigation water use by his clients, review of hydrologic data and records, and review of a ground water modeling of the San Luis Valley performed by the State of Colorado. Mr. Sullivan provided expert testimony on behalf of his clients in a trial before the Division 3 Water Court.

Ground Water Administrative Proceeding – Wood River Basin, Idaho

Mr. Sullivan represents the Sun Valley Company and the Cities of Ketchum, Hailey, and Bellevue in an administrative proceeding in the Wood River Valley in Idaho. Holders of senior surface water rights are seeking curtailment of junior ground water rights based on allegations of injury being suffered by the seniors, and the Idaho Department of Water Resources is proposing to implement conjunctive administration of groundwater rights and surface water rights to address the injury claims. A groundwater model of the Wood River Valley developed by IDWR with input from stakeholders is being used in the dispute to assess impacts from pumping on surface water supplies. Mr. Sullivan provided expert testimony on behalf of SVC and the Cities in a contested administrative hearing before the IDWR Director. Mr. Sullivan is also a member of a technical working group that has been assembled to develop a groundwater management plan that is hoped to settle the ongoing dispute.

1985 – 1990: ***J. W. Patterson & Associates, Inc., Water Resources Engineer***

Performed water supply, hydraulic and hydrologic analyses for agricultural, industrial, commercial, and municipal developments. Managed yield and impact analyses of water rights adjudications, transfers, exchanges and plans for augmentation. Conducted ground water studies including aquifer testing, project dewatering and water well design and construction monitoring.

Continuing Education:

Applied Ground-Water Flow Modeling. International Ground Water Modeling Center, Colorado School of Mines, Golden, CO. March 1993.

Introduction to Simulation Training in RiverWare, Center for Advanced Decision Support for Water and Environmental Systems, University of Colorado, May 2016.

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May 08, 2023
DEPARTMENT OF
WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Sarah A. Klahn, ISB # 7928
SOMACH SIMMONS & DUNN
2033 11th St., Ste. 5
Boulder, CO 80302
(303) 449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris, ISB # 7018
HOLDEN KIDWELL HAHN & CRAPO
100 Riverwalk Dr., Ste. 200
PO Box 50130
Idaho Falls, ID 83405
(208) 523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY

Docket No. CM-DC-2010-001

DECLARATION OF GREGORY K. SULLIVAN, P.E.

I, Gregory K. Sullivan, P.E., being duly sworn do depose and state:

1. I make this declaration based upon personal knowledge and expertise, in support of the Ground Water Users' May 5, 2023, *Motion for Reconsideration* regarding the irrigated acres of Twin Falls Canal Company ("TFCC").

2. My professional resume is provided as **Attachment A** to this Declaration.

3. In late 2022, I actively participated in several meetings of the Technical Working Group ("TWG") that was convened by the Idaho Department of Water Resources ("IDWR") to consider potential changes to the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season*

Demand and Reasonable Carryover ("Fourth Methodology Order"). In the *Final Order Regarding April 2016 Forecast Supply (Methodology Steps 1-3)* that applied the Fourth Methodology Order, the irrigated acres for TFCC were calculated as 194,732 acres.

4. On April 21, 2023, the Director issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand* ("Fifth Methodology Order") and *Reasonable Carryover* and *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"). The Fifth Methodology Order and As-Applied Order specify that TFCC is irrigating **194,732 acres**. *Fifth Methodology Order* at 10; *As-Applied Order* at 2.

5. During the 2008 IDWR hearing concerning the SWC Delivery Call that was filed in 2005, SPF Water Engineering, LLC ("SPF"), experts for the Idaho Ground Water Appropriators, Inc. ("IGWA"), submitted a March 20, 2007, expert report entitled *Estimate of Non-Irrigated Acres within the Twin Falls Canal Company Service Area* (Exhibit 4310). In that report, SPF found that of the total 198,632 acres that were adjudicated, 15,043 acres were not irrigated, leaving **183,589 acres** that were irrigated.

6. IDWR used **183,589 acres** as the irrigated area for TFCC for purposes of its reasonable in-season demand ("RISD") calculations in the 2013 and 2014 Methodology Orders. I have been unable to confirm the acreage figures that were used in 2010 – 2012, but I believe them to be the same 183,589 acres based on the following table pasted from the most recent RISD spreadsheet (DS RISD Calculator_2022_August 15.xlsx):

Summary of Irrigated Acres Utilized in Protocol Calculations

Year	Member ID	Area of Surface Water Irr (ac)	Year Acreage Established	Reference Document
2000-2014	AFRD2	62,361	5/11/2006	Director's Report
2000-2014	A&B*	15,924	5/11/2006	Director's Report
2000-2014	Milner	13,335	5/11/2006	Director's Report
2000-2014	Minidoka	70,144	12/29/2005	Exhibit 4300 Claimed POU Analysis (BID, TFCC, NSCC),Table 6 [15], SPF - 12/29/05
2000-2014	BID	44,715	12/29/2005	Exhibit 4300 Claimed POU Analysis (BID, TFCC, NSCC),Table 6 [15], SPF - 12/29/05
2000-2014	TFCC	183,589	3/20/2007	Exhibit 4310 Estimate of Non-irrigated acres w/in the TFCC Service Area, Table 10 [25], SPF - 3/20/07
2000-2014	NSCC	154,067	5/11/2006	Director's Report

7. During early 2015, IDWR convened another TWG to discuss modifications to the SWC Methodology. The irrigated area for the SWC members was among the topics discussed at these meetings. The table on the following page of acres was contained in a presentation given to the TWG on February 19, 2015, by Matt Anders of IDWR:

SWC Member	2005-2007 SPF	2012 Partial Decrees	2013 SWC Submitted Shapefiles	2013 RISD
A&B		14,637 (2006 PD = 15,924)		15,924
AFRD2		62,361		62,361
Burley	44,715	47,643	46,084	44,715
Milner		13,335		13,335
Minidoka	70,144	75,093	74,112	70,144
NSCC		154,067		154,067
TFCC	183,589	196,162	194,778	183,589

8. Travis Thompson, attorney for several of the SWC members, including TFCC, sent a letter to IDWR Director Spackman on April 8, 2015, requesting that the Director use the "authorized acres" for his client's natural flow water right for purposes of water rights administration. Mr. Thompson's letter states in part:

> With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you last year for purposes of 2014 administration. As noted last year, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.
>
> Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.
>
> The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B - 15,924; BID -46,083; Milner-13,335; NSCC- 154,067; **TFCC - 194,778**.

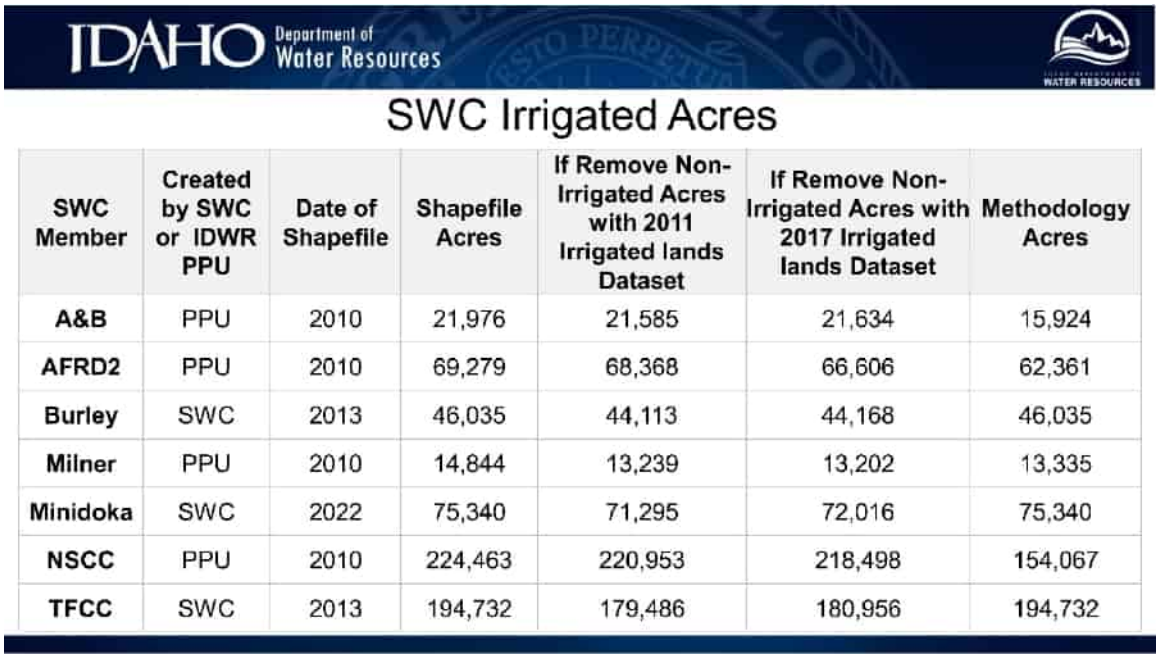
Emphasis added.

9. Mr. Thompson had sent a similar letter to Director Spackman in 2014 with the same request to use a figure of 194,778 acres for the TFCC. However, IDWR continued to use the lower SPF figure of 183,589 acres in the 2014 SWC Methodology orders.

10. Beginning in 2015 and continuing through 2022, IDWR used **194,732 acres** as the irrigated area for the TFCC for purposes of the RISD calculations in the SWC Methodology Orders. This is 46 acres less than the TFCC acreage figure that was in Mr. Thompson's 2014 and 2015 letters. The reason for this slight difference is unknown.

11. In the TWG meetings that were convened by IDWR in late 2022, irrigated area was among the potential changes to the SWC Methodology that were discussed.

12. On December 1, 2023, a presentation was given by IDWR staff (Ethan Geisler, Kara Ferguson, & Matt Anders) entitled, *Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC.* The presentation included the following slide listing the irrigated acres for the SWC members from various sources.



SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	If Remove Non-Irrigated Acres with 2011 Irrigated lands Dataset	If Remove Non-Irrigated Acres with 2017 Irrigated lands Dataset	Methodology Acres
A&B	PPU	2010	21,976	21,585	21,634	15,924
AFRD2	PPU	2010	69,279	68,368	66,606	62,361
Burley	SWC	2013	46,035	44,113	44,168	46,035
Milner	PPU	2010	14,844	13,239	13,202	13,335
Minidoka	SWC	2022	75,340	71,295	72,016	75,340
NSCC	PPU	2010	224,463	220,953	218,498	154,067
TFCC	SWC	2013	194,732	179,486	180,956	194,732

The table confirms that the **194,732 acres** used in recent SWC Methodology orders was from the 2013 SWC shapefile submitted by the SWC in 2013. Also of interest are the values determined by IDWR for the TFCC based on IDWR's 2011 and 2017 Irrigated Lands Datasets when the non-irrigated acres are removed. The resulting values are **179,486 acres** for 2011 and **180,956 acres** for 2017.

13. The irrigated acreage figures determined by IDWR for 2011 (179,486 acres) and 2017 (180,956 acres) are several thousand acres less than the value presented in the 2007 SPF report (183,589 acres) that IDWR used in the SWC Methodology Orders prior to 2015. The decline in acres is reasonable given the continued urbanization of parts of the TFCC service area.

14. In my comments submitted to the IDWR and TWG on January 16, 2023, I indicated that the irrigated acres in the shapefiles submitted by the SWC members should be verified to reasonably match the actual irrigated lands determined from aerial imaging, field verification, and/or remote sensing.

15. IGWA expert, Sophia Sigstedt, made more extensive observations about the TFCC irrigated area in her comments to IDWR and the TWG, also submitted on January 16, 2023:

> The IDWR staff presentation regarding near-real-time METRIC application identified a significant shortcoming in the current method for calculating CWN as the fact that the most up-to-date crop data is from the previous year and that SWC irrigated acre datasets sometimes represent service areas, not the actual irrigated land. Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members. The METRIC data could first be used to create a standard review process for the Methodology Order Step 1 submittal of irrigated acres by the SWC entities. IDWR staff should use a precise determination of irrigated acreage irrespective of whether it uses METRIC in the calculation of CWN. With IDWR staff only checking against the total acres for the decreed place of use, there is little to no incentive to keep the spatial data for the irrigated acres up to date. The METRIC data would be available for the current irrigation season and can be used to assess actual irrigated land. Some of the preliminary analysis by IDWR staff using METRIC data illustrated that through processing they were able to identify about 15,000 acres within the TFCC irrigated acres dataset that should not qualify as irrigated. The mischaracterized acres were all minor areal corrections but over a large service area such as TFCC added up to a significant amount of erroneous total acres. This just highlights the importance of spending the time to get an accurate picture of irrigated acres for an accurate RISD calculation. As previously noted in Lynker's 2015 comment letter the 5% change standard for SWC submittals should be reconsidered in light of large districts like TFCC where a 5% error in the irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation. Liz Cresto an IDWR staff member on the TWG in 2015 also made a similar recommendation in her comment letter attached to the staff memorandum.

16. Based on the information presented by IDWR during the TWG meetings and the comments submitted by myself and Ms. Sigstedt on January 16, 2023, I expected the Director would use the irrigated acres for the TFCC that were discussed in the TWG meetings for purposes computing the RISD for the TFCC in 2023. However, the Fifth Methodology Order and the As-Applied Order continue to specify that TFCC is irrigating **194,732 acres**.

17. On May 5, 2023, the Director took official notice of the records of the TWG in his *Notice of Materials Department Witnesses May Rely upon at Hearing and Intent to Take Official Notice*.

18. The 2017 irrigated area determined by IDWR for the TFCC (180,956 acres) is **13,776 acres** less than the value proposed for 2023 (194,732 acres).

19. I computed the reduction in the annual TFCC demand that would occur if the TFCC acres were reduced by 13,776 acres using the average crop irrigation requirement for the TFCC for 2000-2021 (2.2 AF/ac) from the IDWR backup materials for the 2022 SWC Methodology and the average monthly Project Efficiency values from the Fifth Methodology Order (35%) as shown below:

TFCC Acres	
Methodology:	194,732 acres (Fifth Methodology Order at 10)
NRT Metric:	180,956 acres (12/1/2022 IDWR Presentation to TWG at 19)
Difference:	13,776 acres
TFCC Avg CIR:	2.2 AF/ac (DS RISD Calculator_2022_August 15.xslx)
TFCC Average PE:	35% (Fifth Methodology Order at 14)
Demand Reduction =	(13,776 acres x 2.2 AF/ac) / 0.35
Demand Reduction =	**86,600 AF**

20. The 86,600 AF reduction in the TFCC annual diversion demand that results from using the actual irrigated area for the TFCC in 2017 demonstrates the significance of the irrigated area input to the SWC Methodology. The **86,600 AF** reduction in annual TFCC diversion demand is less than the **75,000 AF** of shortage that is predicted for the TFCC in the April 2023 As-Applied Order.

I certify under penalty of perjury pursuant to the law of the State of Idaho that the foregoing is true and correct.

DATED this 7th day of May 2023.



Gregory K. Sullivan, P.E.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 7th day of May, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.
322 E. Front St.
Boise, ID 83702
file@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139
Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP
P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110
Boulder, CO 80302
sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169
Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130

Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, &
LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L.
Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

/s/ *Chris M. Bromley*
Chris M. Bromley

ATTACHMENT A

Attachment A

Gregory K. Sullivan, P.E.

President and Senior Water Resources Engineer

Education: M.S., Civil Engineering, 1990, University of Colorado - Denver
B.S., Civil Engineering, 1985, Colorado State University

Professional Registration: Professional Engineer in Colorado, Idaho, and New Mexico

Professional Experience:

1990 - Present: ***Spronk Water Engineers, Inc., President and Senior Water Resources Engineer***

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Mr. Sullivan was involved in the refinement and use of the H-I Model of the Arkansas River system in Colorado that was developed to support claims by the State of Kansas that Colorado was violating the terms of the 1948 Arkansas River Compact. The model simulates daily operation of irrigation water uses under approximately two dozen canal systems along the Arkansas River in Colorado between the City of Pueblo and the Colorado-Kansas from 1950 to the present. In addition, the model simulates the operation of sole-source and supplemental irrigation wells, and the impact of those wells on the flow of the Arkansas River. Mr. Sullivan provided expert testimony before a Special Master appointed by the U.S. Supreme Court regarding the use of the H-I Model to evaluate the effects on state line flows resulting from post-compact well development in Colorado.

Injury Analysis - Kansas v. Colorado – Arkansas River Basin

Mr. Sullivan developed a model that was used as part of an analysis to compute the economic impacts and monetary damages to Kansas resulting from the compact violations by Colorado that were determined in the Kansas v. Colorado lawsuit. The model was used to translate monthly depletions to usable stateline flows over a 45-year period into impacts to (a) surface water users in Kansas, (b) to supplemental pumping demands in Kansas and (c) to recharge of the regional ground water system. Mr. Sullivan testified before the Special Master regarding the model development, operation, and results.

Analysis of Replacement Plans - Kansas v. Colorado – Arkansas River Basin

To continue use of post-compact Arkansas River alluvial wells, the well owners in Colorado were required to develop Replacement Plans to offset the impacts of pumping on senior surface water rights in Colorado and on usable stateline flows to Kansas. Mr. Sullivan analyzed the adequacy of these replacement plans through preparation of historical use analyses, water budgets, and other analyses. In addition, Mr. Sullivan used the H-I Model to simulate the effectiveness of the replacement plans in meeting Colorado's delivery obligations under the Arkansas River Compact. Mr. Sullivan provided expert testimony before the Special Master concerning his analyses of the Colorado Replacement Plans.

Change of Water Rights - City of Loveland, Colorado

Mr. Sullivan was the principal investigator for ditch-wide historical use analyses of the major Big Thompson River irrigation ditches that serve lands in and around the City of Loveland. These analyses served as the basis for successful changes of water rights that were approved by the Division 1 Water Court to allow the City to divert its ditch shares at the City's municipal water intakes to help meet its water supply needs. He also guided development of detailed water rights accounting for the City to Mr. Sullivan provided expert testimony in support of the changes of water rights in a contested trial.

Water Supply Yield Modeling - City of Loveland, Colorado

Mr. Sullivan led the development of a model to simulate the daily water supply and demand of the City of Loveland over a study period from 1950 - 2017. The water supplies that are simulated in the model include the ditch shares that have been changed to municipal use, Colorado-Big Thompson Project units, Windy Gap Project units, and the operation of the City's Green Ridge Glade Reservoir. The model is used by the City to evaluate the firm yield of its water supply, and how that yield can be increased through acquisition of additional supplies, development of additional storage, changes in water supply operations and other actions.

Water Supply Planning – ACWWA, Colorado

Mr. Sullivan has provided water resources and water rights consulting for the Arapahoe County Water and Wastewater Authority for over 30 years. ACWWA serves lands in the Cherry Creek basin south of Denver through a

combination of shallow alluvial wells and deep nontributary Denver Basin wells. Water use from these sources is integrated and optimized through operation of a complex plan for augmentation that provides for replacement of out-of-priority depletions to Cherry Creek to protect downstream senior water users. Mr. Sullivan has performed numerous analyses to evaluate the yield of ACWWA's water supplies, including completion of a raw water master plan in 2018.

Plan for Augmentation - Upper Cherry Creek Water Association, Colorado

Mr. Sullivan was instrumental in the development of an umbrella plan for augmentation for five major water users in the Cherry Creek Basin upstream of Cherry Creek Reservoir. The members have pooled their augmentation sources to replace the combined out-of-priority depletions resulting from alluvial well pumping and out-of-priority storage in Cherry Creek Reservoir. The plan includes an innovative method of computing depletions that considers times when Cherry Creek is dry in the vicinity of the member wells.

Cherry Creek Aquifer Modeling Project – Colorado

Mr. Sullivan led the development of a basin-wide simulation model of the hydrology and water use in the Cherry Creek basin upstream of Cherry Creek Reservoir. The model simulates the water supplies and water rights of all municipal water providers in the study area and optimizes the alluvial pumping of the water users and the use of Denver Basin ground water replacement supplies. The model also simulates the operation of Cherry Creek Reservoir and Rueter-Hess Reservoir. The model is used by the study participants to evaluate changes in water supply operations and acquisition of new water supplies.

Snake River Basin Adjudication - Idaho

Mr. Sullivan assisted the City of Pocatello in filing claims to adjudicate water rights as part of the SRBA. This work included historical research of facilities and water uses to document historical flow rates, volumes, and priority dates to assign to the claimed water rights. Mr. Sullivan provided expert testimony before the SRBA Court to help defend the City's claims that were disputed by others.

Snake River Delivery Calls - Idaho

Mr. Sullivan has provided technical analysis and expert testimony to the City of Pocatello in their participation in complex litigation involving water right delivery calls by senior surface water users on the Snake River in Idaho. Pocatello's water supply is derived primarily from junior priority wells that are tributary to the Snake River, and its water supply is threatened by the delivery calls. Mr. Sullivan analyzed the historical operation of seven major irrigation districts that placed the delivery calls to assess the extent of their claimed irrigation water shortages. The irrigation districts serve a combined area of 560,000 acres with annual diversions averaging 3.2 million acre-feet per year. Mr. Sullivan provide expert testimony is several hearings before the hearing officers in Idaho Depart of Water Resources.

ESPA Cities Mitigation Plan – Snake River Basin, Idaho

Mr. provided technical expertise and analysis in development of a mitigation plan for Pocatello, Idaho Falls, and more than a dozen other cities to mitigate the impacts of municipal groundwater pumping from the Eastern Snake Plain Aquifer in Idaho. The plan relies largely on aquifer recharge to mitigate the impacts of aquifer depletions from pumping that is projected to increase from about 60,000 acre-feet per year to over 120,000 acre-feet per year over the next 50 years.

Division 3 Rules Case - Rio Grande Basin, Colorado

Mr. Sullivan represented a group of surface water right owners that opposed the enactment of administrative rules governing the withdrawal and use of ground water in the Rio Grande Basin in Colorado (Water Division 3). The primary basis for their opposition was that the rules did not provide for mitigation of impacts to a large spring that was the source of their surface water rights and which dried up in conjunction with the large-scale development of ground water irrigation in the area. Mr. Sullivan's work included analysis of the historical irrigation water use by his clients, review of hydrologic data and records, and review of a ground water modeling of the San Luis Valley performed by the State of Colorado. Mr. Sullivan provided expert testimony on behalf of his clients in a trial before the Division 3 Water Court.

Ground Water Administrative Proceeding – Wood River Basin, Idaho

Mr. Sullivan represents the Sun Valley Company and the Cities of Ketchum, Hailey, and Bellevue in an administrative proceeding in the Wood River Valley in Idaho. Holders of senior surface water rights are seeking curtailment of junior ground water rights based on allegations of injury being suffered by the seniors, and the Idaho Department of Water Resources is proposing to implement conjunctive administration of groundwater rights and surface water rights to address the injury claims. A groundwater model of the Wood River Valley developed by IDWR with input from stakeholders is being used in the dispute to assess impacts from pumping on surface water supplies. Mr. Sullivan provided expert testimony on behalf of SVC and the Cities in a contested administrative hearing before the IDWR Director. Mr. Sullivan is also a member of a technical working group that has been assembled to develop a groundwater management plan that is hoped to settle the ongoing dispute.

1985 – 1990: ***J. W. Patterson & Associates, Inc., Water Resources Engineer***

Performed water supply, hydraulic and hydrologic analyses for agricultural, industrial, commercial, and municipal developments. Managed yield and impact analyses of water rights adjudications, transfers, exchanges and plans for augmentation. Conducted ground water studies including aquifer testing, project dewatering and water well design and construction monitoring.

Continuing Education:

Applied Ground-Water Flow Modeling. International Ground Water Modeling Center, Colorado School of Mines, Golden, CO. March 1993.

Introduction to Simulation Training in RiverWare, Center for Advanced Decision Support for Water and Environmental Systems, University of Colorado, May 2016.

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WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S OPPOSITION TO GROUNDWATER USERS' MOTION FOR RECONSIDERATION OF ORDER DENYING MOTION FOR CONTINUANCE**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition," "Coalition," or "SWC"), by and through counsel of record, and pursuant to the Department's Rules of Procedure (IDAPA 37.01.01.220) hereby file the following response in opposition to the *Motion for Reconsideration*

of Denial of Continuance ("*Motion*") filed jointly by the Coalition of Cities, Cities of Idaho Falls and Pocatello, the Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Ground Water District, and Bingham Ground Water District (hereinafter collectively referred to as "Groundwater Users") on May 5, 2023. For the reasons set forth below, as well as those stated on the record at the April 28, 2023 pre-hearing conference, the Director should deny the motion for reconsideration.

STANDARD OF REVIEW

The Director denied the Groundwater Users' motion for a continuance. *See Order Denying the Appointment of an Independent Hearing Officer and Motion for Continuance and Limiting Scope of Depositions* (May 5, 2023) ("*May 5 Order*"). The Groundwater Users now ask the Director to reconsider that decision pursuant to Department Rule of Procedure 711 (IDAPA 37.01.01.711). *See Motion* at 2-3. The Director's review of the motion is governed by the same standard of review of the underlying motion. *See e.g. Fragnella v. Petrovich*, 153 Idaho 266, 276, 281 P.3d 103, 113 (2012).

The Department's rules authorize a presiding officer to "continue proceedings for further hearing." Rule 560. Although not stated, the decision to grant a motion for a continuance is presumably vested in the presiding officer's discretion. Idaho case law provides that the "decision to grant a motion for a continuance rests within the sound discretion of the trial court." *See State v. Labbee*, 2023 WL 1131212 at *2 (Idaho Ct. App., Jan. 31, 2023). The Coalition submits that the Director properly exercised his discretion in denying the Groundwater Users' motion given the unique circumstances of water right administration and the requirement to protect senior water rights during the irrigation season. The Director identified these reasons both at the pre-hearing conference and in his *May 5 Order*.

The Coalition offers the following points in support of the Director's decision and in opposition to the Groundwater Users' present request for reconsideration.

I. IGWA Has No Authority and Has Not Proposed to Mitigate for Non-Member Junior Ground Water Right Holders.

A fatal flaw in the Groundwater Users' request for a continuance is their erroneous claim that "IGWA has enough the [sic] water to mitigate for its 2021 breach and for the predicted demand shortfall for the upcoming 2023 season." *See* Motion at 6. The Groundwater Users also wrongly allege that the "other remaining junior users account a fractional percentage of the groundwater depletions which are allegedly causing injury" and "the Director should consider the junior water users 'as a whole' are complying with mitigation plans." *Id.* at 7.

IGWA's representative districts do not represent and have no authority to mitigate for any junior groundwater right holders who are not members of a groundwater district. *See* I.C. § 42-5224(6). This is also confirmed in IGWA's *Notice of Ground Water District Mitigation* ("*Notice*") wherein the districts represent they are only proposing to mitigate for their members.[1] *See Notice* at 2-3 ("These districts' proportionate shares of the 63,645 acre-feet demand shortfall predicted in the April 2023 As-Applied Order are as follows . . ."). Stated another way, the *Notice* does not indicate that the districts will mitigate for the entire predicted demand shortfall of 75,200 acre-feet.

[1] IGWA provided notice of mitigation for Bingham, Bonneville-Jefferson, and Jefferson Clark Ground Water Districts pursuant to its "storage water" mitigation plan (CM-MP-2009-007) and for Aberdeen-American Falls, Carey Valley, Henry's Fork/Madison, Magic Valley and North Snake Ground Water Districts pursuant to the 2016 stipulated mitigation plan (CM-MP-2016-001). The Districts mistakenly believe they pick and choose which mitigation plans to follow. The Coalition reserves all rights with respect to IGWA's *Notice* and any notion that the Districts are free to "mix and match" compliance with prior plans and orders. Further, contrary to the Groundwater Users' claim, nothing in the 2023 *Notice* applies to the parties' prior settlement concerning certain Districts' 2021 breach of their mitigation plan. *See* 2021 Settlement at 2 (Sept. 7, 2022) ("Such amounts will be in addition to the long-term obligations set forth in section 3 of the Settlement Agreement and approved mitigation plan") (emphasis added).

Nowhere in the *Notice* does IGWA claim to represent or mitigate for junior ground water rights represented in the difference between their proportionate share (63,645 af) and the predicted in-season demand shortfall (75,200 af), which is approximately 11,555 acre-feet (i.e. 15%).[2] The Groundwater Users' attempts to minimize this quantity or have it swept into considering junior users "as a whole" across the ESPA is contrary to law and the facts and should be rejected.

Whereas the Director has indicated he does not plan to issue a curtailment order until after the hearing in this matter, each day that passes is critical for purposes of water right administration during the 2023 irrigation season. Thus, any delay in the schedule would inevitably delay administration of any affected junior ground water rights not covered through an approved mitigation plan. Every day that passes furthers the potential that unmitigated pumping will continue to injure senior surface water rights without adequate mitigation as the irrigation season has already commenced throughout the various administrative basins across Eastern Snake Plain Aquifer ("ESPA").

Further exacerbating potential injury this year is a pending sentinel well index measurement for April 2023 that may be approaching the April 2015 level. The attached groundwater level data from one USGS monitoring well going back to early 1950s (2N35E35DCC1) shows a record low reading this spring. *See* **Ex. A**. The declining groundwater levels are likely reducing hydraulically connected reach gains in the Near Blackfoot to Minidoka reach of the Snake River this year, further reducing available water to the Coalition members. Contrary to the Groundwater Users' theory, just looking at the current snowpack does not tell the whole story on injury to the Coalition, the health and status of the ESPA, or trends in reach gains in the Snake River. *See Motion for Continuance* at 3, (Apr. 28, 2023).

[2] This number includes the proportionate share assigned to A&B (458 acre-feet).

II. The Requested Continuance Does Not Account for Non-Compliant Ground Water Districts and Continuing Injury from Out-of-Priority Diversions.

The Steering Committee for the SWC and IGWA held a meeting on April 12, 2023 concerning the Ground Water Districts' 2022 performance and their April 1st report. A joint letter was signed and submitted by counsel for IGWA and SWC to the Director stating that SWC asserts that in 2022 certain Districts breached the 2016 stipulated migration plan and order based upon information provided by IGWA. *See Travis L. Thompson April 13, 2023 Letter to Director Gary Spackman*. The Districts disagree that a breach occurred in 2022 and their counsel has indicated they intend to appeal the Director's *Amended Final Order Regarding Compliance with Approved Mitigation Plan* (April 24, 2023) to district court.

At the April 28th pre-hearing conference the Director appeared to indicate that he would not address the alleged 2022 breach until after a hearing was held on the Fifth Methodology Order. Based upon IGWA's recent *Notice of Ground Water District Mitigation*, several Districts indicated they intend to mitigate pursuant to the 2016 Stipulated Plan and Order, while Bingham, Bonneville-Jefferson, and Jefferson-Clark Ground Water Districts apparently propose to mitigate pursuant to a prior "storage only" mitigation plan.[3] *See Notice* at 2-3. Despite receiving "safe harbor" from 2015-2022 and not securing sufficient storage to mitigate predicted in-season injuries in certain years pursuant to the Director's order, these districts now believe they are free to "pick and choose" which plan to follow. Through this filing it is apparent that these three Districts that are parties to the 2015 Settlement Agreement and 2016 Stipulated Mitigation Plan no longer believe they are bound by the Director's orders approving that plan and subsequent addendums.

[3] The Coalition reserves the right to pursue all administrative and judicial remedies with respect to the Districts' breach of the 2015 Settlement Agreement, the 2016 Stipulated Mitigation Plan and final order approving the same.

Further, it is now known that Bingham, Bonneville-Jefferson, and Jefferson-Clark Ground Water Districts have each breached the 2016 Stipulated Mitigation Plan and Order again in 2022.[4] These Districts' continued non-compliance in 2022 will have impacts on the Coalition's water supply in 2023. To date, these districts have failed to present any viable proposals to cure the non-compliance despite receiving safe harbor from administration in 2022. The Director's 2016 Order approving the Stipulated Mitigation Plan requires the Ground Water Districts to take actions to restore groundwater levels on the ESPA and it is now obvious that the three named districts will not comply with that order again in 2023. *See Notice* at 2 ("The Districts identified in the following table will provide mitigation to the SWC under the Storage Water Plan").[5]

A delay in the hearing will presumably result in a delay of any required actions by the Districts that breached the 2016 Order in 2022 (according to the Director's indication at the April 28th pre-hearing conference), thus further depleting aquifer levels and the source of SWC's natural flow supplies. All the while, the three named Districts will no doubt claim "safe harbor" from administration and will pump their out-of-priority ground water rights unrestricted without taking actions to replenish the aquifer as they previously promised.

[4] Counsel for IGWA has represented they intend to appeal the Director's recent *Amended Final Order Regarding Compliance with Approved Mitigation Plan* (April 24, 2023). Given this position and the parties' impasse at the April 12, 2023 Steering Committee meeting as documented in the April 13, 2023 letter, the Director should address the Districts' failure to undertake the required conservation obligations in 2022 pursuant to the Second Addendum process and his order approving the same. *See Second Addendum* at 3, section 2.c.iv; *Final Order Approving Amendmetn to Stipulated Mitigation Plan* (May 9, 2017). The fact Bingham, Bonneville-Jefferson, and Jefferson-Clark Ground Water Districts are representing they will not comply with that mitigation plan at the outset of 2023 is further reason for the Director to address this matter as soon as possible.

[5] The Districts continued non-performance under the 2016 Stipulated Mitigation Plan exacerbates declining reach gains which were specifically acknowledged in that agreement. To the contrary, the Storage Water Plan does not address the long-term obligations the Districts committed to in 2015.

The blatant repeated failure by Bingham, Bonneville-Jefferson, and Jefferson-Clark Ground Water Districts to comply with the Director's orders approving the 2016 Stipulated Plan is yet another reason to deny the Groundwater Users' motion to reconsider the denial of their motion for continuance of the hearing in this matter.

III. IDWR Has Held Conjunctive Administration Hearings Under Similar Schedules / Virtual Participation Accommodation.

The bulk of the Groundwater Users' reason for asking for a continuance is the current schedules of certain consultants and counsel. *See Motion* at 3-5. Certainly participating in an administrative with numerous parties, counsel, and expert witnesses can be challenging. On April 21, 2023, cognizant of these challenges and proactively addressing likely petitions for hearing, the Director set a hearing for June 6-10, 2023. While individual schedules may need to be adjusted in order for a particular person to participate in this matter, all parties are subject to the same schedule and deadlines set by the Director, which gave the parties over six weeks to prepare for the hearing.[6] The Groundwater Users fail to recognize that the Surface Water Coalition and its consultants are all required to work within the same timeframe and will have to address their individual schedules as well.

Further, IDWR has previously scheduled and held hearings within similar timeframes, including in this very case. Accordingly, the Groundwater Users should not be surprised as to this type of scheduling in conjunctive administration matters occurring at the outset of an irrigation season.

[6] The Coalition opposes the Groundwater Users' theory that this hearing could be moved and replace an already scheduled hearing in another contested case. *See Motion* at 8. The consolidated Big Wood River / Snake River Moratorium matter involves a host of other parties, counsel, consultants, and IDWR staff that are not involved in this case. Given the difficulty in scheduling in that matter with the number of counsel involved, the Director had to delay a proposed hearing timeframe from August to October. Further, the moratorium case hearing was set over a month ago and the parties are subject to pending deadlines in that case. *See Notice of Hearing* (March 31, 2023). The Groundwater Users do not speak for the others involved in that matter and have no basis to suggest changing that schedule in the context of a wholly separate case.

In 2010 the Director issued the first methodology order on April 7th and held a hearing on both the methodology and the first April As Applied order (dated April 29, 2010) on May 24-26, 2010 (i.e. roughly a similar six-week schedule). On appeal Judge Wildman found that the process employed by IDWR did not violate IGWA's or the City of Pocatello's rights to due process. *See Memorandum Decision* at 35-36, 47 (Gooding County Dist. Ct., Fifth Jud. Dist. CV-2010-382 et al., Sept. 26, 2014). Clearly, water right administration, and any necessary administrative procedures must occur in a timely fashion in order to be effective. The Groundwater Users' requested continuance is the type of situation Judge Wood warned against that would inevitably harm senior rights. *See Order on Plaintiffs' Motion for Summary Judgment* at 97 (*AFRD#2 et al. v. IDWR*, Gooding County Dist. Ct., Fifth Jud. Dist., Case No. CV-2006-600, June 2, 2006) ("In practice, an untimely decision effectively becomes the decision; i.e. 'no decision is the decision.'")

In addition to the prior May hearings held in this case back in 2010, the Director recently initiated an administrative proceeding in Basin 37 in early May 2021 and then held an hearing in early June that year. Requests for continuance and injunctive relief were denied in that case, and the parties accommodated the schedule and presented evidence and exhibits during a five-day hearing held between June 8-12, 2021.

Although travel and participation by out-of-state consultants may pose further challenges in this case,[7] the Coalition would propose that consultants who cannot travel to Boise between June 6 and 10, be allowed to present testimony virtually (i.e. Zoom, Webex, etc.).[8] As virtual

[7] The City of Pocatello's consultant, Greg Sullivan, has a scheduled trip to Europe but will be back before the hearing and does not claim he cannot attend in person. *See Dec. of Greg Sullivan* at 5, ¶ 20.

[8] The Director has already approved allowing Candice McHugh to participate remotely to accommodate her travel to a college football event. *See Scheduling Order* (May 2, 2023); *see Dec. of Candice McHugh* at 2; *see also*, *May 5 Order* at 2, n. 1. In light of that accommodation, certainly IGWA's consultant Ms. Sigstedt should be allowed to

hearings have been routinely used in prior administrative and court proceedings around the State of Idaho (particularly during the COVID-19 epidemic), the Department has the technology and capability of handling such requests. A virtual participation accommodation will address the concerns raised by IGWA and the Cities regarding their consultants that may be located out-of-state during that time, or unable to travel to Boise for medical reasons.

The Coalition would agree to work with the parties and their consultants to accommodate such participation during the hearing timeframe and would request the same consideration if needed.

III. Bonneville-Jefferson Ground Water District's Decision to Hire New Counsel and Consultants at this Stage Does Not Justify a Continuance.

Finally, Bonneville-Jefferson Ground Water District makes a specific plea for continuance on the basis that the District recently hired new counsel and consultants. *See Motion* at 5-6. Although the District was previously represented by the law firm of Racine Olson and retained consultants Sophia Sigstedt and Jaxon Higgs, including through the technical working group process last fall and winter, the District has apparently substituted counsel and retained new consultants (Bryce Contor and Thane Kindred, Rocky Mountain Environmental Associates).[9]

While the District has the right to make such changes, those recent changes do not justify continuing a hearing that would inevitably delay conjunctive administration for the benefit of

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participate virtually given her medical restriction that requires her to stay in Colorado until mid-July. *See Dec. of Sophia Sigstedt* at 5. The Coalition would stipulate to Ms. Sigstedt's virtual participation.

[9] Mr. Johns has attended meetings for Bonneville-Jefferson in the past, including the summer of 2022, and recently participated in the hearing on the Director's September 8, 2022 Order held on February 8, 2023. Given that background certainly Mr. Johns has some familiarity with the SWC delivery call and prior orders regarding conjunctive administration. It is not known when Bonneville-Jefferson retained its new consultants.

their members.[10] Moreover, the timing of Bonneville's change is at their own risk given the Director's intention to make adjustments to the methodology order that have been known for months, including by their prior consultants that participated in the technical working group. Such a request for delay is particularly troublesome given Bonneville-Jefferson's repeated failures to comply with its mitigation plan in 2021 and 2022, and its notice that it will not comply with the 2016 Stipulated Plan in 2023. *See Notice* at 2. Moreover, the Director's methodology in this case has been in the public record at IDWR for well over a decade. It is presumed that Bonneville-Jefferson has been fully apprised of the various methodology orders issued between 2010-2016 through its prior counsel and consultants.[11]

In sum, there is no prejudice to Bonneville-Jefferson where it has been aptly represented on these issues by prior counsel and consultants for years, including through the technical working group initiated by IDWR last fall. Changing counsel and consultants is not a valid reason for the Director to reconsider the denial of the motion for continuance.

CONCLUSION

In conclusion the Coalition submits the Director properly exercised his discretion in denying the Groundwater Users' motion for continuance. Time is of the essence for conjunctive administration this irrigation season, and given present aquifer levels and likely decreased reach gains this summer, any delay in the process stands to harm the Coalition's senior surface water rights. The Coalition therefore submits the Groundwater Users' motion for reconsideration should be denied.

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[10] None of the declarations of Bonneville-Jefferson's new counsel or consultants indicate they would not be available to participate at the June 6-10, 2023.

[11] The Technical Working Group presentations and comments were all provided to Bonneville-Jefferson's prior consultants (Ms. Sigstedt and Mr. Higgs) and counsel (Mr. Budge). Further, while the Coalition has similarly retained additional consultants that did not participate in the workgroup, they will likewise be subject to the same timeframe and deadlines to respond and participate in this case.

DATED this 8th day of May, 2023.

MARTEN LAW LLP



Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE



for

W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Type text here

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

Jessica Nielsen
Assistant for Travis L. Thompson

Exhibit A

An official website of the United States government
Here's how you know

MENU

IMPORTANT Legacy real-time page

◯ 7 days ◯ 30 days ◯ 1 year

- using custom time span -

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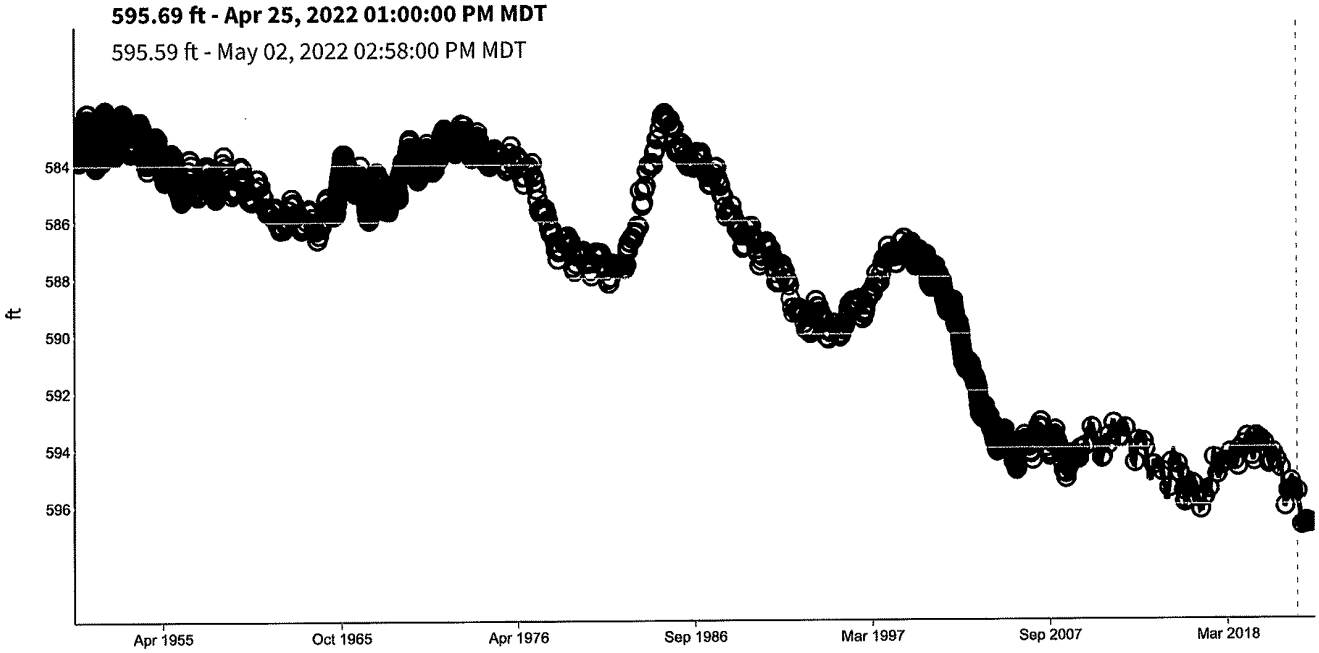
January 1, 1950 - April 30, 2023

Depth to water level, ft below land surface

595.69 ft - Apr 25, 2022 01:00:00 PM MDT

595.59 ft - May 02, 2022 02:58:00 PM MDT



Show legend

	Value	Status
Latest May 08, 2023 07:00:00 AM MDT	596.93	Provisional
Selected Apr 25, 2022 01:00:00 PM MDT	595.69	Approved
Selected field visit May 02, 2022 02:58:00 PM MDT	595.59 ft	Approved

Questions or Comments

RECEIVED
May 08, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **I.R.C.P. 30(b)(6) NOTICE OF TAKING DEPOSITION DUCES TECUM OF IDWR**

To: Idaho Department of Water Resources and ITS counsel of record

PLEASE TAKE NOTICE that counsel for Idaho Ground Water Appropriators, Inc., Bingham Ground Water District, Bonneville-Jefferson Ground Water District, and the Cities of Idaho Falls, Pocatello, Jerome, Burley, Bliss, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Paul, Richfield, Rupert, Shoshone, and Wendell will take the deposition of Idaho Department of Water Resources ("Department") before M&M Court Reporting ("M&M") in accordance with the *Order Authorizing Discovery* issued April 21, 2023, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and Idaho Rules of Civil Procedure 26, 30(a), 34 and 30(b)(6). The deposition will commence on a trailing docket immediately following the deposition of Matthew Anders scheduled to begin at

9:00 a.m. on **May 12, 2023**, and continuing from day to day thereafter until completion, at the office of the **Idaho Department of Water Resources, 322 E. Front Street, Boise, Idaho 83702**. The deponent must be present in person. The court reporter will participate in person. Attorney may participate in person or via the Zoom video platform, hosted by M&M. Participants will receive a Zoom link via email from M&M the day before the deposition.

The Department is required to designate one or more persons to testify on its behalf, and may set forth, for each person designated, the matters on which the person will testify, regarding any information considered by Department staff and/or the Director in developing the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* issued April 21, 2023 ("Fifth Methodology Order") and/or the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order") issued April 21, 2023, that is not included among the materials that Ms. Sukow and Mr. Anders may rely upon and the topics they may testify about pursuant to the *Notice of Materials Department Witnesses May Rely Upon at Hearing And Intent to Take Official Notice* issued May 5, 2023, including but not limited to the following:

1. The futile call doctrine pursuant to rules 10.08 and 20.04 of the Rules for Conjunctive Management of Surface and Ground Water Resources ("CM Rules").

2. The policy of full economic development of underground water resources pursuant to CM Rules 10.07 and 20.03.

3. The policy that an appropriator is not entitled to command the entirety of large volumes of water in a surface or ground water source to support his appropriation contrary to the public policy of reasonable use of water pursuant to CM Rule 20.03.

4. The reasonableness of the diversion and use of water by the Surface Water Coalition pursuant to CM Rules 20.03, 20.05, 40.03, and 42.

5. The extent to which the water needs of the Surface Water Coalition could be met with their existing facilities and water supplies by employing reasonable diversion and conveyance efficiency and conservation practices pursuant to CM Rule 42.

6. The change from a steady-state to a transient-state application of the ESPA Model in the Fifth Methodology Order.

7. The Department's review of comments submitted by outside consultants in response to the *Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition* issued by Department staff dated December 23, 2023.

8. Any alleged non-compliance by groundwater users the so-called IGWA-Surface Water Coalition Settlement Agreement approved as a mitigation plan in IDWR Docket No. CM-MP-2016-001.

9. The documents identified below.

The deponent is required to bring with him or her true and correct copies of all documents reviewed by Department staff and/or the Director in connection with development of the Fifth Methodology Order or the As-Applied Order that relate, directly or indirectly, to the topics identified above, including but not limited to the following:

1. Documents relating to the implementation of a trim line or any other mechanism that could be used to implement the futile call doctrine, the policy of full economic development of underground water resources, and/or the policy that an appropriator is not entitled to command the entirety of large volumes of water in a surface or ground water source to support his appropriation contrary to the public policy of reasonable use of water.
2. Letters, emails, text messages and other correspondence sent by Department personnel to any person not employed by the Department, or received by Department personnel from any person not employed by the Department, concerning the Fifth Methodology Order and/or the April 2023 As-Applied Order, or the development of such orders, prior to 6:45 p.m. mountain daylight time, April 21, 2023.
3. Documents showing the actual or estimated total number of water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans; the total number of water rights by beneficial use (irrigation, municipal, industrial, commercial, etc.) that would be curtailed; and/or the total number of acres authorized for irrigation that would be curtailed.
4. Documents showing the actual or estimated total number of water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.
5. Documents showing the number of water rights by beneficial use (irrigation, municipal, commercial, etc.) that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.
6. Documents showing the actual or estimated total number of acres authorized for irrigation that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.
7. Documents showing the actual or estimated total diversion rate (cubic feet per second) authorized for diversion under water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.
8. Documents showing the actual or estimated total volume of water (acre-feet) authorized for diversion under water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

9. Documents relating to the extent, degree, or magnitude of beneficial use of water that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.
10. Documents relating to projected, estimated, or potential crop loss or any other impairment of beneficial use of water within Twin Falls Canal Company as a result of the 75,200 acre-feet Demand Shortfall predicted by the April 2023 As-Applied Order.
11. Documents comparing the adverse effects of curtailment under the Fifth Methodology Order and/or April 2023 As-Applied Order, in the absence of approved mitigation plan, on beneficial use of the ESPA versus the corresponding benefit to Twin Falls Canal Company.
12. Documents relating to the effect of the Fifth Methodology Order and/or the April 2023 As-Applied Order on ground water districts and/or their patrons who are not compliance with the so-called IGWA-Surface Water Coalition Settlement Agreement approved as a mitigation plan in IDWR Docket No. CM-MP-2016-001.

For purposes of this notice, the term "document" is to be interpreted as broadly as Idaho Rule of Civil Procedure 34 allows and includes all written or graphic matter, whether physical or electronic, however produced, including, but not limited to, letters, emails, text messages, notes, memoranda, meeting minutes, reports, directives, proposals, summaries, analyses, spreadsheets, internal communications, external communications, studies, surveys, working papers, and other physical or electronic data of any kind.

All parties and their counsel are invited to attend. The oral examination will continue from day to day until completed.

DATED this 8th day of May, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

HOLDEN KIDWELL HAHN & CRAPO

By: /S/
Robert L. Harris
Attorneys for City of Idaho Falls

MCHUGH BROMLEY, PLLC

By: /S/
Candice M. McHugh
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding,

SOMACH SIMMONS & DUNN

By: /S/
Sarah A. Klahn
Attorneys for City of Pocatello

Hazelton, Heyburn, Jerome, Paul, Rich-field, Rupert, Shoshone, and Wendell

DYLAN ANDERSON LAW

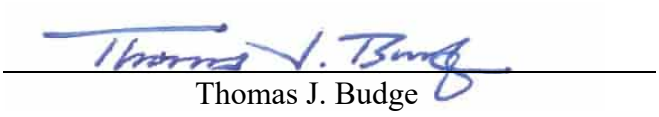
By: /S/
Dylan Anderson
Attorney for Bingham Ground Water District

OLSEN & TAGGART PLLC

By: /S/
Skyler C. Johns
Attorneys for Bonneville-Jefferson Ground Water District

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
May 08, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

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Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **Groundwater Users' First Set of Request for Production to IDWR; Or, Alternatively, Request for Public Records**

To: Idaho Department of Water Resources

Idaho Ground Water Appropriators, Inc., Bingham Ground Water District, Bonneville-Jefferson Ground Water District, and the Cities of Idaho Falls, Pocatello, Jerome, Burley, Bliss, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Paul, Richfield, Rupert, Shoshone, and Wendell; and Bingham Ground Water District and Bonneville-Jefferson Ground Water District (collectively, the "Groundwater Users"), hereby require you to produce the following documents pursuant to rules 520 and 521 of the Rules of Procedure of the Idaho Department of Water Resources (IDWR), Rules 26 and 34 of the Idaho Rules of Civil Procedure, and the *Order Authorizing Discovery* issued April 21, 2023, in this matter.

If the Department determines that the information requested below is not discoverable, the Department is requested to produce such documents pursuant to the Public Records Act, Chapter 1, Title 74, Idaho Code. If documents are produced under the Public Records Act, the Groundwater Users will promptly pay statutorily authorized fees upon request.

Given the compressed nature of the hearing schedule in this matter, the Groundwater Users respectfully request that such documents be produced as expeditiously as possible.

INSTRUCTIONS

1. When answering these discovery requests, you are required to furnish all information and documents known or available upon reasonable inquiry to you.

2. These discovery requests are deemed continuing, and your answers are to be supplemented as additional information become available or known to you.

3. If any requested document was at one time in existence but is no longer in existence, please state: (a) the date it ceased to exist; (b) the circumstances under which it ceased to exist; (c) the identity of all persons having knowledge of the circumstances under which it ceased to exist; and (d) the identity of all persons having knowledge of its contents.

4. If any requested information is withheld due to a claim of privilege, please state: (a) the request to which it is responsive; (b) its title and general subject matter; (c) its date; (d) the names and titles of its authors or preparers; (e) the names and titles of the persons for whom it was prepared and all persons to whom it was sent or shown; (f) the privilege claimed; and (g) sufficient description to enable IGWA to assess the applicability of the privilege as required by I.R.C.P. 26(b)(5)(A).

DEFINITIONS

1. April 2023 As-Applied Order means the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* issued April 21, 2023, in this matter.

2. Fifth Methodology Order means the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* issued in this matter on April 21, 2023

3. Fourth Methodology Order means the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* issued April 19, 2016, in this matter.

4. Department means the Idaho Department of Water Resources.

5. Document means any tangible or electronic record, including but not limited to letters, emails, agreements, memoranda, notes, reports, minutes, books, ledgers, invoices, receipts, surveys, photographs, maps, drawings, diagrams, recordings, computer files or other form of data compilation, including duplicates, copies, substitutes, facsimiles, and summaries thereof.

6. ESPA means the Eastern Snake Plain Aquifer.

7. Person means any person or legal entity and its agents or employees.

8. You and your means the Department and its employees, officers, and staff.

REQUESTS FOR PRODUCTION OF DOCUMENTS

The Groundwater Users request that the following documents be provided in electronic format via email, thumb drive, or other digital medium. Alternatively, the documents shall be produced for inspection and copying at the office of the Department, 322 Front Street, Boise, Idaho.

Request for Production 1: Produce true and correct copies of all documents indicating when the Department first began considering a review and/or revision of the Fourth Methodology Order.

Request for Production 2: Produce true and correct copies of all documents indicated when the Department decided to proceed with a review and/or revision of the Fourth Methodology Order.

Request for Production 3: Produce true and correct copies of all documents relating to the Department's consideration of, in connection with the Fifth Methodology Order, the futile call doctrine, the policy of full economic development of underground water resources, the policy of reasonable use of water, or the policy of optimum development of water resources.

Request for Production 4: Produce true and correct copies of all documents relating to the Department's consideration of, in connection with the Fifth Methodology Order, the extent to which the water needs of the Surface Water Coalition or its members could be met with their existing facilities and water supplies by employing reasonable diversion and conveyance efficiency and conservation practices.

Request for Production 5: Produce true and correct copies of all documents generated, prepared, considered, discussed, utilized, reviewed, evaluated, analyzed, or relied upon by the Department in connection with development of the Fifth Methodology Order and/or the April 2023 As-Applied Order.

Request for Production 6: Produce true and correct copies of all letters, emails, text messages and other written correspondence sent by Department personnel to any person not employed by the Department, or received by Department personnel from any person not employed by the Department, prior to 6:45 p.m. mountain daylight time, April 21, 2023, concerning the Fifth Methodology Order, the April 2023 As-Applied Order, or the development, formulation, drafting, implication, application or effect of such orders.

Request for Production 7: Produce true and correct copies of all documents showing the actual or estimated total number of water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Request for Production 8: Produce true and correct copies of all documents showing the number of water rights by beneficial use (irrigation, municipal, commercial, etc.) that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Request for Production 9: Produce true and correct copies of all documents showing the actual or estimated total number of acres authorized for irrigation that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Request for Production 10: Produce true and correct copies of all documents showing the actual or estimated total diversion rate (cubic feet per second) authorized for diversion under water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Request for Production 11: Produce true and correct copies of all documents showing the actual or estimated total volume of water (acre-feet) authorized for diversion under water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Request for Production 12: Produce true and correct copies of all documents relating to the extent, degree, or magnitude of beneficial use of water that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Request for Production 13: Produce true and correct copies of all documents relating to projected, estimated, or potential crop loss or any other impairment of beneficial use of water within Twin Falls Canal Company as a result of the 75,200 acre-feet Demand Shortfall predicted by the April 2023 As-Applied Order.

Request for Production 14: Produce true and correct copies of all documents comparing the adverse effects of curtailment under the Fifth Methodology Order and/or April 2023 As-Applied Order, in the absence of approved mitigation plan, on beneficial use of the ESPA versus the benefits of curtailment to Twin Falls Canal Company.

Request for Production 15: Produce true and correct copies of all documents that reference or reflect the Department's review or consideration, in connection with the Fifth Methodology Order and/or the As-Applied Order, of any alleged non-compliance with, or breach of, the so-called IGWA-Surface Water Coalition Settlement Agreement approved as a mitigation plan in IDWR Docket No. CM-MP-2016-001.

Request for Production 16: Produce true and correct copies of all documents showing the proportionate shares of the projected demand shortfall of 75,200 acre-feet set forth in the April 2023 As-Applied Orde attributable to, respectively, North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, Aberdeen-American Falls Area Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, and all documents showing the calculation of their proportionate shares.

DATED this 8th day of May, 2023.

RACINE OLSON, PLLP

By: 
Thomas J. Budge
Attorneys for IGWA

HOLDEN KIDWELL HAHN & CRAPO

By: /S/
Robert L. Harris
Attorneys for City of Idaho Falls

MCHUGH BROMLEY, PLLC

By: /S/
Candice M. McHugh
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

SOMACH SIMMONS & DUNN

By: /S/
Sarah A. Klahn
Attorneys for City of Pocatello

DYLAN ANDERSON LAW

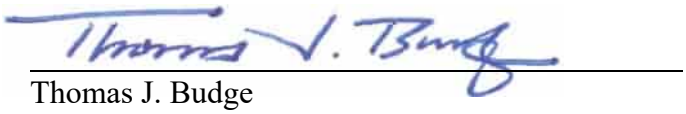
By: /S/
Dylan Anderson
Attorney for Bingham Ground Water District

OLSEN & TAGGART PLLC

By: /S/
Skyler C. Johns
Attorneys for Bonneville-Jefferson Ground Water District

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of May, 2023, I served the foregoing document on the persons below via email as indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RAÚL R. LABRADOR
ATTORNEY GENERAL

SCOTT L. CAMPBELL
Chief of Energy and Natural Resources Division

Garrick L. BAXTER, ISB No. 6301
Deputy Attorney General
Idaho Department of Water Resources
P.O. Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov

Attorneys for the Idaho Department of Water Resources

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DEPARTMENT'S RESPONSE TO GROUNDWATER USERS' REQUEST FOR PRODUCTION AND REQUEST FOR PUBLIC RECORDS**

This document contains the Idaho Department of Water Resources' ("Department") responses to the *Groundwater Users' First Set of Request for Production to IDWR; Or, Alternatively, Request for Public Records.*

GENERAL OBJECTIONS

1. The Department has not completed its own investigation. Accordingly, the responses that follow are based upon the best knowledge, information, and belief of the Department at this time. The Department reserves the right to make any further responses if it appears that any omission or error has been made in connection with these responses or that more accurate information has become available. These responses are made without prejudice to the Department's right to use such evidence as may later be discovered or evaluated.

2. The Department objects to any and all definitions, instructions and requests, or any part thereof, to the extent they call for material subject to the attorney-client privilege, the work product doctrine, investigative privilege or any other privilege, immunity or statutory prohibition. This objection applies to all production requests that seek such information. This objection is intended to apply to all of the requests that seek such information and will not be repeated for each request to which it applies. The Department has, to the extent possible, construed each request as requesting only information and/or documents not subject to any applicable protection.

3. The Department objects to any and all requests, or any part thereof, to the extent that they require identification of facts or information not relevant to the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") or the *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order") and are outside the scope of discovery. The responses are made subject to all objections as to competence, relevance, materiality, and admissibility.

4. The Department objects to any and all requests, or any part thereof, to the extent they purport to impose burdens on the Department in excess of those allowed by the Idaho Rules of Civil Procedure.

RESPONSES TO REQUESTS FOR PRODUCTION

Request for Production No. 1: Produce true and correct copies of all documents indicating when the Department first began considering a review and/or revision of the Fourth Methodology Order.

Response to Request for Production No. 1: Objection. The request calls for the production of documents protected by the attorney-client privilege and/or work product doctrine. Without waiving any objections, including the General Objections, the Department responds that documents the Department determines to be responsive will be posted to the Department's publicly available website. To access please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 2: Produce true and correct copies of all documents indicated when the Department decided to proceed with a review and/or revision of the Fourth Methodology Order.

Response to Request for Production No. 2: Objection. The request calls for the production of documents protected by the attorney-client privilege and/or work product doctrine. Without waiving any objections, including the General Objections, the Department responds that documents the Department determines to be responsive will be posted to the Department's publicly available website. To access please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 3: Produce true and correct copies of all documents relating to the Department's consideration of, in connection with the Fifth Methodology Order, the futile call doctrine, the policy of full economic development of underground water resources, the policy of reasonable use of water, or the policy of optimum development of water resources.

Response to Request for Production No. 3: The Department has no such documents at this time.

Request for Production 4: Produce true and correct copies of all documents relating to the Department's consideration of, in connection with the Fifth Methodology Order, the extent to which the water needs of the Surface Water Coalition or its members could be met with their existing facilities and water supplies by employing reasonable diversion and conveyance efficiency and conservation practices.

Response to Request for Production No. 4: The Department has no such documents at this time.

Request for Production 5: Produce true and correct copies of all documents generated, prepared, considered, discussed, utilized, reviewed, evaluated, analyzed, or relied upon by the Department in connection with development of the Fifth Methodology Order and/or the April 2023 As-Applied Order.

Response to Request for Production No. 5: Objection. The request calls for the production of documents protected by the attorney-client privilege and/or work product doctrine. The Department objects to this document request as overly broad and unduly burdensome. Without waiving any objections, including the General Objections, the Department responds that it already provided responsive documents when the Department posted technical analysis documents to the Department's publicly available website on May 5 and May 15, 2023. Additional documents the Department determines to be responsive will be posted to the Department's publicly available website. To access please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 6: Produce true and correct copies of all letters, emails, text messages and other written correspondence sent by Department personnel to any person not employed by the Department, or received by Department personnel from any person not employed by the Department, prior to 6:45 p.m. mountain daylight time, April 21, 2023, concerning the Fifth Methodology Order, the April 2023 As-Applied Order, or the development, formulation, drafting, implication, application or effect of such orders.

Response to Request for Production No. 6: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 7: Produce true and correct copies of all documents showing the actual or estimated total number of water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Response to Request for Production No. 7: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 8: Produce true and correct copies of all documents showing the number of water rights by beneficial use (irrigation, municipal, commercial, etc.) that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Response to Request for Production No. 8: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 9: Produce true and correct copies of all documents showing the actual or estimated total number of acres authorized for irrigation that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Response to Request for Production No. 9: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 10: Produce true and correct copies of all documents showing the actual or estimated total diversion rate (cubic feet per second) authorized for diversion under water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Response to Request for Production No. 10: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 11: Produce true and correct copies of all documents showing the actual or estimated total volume of water (acre-feet) authorized for diversion under water rights that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Response to Request for Production No. 11: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 12: Produce true and correct copies of all documents relating to the extent, degree, or magnitude of beneficial use of water that would be curtailed under the April 2023 As-Applied Order in the absence of approved mitigation plans.

Response to Request for Production No. 12: All documents the Department determines to be responsive will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

Request for Production 13: Produce true and correct copies of all documents relating to projected, estimated, or potential crop loss or any other impairment of beneficial use of water within Twin Falls Canal Company as a result of the 75,200 acre-feet Demand Shortfall predicted by the April 2023 As-Applied Order.

Response to Request for Production No. 13: The Department has no such documents at this time.

Request for Production 14: Produce true and correct copies of all documents comparing the adverse effects of curtailment under the Fifth Methodology Order and/or April 2023 As-Applied Order, in the absence of approved mitigation plan, on beneficial use of the ESPA versus the benefits of curtailment to Twin Falls Canal Company.

Response to Request for Production No. 14: The Department has no such documents at this time.

Request for Production 15: Produce true and correct copies of all documents that reference or reflect the Department's review or consideration, in connection with the Fifth Methodology Order and/or the As-Applied Order, of any alleged non-compliance with, or breach of, the so-called IGWA-Surface Water Coalition Settlement Agreement approved as a mitigation plan in IDWR Docket No. CM-MP-2016-001.

Response to Request for Production No. 15: Objection. Issues pertaining to IGWA's non-compliance with the Settlement Agreement are outside the scope of this proceeding. IGWA's compliance is a separate administrative proceeding in a separate docket – Docket No. CM MP 2016-001. Without waiving any objections, including the General Objections, the Department responds that it has no such documents at this time.

Request for Production 16: Produce true and correct copies of all documents showing the proportionate shares of the projected demand shortfall of 75,200 acre-feet set forth in the April 2023 As-Applied Orde[r] attributable to, respectively, North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, Aberdeen-American Falls Area Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, and all documents showing the calculation of their proportionate shares.

Response to Request for Production No. 16: The documents relevant to the calculation of IGWA's proportionate share of the predicted demand shortfall were posted to the Department's publicly available website on May 5, 2023. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/. Regarding each Ground Water District's estimated distribution of proportionate shares, a table summarizing the results was provided to the parties in this case by email on May 5, 2023, at 4:14 pm. The supporting model files will be posted to the Department's publicly available website. To access, please visit: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/.

RESPONSE TO PUBLIC RECORDS REQUEST

Because the Department is providing the documents pursuant to the Groundwater Users' request for production, the Department will not be responding to the public records request. Moreover, public records requests are unavailable "to supplement, augment, substitute or supplant discovery procedures… ." Idaho Code § 74-115(3).

DATED this 18th day of May 2023.



GARRICK L. BAXTER
Deputy Attorney General
Idaho Department of Water Resources

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 18th day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☐ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☐ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☐ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☐ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☐ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☐ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☐ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☐ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☐ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☐ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☐ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☐ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☐ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☐ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
May 18, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB #7928
Maximilian C. Bricker, ISB #12283
Somach Simmons & Dunn, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com

Attorneys for the City of Pocatello

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **ENTRY OF APPEARANCE**

TO: Director, Idaho Department of Water Resources, and all Parties of Record:

NOTICE IS HEREBY GIVEN that Maximilian C. Bricker of Somach Simmons & Dunn, P.C., enters his appearance on behalf of the City of Pocatello in the above-entitled matter. Sarah A. Klahn shall remain as counsel of record for the City of Pocatello.

Respectfully submitted this 18th day of May, 2023.

Maximilian C. Bricker, ISB #12283
SOMACH SIMMONS & DUNN, P.C.

ATTORNEYS FOR CITY OF POCATELLO

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 18th day of May, 2023, the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

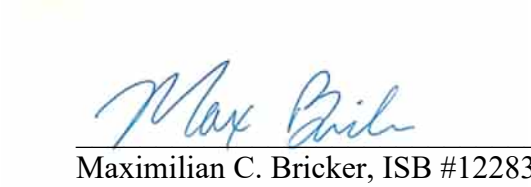
Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Maximilian C. Bricker, ISB #12283

RECEIVED
May 19, 2023
DEPARTMENT OF
WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Sarah A. Klahn, ISB # 7928
SOMACH SIMMONS & DUNN
2033 11th St., Ste. 5
Boulder, CO 80302
(303) 449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris, ISB # 7018
HOLDEN KIDWELL HAHN & CRAPO
100 Riverwalk Dr., Ste. 200
PO Box 50130
Idaho Falls, ID 83405
(208) 523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **CITIES' I.R.C.P 30(b)(6) NOTICE OF TAKING DEPOSITION DUCES TECUM OF TWIN FALLS CANAL COMPANY**

TO: Twin Falls Canal Company and its counsel of record:

PLEASE TAKE NOTICE that counsel for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and

Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"), will take the deposition of the Twin Falls Canal Company ("TFCC") before M&M Court Reporting ("M&M") in accordance with the *Order Authorizing Discovery* issued on April 21, 2023, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and IRCP 26, 30(a), 30(b)(6), and 34. The deposition will commence at 10:00 a.m. on May 26, 2023, and continuing from day to day thereafter until completion, at the office of TFCC, 357 6th Ave. W., Twin Falls, Idaho. The deponent must be present in person. The court reporter will participate in person. Attorney may participate in person or via the Zoom video platform, hosted by M&M. Participants will receive a Zoom link via email from M&M the day before the deposition.

TFCC is required to designate one or more persons to testify on its behalf, and may set forth, for each person designated, the matters on which the person will testify, including but not limited to the following:

1. TFCC project efficiencies and how they have changed over time;
2. TFCC irrigation water distribution system, including how it has changed over time;
3. TFCC irrigation water delivery records including collection and maintenance of such records;
4. Identification of any and all acres within the TFCC service area that have been "hardened", i.e., can no longer produce crops due to the construction of permanent structures and/or acres that are enrolled in government programs, including but not limited to Conservation Reserve Program and/or Conservation Reserve Enhancement Program, thus foreclosing irrigation;
5. Information associated with TFCC farmer's reliance on sources of irrigation water other than deliveries from TFCC, including but not limited to supplemental and/or primary ground water wells;

6. Records related to releases at Spring Creek and other releases of water below Milner dam from the TFCC system;

7. Discharge data and information including points of discharge and volume records, NDPES documents and reports;

8. Records maintained by TFCC ditch riders and/or other TFCC employees engaged in distributing water to TFCC farmers;

9. Records related to private leases of storage water from TFCC to entities other than TFCC;

10. Records related to leases of storage water from TFCC to Water District 01;

11. Identification of and records related to installed hydropower projects within the TFCC service area that use water diverted by TFCC to generate power;

12. Records of TFCC board meetings;

13. Records of TFCC-related revenues associated with hydro-power generation; and

14. Information related to discussions with IDWR staff, attorneys or the Director regarding the SWC delivery call, IGWA's "breach", need to update the methodology and use of modelling to address injury to TFCC, and TFCC's need for water.

In addition to making a deponent(s) available to answer questions on these topics, the Cities request that the deponent(s) provide any and all supporting documentary materials related to the above topics in electronic format **three (3) days prior** to the scheduled deposition to facilitate efficient examination. To the extent this request is not practical for some reason, the Deponent must bring such documents to the deposition. Electronic format is preferred.

For purposes of this notice, the term "document" is to be interpreted as broadly as Idaho Rule of Civil Procedure 34 allows and includes all written or graphic matter, whether physical or electronic, however produced, including, but not limited to, letters, emails, text messages, notes, memoranda, meeting minutes, reports, directives, proposals, summaries, analyses, spreadsheets, internal communications, external communications, studies, surveys, working papers, and other

physical or electronic data of any kind. All parties and their counsel are invited to attend. The oral examination will continue from day to day until completed.

DATED this 19th day of May, 2023.

/s/ *Robert L. Harris*
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ *Candice M. McHugh*
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Chris M. Bromley*
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Sarah A. Klahn*
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 19th day of May, 2023, the above and foregoing, was served electronically as follows:

Idaho Dept. of Water Res.
PO Box 83720
Boise, ID 83720-0098
file@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING MOTION FOR RECONSIDERATION OF DENIAL OF CONTINUANCE**

BACKGROUND

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") and his *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order"). The Methodology Order revises the nine steps used to determine material injury to members of the Surface Water Coalition ("SWC"). The As-Applied Order predicts a shortfall for the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to December 30, 1953.

Anticipating that one or more parties would request a hearing pursuant to Idaho Code § 42-1701A(3) in response to one or both of the orders, the Director also issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Notice of Hearing") on April 21, 2023. The Notice of Hearing scheduled a prehearing conference for April 28, 2023, and an in-person evidentiary hearing on the Methodology Order and As-Applied Order for June 6–10, 2023.

Immediately before the April 28, 2023 prehearing conference, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, and Wendell (collectively the "Cities") filed a *Motion for Continuance* requesting that the Director continue the June 6-10 evidentiary hearing "until a date in December or January 2024 . . . ." Mot. for Continuance at 8.

During the April 28, 2023 prehearing conference, the Cities presented argument in support of their *Motion for Continuance*. The Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Groundwater District ("BJGD"), and McCain Foods orally moved to join the Cities' *Motion for Continuance*. The Cities requested that the hearing be delayed approximately six months. *Id*. The Cities asserted that additional time is needed to conduct discovery, prepare witnesses, properly evaluate the updated Methodology Order and As-Applied Order, and because one of its attorneys (Ms. Candice McHugh) will be unable to appear in person June 6–10. *Id*. at 4–6. The Cities further asserted the Director should grant their

request because no exigency exists given the above-average snowfall this year. *Id*. at 6–8. The SWC opposed the Cities' motion, arguing the hearing should remain as scheduled on June 6–10, 2023.

The Director orally denied the Cities' request to delay the hearing until December or January 2024. The Director stated he was, however, willing to move the hearing anytime within the first three weeks of June 2023 if all the parties agreed to move the hearing. In denying the Cities' request, the Director emphasized his court-ordered obligation to timely predict water supplies and issue orders timely to ensure senior water right holders are protected.

On May 5, 2023, the Director issued an *Order Denying the Cities' Motion for Appointment of Independent Hearing Officer and Motion for Continuance and Limiting Scope of Depositions* ("Order Denying Motion to Continue"). In the order, the Director memorialized his oral denial of the Motion for Continuance but advised that he was willing to move the hearing within the first three weeks of June 2023 if the parties filed a stipulated motion requesting the change. *Order Denying Motion to Continue* at 2. By separate order, the Director authorized Ms. McHugh to appear at the hearing remotely. Scheduling Order and Order Authorizing Remote Appearance at Hr'g at 3.

On May 5, 2023, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, and Wendell along with IGWA, BJGD, and Bingham Groundwater District (collectively the "Groundwater Users") filed a *Motion for Reconsideration of Denial of Continuance* ("Motion for Reconsideration") asking the Director to reconsider his order denying the request to continue the hearing. In support of its Motion for Reconsideration, the Groundwater Users filed declarations from the following individuals: Candice McHugh, counsel for the Coalition of Cities, Amalgamated Sugar Company, and McCain Foods; Skyler Johns, Counsel for BJGD; Thane Kindred and Bryce Contor, experts for BJGD; and Sophia Sigstedt and Jaxon Higgs, experts for IGWA.

On May 8, 2023, the SWC filed *Surface Water Coalition's Opposition to Groundwater Users' Motion for Reconsideration of Order Denying Motion for Continuance* ("Objection").

ANALYSIS

Rule 560 of the Department's Rules of Procedure grants the presiding officer the discretion to continue a proceeding. IDAPA 37.01.01.560. Rules 710 and 711 advise that scheduling orders are interlocutory orders, and that the presiding officer has the discretion to "rescind, alter or amend any interlocutory order…". IDAPA 37.01.01.710–711.

A. Unavailability of Counsel and Experts.

The Groundwater Users contend the June 6–10 hearing should be continued due to the unavailability of numerous witnesses and an attorney. *Motion for Reconsideration* at 3–5. The Groundwater Users further contend that a failure to continue the hearing will result in prejudice to the Groundwater Users. *Id.* at 5. To support their unavailability argument, the Groundwater Users submitted declarations from the following individuals:

Jaxon Higgs. Mr. Higgs is a hydrogeologist who provides technical analysis to IGWA. Decl. of Jaxon Higgs ¶¶ 3, 4. Mr. Higgs advises that he will be on a road trip vacation in Mexico from May 27–June 10 and will be unavailable to attend the hearing on June 6-10. *Id*. ¶ 7.

Sophia Sigstedt. Ms. Sigstedt is a hydrogeologist who provides technical analysis to IGWA. Decl. of Sophia Sigstedt ¶¶ 2, 3. Ms. Sigstedt advises she is dealing with a medical condition that prohibits her from leaving her home state of Colorado until July 10, 2023, and limits the amount of work she can perform during this time. *Id*. ¶ 15.

Candice McHugh. Ms. McHugh is an attorney representing the Coalition of Cities, Amalgamated Sugar, and McCain Foods. Decl. of Candice McHugh ¶ 2. Ms. McHugh advises that her partner Chris Bromley has an argument before the Idaho Supreme Court on June 5, and will need the week of May 29 to prepare for that argument. *Id*. Ms. McHugh advises that she will be out of state from June 4–8, and that she will be flying "virtually all day" on June 4 and June 8. *Id*. ¶ 6. Ms. McHugh contends that, given their schedules, she and Mr. Bromley will be unable to fully and fairly represent their clients if the hearing is held on June 6–10. Decl. of Candice McHugh ¶ 7.

In response, the SWC points out that the Department has already authorized Ms. McHugh to appear remotely to accommodate her travel, and that the SWC would stipulate to Ms. Sigstedt's appearing remotely to accommodate her medical condition. *Objection* at 8–9 n.8.

The Director recognizes that some flexibility with witnesses and attorneys is necessary. Ms. McHugh has already been granted the ability to appear remotely. Mr. Bromley, Ms. McHugh's law partner, will be available to attend on the one day that Ms. McHugh will be traveling and unavailable. Clients of the McHugh Bromley law firm will have representation during all days of the hearing. Regarding the participation by experts, the Director will authorize Ms. Sigstedt and Mr. Higgs to participate in the hearing remotely.

B. Insufficient time to prepare.

The Groundwater Users next assert that the June 6–10 hearing should be continued because they are without sufficient time to prepare, resulting in prejudice. *Motion for Reconsideration* at 5–6. To support this claim, the Groundwater Users submitted declarations from the following individuals:

Greg Sullivan. Mr. Sullivan is an expert for the Coalition of Cities and the City of Pocatello. Decl. of Greg Sullivan ¶¶ 3–5. Mr. Sullivan asserts he will be on a trip in Europe from May 17–June 3, leaving him an insufficient amount of time to prepare for a hearing. *Id*. ¶¶ 20–21.

Mr. Sullivan estimates he needs 3–5 months to prepare for the hearing. *Id*. ¶ 25.

Bryce Contor. Mr. Contor is a hydrologist who consults for BJGWD. Decl. of Bryce Contor ¶¶ 2, 6. Mr. Contor asserts he does not have time to perform an adequate technical review of the information prior to the hearing. *Id*. ¶¶ 8, 10.

Thane Kindred. Mr. Kindred is a geologist hired by BJGWD to provide technical advice and conduct a comprehensive review of the Methodology Order. Decl. of Thane Kindred ¶¶ 3, 5. Mr. Kindred advises he will not have sufficient time to conduct his review prior to the June 6–10 hearing. *Id*. ¶¶ 5, 7. Mr. Kindred further advises he does not have all the information he needs and will need at least two months to conduct his analysis. *Id*. ¶¶ 5, 7.

Sophia Sigstedt. Ms. Sigstedt is a hydrogeologist who provides technical analysis to IGWA. Decl. of Sophia Sigstedt ¶¶ 2, 3. Ms. Sigsted advises she would like to analyze *inter alia* the number of acres irrigated by the Twin Falls Canal Company, the Forecast Supply Predictors from 1900–2022, and whether the data supports the Director's decision to use 2018 as the Baseline Year. *Id*. ¶¶ 8–10. Ms. Sigstedt advises she lacks sufficient time to conduct her analysis prior to the hearing on June 6–10, and further advises she will need until October of 2023 to complete her work. *Id*. ¶ 14.

Skyler Johns. Mr. Johns is an attorney for BJGWD. Decl. of Skyler Johns ¶¶ 2. Mr. Johns asserts he did not receive "formal notice" from the Department that it would transition from steady-state to transient-state analysis. *Id*. ¶ 5. Mr. Johns advises that neither himself nor his experts were part of the technical working group. *Id*. Mr. Johns further advises that as of the date he signed his declaration (May 5, 2023), he did not have access to all the documents he needs to conduct a review and prepare his legal arguments. *Id*. ¶ 7. Mr. Johns contends he will need at least 6 months to prepare for the hearing, and that without such time his clients will be prejudiced. *Id*. ¶¶ 8–10.

Candice McHugh. Ms. McHugh is an attorney representing the Coalition of Cities, Amalgamated Sugar, and McCain Foods. Decl. of Candice McHugh ¶ 2. Ms. McHugh further advises that "[t]he hearing as currently set will not allow me to assist or attend the hearing in any meaningful manner and prejudices the interest of McHugh Bromley, PLCC's clients." *Id*. ¶ 9.

The SWC responds that six weeks is plenty of time to prepare for a hearing, as evidenced by the fact that the First Methodology Order in this exact case was issued on April 7, 2010, with

an evidentiary hearing held on May 24, 2010. *Objection* at 7–8. The SWC further advises that this type of scheduling in a conjunctive management administration should surprise no one. *Id*.

While the Director recognizes that the current schedule may be a burden on the parties, it is a burden being born by all parties, both the senior water users and the junior ground water users. Plus, an accelerated schedule is not unheard of in water administrative proceedings. Furthermore, while Bonneville- Jefferson Groundwater District has decided to hire new counsel and hire its own new experts, this does not justify a continuance. BJGD has long been a party to this proceeding. The Director will not allow a junior ground water user that has long been a party to the proceeding to delay administration because new counsel and experts are hired.

The ground water users claim being surprised by changes to the Methodology Order. In the fall of 2022, the Department conducted multiple presentations regarding possible amendments to the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order"). The Director also publicly expressed his intention to update the Fourth Methodology Order. The parties were notified that the Director was considering changes and the issues being considered by the Director. The Department distributed data, technical analysis, and recommendations to the parties' technical experts. For some of the Department presentations, the experts submitted comments to the Department on the proposed changes. As the declarations show, the experts for IGWA and the Cities have represented those entities for many years. The experts have a familiarity with the methodology order. After considering the need of the senior water user to have timely administration versus the ground water users desire to have more time to prepare for hearing, the Director will adhere to the current schedule.

C. Current Conditions and Lack of prejudice to Groundwater Users.

In both their Motion for Continuance and Motion for Reconsideration, the Groundwater Users argue that there will be no prejudice to the senior surface water users this year because of high snowpack. The Director disagrees that high snowpack means the SWC will not be injured. While there is a good snowpack in the hills above the ESPA, snowpack is only part of the SWC's water supply, and recharge from the aquifer is at a record low. Additionally, southern Idaho is emerging from a two-year drought, and the existing storage supply going into this irrigation season is low. Forecasters are uncertain whether the storage supply system will fill this year. The Director agrees with the SWC that the "current snowpack does not tell the whole story." *Objection* at 9–10.

The Groundwater Users also contend that they have provided "sufficient mitigation this season so little to no injury will occur to the senior users." *Motion for Reconsideration* at 3. Citing to IGWA's *Notice of Ground Water District Mitigation* ("Notice of Mitigation"), the Groundwater Users argue that IGWA has "enough water to mitigate for its 2021 breach and for the predicted shortfall for the upcoming 2023 season." *Id*. at 6. The Groundwater Users state, "[G]iven the fact that IGWA has enough water for this season to offset the entire injury forecasted to [Twin Falls Canal Company] … the Director should consider that the junior water users 'as a whole' are complying with mitigation plans." *Id*. at 7.

The problem with this argument is that IGWA's Notice of Mitigation does not say that it is agreeing to provide storage water "to offset the entire injury forecasted to [Twin Falls Canal Company]." IGWA's Notice of Mitigation states that it is acting on behalf of its member ground water districts and that IGWA is mitigating for its districts' "proportionate share" of the demand shortfall. *Notice of Mitigation* at 1–3.

But even more important, the Director is currently reviewing IGWA's Notice of Mitigation to determine whether the proposal would mitigate for the 2023 demand shortfall to the SWC. The Notice of Mitigation has several potential shortcomings:(1) Instead of relying on one single mitigation plan for all members, individual ground water districts are seeking to mitigate under different mitigation plans. This "hybridization" of mitigation plans presents serious questions about whether mixing of mitigation plans is allowable and whether there is compliance with a mitigation plan at all. (2) One of the mitigation plans, proposed in 2009 and approved in 2010, could be read to require IGWA, not individual ground water districts, to supply the entire demand shortfall to the SWC from rented storage water. The 2010 order approving the mitigation plan does not recognize a reduced mitigation obligation for IGWA based on IGWA's share of the mitigation obligation. Furthermore, the approved 2010 mitigation plan does not recognize an additional division of IGWA's obligation into fractional mitigation components for each of IGWA's members. (3) The ground water districts wanting to mitigate pursuant to the 2016 Stipulated Mitigation Plan have proportionately determined their individual obligations. But the mitigation plan does not recognize proportionate sharing of the storage water component. Further, the ground water districts are ignoring the additional requirement of an additional 30,000 acre-feet of storage to be rented for mitigation that was a component of an agreement to cure a breach of the 2016 Stipulated Mitigation Plan. (4) Jefferson-Clark Groundwater District is claiming to mitigate with storage water but none of the storage water agreements presented to the Director are in the name of Jefferson-Clark Groundwater District. (5) The Notice of Mitigation was filed by Thomas Budge on behalf of all IGWA members and purports to provide storage agreements for BJGWD and BGWD. Yet both BJWD and BGWD have recently hired independent counsel. It is unclear therefore whether IGWA's Notice of Mitigation would bind BJGWD and BGWD. Moreover, as the SWC observes, there are concerns about whether IGWA breached the 2016 Stipulated Mitigation Plan. In conclusion, it is far from clear that the IGWA's Notice of Mitigation complies with the requirements of an approved mitigation plan.

The Director has a responsibility to timely respond to injury incurred by senior water users and there should be no unnecessary delays in that process. *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, 143 Idaho 862, 874, 154 P.3d 433, 445 (2007). "Clearly, a timely response is required when a delivery call is made and water is necessary to respond to that call." *Id*. The Department also agrees with the SWC that "[i]n practice, an untimely decision effectively becomes the decision; i.e. no decision is the decision." *Objection* at 3 (citing *Order on Plaintiffs' Motion for Summary Judgment* at 97 (*AFRD#2 et al. v. IDWR*, No. CV-2006-600 (Gooding County Dist. Ct. Idaho June 2, 2006)). The Director will not be issuing a curtailment order until after a hearing in this matter so that junior ground water users have the opportunity for a hearing before being curtailed. To ensure timely administration for predicted material injury in this current irrigation season, the Director cannot agree to continue the hearing beyond

June. The Director reiterates that he is willing to work with the parties to move the hearing to any time within the first three weeks of June 2023.[1]

ORDER

Based on the forgoing discussion, IT IS HEREBY ORDERED that the Groundwater Users' *Motion for Reconsideration of Denial of Continuance* is DENIED.

IT IS FURTHER ORDERED that Sophia Sigstedt and Jaxon Higgs may appear virtually by video link on June 6–10, 2023. Sarah Tschohl, on behalf of the Department, will email the remote participation link to Ms. Sigstedt and Mr. Higgs no later than May 30, 2023.

DATED this 19th day of May 2023.

Gary Spackman
Director

[1] The Groundwater Users allege that the Director has "delegated to the SWC the ability to veto a continuance to a reasonable hearing date." *Motion for Reconsideration* at 7. This is inaccurate. Consistent with the obligation to timely respond, the Director settled on a hearing date that would provide the parties time to prepare for hearing but also allow for curtailment during this irrigation season if necessary. The Director has repeatedly expressed his willingness reset the hearing within the first three weeks of June.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 19th day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
May 22, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB #7928)
SOMACH SIMMONS & DUNN, P.C.
303-449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Dylan Anderson (ISB# 9676)
Dylan Anderson Law
208-684-7701
dylan@dylanandersonlaw.com
Attorney for Bingham Groundwater District

Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
208-232-6101
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
208-552-6442
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
Attorneys for Bonneville-Jefferson Ground Water District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **JOINT NOTICE OF CONTINUED DEPOSITION DUCES TECUM OF MATTHEW ANDERS, P.G. (Day 2)**

TO: Matthew Anders and all counsel of record.

PLEASE TAKE NOTICE that on **May 26, 2023, from 9:00 a.m. – 5:00 p.m.**, counsel for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell (collectively, the "Coalition"), City of Pocatello, City of Idaho Falls, Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Ground Water District, and Bingham Groundwater District in the above-entitled action will continue to take the deposition of MATTHEW ANDERS, P.E., in accordance with the Order Authorizing Discovery issued April 21, 2023, in this matter, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and Idaho Rules of Civil Procedure 26, 30(a), and 34, and continue from day to day thereafter until completion, at the offices of the **Idaho Department of Water Resources, 322 E. Front Street, Boise, Idaho 83702**. This deposition will be "hybrid," with the witness, court reporter, and some attorneys present at the Idaho Department of Water Resources ("IDWR" or "Department"), and others present via the Zoom video platform, hosted by M&M Court Reporting. Participants will receive a Zoom link via email from M&M the day before the deposition.

DATED May 22, 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

RACINE OLSON, PLLP

By /s/ Thomas J. Budge
Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)

Attorneys for Idaho Ground Water Appropriators, Inc.

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

OLSEN TAGGART PLLC

By /s/ Skyler C. Johns
Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB#8551)

Attorneys for Bonneville-Jefferson Ground Water District

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

DYLAN ANDERSON LAW

By /s/ Dylan Anderson
Dylan Anderson (ISB# 9676)

Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 22th day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Courtesy Copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

RECEIVED
May 22, 2023
DEPARTMENT OF
WATER RESOURCES

Candice M. McHugh, ISB # 5908
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
380 S. 4th St., Ste. 103
Boise, ID 83702
(208) 287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Sarah A. Klahn, ISB # 7928
SOMACH SIMMONS & DUNN
2033 11th St., Ste. 5
Boulder, CO 80302
(303) 449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris, ISB # 7018
HOLDEN KIDWELL HAHN & CRAPO
100 Riverwalk Dr., Ste. 200
PO Box 50130
Idaho Falls, ID 83405
(208) 523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **CITIES' AMENDED I.R.C.P 30(b)(6) NOTICE OF TAKING DEPOSITION DUCES TECUM OF TWIN FALLS CANAL COMPANY**

TO: Twin Falls Canal Company and its counsel of record:

PLEASE TAKE NOTICE that counsel for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and

Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"), will take the deposition of the Twin Falls Canal Company ("TFCC") before M&M Court Reporting ("M&M") in accordance with the *Order Authorizing Discovery* issued on April 21, 2023, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and IRCP 26, 30(a), 30(b)(6), and 34. The deposition will commence at 10:00 a.m. on May 25, 2023, and continuing from day to day thereafter until completion, at the office of TFCC, 357 6th Ave. W., Twin Falls, Idaho. The deponent must be present in person. The court reporter will participate in person. Attorney may participate in person or via the Zoom video platform, hosted by M&M. Participants will receive a Zoom link via email from M&M the day before the deposition.

TFCC is required to designate one or more persons to testify on its behalf, and may set forth, for each person designated, the matters on which the person will testify, including but not limited to the following:

1. TFCC project efficiencies and how they have changed over time;
2. TFCC irrigation water distribution system, including how it has changed over time;
3. TFCC irrigation water delivery records including collection and maintenance of such records;
4. Identification of any and all acres within the TFCC service area that have been "hardened", i.e., can no longer produce crops due to the construction of permanent structures and/or acres that are enrolled in government programs, including but not limited to Conservation Reserve Program and/or Conservation Reserve Enhancement Program, thus foreclosing irrigation;
5. Information associated with TFCC farmer's reliance on sources of irrigation water other than deliveries from TFCC, including but not limited to supplemental and/or primary ground water wells;

6. Records related to releases at Spring Creek and other releases of water below Milner dam from the TFCC system;

7. Discharge data and information including points of discharge and volume records, NDPES documents and reports;

8. Records maintained by TFCC ditch riders and/or other TFCC employees engaged in distributing water to TFCC farmers;

9. Records related to private leases of storage water from TFCC to entities other than TFCC;

10. Records related to leases of storage water from TFCC to Water District 01;

11. Identification of and records related to installed hydropower projects within the TFCC service area that use water diverted by TFCC to generate power;

12. Records of TFCC board meetings;

13. Records of TFCC-related revenues associated with hydro-power generation; and

14. Information related to discussions with IDWR staff, attorneys or the Director regarding the SWC delivery call, IGWA's "breach", need to update the methodology and use of modelling to address injury to TFCC, and TFCC's need for water.

In addition to making a deponent(s) available to answer questions on these topics, the Cities request that the deponent(s) provide any and all supporting documentary materials related to the above topics in electronic format **three (3) days prior** to the scheduled deposition to facilitate efficient examination. To the extent this request is not practical for some reason, the Deponent must bring such documents to the deposition. Electronic format is preferred.

For purposes of this notice, the term "document" is to be interpreted as broadly as Idaho Rule of Civil Procedure 34 allows and includes all written or graphic matter, whether physical or electronic, however produced, including, but not limited to, letters, emails, text messages, notes, memoranda, meeting minutes, reports, directives, proposals, summaries, analyses, spreadsheets, internal communications, external communications, studies, surveys, working papers, and other

physical or electronic data of any kind. All parties and their counsel are invited to attend. The oral examination will continue from day to day until completed.

DATED this 22nd day of May, 2023.

/s/ *Robert L. Harris*
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ *Candice M. McHugh*
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Chris M. Bromley*
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ *Sarah A. Klahn*
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 22nd day of May, 2023, the above and foregoing, was served electronically as follows:

Idaho Dept. of Water Res.
PO Box 83720
Boise, ID 83720-0098
file@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
May 22, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **MOTION TO RE-SET HEARING DATES**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"), Idaho Ground Water Appropriators ("IGWA") by and through its attorney of record Thomas J. Budge,

Bingham Ground Water District by and through its attorney, Dylan Anderson and Bonneville-Jefferson Ground Water District, by and through its attorney Skyler Jones, (collectively the "Parties') and request the hearing dates for the above captioned matter be moved to June 19-23, 2023..

As stated in his recent *Order Denying Motion for Reconsideration of Denial of Continuance*, ("Order Denying Reconsideration") the Director states that "he is willing to work with the parties to move the hearing to anytime within the first three weeks of June 2023." Id. at 6.[1] The Director stated that a hearing within the month of June will "ensure timely administration for predicted material injury in this current irrigation season." *Id.* While the Parties to this Motion do not believe that moving the hearing dates back comport with the necessary due process this case requires and do not hereby waive any arguments relative to the process, the Parties believe that moving the hearing date back is needed and necessary for them to better prepare and accommodate their experts. The Parties conferred with counsel for the Surface Water Coalition but could not reach agreement on a continuance.

The bases for Parties' request to re-set the hearing to June 19-23 are as follows:

1. IGWA's expert, Jaxon Higgs will be available for hearing, whereas currently he will be out of the country. See previously filed Declaration of Higgs. Re-setting the dates will at least allow one of IGWA's experts to attend the hearing in-person which is vital to effectively assist at hearing and evenings. Currently, none of IGWA's experts can attend the hearing in person. Id. See too previously filed Declaration of Sigstedt.

2. The Cities' expert, Greg Sullivan returns on June 2 from an overseas trip. By

[1] To be clear, counsel for IGWA and counsel for the Cities on multiple separate occasions tried to get the SWC to agree to move the hearing to a more reasonable time period but were met with either outright denials or other requests that impeded the ability to reach agreement among all the parties.

resetting the hearing to June 19, Mr. Sullivan will be available to assist the Cities with trial preparation. In addition, Mr. Sullivan's expert report would be due June 12 which gives him 10 days to finalize such report upon his return, whereas currently his report is due when he is out of the country. See previously filed Declaration of Sullivan.

3. The Cities' counsel, Candice McHugh will be available to both assist in witness preparation and to attend the hearing in person. See previously filed Declaration of McHugh.[2]

4. The Cities have filed a *Petition for Judicial Review* and *Motion for Stay Based on IDWR's Interference with Lawful Discovery* and *Complaint for Declaratory Relief and Writ of Prohibition and Petition for Writ of Mandamus*. Resetting the hearing to June 19 will allow due consideration of the pending Complaint and Writ Action.

5. IGWA and the GWDS have filed a *Petition for Judicial Review* and have also filed: Ground Water Districts' *Motion to Compel, Ground Water Districts' Motion for Order to Show Cause, Ground Water Districts' Motion for Stay, Ground Water Districts' Motion for Injunctive Relief, Ground Water Districts' Motion for Expedited Decision*. Moving the hearing dates back will allow due consideration of the various Motions.

CONCLUSION

Based on the foregoing, the Parties to this Motion request that the Director re-set the hearing dates as requested.

In addition, the Parties to this Motion recognize that the Surface Water Coalition has a right to respond to this motion but given the compressed hearing schedule, the Parties request

[2] The resetting will also facilitate Mr. Bromley's preparation for the Supreme Court argument on June 5 in the Basin 37 matter.

that the Director order them to respond by the end of business Wednesday, May 23, 2023, and issue an order on this Motion by Friday, May 26, 2023.

Submitted this 22nd day of May, 2023.

/s/ Sarah Klahn
_____
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

/s/ Candice M. McHugh
_____
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Robert Harris
_____
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ Chris M. Bromley
_____
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Thomas J. Budge
_____
Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

/s/ Skyler C. Johns
_____
Skyler C. Johns
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 22nd day of May, 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Idaho Dept. of Water Res.

file@idwr.idaho.gov
garrick.baxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Dylan Anderson
Dylan Anderson Law PLLC
P.O. Box 35
Rexburg, Idaho 83440
dylan@dylanandersonlaw.com

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

/s/ Candice McHugh
_____
Candice M. McHugh

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

RECEIVED
May 23, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
tj@racineolson.com
elisheva@racineolson.com
Tel: (208) 232-6101
Attorneys for IGWA

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
P.O. Box 35
Rexburg, Idaho 83440
Tel: (208) 684-7701
dylan@dylanandersonlaw.com
Attorney for Bingham Groundwater District

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
1449 E 17th St, Ste A / P.O. Box 3005
Idaho Falls, Idaho 83403
Tel: (208) 552-6442
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **GROUND WATER DISTRICTS' I.R.C.P. 30(b)(6) NOTICE OF TAKING DEPOSITION DUCES TECUM OF TWIN FALLS CANAL COMPANY**

To: Twin Falls Canal Company and its counsel of record:

PLEASE TAKE NOTICE that counsel for Idaho Ground Water Appropriators, Inc., Bingham Ground Water District, and Bonneville-Jefferson Ground Water District will join in taking the deposition of Twin Falls Canal Company ("TFCC") as set forth in the *Cities' I.R.C.P. 30(b)(6) Notice of Taking Deposition Duces Tecum of Twin Falls Canal Company* served May 19, 2023, in this matter. Please provide to said counsel via email by 12:00 p.m. May 24, 2023, copies of all documents requested in the Cities' deposition notice. In addition to documents responsive to Cities' deposition notice, please provide the following:

A. A map, image, schematic, diagram, survey, or other such illustrative document of TFCC's water storage and delivery system;
B. Copies of any document reporting or cataloging TFCC's spill sites and the measurements relating to TFCC's spill sites;
C. An Idaho Department of Water Resources ("IDWR") water report and map for each water right owned by TFCC;
D. An IDWR water report and map for each water right delivered through TFCC's water storage and delivery system that is not owned by TFCC;
E. Copies of TFCC's bylaws and any other company governing guidelines, rules, articles, or documents;
F. Copies of all water delivery agreements, wheeling agreements, and other agreements by which TFCC delivers water under water rights not owned by TFCC;
G. A copy of the 2006 Settlement Agreement among the canal companies;
H. Copies of all letters, agreements, memoranda, and other documents between TFCC and Idaho Power Company, or any other power company, relating directly or indirectly to the delivery of water through TFCC's water storage and delivery system, the discharge of water from TFCC's water storage and delivery system, or the generation of hydropower using TFCC's water storage and delivery system.

For the purposes of this notice, the term "document" is the same as that described in the Cities' deposition notice.

DATED this 23rd day of May, 2023.

RACINE OLSON, PLLP

By:_____
Thomas J. Budge
Attorneys for IGWA

OLSEN & TAGGART PLLC

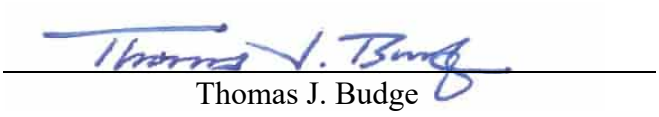
By:_____
Signed for: Skyler C. Johns
Attorneys for Bonneville-Jefferson Ground Water District

DYLAN ANDERSON LAW

By:_____
Signed for: Dylan Anderson
Attorney for Bingham Ground Water District

CERTIFICATE OF SERVICE

I hereby certify that on this 23rd day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
May 23, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S OPPOSITION TO GROUNDWATER USERS' MOTION TO RE-SET HEARING DATES**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition," "Coalition," or "SWC"), by and through counsel of record, and pursuant to the Department's Rules of Procedure (IDAPA 37.01.01.220) hereby file the following response in opposition to the *Motion to Re-set Hearing*

Dates ("*Motion*") filed jointly by the Coalition of Cities, Cities of Idaho Falls and Pocatello, the Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Ground Water District, and Bingham Ground Water District (hereinafter collectively referred to as "Groundwater Users") on May 22, 2023. This response is supported by the attached exhibits and the *Declaration of David Colvin* filed together herewith. For the reasons set forth below, the Director should deny the Groundwater Users' motion, again.

BACKGROUND / APPLICABLE RULE

The Groundwater Users identify no basis or applicable rule for their present "motion." Presumably it is a second motion for reconsideration of the Director's denial of their original motion for continuance. As indicated in the *Order Denying Motion for Reconsideration of Denial of Continuance* ("*Reconsideration Order*"), the Director has discretion to "rescind, alter or amend any interlocutory order" pursuant to Rules 710 and 711. *See* IDAPA 37.01.01.560. For the reasons contained in that *Order* and as set forth below, the Director should again deny the present effort to delay the hearing in this case.

The Surface Water Coalition submits the Director properly exercised his discretion in denying the Groundwater Users' repeated requests and that there is nothing in the present *Motion* that would warrant reconsidering the prior reasoning or decisions.

ARGUMENT

I. The Groundwater Users Offer No New Facts or Argument Warranting a Delay in this Hearing and Ultimately Conjunctive Administration of Junior Priority Ground Water Rights During the 2023 Irrigation Season.

The Groundwater Users offer no new facts that would justify any further delay in this case. Instead, they repeat the same claims the Director fully considered and addressed in the *Reconsideration Order*. *See generally*, *Motion* at 2-3. While the Director provided for remote

participation for consultants that cannot travel to Idaho or will be voluntarily out-of-state at that time, that accommodation is overlooked.[1] *See Order* at 7. The Groundwater Users are familiar with remote participation as evidenced by their counsel's participation in the depositions of IDWR staff last week as well as their consultants full participation in the Technical Work Group meetings hosted by the Department over a six-week period beginning in November of 2022. In fact, it was at those meetings where information was presented that ultimately resulted in the modifications to the Methodology in the *Fifth Order*.

The Groundwater Users ask the Director to move the hearing presently set for June 6-10 to June 19-23.[2] *Motion* at 2. However, even with this delay they "do not believe that moving the hearing dates back comport with necessary due process this case requires and do not hereby waive any arguments relative to the process." *Id.* In other words, the Groundwater Users admittedly really don't believe moving the hearing two weeks matters or addresses the concerns alleged. Perhaps if the requested "re-set" acknowledged satisfaction of alleged due process concerns, the motion and its basis would look differently. However, they make no such claim. The reality is as pointed out in the Groundwater Users' briefing is that they want the delay, not to prepare for hearing, <u>but to primarily provide more time for the processing of their district court filings</u>.

[1] The Groundwater Users' request to move the hearing to June 19th would still require Ms. Sigstedt to participate remotely as she indicated she could not travel out-of-state until mid-July. *See Sigstedt Dec.* Accordingly, that is not a reason to reconsider the Director's order. Moreover, IGWA admits that "Jaxon Higgs will be available for hearing." *Motion* at 2. Even though Mr. Higgs "will be out of the country," the Director's remote accommodation addresses that concern. *See Order* at 7. Mr. Higgs does not indicate where he will be in Mexico but presumably he would be located in either the Mountain or Central time zone, i.e. a one hour difference from Boise, Idaho.

[2] The Coalition disputes the Groundwater Users' characterization of their discussions concerning moving the hearing date. *See Motion* at 2, n. 1. Each time the Groundwater Users' counsel requested moving the hearing, counsel for the Coalition advised of the problems with delaying administration to their clients' senior water rights and the fact that IGWA's *Notice of Mitigation* did not cover all affected junior ground water rights. As acknowledged by the Director, senior water right holders are entitled to timely administration and the schedules of counsel and consultants do not trump that statutory duty.

Since the denial of their original motion for reconsideration the Groundwater Users have filed three separate lawsuits against the Director and the Department in Ada County District Court. *See generally, IGWA et al. v. IDWR*, Case No. CV01-23-8187; *City of Pocatello et al. v. IDWR*, Case No. CV01-23-8258; *City of Pocatello et al. v. IDWR*, Case No. CV01-23-8306. In those actions the Groundwater Users seek among other relief, a stay, injunctive relief, and writs of mandamus and prohibition. Despite exercising their statutory rights and requesting an administrative hearing on the Director's *Fifth Order* pursuant to Idaho law, the Groundwater Users now ask the Director to delay that hearing in order to accommodate their lawsuits against the State of Idaho. *Motion* at 3 ("[r]esetting the hearing to June 19 will allow due consideration of the pending Complaint and Writ Action"). Stated another way, the Groundwater Users are not declaring the two-week delay would satisfy their due process claims, but instead are effectively asking the Director to voluntarily delay the administrative case proceeding so that the district court might enjoin it altogether. Whereas the State of Idaho and all parties involved will likely spend significant time and resources on these cases and the multitude of motions, it is likely such matters will be dismissed as a matter of law. *See e.g. Order Denying Application for Temporary Restraining Order* (*SVGWD v. IDWR*, Blaine County Dist. Ct., Fifth Jud. Dist., Case No. CV07-21-243, May 27, 2021); *Order Granting Motion to Dismiss* (*IGWA v. IDWR*, Jerome County Dist. Ct., Fifth Jud. Dist., Case No. CV27-22-945, Dec. 8, 2022) ("Since IGWA has an adequate administrative remedy available to it which has not been exhausted under Idaho Code § 42-1701A(3), its *Petition* must be dismissed"). The Director should see through the Groundwater Users' requested "re-set" for what it is, a delay tactic that will cost all parties substantial resources and attorneys fees, and deny it accordingly.

Most importantly, as noted before, any delay in the hearing would effectively delay conjunctive administration during the 2023 irrigation season. *See generally*, *SWC Opposition to Groundwater Users' Motion for Reconsideration* (May 8, 2023). Whereas the Ground Water Districts' breach of the 2021 Stipulated Mitigation Plan took several months to address, it created great concern for potential curtailment at the end of the growing season. Any additional delay in this hearing has the potential to re-create that same situation, including for groundwater users that do not have an approved mitigation plan.

Indeed, the Director has stated that he "will not be issuing a curtailment order until after a hearing in this matter so that junior ground water users have the opportunity for a hearing before being curtailed." *Order* at 6. This may include addressing the Ground Water Districts' 2022 breach of the Stipulated Mitigation Plan. Although over-pumping by certain Districts last year will have continuing impacts on the Snake River into this irrigation season, any delay in administration could reduce the effectiveness of any curtailment remedy if necessary.

For example, even if the Director issued a final order within a week of the close of the scheduled hearing, any actual curtailment could be delayed beyond that timeframe. For example, in 2022, after issuing the Steps 1-3 As Applied Order on April 20, 2022 forecasting a projected injury of 162,000 acre-feet, the Director stated that junior ground water users who did not establish their ability to mitigate by May 1, 2022 would be curtailed effective at 12:01 a.m. on May 20, 2022. *See Final Order Curtailing Ground Water Rights Junior to December 25, 1979* (CM-DC-2010-001; May 5, 2022). In other words, the actual curtailment was ordered to occur approximately two (2) weeks after the order was issued.[3] If a similar schedule were to apply here, delaying the hearing to June 19-23 could foreseeably forestall any required curtailment to

[3] The Director has ordered curtailment to occur sooner within the issuance of an order following hearing as evidenced in the Basin 37 administration case. *See Final Order* (Docket No. AA-WRA-2021-001, June 28, 2021).

the middle of July. This sort of delay in administration is unacceptable to the Coalition and their landowners and shareholders, particularly for entities like TFCC that typically rely solely on reach gains from ESPA aquifer discharges for the source of their natural flow water rights. Given the trends over the last several years, it is likely that natural flow declines will continue and would not satisfy increasing irrigation demands throughout the summer.

Further, the Director aptly highlighted the problems and issues with IGWA's *Notice of Mitigation*. *See Order* at 6. Again, IGWA's representative districts do not represent and have no authority to mitigate for any junior groundwater right holders who are not members of a groundwater district. *See* I.C. § 42-5224(6). This is also confirmed in IGWA's filing wherein the districts represent they are only proposing to mitigate for their members. *See Notice* at 2-3 ("These districts' proportionate shares of the 63,645 acre-feet demand shortfall predicted in the April 2023 As-Applied Order are as follows . . ."). Stated another way, the *Notice* does not indicate that the districts will mitigate for the entire predicted demand shortfall of 75,200 acre-feet.

Any delay in the schedule would inevitably delay administration of any affected junior ground water rights not covered through an approved any effectively operating mitigation plan. Every day that passes furthers the potential that unmitigated pumping will continue to injure the Coalition's senior surface water rights without adequate mitigation as the irrigation season has already commenced throughout the various administrative basins across the ESPA.

Further exacerbating potential injury this year is the deteriorating water supply evidenced by the U.S. Bureau of Reclamation's revised May 1st streamflow forecast and the recently released 2023 aquifer sentinel well index. *See* Ex. A; *see also,* Ex. A to *Dec. of David Colvin*. The reduced surface water supply forecast due to increased temperatures and lack of spring

precipitation, as well as declining groundwater levels are likely reducing hydraulically connected reach gains in the Near Blackfoot to Minidoka reach of the Snake River this year. Moreover, it is still uncertain at this time whether storage water supplies will completely fill. *See* Ex. B. Delaying administration under such worsening conditions is not warranted and is contrary to Idaho law.

The Coalition submits the Director properly found that after "considering the need of the senior water user to have timely administration versus the ground water users desire to have more time to prepare for hearing, the Director will adhere to the current schedule." *Order* at 5 (emphasis added). The Coalition requests the Director to deny the Groundwater Users' motion to re-set the hearing accordingly and confirm that the hearing is still scheduled for June 6-10, 2023 as previously ordered.

II. Coalition Consultant Conflict.

In addition to the reasons explained above, delaying the hearing until June 19th would create a conflict for one of the Coalition's primary consultants, David Colvin, who will be out of the country and unavailable from June 8-21, 2023. *See Dec. of David Colvin*. Mr. Colvin has been assisting the Coalition for several years, including through the Technical Working Group process last fall and winter. Mr. Colvin is traveling to Vietnam, which would have an extreme time difference (13 hours ahead) making remote participation problematic. *See id.* Mr. Colvin has made travel arraignments and is planning on attending the hearing June 6-7. *See id.* Whereas moving the hearing would conflict with this schedule which has been set for weeks, the Coalition opposes the Groundwater Users' *Motion* on this basis as well.

CONCLUSION

In conclusion, the Coalition submits the Director properly exercised his discretion in denying the Groundwater Users' motion for continuance the first two times. The administrative hearing requested by the Groundwater Users and the Coalition was set over four weeks ago on April 21st and is set to begin two weeks from today. Since the parties have already been preparing for the current schedule, including deadlines set for May 30th and the June 6-10 hearing, there is no new reason to delay that schedule, particularly when the Groundwater Users are seeking that delay to accommodate their lawsuits against the State.

Time is still of the essence for conjunctive administration this irrigation season and given present aquifer levels and likely decreased reach gains this summer, any delay in the process stands to further harm the Coalition's senior surface water rights. The Coalition therefore submits the Groundwater Users' motion to re-set the hearing should be denied.

DATED this 23rd day of May, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

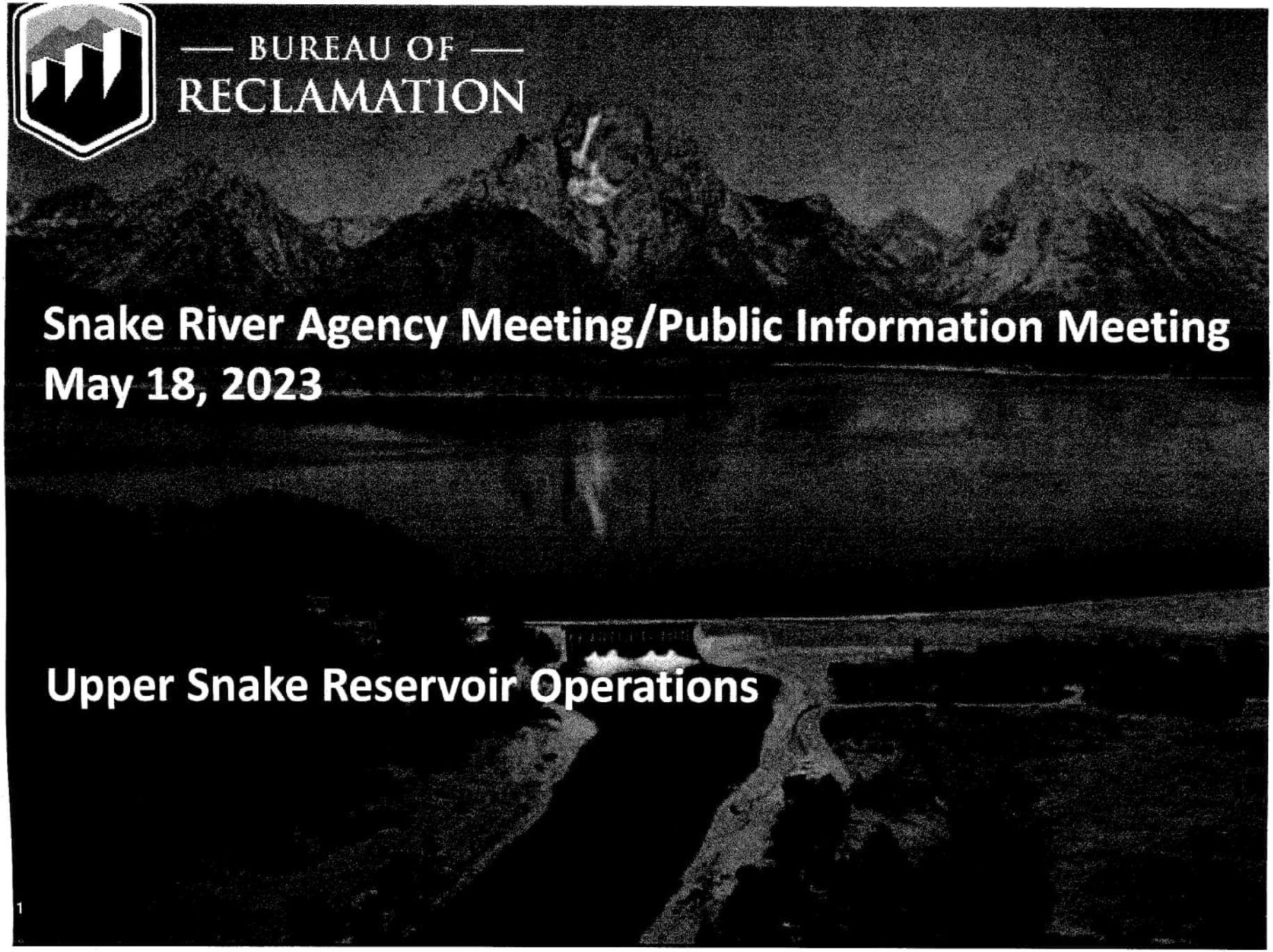
I hereby certify that on this 23rd day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

Exhibit A


BUREAU OF
RECLAMATION
Snake River Agency Meeting/Public Information Meeting
May 18, 2023
Upper Snake Reservoir Operations
1

000493

May 2023 Volume Runoff Forecasts

CURRENT MONTHLY FORECAST SUMMARY
MAY 1, 2023

FORECAST POINT	FORECAST PERIOD	1991-2020 AVERAGE (KAF)	FORECAST (KAF)	PERCENT NORMAL
*** HEISE	MAY-JUL	2898	3200	110%
JACKSON LAKE	MAY-JUL	701	734	105%
ISLAND PARK	MAY-JUL	158	180	114%
TETON	MAY-JUL	303	345	114%
*** RIRIE	MAY-JUN	35	100	289%
*** LITTLE WOOD	MAY-JUL	52	95	184%

* Coordinated with USACE

Mid-May Heise Forecast Reduced to 105% of Normal due to dry conditions

000494

Exhibit B

WATER REPORT – May 16, 2023

Total system natural flow continues to be sufficient to fill irrigation rights currently diverting water that are senior to the American Falls Reservoir 1921 priority storage right while continuing to accrue new storage into the 1917-priority Henrys Lake and 1913-priority Jackson Lake storage rights. It appears the American Falls storage right will reach 100% accrual near the end of this week, at which time the 1935-priority Island Park, 1936-priority Grassy Lake, 1939-priority Palisades, and perhaps the 1969-priority Ririe Reservoir space will begin accruing additional storage under their priorities.

All system natural flow is expected to be delivered to senior canal rights or stored to reservoir storage rights without spilling past Milner for at least the next few weeks. Whether the natural flow will be sufficient to fill the entire reservoir system and spill excess water past Milner probably won't be known for certain until mid-June.

CALENDAR

May 17th – Henrys Fork Watershed Council Meeting beginning at 9 AM at Fremont County Annex Building in St. Anthony or via Zoom link https://us02web.zoom.us/j/88172196681.

May 18th – Jackson Lake Operations Public Information Meeting beginning 3pm at Teton County Library in Jackson, Wyoming.

RECEIVED
May 23, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Facsimile: (208) 735-2444
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company and Twin Falls Canal Company

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DECLARATION OF DAVID COLVIN**

I, David Colvin, P.G., hereby declare and state as follows:

1. I am over the age of 18 and state the following based upon my own personal knowledge.

2. I am licensed as a Professional Geologist in the State of Idaho (#PGL-1453). I have a Bachelor of Science degree in Geology from Syracuse University. I have a Master of

Science degree in Environmental Science and Engineering from the Colorado School of Mines.

3. I am a Principal Hydrogeologist and the Groundwater Team Leader for LRE Water, located at 1221 Auraria Pkwy, Denver, CO 80204. I provide groundwater resource management and planning services.
4. I have been a member of the Eastern Snake Hydrologic Modeling Committee since 2011.
5. I have been retained by the Surface Water Coalition to provide Eastern Snake Plain Aquifer water resources support, including a review of the annual well measurement data that is part of the sentinel well index. Attached hereto as Exhibit A is a true and correct copy of the index graph and table that includes the most recent data gathered in the spring of 2023.
6. In November and December of 2022, I participated in Technical Work Group meetings related to Idaho Department of Water Resources (IDWR) staff considerations for methodology updates related to the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*.
7. I have reviewed the IDWR staff recommendations and materials related to the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* and the *April As Applied Order*.
8. I have previously planned international travel to Vietnam from June 8 to June 21. The time difference between Boise, Idaho and Vietnam is 13 hours. I will be unable to attend

an administrative hearing concerning the above-referenced orders in person during this timeframe. I have made travel arrangements and am planning on attending the hearing on June 6 and 7, 2023.

I declare under penalty of perjury under the laws of the State of Idaho that the foregoing is true and correct.

Dated this 23rd day of May, 2023.

_/s/ *David Colvin*_____
David Colvin

CERTIFICATE OF SERVICE

I hereby certify that on this 23rd day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
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W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

_____

Jessica Nielsen
Assistant for Travis L. Thompson

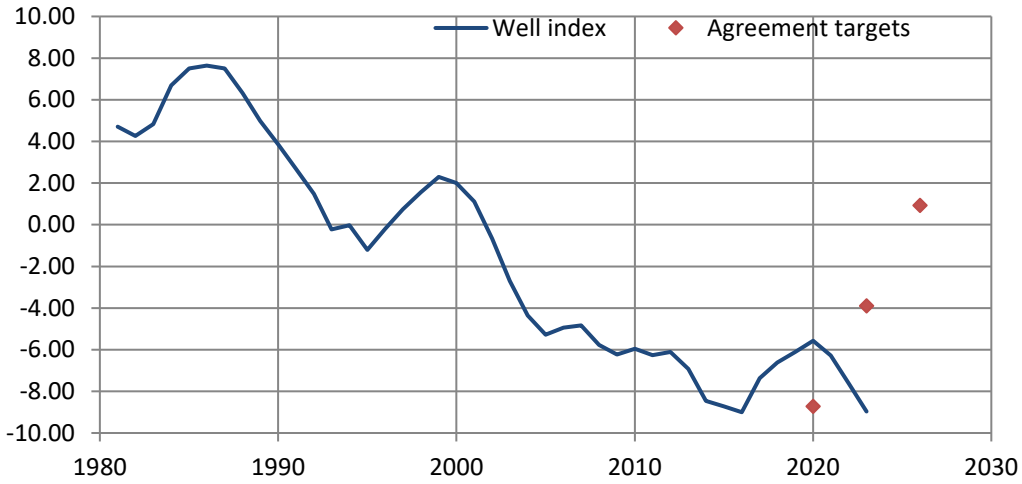
Exhibit A

Groundwater Level Index Calculation Tool

Based on settlement agreement between Surface Water Coalition and IGWA, August 2015
Developed by Brockway Engineering and Lynker Technologies, August 2016 revision

Instructions:

1. Enter March-April groundwater levels on the Well Data tab.
2. Calculated index will display below.
3. Compare calculated index with specfic targets in the agreement.



Year	Well Index	Agreement Targets
1981	4.71	
1982	4.26	
1983	4.83	
1984	6.68	
1985	7.51	
1986	7.64	
1987	7.51	
1988	6.32	
1989	4.98	
1990	3.86	
1991	2.68	
1992	1.48	
1993	-0.22	
1994	-0.03	
1995	-1.20	
1996	-0.21	
1997	0.75	
1998	1.56	
1999	2.29	
2000	2.00	

2001	1.11	
2002	-0.67	
2003	-2.70	
2004	-4.35	
2005	-5.28	
2006	-4.94	
2007	-4.84	
2008	-5.77	
2009	-6.23	
2010	-5.96	
2011	-6.26	
2012	-6.11	
2013	-6.92	
2014	-8.45	
2015	-8.73	
2016	-9.00	
2017	-7.37	
2018	-6.62	
2019	-6.11	
2020	-5.57	**-8.72**
2021	-6.28	
2022	-7.62	
2023	-8.97	**-3.90**
2024		
2025		
2026		**0.93**
2027		
2028		
2029		
2030		

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DETERMINING DEFICIENCY IN IGWA'S NOTICE OF SECURED WATER**

BACKGROUND

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"). The Methodology Order revised the nine steps used to determine material injury to members of the Surface Water Coalition ("SWC").

Step 3 of the Methodology Order states that by May 1, or within fourteen days from issuance of a final order predicting a shortfall, "whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share" of any predicted shortfall unless the forecast is revised. *Methodology Order* at 40. Step 3 further states that "[t]he secured water will not be required to be delivered to the injured members of the SWC until the Time of Need." *Id*.

On April 21, 2023, the Director also issued his *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order") in which the Director determined the predicted shortfall obligation for junior ground water users for 2023. The Director concluded that Twin Falls Canal Company ("TFCC") is the only entity with a predicted shortfall for 2023 and the shortfall value is 75,200 acre-feet. The Director ordered:

> On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted [demand shortfall] of 75,200 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted [demand shortfall] of 75,200 acre-feet in accordance with an approved mitigation

plan, the Director will issue an order curtailing the junior-priority ground water user.

As-Applied Order at 6.

On May 5, 2023, the Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of certain water districts[1] (collectively "Districts"), filed with the Department a *Notice of Ground Water District Mitigation* ("Notice of Mitigation"). The Notice explains that "IGWA has three approved mitigation plans." *Notice of Mitigation* at 2. IGWA states the first plan (the "2009 Storage Water Mitigation Plan") "authorizes the Districts to provide mitigation via the delivery of storage water to the SWC." *Id*. IGWA states that the second plan "authorizes the Districts to obtain mitigation credit" for various activities. *Id*. IGWA states the third plan (known as the "2015 Settlement Agreement Mitigation Plan") authorizes the Districts to "obtain mitigation protection by complying with a settlement agreement entered into between the Districts and the SWC in 2015." *Id*. IGWA recognizes that "[u]nder this plan, the Districts are required to conserve 240,000 acre-feet of water and deliver 50,000 acre-feet of storge annually to the SWC . . . ." *Id*.

Since the 2015 Settlement Agreement Mitigation Plan was approved by the Department, IGWA has only mitigated under that plan. This year, IGWA is proposing something new. Certain ground water district members are seeking to mitigate under the 2009 Storage Water Mitigation Plan and other ground water district members are seeking to mitigate under the 2015 Settlement Agreement Mitigation Plan. Instead of relying on one or two mitigation plans for all members, individual ground water districts are seeking to mitigate under different mitigation plans. IGWA states Bingham Ground Water District, Bonneville-Jefferson Ground Water District and Jefferson-Clark Ground Water District will provide mitigation under the 2009 Storage Water Mitigation Plan. *Notice* at 2. IGWA includes the following table to identify what it believes each district's proportionate share of the shortfall is:

District	Proportionate Share
Bingham GWD	13,384
Bonneville-Jefferson GWD	8,469
Jefferson-Clark GWD	6,939
Total	28,792

Id.

IGWA states "Attached hereto as Appendix A are copies of storage water leases totaling 38,714 acre-feet, submitted on behalf of the above-identified Districts." *Id*. at 3.

[1] IGWA's submitted the Notice of Mitigation on behalf of: North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District. *Notice of Mitigation* at 1.

IGWA includes the following table to identify the districts planning to mitigate under the 2015 Settlement Agreement Mitigation Plan and each district's proportionate shares of the reduction obligation and the storage water obligation:

District	240,000 AF	50,000 AF
Aberdeen-American Falls GWD	39,395	8,705
Carey Valley GWD	821	173
Henry's Fork GWD + Madison GWD	6,299	0
Magic Valley GWD	37,931	8,000
North Snake GWD	29,765	6,410
Total	114,211	23,288

Id.

IGWA states:

> Each District's proportionate share of 240,000 is based on the Director's allocation set forth in the *Amended Final Order Regarding Compliance with Approved Mitigation Plan* issued April 24, 2023, in this matter. Each District's proportionate share of 50,000 is based on the allocation IGWA has utilized since the Settlement Agreement Plan was implemented in 2016.

Id.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

1. Idaho Code § 42-602, addressing the authority of the Director over the supervision of water distribution within water districts, states:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director. The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

2. The first question that must be answered is whether the ground water districts can mix the mitigation plans in the way they are proposing. IGWA's "hybridization" of mitigation plans presents serious questions about whether mixing of mitigation plans is allowable.

2009 Storage Water Mitigation Plan

3. The 2009 Storage Water Mitigation Plan was submitted to the Department on November 9, 2010. IGWA's Mitigation Plan for the Surface Water Coalition Delivery Call at 7, *In re Idaho Ground Water Appropriators, Inc.'s Mitigation Plan in Response to the Surface Water Coalition's Water Delivery Call*, No. CM-MP-2009-007 (Idaho Dep't of Water Res. Nov. 9, 2009) [hereinafter "2009 Storage Water Mitigation Plan"]. The plan was submitted by IGWA "on behalf of its Ground Water District Members and its other water user members …, for and on behalf of their respective members and those groundwater users who are non-member participants in their mitigation activities…." *2009 Storage Water Mitigation Plan* at 1.

4. The mitigation plan proposes supplying water stored in Snake River reservoirs to the SWC "that will be available on an annual basis for delivery to SWC entities as may be required by the Director's orders." *Id*. at 3. While the plan was submitted for the benefit of IGWA's members and non-member participants, the plan clearly states that IGWA will mitigate for all ground water users, not just its members and non-member participants:

> This Mitigation Plan will mitigate *any and all* material injury by guaranteeing and underwriting the senior water user's water supply. If the Director projects material injury for a senior water user, then the Ground Water Users will provide water for mitigation in accordance with this Mitigation Plan for that mitigation year. . . .This Mitigation Plan will *fully mitigate and compensate* the senior water user for material injury by making water available for direct delivery of replacement water by the Water District 1 Watermaster when necessary during the irrigation season.
> . . . .
>
> [T]he Ground Water Users will supply sufficient water to eliminate the resulting water debt ("excess use") of Twin Falls Canal Company on the books of Water District 1."

Id. at 3–4 (emphasis added).

5. The *Order Approving Mitigation Plan* issued on June 3, 2010, makes clear that any obligation determined will be set based on the amount of shortfall determined through the methodology order process: "IGWA's obligation to provide storage water shall be determined as set forth in the Methodology Order"; "IGWA's obligation for mitigation shall be determined as set forth in the Methodology Order." Order Approving Mitigation Plan at 10, *In re Idaho Ground Water Appropriators, Inc.'s Mitigation Plan in Response to the Surface Water Coalition's Water Delivery Call*, No. CM-MP-2009-007 (Idaho Dep't of Water Res. Nov. 9, 2009).

6. The *Order Approving Mitigation Plan* makes clear that if IGWA does not provide the required storage, all ground water rights are subject to curtailment: "[I]f IGWA does not provide proof of acquisition of storage water and commitment of storage water as set forth above, ground water rights pumping from the Eastern Snake Plain Aquifer will be curtailed according to the Methodology Order to provide water to the SWC." *Id.* at 11.

7. Pursuant to the plain language of the 2009 Storage Water Mitigation Plan and *Order Approving Mitigation Plan*, IGWA cannot pick and choose who gets the benefit of storage water if IGWA is not providing storage water amounts equal to the shortfall obligation. If IGWA submits to the Director adequate contracts to establish it has secured storage water and the amount secured is less than the shortfall obligation, the Director will credit the contracted volume against the overall obligation, thus reducing the overall obligation for all ground water users. This approach is consistent with the plain language of the plan and the order approving the plan.

8. Furthermore, IGWA is required to provide the Director with legally enforceable contracts, options or similar documentation to establish that it has secured the water necessary to meet the carryover obligation. *See* Order on Petition for Judicial Review at 19, *A&B Irrigation Dist. v. Tuthill*, No. CV-2008-551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009). The Director concludes that IGWA has failed to provide documentation that satisfies this standard. Before the Notice of Mitigation was filed, the two entities listed on the contracts, Bingham Groundwater District and Bonneville-Jefferson Groundwater District, hired independent counsel. See *Notice of Substitution of Counsel for Bingham Ground Water District* at 1 (May 2, 2023) ("Pursuant to this substitution of counsel, Bingham Ground Water District will forthwith be represented independently of IGWA."); *Substitution of Counsel* at 1 (Jan. 4, 2023) ("COMES NOW Skyler C. Johns, of Olsen Taggart PLLC, and hereby substitutes as counsel on behalf of Intervenor, Bonneville-Jefferson Ground Water District.") Because the Notice of Mitigation was filed by counsel for IGWA, it is unclear whether IGWA has the authority to submit the ground water districts contracts to the Director for consideration. Second, even if IGWA had authority to submit the agreements, a review of the Departments records indicate that most of the leases have not been approved by Water District 01 due to a lack of payment of fees. Without payment of the required fees, the Districts have not yet secured the required water.

9. Because IGWA failed to provide appropriate contracts, ground water users are not in compliance with the 2009 Storage Water Mitigation Plan and will not be entitled to curtailment protection under the plan. If IGWA subsequently submits documentation establishing that it has authority to submit contracts on behalf of Bingham and Bonneville-Jefferson Groundwater Districts and pays the required Water District 01 fees, but the amount of water secured is less than the shortfall obligation, then the Director will credit the contracted volume against the overall shortfall obligation, thus reducing the overall obligation for all ground water users.

2015 Settlement Agreement Mitigation Plan

10. In 2015, the SWC and certain members of IGWA[2] entered into the *Settlement Agreement Entered into June 30, 2015 Between Participating Members of the Surface Water*

[2] The following eight ground water districts and one irrigation district are signatories to the SWC-IGWA Agreement: Aberdeen-American Falls Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Carey Valley Ground Water District, Fremont Madison Irrigation District, Jefferson Clark Ground Water District, Madison Ground Water District, Magic Valley Ground Water District, and North Snake Ground Water District.

Coalition and Participating Members of the Idaho Ground Water Appropriators, Inc. ("SWC-IGWA Agreement").

11. In October of 2015, the SWC and IGWA entered into an *Addendum to Settlement Agreement* ("First Addendum").

12. On March 9, 2016, the SWC and IGWA submitted the *Surface Water Coalition's and IGWA's Stipulated Mitigation Plan and Request for Order* ("Request for Order") to the Director. *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dept. of Water Res. Mar. 9, 2016). Attached to the Request for Order as Exhibits B, and C were the SWC-IGWA Agreement, the First Addendum. These documents were submitted as a stipulated mitigation plan in response to the SWC's delivery call. *Request for Order* at 3.

13. On May 2, 2016, the Director issued the *Final Order Approving Stipulated Mitigation Plan* ("Order Approving Mitigation Plan"), which approved the parties' mitigation plan subject to conditions. *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dept. of Water Res.).

14. On December 14, 2016, the SWC and IGWA entered into the *Second Addendum to Settlement Agreement* ("Second Addendum"). *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dept. of Water Res.). The *Second Addendum* amended the *SWC-IGWA Agreement* by providing additional details concerning the implementation of certain sections, most notably sections 3.a (Consumptive Use Volume Reduction); 3.e (Ground Water Level Goal and Benchmarks), 3.m (Steering Committee), and 4.a. (Adaptive Water Management). *Compare SWC-IGWA Agreement* §§ 3–4, *with Second Addendum* § 2.

15. On February 7, 2017, the SWC and IGWA submitted the *Surface Water Coalition's and IGWA's Stipulated Amended Mitigation Plan and Request for Order* ("Second Request for Order"). *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dept. of Water Res.). The SWC and IGWA requested that the Director issue an order approving the Second Addendum as an amendment to the mitigation plan. *Second Request for Order* ¶ 6.

16. On May 9, 2017, the Director issued the *Final Order Approving Amendment to Stipulated Mitigation Plan* ("Order Approving Amendment to Mitigation Plan"), approving the Second Addendum as an amendment to the parties' mitigation plan subject to conditions. *Order Approving Amendment to Mitigation Plan* at 5, *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dept. of Water Res.).

17. In the SWC-IGWA Agreement, the SWC and IGWA members agreed, among other things, that "[t]otal ground water diversion shall be reduced by 240,000 ac-ft annually." *SWC-IGWA Agreement* § 3.a.i. The SWC and IGWA stipulated that "[e]ach Ground Water and Irrigation District with members pumping from the ESPA shall be responsible for reducing their proportionate share of the total annual ground water reduction or in conducting an equivalent private recharge activity." *SWC-IGWA Agreement* § 3.a.ii.

18. The parties also agreed that "IGWA will provide 50,000 ac-ft of storage water though private lease(s) of water from the Upper Snake Reservoir system, delivered to the SWC 21 days after the date of allocation, for the use to the extent needed to meet irrigation requirements." *SWC-IGWA Agreement* § 3.b.i.

19. The SWC and IGWA also stipulated "that the mitigation provided by participating IGWA members under the [2015] Agreements is, provided the [2015] Agreements are implemented, sufficient to mitigate for any material injury caused by the groundwater users who belong to, and are in good standing with, a participating IGWA member." *Request for Order* ¶ 8. The SWC and IGWA agreed "[n]o ground water user participating in this [SWC-IGWA] Agreement will be subject to a delivery call by the SWC members as long as the provisions of the [SWC-IGWA] Agreement are being implemented." *SWC-IGWA Agreement* § 5.

20. In the Notice of Mitigation, the ground water districts wanting to mitigate pursuant to the 2015 Settlement Agreement Mitigation Plan have proportionately determined their individual obligations for both reduction obligations and storage obligations. While the 2015 Settlement Agreement Mitigation Plan allows for determining the proportionate share of the reduction obligation of the parties, it does not authorize the 50,000 acre-foot storage volume to be shared proportionately by the parties. To be in compliance with the plan, the entire 50,000 acre-feet must be provided.

21. Moreover, in response to a breach of the mitigation plan in 2021, the Director approved a one-year settlement agreement to remedy the 2021 breach. *Amended Final Order Regarding Compliance with Approved Mitigation Plan* at 20, *In re IGWA's Settlement Agreement Mitigation Plan*, No. CM-MP-2016-001 (Idaho Dept. of Water Res. Apr. 24, 2023). In the settlement agreement, the parties agreed that "IGWA will collectively provide to the SWC an additional 30,000 acre-feet of storage water in 2023 and an additional 15,000 acre-feet of storage water in 2024 within 10 days after the Date of Allocation of such year. Such amounts will be in addition to the long-term obligations set forth in section 3 of the Settlement Agreement and approved Mitigation Plan." *Settlement Agreement* at 2. While we are not yet to the day of allocation, the Director wants to ensure that it is clear to the parties that, as with the 50,000 acre-foot obligation, this additional amount of storage water is not subject to proportional sharing.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that IGWA's *Notice of Ground Water District Mitigation* is deficient and fails to demonstrate that IGWA is operating in accordance with an approved mitigation plan. If the Director issues an order of curtailment after the June 6–10, 2023 hearing, IGWA's members and non-member participants will not be entitled to curtailment protection under either the 2009 Storage Water Mitigation Plan or 2015 Settlement Agreement Mitigation Plan.

Dated this 23rd day of May 2023.

GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 23rd day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER GRANTING REQUESTS FOR HEARING**

BACKGROUND

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") as well as his *Final Order Regarding April 2023 Forecast Supply* ("As-Applied Order"). The Methodology Order revises the nine steps used to determine material injury to members of the Surface Water Coalition ("SWC"). The As-Applied Order predicts a shortfall for the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to December 30, 1953.

Anticipating that one or more parties would request a hearing in response to one or both of the orders, the Director also issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Notice of Hearing") on April 21, 2023. The Notice of Hearing set the hearing for the Methodology Order and As-Applied Order for June 6–10, 2023, at the Department's State Office, located at 322 E. Front Street, 6th Floor, Conference Rooms 602A–D, Boise, Idaho.

On April 28, 2023, the Department received the following filings:

- *The Coalition of Cities' Request for Hearing*; [1]
- *McCain Foods USA, Inc.'s Request for Hearing and Objection*;
- *The Coalition of Cities' Amended Request for Hearing*; and
- *Pocatello's Request for Hearing*.

On May 2, 2023, the Department received *IGWA's Petition for Reconsideration and Request for Hearing*.[2]

[1] For purposes of the request for hearing, the "Coalition of Cities" refers to the Idaho cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell.

[2] For purposes of the request for hearing, ("IGWA") refers to the following ground water districts: North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, Aberdeen-

On May 4, 2023, the Department received the following filings:

- *Amalgamated Sugar Company's Request for Hearing, Objection, Identification of Issues and Notice of Mitigation*;
- *City of Idaho Falls Challenge and Request for Hearing*;
- *Bonneville-Jefferson Ground Water District's Request for Hearing*; and
- *Bingham Ground Water District's Request for Hearing*.

On May 5, 2023, the Department received the *Surface Water Coalition's Request for Hearing and Statement of Issues*.

ANALYSIS AND CONCLUSIONS OF LAW

Idaho Code § 42-1701A(3) provides in relevant part:

> Unless the right to a hearing before the director . . . is otherwise provided in by statute, any person aggrieved by any action of the director, including any decision, determination, order or other action . . . who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action.

The parties have not previously been afforded an opportunity for hearing on the Methodology Order or the As-Applied Order and are entitled to a hearing pursuant to Idaho Code § 42-1701A(3). As described above, the Director has already set a hearing on the Methodology Order and the As-Applied Order for June 6–10, 2023. To resolve any question regarding the status of the pending requests for hearing, the Director will grant the requests and will hold the hearing as previously set in the Notice of Hearing.

ORDER

IT IS HEREBY ORDERED that the parties' requests for hearing are GRANTED. The hearing will be held as previously noticed in the *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery*: June 6–10, 2023, at the Department's State Office, located at 322 E. Front Street, 6th Floor, Conference Rooms 602A–D, Boise, Idaho.

DATED this 23rd day of May 2023.

GARY SPACKMAN
Director

American Falls Area Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 23rd day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☐ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
May 25, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB #7928)
SOMACH SIMMONS & DUNN, P.C.
303-449-2834
sklahn@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Dylan Anderson (ISB# 9676)
Dylan Anderson Law
208-684-7701
dylan@dylanandersonlaw.com
Attorney for Bingham Groundwater District

Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
208-232-6101
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
208-552-6442
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
Attorneys for Bonneville-Jefferson Ground Water District

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **<u>AMENDED</u> JOINT NOTICE OF CONTINUED DEPOSITION DUCES TECUM OF MATTHEW ANDERS, P.G. (Day 2)**

TO: Matthew Anders and all counsel of record.

PLEASE TAKE NOTICE that this notice has been updated regarding the start time. On **May 26, 2023, from 10:00 a.m. – 5:00 p.m.**, counsel for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell (collectively, the "Coalition"), City of Pocatello, City of Idaho Falls, Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Ground Water District, and Bingham Groundwater District in the above-entitled action will continue to take the deposition of MATTHEW ANDERS, P.E., in accordance with the Order Authorizing Discovery issued April 21, 2023, in this matter, IDAPA 37.01.01.520.01.a and 37.01.01.520.02, and Idaho Rules of Civil Procedure 26, 30(a), and 34, and continue from day to day thereafter until completion, at the offices of the **Idaho Department of Water Resources, 322 E. Front Street, Boise, Idaho 83702**. This deposition will be "hybrid," with the witness, court reporter, and some attorneys present at the Idaho Department of Water Resources ("IDWR" or "Department"), and others present via the Zoom video platform, hosted by M&M Court Reporting. You may access the meeting by Zoom with the following information:

Join Zoom Meeting:

https://us02web.zoom.us/j/86301872706?pwd=NVNqT1R2UGtKWEMya3FuK0s0dUFkQT09

Meeting ID: 863 0187 2706

Passcode: 864529

DATED May 25, 2023.

SOMACH SIMMONS & DUNN

By 
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

RACINE OLSON, PLLP

By /s/ Thomas J. Budge
Thomas J. Budge, (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)

Attorneys for Idaho Ground Water Appropriators, Inc.

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

OLSEN TAGGART PLLC

By /s/ Skyler C. Johns
Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)

Attorneys for Bonneville-Jefferson Ground Water District

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

DYLAN ANDERSON LAW

By /s/ Dylan Anderson
Dylan Anderson (ISB# 9676)

Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 25th day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Courtesy Copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB # 7928

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING MOTION TO RE-SET HEARING**

BACKGROUND

On May 22, 2023, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, and Wendell (collectively the "Cities"), the Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Groundwater District ("BJGWD"), and Bingham Groundwater District ("BGWD") (collectively "Groundwater Users"), filed a *Motion to Re-Set Hearing* ("Motion to Re-Set"), wherein the Groundwater Users requested that the hearing be re-set from June 6–10 to June 19–23. *Motion to Re-Set* at 2.

On May 23, 2023, the Surface Water Coalition ("SWC") filed *Surface Water Coalition's Opposition to Groundwater Users' Motion to Re-Set Hearing Dates* ("Objection to Motion to Re-Set Hearing").

ANALYSIS

Rule 560 of the Department's Rules of Procedure grants the presiding officer the discretion to continue a proceeding. IDAPA 37.01.01.560. Rules 710 and 711 advise that scheduling orders are interlocutory orders, and that the presiding officer has the discretion to "rescind, alter or amend any interlocutory order…". IDAPA 37.01.01.710–711.

The Groundwater Users contend that resetting the hearing for June 19–23 will allow IGWA's expert Jaxon Higgs and counsel for the Cities Candice McHugh to attend the hearing in person. *Motion to Re-Set* at 2–3. The Groundwater Users further contend that resetting the hearing will allow the Cities' expert Greg Sullivan and Ms. McHugh more time for preparation. *Id*. The Groundwater Users also point out that the Groundwater Users have filed various district court actions and associated motions and resetting the hearing date would allow "due consideration" to the various motions. *Id*. at 3.

The SWC opposes the motion, arguing the Groundwater Users "offer no new facts that would justify any further delay in this case. Instead, they repeat the same claims the Director fully considered and addressed" in his order responding to the Groundwater Users' previous

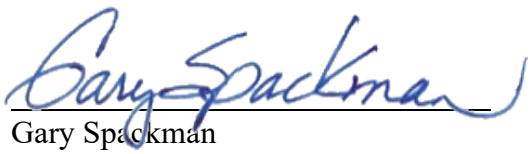
request to move the hearing dates. *Objection to Motion to Re-Set Hearing* at 2. The SWC argues that "[w]hile the Director provided for remote participation for consultants that cannot travel to Idaho or will be voluntarily out-of-state at that time, that accommodation is overlooked." *Id.* The SWC characterizes the Groundwater Users' motion to reset as nothing more than a delay tactic to buy time for their various district court lawsuits. *Objection to Motion to Re-Set Hearing* at 3–4. The SWC argues that any delay in hearing will unreasonably delay water administration and that worsening water supply conditions justify moving forward promptly. *Id*. 5–7. The SWC also asserts its expert David Colvin will be traveling to Vietnam from June 8–21, and that Mr. Colvin has already made arrangements to appear in person at the hearing on June 6–7. *Id*. at 7; *see also* Colvin Decl. ¶¶ 4, 8.

Unfortunately, it appears that given the number of parties involved, there will not be a time later in June that will be free of conflicts. The Groundwater Users do not provide any new or additional information that would justify moving the hearing date. The Director has already authorized remote participation for the Groundwater Users' experts and counsel. The Director previously stated that he would "consider moving the hearing to other dates within the first three weeks of June 2023 if the parties file[d] a stipulated motion requesting the change." *Order Denying Second Motion to Continue* at 4. Because the parties failed to stipulate to resetting the hearing, the Director concludes it is best to keep the current hearing dates of June 6–10, 2023.

ORDER

Based on the forgoing discussion, IT IS HEREBY ORDERED that the Groundwater Users' *Motion to Re-Set Hearing Dates* is DENIED.

DATED this 26th day of May 2023.



Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 26th day of May 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for McCain Foods USA, Inc.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **MCCAIN FOODS USA, INC.'S IDENTIFICATION OF WITNESSES AND EXHIBITS**

McCain Foods USA, Inc. ("McCain") submits this *Disclosure of Proposed Witnesses for Hearing* pursuant to the *Scheduling Order*.

I. IDENTIFICATION OF POSSIBLE WITNESSES AND SCOPE OF TESTIMONY

a. **Scott King, P.E.**
HDR
300 E Mallard St, Ste 350
Boise, ID 83706
2080-383-4140

Mr. King may testify about McCain's water rights, its effort to mitigate and its option for mitigation, the difference in priority date curtailment for transient v steady state model use, the process and timelines and the timelines and process imposed in the above captioned matter.

2. IDENTIFICATION OF POSSIBLE EXHIBITS

600	McCain's Water Rights at Burley Plant
601	McCain's Petition to SWID
602	McCain's Notice of Mitigation
603	May 24, 2023 Email from Garrick Baxter to Candice McHugh
604	May 1, 2023 Letter from IDWR

Submitted this 30th day of May, 2023.

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for McCain

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 30th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for Amalgamated Sugar Company

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **AMALGAMATED SUGAR COMPANY'S IDENTIFICATION OF WITNESSES AND EXHIBITS**

Amalgamated Sugar Company's ("Amalgamated") submits this *Disclosure of Proposed Witnesses for Hearing* pursuant to the *Scheduling Order*.

1. IDENTIFICATION OF POSSIBLE WITNESSES AND SCOPE OF TESTIMONY

Dean Delorey
Amalgamated Sugar Company
1951 S. Saturn Way, Suite 100
Boise, ID 83709

Mr. Delorey may testify about Amalgamated's water rights, its effort to try and mitigate and its option for mitigation, including the process imposed in the above captioned matter.

2. **IDENTIFICATION OF POSSIBLE EXHIBITS**

700	Amalgamated's Water Rights at Mini-Cassia Plant
701	Amalgamated's Petition to Magic Valley Ground Water District
702	Amalgamated's Notice of Mitigation
702	May 24, 2023 Email from Garrick Baxter to Candice McHugh

Submitted this 30th day of May, 2023.

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for Amalgamated

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 30th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S WITNESS LIST**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby submits the following list of witnesses for the June 6-10, 2023

hearing pursuant to the *Scheduling Order and Order Authorizing Remote Appearance at Hearing* (May 2, 2023).

Lay Witnesses

The Coalition may call any of the of the following managers for the respective irrigation districts and canal companies.

Jay Barlogi, Twin Falls Canal Company

Mr. Barlogi is expected to testify on the subjects covered in his pre-filed testimony (SWC Ex. 1) and any other matters related to the operations and water delivery by the canal company.

Justin Temple, A&B Irrigation District

Mr. Temple is expected to testify about the operations and water delivery by the irrigation district, including the delivery of surface water to certain lands within the district (SWC Ex. 2).

Kevin Lakey, American Falls Reservoir District #2

Mr. Lakey is expected to testify about the operations and water delivery by the reservoir district.

Don Terry, Burley Irrigation District

Mr. Terry is expected to testify about the operations and water delivery by the irrigation district.

Jeff Warr, Milner Irrigation District

Mr. Warr is expected to testify about the operations and water delivery by the irrigation district.

Dan Davidson, Minidoka Irrigation District

Mr. Davidson is expected to testify about the operations and water delivery by the

irrigation district.

Alan Hansten, North Side Canal Company

Mr. Hansten is expected to testify about the operations and water delivery by the canal company.

Expert Witnesses:

Dave Colvin (LRE Water)

Mr. Colvin is expected to testify about the subjects covered in the expert report he participated in (SWC Ex. 3). Mr. Colvin may also provide testimony about the Technical Working Group process related to the methodology updates that occurred during the fall/winter of 2022.

Dave Shaw (ERO Resources)

Mr. Shaw is expected to testify about the subjects covered in the expert report he participated in (SWC Ex. 4). Mr. Shaw may also provide testimony about the Technical Working Group process related to the methodology updates that occurred during the fall/winter of 2022.

Charles G. Brockway (Brockway Engineering PLLC)

Dr. Brockway is expected to testify about the subjects covered in his expert report that he participated in (SWC Ex. 4).

G. Erick Powell (Brockway Engineering PLLC)

Dr. Powell is expected to testify about the subjects covered in the expert reports that he participated in (SWC Exs. 3, 4).

The Coalition reserves the right to examine and call all individuals disclosed in other parties' disclosures of witnesses, including the Department witnesses Jennifer Sukow and Matt

Anders. The Coalition also reserves the right to call any witnesses necessary for rebuttal testimony.

DATED this 30th day of May, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only Tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S NOTICE OF SERVICE OF EXHIBITS AND EXPERT REPORTS**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby provides notice of service of its exhibits and expert reports on the

parties to this case pursuant to the *Scheduling Order and Order Authorizing Remote Appearance at Hearing* (May 2, 2023). Counsel emailed the following to those counsel of record listed on the certificate of service.

SWC Exhibit List

SWC Ex. 1	-	Pre-Filed Direct Testimony of Jay Barlogi
SWC Ex. 2	-	A&B Water Delivery Summary to Certain Unit B Lands (2016-2022)
SWC Ex. 3	-	Groundwater Expert Report – 2023 Methodology
SWC Ex. 4	-	SWC Expert Report on Fifth Methodology and Related Orders
SWC Ex. 5	-	TFCC with 2017 Acre Differences letter
SWC Ex. 6	-	Selected Comparison of 2017 area2
SWC Ex. 7	-	Selected Comparison of 2017 area3

DATED this 30th day of May, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of May, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only Tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

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May 30, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB #7928
Maximilian C. Bricker, ISB #12283
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com
Attorneys for the City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities")

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **CITY OF IDAHO FALLS, CITY OF POCATELLO, AND COALITION OF CITIES' JOINT DISCLOSURE OF PROPOSED WITNESSES FOR HEARING**

The City of Idaho Falls, the City of Pocatello, and the Coalition of Cities[1] (collectively, "Cities") submit this *Joint Disclosure of Proposed Witnesses for Hearing* in compliance with the *Scheduling Order*.

[1] The Coalition of Cities includes the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

I. IDENTIFICATION OF POSSIBLE WITNESSES AND SCOPE OF TESTIMONY

a. Greg Sullivan, P.E.

Spronk Water Engineers, Inc.
1000 Logan Street
Denver, CO 80203
303-861-9700

Mr. Sullivan may testify as an expert on matters related to crop evapotranspiration, irrigation methods and practices, water distribution systems, project efficiencies, projecting water demands, forecasting water supplies, conjunctive water management, groundwater modeling, the Eastern Snake Plain Aquifer, and hydraulic engineering. His expert report has been timely disclosed under the *Scheduling Order*.

b. Matthew Anders, P.G.

Idaho Department of Water Resources, Hydrology Section
322 E. Front Street
Boise, ID 83702

Mr. Anders may testify as a lay witness on matters related to the Department's preparation and issuance of the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order"), and the preparation, issuance, and application of the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order").

c. Jennifer Sukow, P.E., P.G.

Idaho Department of Water Resources, Hydrology Section
322 E. Front Street
Boise, ID 83702

Ms. Sukow may testify as a lay witness on matters related to the Department's preparation and issuance of the *Fifth Methodology Order*, and preparation, issuance, and application of the *As-Applied Order*.

d. Mathew Weaver, P.E.

Deputy Director
Idaho Department of Water Resources
322 E. Front Street
Boise, ID 83702

Mr. Weaver may testify as a lay witness on matters related to the Department's preparation and issuance of the *Fifth Methodology Order*, and preparation, issuance, and application of the *As-Applied Order*.

e. Jay Barlogi

General Manager
Twin Falls Canal Company
357 6th Avenue W.
Twin Falls, ID 83301

Mr. Barlogi may testify as a lay witness on matters related to the Twin Falls Canal Company's ("TFCC") water supplies, water demands, irrigated acres, water distribution system, operations, the irrigation methods and practices of the shareholders thereof, and the *Fifth Methodology Order* and *As-Applied Order* as they pertain to TFCC.

f. Anthony Olenichak

Water Master
Water District 01
900 North Skyline Drive
Idaho Falls, ID 83402

Mr. Olenichak may testify as a lay witness on matters related to water supply forecasting and the distribution of water supplies to water users in Water District 01.

g. Persons identified in other parties' disclosures made pursuant to the *Scheduling Order* in this case.

h. Any witness necessary for rebuttal.

DATED this 30th day of May 2023.

SOMACH SIMMONS & DUNN

By 
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 30th day of May, 2023, I caused to be filed a true and correct copy of the foregoing document to be filed and served via electronic mail to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB #7928

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB #7928
Maximilian C. Bricker, ISB #12283
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com
Attorneys for the City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities")

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **CITY OF IDAHO FALLS, CITY OF POCATELLO, AND COALITION OF CITIES' JOINT DISCLOSURE OF PROPOSED EXHIBITS FOR HEARING**

The City of Idaho Falls, the City of Pocatello, and the Coalition of Cities[1] (collectively, "Cities") submit this *Joint Disclosure of Proposed Exhibits for Hearing* in compliance with the Director of the Idaho Department of Water Resources Department's May 2, 2023 *Scheduling Order and Order Authorizing Remote Appearance at Hearing* (p. 3), and use the exhibit numbers assigned to the City of Pocatello (300-399) rather than file separate lists which would contain multiple duplicates of exhibits.

[1] The Coalition of Cities includes the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Cities' Exhibit No.	Exhibit Description
	ORDERS
300	4/21/2023 Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover
301	4/21/2023 Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)
302	11/30/2022 Final Order Establishing 2022 Reasonable Carryover (Methodology Step 9)
303	8/18/2022 Order Revising July 2022 Forecast Supply (Methodology Steps 7-8)
304	7/20/2022 Order Revising April 2022 Forecast Supply and Amending Curtailment Order (Methodology Steps 5 & 6)
305	4/20/2022 Final Order Regarding April 2022 Forecast Supply (Methodology Steps 1-3)
306	4/19/2016 Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover
	DEPOSITION NOTICES & TRANSCRIPTS
307	5/4/2023 Joint Notice of Deposition Duces Tecum of Jennifer Sukow, P.E., P.G. (Sukow Depo Ex. 1)
308	5/4/2023 Joint Notice of Deposition of Matthew Anders, P.G. (Anders Depo Ex. 10)
309	5/10/2023 Deposition Transcript of Jennifer Sukow, P.E., P.G.
310	5/12/2023 Deposition Transcript of Matthew Anders, P.G., Volume 1
311	5/22/2023 Cities' Amended I.R.C.P. 30(b)(6) Notice of Taking Deposition Duces Tecum of Twin Falls Canal Company (Barlogi Ex. 20)
312	5/23/2023 GWD Notice of Taking Deposition Duces Tecum of TFCC- (Barlogi Ex 28)
313	5/25/2023 Amended Notice of Deposition of Matthew Anders, P.G.
314	5/25/2023 Deposition Transcript of Twin Falls Canal Company (Barlogi)
315	5/26/2023 Deposition Transcript of Matthew Anders, P.G., Volume 2

Cities' Exhibit No.	Exhibit Description
	DEPOSITION EXHIBITS
316	12/23/2022 IDWR Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the SWC, by Kara Ferguson & Matt Anders (Sukow Depo Ex. 4)
317	4/25/2023 Surface Water Coalition Delivery Call, Amended 5th Methodology and April 2023 As-Applied Orders, FAQs (Sukow Depo Ex. 5)
318	11/28/2022 IDWR, SWC Methodology - Calculation of Priority Dates for Curtailment of Junior Ground Water Users, Presented to the SWC Methodology Technical Working Group (Sukow Depo Ex. 6)
319	11-12/2022 Table 1 - Summary of Hindcast SWC Delivery Call Demand Shortfall Calculations 2000-2022 (Sukow Depo Ex. 7)
320	5/23/2023 Email to TJ Budge from Garrick Baxter, Subject: Request to Delineate Proportionate Shares of Mitigation Obligation (Sukow Depo Ex. 8)
321	1/2013 Enhanced Snake Plain Aquifer Model, Version 2.1, Final Report, (Sukow Depo Ex. 9)
322	1/16/2023 Spronk Water Engineers, Inc., Comments on Behalf of the Coalition of Cities and the City of Pocatello on the IDWR Recommendation SWC Methodology Update (Anders Depo Ex. 11)
323	Color Photograph of Thumb Drive Directories (Anders Depo Ex. 12)
324	2/19/2015 Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition (Anders Depo Ex. 13)
325	12/1/2022 Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC (Anders Depo Ex. 14)
326	1/16/2023 Comments on 2022 IDWR Staff Recommendations Memorandum (Anders Depo Ex. 15)
327	11/17/2022 Evaluation of Method for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: April and July Forecast Supply (Anders Depo Ex. 16)
328	12/1/2022 Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of Near Real Time METRIC. Presented by Ethan Geisler, Kara Ferguson, & Matt Anders (Anders Depo Ex.17)
329	IDAPA 37.03.11 Rules for Conjunctive Management of Surface and Ground Water Resources (Anders Depo Ex. 18)

Cities' Exhibit No.	Exhibit Description
330	5/24/2023 Screenshot of 2023 SWC-IGWA Legal Folders (Barlogi Ex. 21)
331	5/24/2023 Screenshot of Folders within the Deposition Folder (Barlogi Ex. 22)
332	1990-2022 Water Delivery Schedule Spreadsheets (Barlogi Ex. 23)
333	10/14/2005 Sample Amended Agreement for Sprinkler Installation (Barlogi Ex. 24)
334	5/24/2023 Twin Falls County Census Bureau Population Graph (Barlogi Ex. 25)
335	5/10/2023 SWC Data Requested by C. Brockway – (Barlogi Ex. 26)
336	5/22/2023 S. Tschohl Email Response to Brockway Request (Barlogi Ex. 27)
337	3/29/2013 A-B et al Response to 2.21.2013 Letter re Step 1 Methodology Order(Barlogi Ex. 29)
338	10/31/2022 TFCC Profit & Loss 11.2014 through 10.2022 (Barlogi Ex. 30)
339	1/26/2012 TFCC Operation Policy (Barlogi Ex. 31)
340	6/21/2022 Settlement Agreement Small Group Meeting Main Discussion Points (Anders Depo Ex. 40)
341	7/13/2022 Surface Water Coalition Steering Committee Meeting Methodology Outline v.2 (Anders Depo Ex. 41)
342	7/13/2022 Surface Water Coalition Steering Committee Meeting Speaking Outline (Revisions_Methodology_Outline) (Anders Depo Ex. 42)
343	9/30/2022 (9:07:27 AM) Email from G. Baxter re Methodology Order Technical Work Group (Anders Depo Ex. 43)
344	9/30/2022 (1:44:07 PM) Email from G. Baxter re Methodology Order Technical Work Group (Anders Depo Ex. 44)
345	9/30/2022 (2:38:10 PM) Email from G. Baxter re Methodology Order Technical Work Group (Anders Depo Ex. 45)
346	1/3/2023 (12:18:22 PM) Email from M. Weaver re FW: 4th Amended Methodology Order (Anders Depo Ex. 47)
	OTHER DOCUMENTS
347	5/30/2023 Expert Report of Gregory K. Sullivan, P.E. on Behalf of the Cities of Pocatello, Idaho Falls, and the Coalition of Cities
348	City of Pocatello – Summary of Water Rights
349	City of Idaho Falls – Summary of Water Rights
350	Coalition of Cities – Summary of Water Rights
351	3/17/2023 Letter from BWCC/AFRD2 to IDWR re: Shapefile
352	3/10/2023 Marten Law Letter to IDWR re: Shapefile

Cities' Exhibit No.	Exhibit Description
353	3/2/2023 Email from Minidoka Irr. Dist. to IDWR re: Shapefile
354	2/21/2023 Email from G. Spackman FW Discussion on Amended Methodology#4
355	2/2/2023 Letter from AFRD2 to IDWR re: Shapefile
356	1/30/2023 Letter from IDWR to SWC Managers re: Annual Shapefile Submission
357	12/20/2022 (8:54 AM) Email from M. Anders re TWG Data
358	Opinion, *State v. Twin Falls Canal Co.*, 21 Idaho 410 (June 15, 1911)
359	Opinion, *State v. Twin Falls Land & Water Co.*, 37 Idaho 73 (April 2, 1923
360	Opinion, *Twin Falls Land & Water Co. v Twin Falls Canal Co.*, 79 F.2d 431 (September 9, 1935)

DATED this 30th day of May 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

MCHUGH BROMLEY, PLLC

By___/s/ Candice M. McHugh_____
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

HOLDEN KIDWELL HAHN & CRAPO

By___/s/ Robert L. Harris_____
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 30th day of May, 2023, I caused to be filed a true and correct copy of the foregoing document to be filed and served via electronic mail to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP
P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com
W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB #7928

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc.

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Witness and Exhibit Lists**

Idaho Ground Water Appropriators, Inc., ("IGWA"), acting for and on behalf of North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, American Falls-Aberdeen Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, submits the following witness and exhibit lists.

WITNESSES

1. **Sofia Sigstedt.** Sofia Sigstedt is expected to testify as to her expert report, technical aspects of the Fifth Methodology Order and the April 2023 As-Applied Order, communications with the Department's technical working group, and other matters involving the Fifth Methodology Order and the April 2023 As-Applied Order.

2. **Jaxon Higgs.** Jaxon Higgs intended to testify as to his expert report, the proportionate mitigation obligations of IGWA's member ground water districts under the April 2023 As-Applied Order, irrigated acreage within Twin Falls Canal Company, conveyance efficiency of Twin Falls Canal Company, and other matters involving the Fifth Methodology Order and the April 2023 As-Applied Order. Mr. Higgs is not able to participate in the hearing scheduled June 6-10, 2023, due to a previously scheduled

family vacation out of the country.

3. **Mathew Weaver.** Mathew Weaver is expected to testify regarding information considered by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order, the Department's application of the futile call doctrine, and other matters involving the Fifth Methodology Order and the April 2023 As-Applied Order.

4. **Tony Olenichak.** Tony Olenichak is expected to testify regarding the Department's distribution of water to members of the Surface Water Coalition and the Department's application of the futile call doctrine.

5. **Jennifer Sukow.** Jennifer Sukow is expected to testify regarding information considered and technical analyses performed by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order.

6. **Matt Anders.** Matt Anders is expected to testify regarding information considered and technical analyses performed by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order.

7. **Kara Ferguson.** Kara Ferguson is expected to testify regarding information considered and technical analyses performed by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order.

8. **Other Department Staff.** IGWA reserves the right to call any other Department staff having information considered and technical analyses performed in connection with the development of the Fifth Methodology Order and the April 2023 As-Applied Order.

9. **Jay Barlogi.** Jay Barlogi is expected to testify regarding Twin Falls Canal Company's water delivery system, conveyance efficiencies, hydropower plants served by the Company's delivery system, Company policies, and others matters involving the Company.

10. **Lynn Carlquist.** Lynn Carlquist is expected to testify regarding the consequences for IGWA member districts and their patrons of the Fifth Methodology Order and the April 2023 As-Applied Order, and other matters involving the administration of water rights under the SWC delivery call related to the Fifth Methodology Order and the April 2023 As-Applied Order.

11. **Tim Deeg.** Tim Deeg is expected to testify regarding the consequences for IGWA member districts and their patrons due to the decisions contained within the Fifth Methodology Order and the April 2023 As-Applied Order, and other matters involving the administration of water rights under the SWC delivery call related to the Fifth Methodology Order and the April 2023 As-Applied Order.

12. **Kirk Jacobs.** Kirk Jacobs is expected to testify regarding the consequences for IGWA member districts and their patrons due to the decisions contained within the Fifth Methodology Order and the April 2023 As-Applied Order, and other matters involving the administration of water rights under the SWC delivery call related to the Fifth

Methodology Order and the April 2023 As-Applied Order.

13. Any witness identified by any other party.

14. Any witness needed to authenticate any exhibit.

15. Any witness needed for rebuttal purposes.

EXHIBITS

Attached herewith as ***Appendix A*** is IGWA's Exhibit List. In addition, IGWA reserves the right to utilize as exhibits (a) any document listed in the exhibit list of any other party to this proceeding; (b) water right records kept by the Department in its ordinary course of business; (c) any exhibit, pleading, or order filed previously with the Department in this matter; (d) transcripts of testimony proffered previously in this matter; (e) exhibits created for illustrative purposes; (f) exhibits utilized for rebuttal purposes; (g) subsequently disclosed exhibits for which the Director approves late disclosure; and (h) documents of which the Director takes official notice per IDAPA 30.01.01.602.

DATED this 30th day of May, 2023.

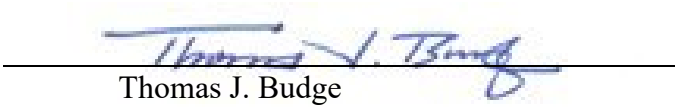
RACINE OLSON, PLLP

By: Thomas J. Budge

Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of May, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

IGWA's Hearing Exhibits	
#	Description
100	20150310 IGWA Comments on Draft IDWR Staff Memo
101	20150310 Pocatello Comments on Draft IDWR Staff Memo
102	20150310 SWC Comments on Draft IDWR Staff Memo
103	20150316 SWC Staff Recommendations Memo (CM-DC-2010-001)
104	20221116 SWC Delivery Call Overview
105	20221117 Forecast_Supply_SWC_TWG
106	20221119 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides
107	20221119 BLY_SWC_TWG_11-16-22_with supplemental slides
108	20221119 ESPAM_SWC_TWG_11-28-22
109	20221119 Project Efficiency_SWC_TWG_11-28-22_with supplemental slides
110	20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)
111	20221209 BLY_reasonable carryover
112	20221209 NRT METRIC_SWC_TWG
113	20221214 Forecast_Supply_SWC_TWG_12-14-2022_V2 (Numbered)
114	20221221 SWC Diversions and CWN Charts
115	20221223 IDWR Preliminary Recommendations
116	20230116 Cities Comments on SWC Metholodogy Recommendation
117	20230116 Lynker Memo re IDWR Staff Recommendations
118	20230116 SWC Comments to IDWR re Methodology Update
119	Depo Ex. 1 - 20230504 Joint Notice of Deposition Duces Tecum - J. SUKOW
120	Depo Ex. 2 - 20230421 Fifth Amended Final Order Regarding Methodology
121	Depo Ex. 3 - 20230421 Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)
122	Depo Ex. 4 - 20221223_SWC_TWG_Summary
123	Depo Ex. 5 - 20230425 FAQ on new Methodology and SWC delivery call
124	Depo Ex. 6 - 20221119 ESPAM_SWC_TWG_11-28-22
125	Depo Ex. 7 - Hindcast_Table1_Settlement_20221221
126	Depo Ex. 8 - 20230503 Baxter email re GWD mitigation obligations
127	Depo Ex. 9 - ESPAM V.2.1 Final Report
128	Depo Ex. 10 - 20230504 Joint Notice of Deposition Duces Tecum - M. ANDERS
129	Depo Ex. 11 - 20230116 Cities Comments on SWC Metholodogy Recommendation
130	Depo Ex. 14 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)
131	Depo Ex. 15 - 20230116 MEMORANDUM_630PM_Lynker
132	Depo Ex. 16 - 20221117 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides (Numbered)
133	Depo Ex. 17 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)
134	Depo Ex. 18 - CM Rules
135	Depo Ex. 19 - 20160419 Fourth Methodology Order
136	Depo Ex. 20 - Cities Amended Notice of Deposition of TFCC
137	Depo Ex. 21 - Screenshot of 2023 SWC-IGWA Legal Folders
138	Depo Ex. 22 - Screenshot of Folders within the Deposition Folder
139	Depo Ex. 23 - TFCC Water Delivery Schedule 1990 to 2022 Spreadsheets
140	Depo Ex. 24 - Amended Agreement for Sprinkler Installation
141	Depo Ex. 25 - Census Bureau Population in Twin Falls County Graph
142	Depo Ex. 26 - SWC data requested by Chuck Brockway

143	Depo Ex. 27 - Email from Sarah Tschohl to multiple parties dated 5-22-23
144	Depo Ex. 28 - GWD Depo Notice to TFCC
145	Depo Ex. 29 - Ltrs from Thompson to Spackman 2013 to 2022
146	Depo Ex. 30 - TFCC Profit and Loss 2014 to 2022
147	Depo Ex. 31 - TFCC Operating Policy
148	Depo Ex. 40 - 20220621 - Small Group Discussion Points - 4Bedke
149	Depo Ex. 41 - 2022.7.13 SWC Methodology Outline_v2
150	Depo Ex. 42 - 2022.7.13 Revisions_Methodology_Outline
151	Depo Ex. 45- GBaxter_RE_ Methodology Order Technical Work Group_20220930_3_Redacted (002)
152	Depo Ex. 46 - 2022.12.20 Anders Email re TWG Data (002)
153	Depo Ex. 47 - 2023.1.3 Email FW_ 4th Amended Methodology Order (002)
154	Depo Ex. 48 - Attmt to 1.3.23 email to M.Weaver - 20160419_SWC RevisedMethodologyLC-MA-EB-Gary-EB3
155	ESPAM21FinalReport
156	ESPAM21FinalReportAppendixA
157	ESPAM21FinalReportAppendixB
158	ESPAM21FinalReportAppendixC
159	ESPAM21FinalReportFiguresSize8.5x11
160	ESPAM21FinalReportFiguresSize11x17
161	ESPAM21FinalReportTables
162	ModelCalibration22_Final
163	ModelCalibration22_FinalAppendixA
164	CurtScen22_FinalwApp
165	ESPAM2 Recharge Tools Documentation_ Processing Steps
166	Super_FullyPop_Final
167	E22PredUnc_Final
168	E22PredUnc_FinalAppendixA
169	E22PredUnc_FinalAppendixB
170	20060428 Affidavit of Scott N. King (SWC Dist Ct Agency Record 3427)
171	20070320 Expert Report of Scott King (Irr Acres Analysis TFCC)
172	20070926 Direct Testimony of Scott King (SWC Dist Ct Agency Record 5205)
173	Exhibit 4166 TFCC Water Management Plan 1999
174	Exhibit 4166A
175	Exhibit 4167 TFCC Operation Policy
176	Exhibit 4607 TFCC Meeting 2005
177	Exhibit 4608 TFCC Meeting Minutes 2004
178	Exhibit 4610 TFCC Ditch Writer 2005
179	01-00209 SRBA SF5
180	20071107 Spronk Water Engineers Expert Rebuttal Report (SWC Dist Ct Agency Record 5371)
181	20080616 Spronk Water Engineering Expert Report (A&B ISC Agency Record Ex 301)
182	20080716 Direct Test. of Charles Brendecke (A&B Dist Ct Agency Record)
183	20080827 Rebuttal Test of Charles Brendecke (A&B ISC Agency Record Ex 460)
184	20120406 Jt Stip to Withdraw Objs TFCC
185	20221001 Budge.Baxter email string RE_ Methodology Order TWG
186	20230425 FAQ on new Methodology and SWC delivery call
187	20230425 IDWR Press Release

188	20230503 Baxter email re GWD mitigation obligations
189	20230504 Baxter emails re deposition of Weaver
190	20230504 CM-DC-2010-001 Joint Notice of Deposition Duces Tecum - M. ANDERS (00151692xD2C75)
191	CM-DC-2010-001_20150316_SWC_Staff_Recommendations_Memo
192	CM-MP-2014-007-20150123-Staff-Memo-Cities-2nd
193	CurtScen22_FinalwApp
194	Hindcast BLY v Nov Actual DS chart
195	Table1_Settlement_20221221
196	Transient State Benefits by GWD 2023
197	Attachment 1 - IGWA Proportionate Share Modeling
198	Attachment 2 - Model Cells by District
199	Figure 2-1 Sequence of IDWR Irrigated Land dataset processing
800	Figure 2-2 Example of seasonal 2002 METRIC ET within the ESPAM boundary
801	Figure 2-3 Total SWC April-Oct Diversion 1992-2021
802	Figure 2-4 Sum of Heise natural flow and storage allocation for Snake River above Milner 1992-2021
803	Figure 2-5 Reference ET for Twin Falls with both AgriMet and ETIdaho data 1992-2021
804	Figure 2-6 Growing Degree Days for Twin Falls AgriMet Site 1992-2021
805	Figure 2-7 Growing Season Precip Twin Falls Weather Station 1992-2021
806	Figure 2-8 Normal Distribution of SWC Total Diversions over POR 2000-2014
807	Figure 2-9 Normal distribution of SWC Total Diversion over POR 2000-2021
808	Figure 2-10 IDWR hindcast analysis annual carryover volumes for TFCC 1995-2022 4MO v 5MO
809	Figure 3-1 Excerpts from Ralston 2008 Fence Diagrams
810	Figure 3-2 Excerpt from Ralston 2008 geologic map
811	Figure 3-3 Tranmissivity changes ESPAM 1.1 vs 2.1 vs. 2.2
812	Figure 3-4 Specific Yield changes ESPAM 1.1 vs 2.1 vs 2,2
813	Figure 3-5 Changes in timing rate of river reach gains ESPAM 2.1 vs 2.2
814	Figure 3-6 Changes in steady state response function BF to Minidoka reach ESPAM 2.1 vs 2.2
815	Figure 3-7 Annual volume net aquifer recharge 1981 to 2018
816	Figure 3-8 Storage and Transmissivity distribution using alt METRIC processing
817	Figure 3-9 Comparison water budget components pre and post calibration using METRIC
818	Figure 3-10 Distribution of jr gw pumping curtailed under 1963 priority date
819	Figure 3-11
820	Figure 3-12
821	Figure 3-13
822	Figure 3-14
823	Figure 3-15
824	Figure 3-16
825	Table 2-1 Summary of SWC irrated acres 2015 TWG
826	Table 2-2 Summary of irrigated acres utilized in protocol calculations
827	Table 2-3 Summary of SWC irrigated acres 2022 TWG
828	Table 2-4 BLY Alternatives and BLY Criteria
829	Table 2-5 Variables Tested in 2015 Multiple Linear Regression Models
830	Table 2-6 Variables tested in 2022 Multiple Linear Regression Models
831	Table 2-7 Maximum Projected Carryover Need Fourth MO Compared to Fifth MO
832	Table 2-8 IDWR Hindcast of April DS with BLY 2018 and Lynker Est Jr GW Curtailment

833	Table 2-9 IDWR Hindcast of Nov Actual DS based on IDWR RISD comparing TFCC acre changes
834	Table 2-10 April Reduction to FS models for natural flow available to SWC entities
835	Table 3-1 Higgs analysis on IGWA proportionate share related to reach gain benefits
836	Expert Report of Jaxon Higgs
837	Expert Report of Sofia Sigstedt

RECEIVED
May 30, 2023
DEPARTMENT OF
WATER RESOURCES

Dylan Anderson (ISB 9676)
Dylan Anderson Law PLLC
PO BOX 35
Rexburg ID 83440

Telephone: 208 684-7701
Email: dylananderson@dylanandersonlaw.com

Attorney for Bingham Ground Water District

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BINGHAM GROUND WATER DISTRICT'S DISCLOSURE OF PROPOSED EXHIBITS, PROPOSED WITNESSES, AND EXPERT REPORT OF DARRYLL OLSEN Ph.D.**

Bingham Ground Water District (BGWD), submits this DISCLOSURE OF PROPOSED EXHIBITS, PROPOSED WITNESSES, AND EXPERT REPORT OF DARRYLL OLSEN Ph.D. in accordance with the Director's Scheduling Order dated May 2nd, 2023.

EXHIBIT LIST

At this time, Bingham Ground Water District does not expect exhibits that have not been identified by other parties, but reserves the right to provide rebuttal exhibits as needed.

POSSIBLE WITNESS LIST AND SCOPE OF TESTIMONY

1. Darryll Olsen, Ph.D
   Pacific Northwest Project
   3030 W. Clearwater, Ste. 205-A
   Kennewick, WA
   509-783-1623

Mr. Olsen may testify regarding the economic impacts of possible curtailment within a specific 5 county area covered by groundwater districts. These impacts include micro and macro impacts as outlined by his white

paper prepared in January 2023 for Bingham Ground Water District, and his updated memo created May 30, 2023 for these proceedings. Bothe the memo and white paper are attached as his expert report at the end of this document.

2. Alan Jackson
   Bingham Ground Water District
   1725 Riverton Rd,
   Blackfoot ID, 83221
   208 684-9634

Mr. Jackson may testify regarding groundwater operations, as well as past experience with canal companies and Rubicon Water systems. He may testify regarding Bingham Ground Water District's participation in proceedings, settlements, meetings, or other relevant information.

Bingham Ground Water District, reserves the right to call rebuttal witnesses as needed.

EXPERT REPORTS

Attached to this document is a Memo and White Paper, both constituting the report from Darryll Olsen Ph.D, prepared for Bingham Ground Water District.

Dated May 30, 2023

Dylan Anderson Law, PLLC

___/s/ Dylan Anderson_____
Dylan Anderson,
Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 130th day of May, 2023, I caused to be filed a true and correct copy of the foregoing document via E-File and Serve, and upon such filing, the following parties were served via electronic mail:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, &
LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
CITY OF IDAHO FALLS
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak
IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

Rich Diehl
City of Pocatello
P.O. Box 4169
Pocatello, ID 83205
rdiehl@pocatello.us

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110
Boulder, CO 80302
sklahn@somachlaw.com
dthompson@somachlaw.com

/s/ Dylan Anderson .
Dylan Anderson
Attorney for Bingham Groundwater District

Pacific Northwest Project
Technical Information Memorandum

DATE: May 30, 2023

TO: Mr. Gary Spackman, Director, IDWR
SE Idaho Groundwater District Boards-Managers

FROM: Darryll Olsen, Ph.D., Pacific NW Project*

SUBJECT: Supplemental Technical Memorandum for:
Policy White Paper Review for Economic Impacts Surrounding Water Right-Water Supply Restrictions to Groundwater Appropriators, Irrigation Sector Operations

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Given the pending decisions affecting groundwater and surface-water irrigation allocations in South-East Idaho, the Pacific NW Project is providing supplemental information to the initial Policy White Paper (January 2023), further highlighting key economic impacts associated with water right-water supply curtailments/regulations affecting groundwater irrigators (see attached Table 1).

This information should better inform water managers. the IWRD Director, Gov. Brad Little, Idaho legislators, and other key parties (including the media/press) about the probable economic impacts affecting water supply curtailments to South-East Idaho groundwater pumpers with junior appropriation water rights. At best, the economic impacts should be viewed as the assets at risk to Idaho and the five-county study area.

The IDWR is taking a very cautious approach to protecting surface water right allocations;[1] so being, an equally cautious approach to recognizing, and appreciating, probable economic impacts to groundwater allocations restrictions should be employed as well. The regional/state economic impacts are very real, and they provoke the need to call for a workable course of action to deal with both groundwater and surface-water irrigation needs.

This Technical Memorandum raises the following questions:

1. <u>What is the significance of Irrigated Agriculture or the Irrigated Agriculture Industry in Idaho and the primary project area?</u>

3030 W. Clearwater, Ste. 205-A, Kennewick, WA
509-783-1623, DOlsenEcon@aol.com

---

[1] The IDWR relies on judicial/cultural review of definitions for "material injury" and "reasonable use" to formulate its initial 2023 water allocation rule. While the approach retains justification, it does not bar discretionary decisions by the IDWR Director. Current above average flow conditions could be given greater deference in determining the difference between a "material injury" versus an "empirical injury," where reduced water supply impacts cannot be physically observed on the ground.

2. What does the current water supply situation in SE Idaho suggest (per Table 2 attached)?

3. How is "material injury" to senior water rights considered versus "empirical injury?" What does this mean for the current decision-making situation?

4. What types of economic impact measures and methods are used in this Technical Memorandum and the White Paper?

5. How are irrigated acreage impacts derived? What does this mean in terms of curtailed groundwater acres relative to surface supplies, acre-ft. and acres?

6. What does the economic impact analysis indicate affecting household income, revealed as direct and secondary (regional impacts)?

7. How should near-term versus long-term economic impacts be best understood?

8. What about water resources policy? What can the director do or consider given legal and conventional water resources management rules?

9. If *empirical impacts* are highly improbable, or difficult to measure, should that factor be given consideration by the IDWR director in determining reasonable protection for senior appropriator water rights? Does the weight of the probable economic impacts further support a "do no harm" approach?

10. The White Paper speaks to "internal" and "external" factors affecting groundwater and surface-water allocation conflicts in SE Idaho. What does this mean?

*Principal Investigator:

Darryll Olsen, Ph.D., Regional Planner/Resource Economist.

- About 35 years of experience preparing/directing all types of water resources economic impact projects and policy issues (Western U.S.).
- Principal economist for Argonne National Laboratory-FERC water resources project evaluations—hydro power, NED and RED impacts.
- Extensive economic evaluation work with Utah Dept. of Water Resources, water supply delivery projects; including water right change/transfers.
- Board Representative for Columbia-Snake River Irrigators Association; lead economic, technical, legislative, and litigation projects.
- Board Director, Badger Mt. Irrigation District (Ag. Irrigation, Domestic Irrigation-Household Water Service).
- Principal Author, RCW 90.80, Water Conservancy Boards in WA State; evaluated and/or approved hundreds of water right changes/transfers.
- Contributing Author, RCW 90.90, Columbia R. Basin Water Supply Act.

Table 1. Estimated Household Income Impacts--State and Subject Area for Irrigated Agriculture, 2021$, with Junior Water Rights Curtailment, At Risk Acres in Primary Southeast Idaho Area

Economic Sector	Direct Impacts	Estimated Irrigated Ag. %	Adjusted Direct Sector Values	Secondary* Income Adjusted Multiplier**	Direct & Secondary Total Impact Area
Idaho					
Farm Production	$1,699,000,000	85%	$1,444,150,000	1.5	$2,166,225,000
Ag. Services	$426,178,000	80%	$340,942,400	1.3	$443,225,000
Food Processing	$1,508,185,000	85%	$1,281,957,250	3.3	$4,230,459,000
State Total Impact:	**$3,633,363,000**	------	**$3,067,049,650**	**2.2**	**$6,839,909,000**
Bingham Co.					
Farm Production	$48,489,000	90%	$43,640,100	1.5	$65,460,000
Ag. Services	$30,467,000	90%	$27,420,300	1.25	$34,275,000
Food Processing	$72,221,000	90%	$64,998,900	2.9	$188,497,000
County Total Impact:	**$151,177,000**	------	**$136,059,300**	**2.1**	**$288,232,000**
Bonneville Co.					
Farm Production	$34,279,000	90%	$30,851,100	1.5	$46,277,000
Ag. Services	$10,367,000	90%	$9,330,300	1.25	$11,663,000
Food Processing	$197,406,000	92%	$181,613,520	2.9	$526,679,000
County Total Impact:	**$242,052,000**	------	**$221,794,920**	**2.6**	**$584,619,000**
Clark Co.					
Farm Production	$2,000,000	75%	$1,500,000	1.5	$2,250,000
Ag. Services	$1,000,000	75%	$750,000	1.25	$937,500
Food Processing	$100,000	75%	$75,000	2.9	$217,500
County Total Impact:	**$3,100,000**	------	**$2,325,000**	**1.5**	**$3,405,000**
Jefferson Co.					
Farm Production	$22,300,000	90%	$20,070,000	1.5	$30,105,000
Ag. Services	$21,888,000	90%	$19,699,200	1.25	$24,624,000
Food Processing	$56,752,000	92%	$52,211,840	2.9	$151,414,000
County Total Impact:	**$100,940,000**	------	**$91,981,040**	**2.2**	**$206,143,000**
Power Co.					
Farm Production	$37,219,000	90%	$33,497,100	1.5	$50,246,000
Ag. Services	$11,128,000	90%	$10,015,200	1.25	$12,519,000
Food Processing+	$40,000,000	92%	$36,800,000	2.9	$106,720,000
County Total Impact:	**$88,347,000**	------	**$80,312,300**	**2.1**	**$169,485,000**
Total Multi-County:	**$585,616,000**		**$532,472,560**	**2.4**	**$1,252,000,000**

Estimated annual household income impact for Multi-County Area: About $1,500/irrigated acre, crop/pasture.
Estimated annual household income for impact of 150,000 acres multi-county impacts: $225,000,000.
Estimated annual household income for impact of 400,000 acres multi-county impacts: $600,000,000.

* Secondary or regional impacts include indirect and induced impacts, associated with direct sector production inputs (inter-sector purchases throughout the regional economy) and related purchases from community services.

** Bureau of Economic Analysis (BEA) RIMS II economic sector multipliers have been adjusted to avoid inter-sector double counting of of income streams (production revenues). Adjustments made by Pacific NW Project.

+ Food processing sector data for Power County are a "place holder" estimate to avoid IRS disclosure issues; it may be a conservative estimate.

Sources:

White Paper (January 2023) data, tables, and methodology and sources cited therein; see attached White Paper.
U.S. Bureau of Economic Analysis (BEA), Regional and Local Data Bases and Apps., multiple data bases for state and county NAICS sector data, for 2021 (2022). Household income data includes farm proprietor, labor income, agricultural services, and food processing. Generally cited under "BEAR Facts" data bases and apps (multiple BEA website locations, updated annually; detailed regional multipliers prepared for the state and five-county primary subject area by BEA I-O modelers, May 2023; review of NASS Idaho State Agricultural Data, 2022 (National Agricultural Statistics Service).

NOTE: Food processing sector for Power County is a "place holder" estimate to avoid IRS disclosure issues; some corporate income is included in the state-county areas. Main access site initiated at: https://apps.bea.gov/regional/bearfacts/, and sites referenced therein (includes state GDP and household income and employment estimates).

Table 2

Northwest River Forecast Center, Water Supply Forecast, Snake River Control Points

April-September Forecast Flows-KAF: May 27, 2023.

Control-Monitoring Point	KAF Probability of Average Flows (50%)	KAF Probability of 90% Exceedence of Low Flows	Low vs Average Flows Difference KAF
Near Heise ID--April-Sept*			
5-13-2023	**4,107**	**3,999**	108
	107% of Ave.		
Near Shelley ID--April-Sept			
5-13-2023**	5,289	5,087	202
	108% of Ave.		
American Falls Dam--April-Sept			
5-13-2023	**3,179**	**2,977**	202
	121% of Ave.		
King Hill--April-Sept			
5-13-2023	2,793	2,667	126
	82% of Ave.		
Swan Falls--April-Sept			
5-13-2023	2,996	2,874	122
Estimated Difference Between Shelly and King Hill--KAF	2,496	2,420	76

IDWR April 2023 Forecast, April-July 2023

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	BLY 2018	Shortfall
A&B	14,833	135,411		150,244	64,192	0
AFRD2	115,223	387,853	1,000	504,076	453,890	0
BID	109,313	221,713	5,130	336,156	262,211	0
Milner	18,347	88,047		106,393	58,417	0
Minidoka	156,468	342,620	8,370	507,458	354,851	0
NSCC	457,802	819,773	-7,750	1,269,825	1,026,661	0
TFCC	820,663	232,606	-6,750	1,046,519	1,121,717	75,200
				Total Projected Demand Shortfall (AF)		75,200

*** Estimated volume flows Near Heise at 4,107, for the April-Sept period, 107% of average flows are estimated.**

Sources: NOAA, Northwest River Forecast Center, Water Supply Forecast Listing, 5-27-2023; IDWR, Flows Forecast April 1, 2023.

Observations:

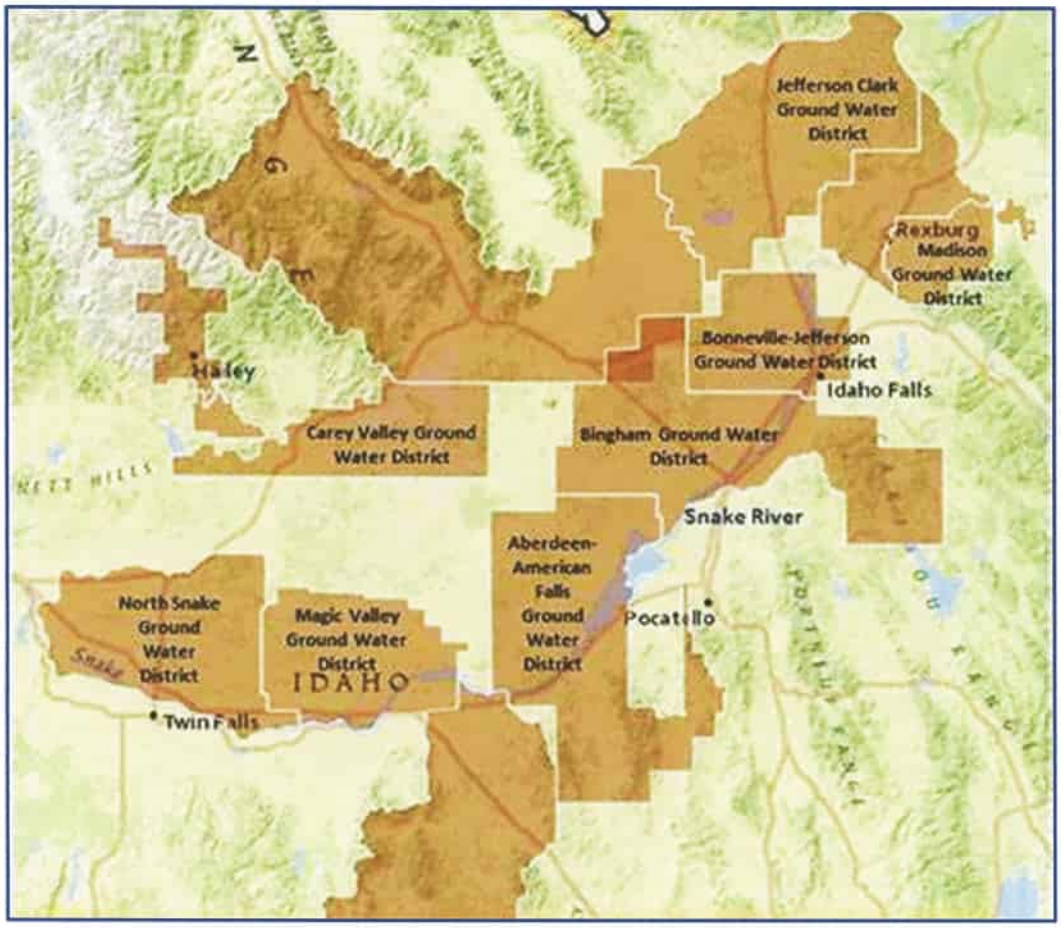
1) The estimated acre-ft./acre water demand/use for the Twin Fall Canal Company at 5.76 act-ft./acre, Total Supply, with forecast supply at 5.37 acre-ft./acre. Total irrigated acres are about 194,732.

This suggests that 3.5 acre-ft./acre could be net crop consumptive use, with 2.26 acre-ft./acre applied to carriage use/loss with some return flows; or about 40% of total dedicated supply demand.

2) For conversion to groundwater curtailment levels, it requires approximately 3 acre-ft./acre to supply 1 acre-ft. at TFCC. Conversion/impact rate is still under review for the Snake River Plain Acquifer.

Southeastern Idaho Water Resources Management Impacts

Surface-Groundwater Irrigation Demands



A Policy White Paper Review

Prepared By
Darryll Olsen, Ph.D.
Pacific Northwest Project

Prepared For:
Bingham Groundwater District
January 2023

In Summary

1. Idaho's Irrigated Agriculture Industry—Cannot be Replaced.

Idaho's Irrigated Agriculture Industry—composed of direct agricultural production, agricultural services, and food processing—sustains valuable regional, national, and international markets. It is a benchmark for agricultural producers throughout the world. State political leaders should appreciate that loss of any part of it cannot be replaced.

2. Irrigation Water Supply—the Big Picture.

Idaho's Irrigated Agriculture Industry does not exist in a geographical vacuum. Western Industry assets and the Irrigated Agriculture Industry are facing unprecedented water supply challenges. This is being exacerbated by climate change impacts, turning important Industry producers into *climate change refugees*. The Pacific Northwest retains a relatively stable water supply.

3. Surface and Groundwater Conflicts in Southeastern Idaho.

The water supply conflicts in Southeastern Idaho have evolved after decades of successful Industry growth. Conflict has revolved around changing conjunctive surface and groundwater supplies strained by increasing demands, and long-term drought. Without implementing new water management options, 150,000 acres of irrigated land will be in jeopardy.

4. Idaho's Irrigated Agriculture Industry—How Valuable Are We?

a. Idaho's Irrigated Agriculture Industry relies on about 3.4 million acres, with a farmgate value of about $6.4 billion.

b. The five-county Focus Area (Bingham, Bonneville, Clark, Jefferson, and Power counties), consists of about 843,000 acres, with a farmgate value of about $1.1 billion. "Target acres" within the Focus Area represents about 150,000 acres.

c. The statewide Industry provides about $8.8 billion in total, annual household income.

d. The Focus Area creates about $1.1 to $1.6 billion in total household income (regional-statewide impacts).

e. The irrigated land market value for 150,000 acres is about $862,000,000 to $1.7 billion, generating about $15-30 million in property tax revenues.

f. The loss of 150,000 acres would reduce household income by about $268 million.

5. Reducing Conflict—Action Items for the Idaho Legislature and Executive Office.

a. Pragmatic institutional, operational, and infrastructure measures—do exist.

b. State funding role—provide a 10-year "fixed" program for $175 million, for enhanced water management in the Focus Area.

6. Final Thoughts.

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Western water law is under siege by interests that are unsympathetic to irrigated agriculture. Across the Western U.S., cries for greater regulatory intervention are being made by frustrated or bias state regulators, environmental groups, and Tribes. Even some irrigators are turning to courts to comply with, or modify, earlier vintage water supply agreements that can no longer survive under the effects of climate change or sustained irrigation water demands. And Idaho is no stranger to calls for added fish flows from Endangered Species Act (BiOp) inriver, fish flow targets.

Some of the regulatory and statutory proposals call for a complete overhaul of state water rights, management, and regulation. Even from the University of Utah College of Law, comes a call for re-adjudicating existing water rights, to give priority to socio-ecological "needs." In Washington, the state's water management authority has proposed legislative recommendations, to restrict measures for water right change/transfers and marketing that do not address environmental justice and social equity issues (as defined by the state). This has been coined "Critical Water Theory," where all state administrative actions constrict or uncritically control water rights, particularly those in private sector hands.[7]

Idaho is unique in that junior and senior water right holders have usually sought a high level of collaboration, and they are working with a state water management agency that clearly wants to resolve problems for the Irrigated Agriculture Industry.[8] This period of grace may be short-lived, and a reasoned mindset may fade away or be disrupted by others.

[7] University of Utah, S.J. Quinney College of Law, "Climate Change and Water Law Scholarship," Utah Law Digital Commons, 2020; Water Resources Program, Ecology, "Trust, Transfers, and Water Banking Legislative Report," Draft Recommendations, August-September 2022, Olympia, WA.

[8] Some point to the Yakima River Basin, WA, Yakima Integrated Plan (YIP), as a "model" of collaboration. But most improvements to date are "ecological" in nature, and the most significant water supply mitigation for irrigators has come from direct irrigator development of access to "dead storage" in the upper basin. The overall YIP is multidecadal in structure and costs billions of dollars.

ATTACHMENTS

1. Analysis Methodology for State-Regional Irrigated Agriculture Industry Household Income Impacts.

2. Table 1. Estimated Farmgate Production Value.

3. Table 2. Estimated Household Income Impacts.

4. Table 3. Estimated Markey Irrigated Land Values and Property Tax Values.

5. Figure 1. Groundwater Focus Districts.

6. Figure-Map 2. Easter Snake Plain Aquifer Area-1.

7. Figure-Map 3. Eastern Snake Plain Aquifer Area-2.

8. Figure 4. Climate Analysis for Blackfoot-Neeley Reach Gain/loss.

9. Figure 5. Agricultural Production Prices Received and Costs Index.

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direct irrigation production data to make precise estimates, so qualitative or judgment-based assumptions must be applied, taking into account state-regional production data and conditions. The estimated irrigation-production allocations are presented in Table 1.

- An estimated percent of production value allocated to irrigated agriculture then can be applied to household income created by agricultural production, agricultural services, and food processing sectors (see Table 2). The allocations are combined to derive direct household income to the state and region (counties). These estimates are highly reliable, based on BEA 2020 income data.

- Economic sector linkages among the agricultural production, agricultural services, and food processing sectors are relatively direct and uniform; as such, the application of the production value estimates to direct household income among the sectors is considered a reasonable estimate as well. In particular, higher levels of income derived from irrigated agriculture (versus non-irrigated agriculture) are expected, and the impacts to agricultural services and food processing are usually higher as well.

- Using input-output model (IMPLAN and state sources where available) multipliers for the state and select region, value added (and income) multipliers have been calculated for the combined economic sectors of the Irrigated Agriculture Industry. The multipliers are then applied to the direct income estimates (see Table 2 and discussion therein). In previous studies the multipliers used here reflect several years of estimation and review, and the overall approach has been previously discussed with IMPLAN modelers and other conversant with I/O applications.

- The direct and secondary linkages among the economic sectors are relatively stable over time, although efficiencies in production and newly developed production products will increase the multipliers impacts. As such, it could be assumed that the multiplier levels considered here (VA multipliers and household income estimates) may be conservative. Future estimates would benefit from new IMPLAN modeling work that may marginally change the impact estimates.

Table 1. Estimated Farmgate Production Value--Total and for Irrigated Agriculture, 2018

State	Market Value Crops	Market Value Livestock	Total $ Ag. Production	Estimated Acres Irrigated Land*	Market Est. Irr. Ag. %	Estimated $$ Irrigated Land*
Idaho/Crops**	$3,210,800,000	$4,356,600,000	$7,567,400,000	3,398,100	85%	$6,432,290,000
Potatoes				335,000		
Hay-Forage				1,510,000		
Sugar Beets				168,000		
All Corn				418,100		
All Cattle Nos.		2,435,100				
Inventory						
County/Crops**						
Bigham	$352,322,000	$100,822,000	$453,144,000	333,894	90%	$407,829,600
Potatoes				67,300		
Hay-Forage				92,700		
Sugar Beets				21,800		
All Corn				5,720		
All Cattle Nos.		97,760				
Inventory						
Bonneville	$110,833,000	$57,029,000	$167,862,000	131,620	90%	$151,075,800
Potatoes				NA		
Hay-Forage				21,600		
All Corn				NA		
All Cattle Nos.		58,100				
Inventory						
Clark	$19,233,000	$66,628,000	$85,861,000	31,600	75%	$64,395,750
Potatoes				NA		
Hay-Forage				12,500		
All Corn				NA		
All Cattle Nos.		8,130				
Inventory						
Jefferson	$172,865,000	$121,692,000	$294,557,000	198,300	90%	$265,101,300
Potatoes				31,000		
Hay-Forage				81,980		
All Corn				5,160		
All Cattle Nos.		84,800				
Inventory						
Power	$210,861,000	$24,581,000	$235,442,000	147,746	90%	$211,897,800
Potatoes				43,850		
Hay-Forage				11,300		
Sugar Beets				15,200		
All Corn				12,900		
All Cattle Nos.		27,500				
Inventory						
County						
Totals:	$866,114,000	$371,000,790	$1,236,866,000	843,160	89%	$1,100,810,740
Potatoes				142,150		
Hay-Forage				220,080		
Sugar Beets				37,000		
All Corn				18,060		
All Cattle Nos.		276,290				
Inventory						

* Includes irrigated pasture.
** Major crops considered for State/County production.

Sources: NASS, 2017 Census of Agriculture, State and County Data, Idaho; and NASS Statistical Highlight, IDA, 2020.
NASS: National Agricultural Statistics Service, Data Series for Idaho and Counties.

NOTE: Percentage estimate of market value tied primarily to irrigated agriculture (including cattle production) from Pacific Northwest Project. Assumes relatively small percentages of non-irrigated wheat-pasture, other.

Table 2. Estimated Household Income Impacts--Groundwater Subject Area for Irrigated Agriculture, 2020$.

State	Direct Impact Sectors: Farm Production	Ag Services	Food Processing	Total Ag. Industry	Est. Irr. Ag. %	Est. Irr. Ag.	Multiplier: Est. Income	Total Impact
Idaho	$2,354,384,000	$322,461,300	$1,446,332,000	$4,123,177,300	85%	$3,504,700,705	2.5	$8,761,752,000
		(70% Serv. Est.)						
County								County-Statewide
Bigham	$115,256,000	$24,251,500	$66,862,000	$206,369,500	90%	$175,414,080	2.1	$368,370,000
		(70% Serv. Est.)					2.5	$516,000,000
Bonneville	$60,781,000	NA	$198,521,000	$259,302,000	90%	$233,371,800	2.1	$490,080,780
							2.5	$583,430,000
Clark	$5,115,000	NA	$67,000	$5,182,000	75%	$3,886,500	1.8	$6,996,000
							2.0	$7,773,000
Jefferson	$47,772,000	$23,249,350	$54,942,000	$125,963,350	90%	$113,367,020	2.1	$238,070,700
		(95% Serv. Est.)					2.5	$283,417,550
Power	$68,193,000	$10,701,900	$30,000,000	$108,894,900	90%	$98,005,410	2.1	$205,811,300
		(90% Serv. Est.)					2.5	$245,013,500
								County-Statewide
TOTAL:	$297,117,000	$58,202,750	$350,392,000	$705,711,750	------	$624,044,810	------	$1,309,328,780
								$1,635,634,050

Estimated annual household income impact for Multi-County Area: $1,550/irrigated acre, crop and pasture.
Estimated annual household income impact for Statewide Area: $1,940/irrigated acre, crop and pasture.
Estimated annual household income for impact of 150,000 acres multi-county impacts: $232,500,000.
Estimated annual household income for impact of 150,000 acres state-wide impacts: $291,000,000.

U.S. Bureau of Economic Analysis (BEA), Regional and Local Data Bases and Apps, multiple data bases for state and county NAICS sector data, for 2020 (2022). Household income data includes farm proprietor, labor income, agricultural services, and food processing. Generally cited as "BEAR Facts" data bases and apps (multiple BEA web site locations, updated annually..

NOTE: Food processing sector for Power County is a "place holder" estimate to avoid IRS disclosure issues; some corporate income is included in the state-county areas. Main access site initiated at: https://apps.bea.gov/regional/bearfacts/, and sites referenced therein (includes state GDP and household income).

NOTE: Regional-state household income multipliers based on IMPLAN and state input-output modeling for multiple areas, including WA-ID-CA and the Columbia Basin areas focusing on Production Irrigated Agriculture industry (production agriculture, agricultural services, and food processing combined sectors). Multiple analyses where considered. The modeling runs were relying on 1998-2013 data; the intersector linkages remain relatively stable over time, as such the multiplier estimates used here are deemed reasonable for the needs of this Policy White Paper. We note that the concentration of food processing for the counties is high, and this sector retains higher multiplier values, than the production irrigated agriculture sector alone. We note as well that more recent impact analyses for irrigation manufacturing and services suggest higher range multipliers.

For IMPLAN modeling purposes, the above sectors are combined (direct impact), with indirect-induced impacts calculated from the joint sector modeling (Pacific Northwest Project approach). Previously working with IMPLAN group modeling staff and regional IMPLAN modeling economists, this review considered both income and value added (VA) multiplier use, recognizing structural differences. Nevertheless, the VA multiplier is applied here in an attempt to reflect the full household income impacts associated with labor income, all forms of proprietary income, and associated land income (rent), and taxes contributed to additional statewide income. In effect, all income. The U.S. BEA Regional Input-Output Modeling System, RIM II Guidebook, defines value added income as generated from compensation, payments to government (taxes), and investment returns--essentially all income impacts.

Regional impact sources include: Pacific Northwest Project, "The Economic Importance of Western Irrigated Agriculture, 2015," White Paper Review, Prepared for the Family Farm Alliance, Kennewick WA (available at CSRIA.org and FFA web site). Statewide VA multipliers in the 2.0 to 2.5 range.

Office of Financial Management/UW, "The 2012 Washington Input-Output Study," OFM-Olympia-WA, Forecasting & Research, 2021. Used by State of Washington for estimating biennial budget impacts, multipliers for agriculture and food processing (employment multipliers at 1.5-3.3, often associated with income multipliers).

Entrix, Inc., "Economic Contribution of Agriculture Irrigated by the Columbia Basin Project," Prepared for the Columbia Basin Irrigation Dists., 2010, Entrix, Inc, Vancouver, WA. Multi-County and Statewide VA multipliers in the 1.8 to 2.4 range (some multi-state "linkage" indicated).

Columbia-Snake River Irrigators Association/IRZ Consulting, "Economic Impacts from Irrigation Development, East-Low Canal, Columbia Basin Project," Prepared for Office of Columbia River-Adams County, CSRIA, Kennewick WA 2013. (Regional and Statewide VA multipliers in the 1.5 to 2.0 range.

Congressional Research Service, "California Agricultural Production and Water Use, CRS, WA-DC, 2015. Statewide employment multipliers estimated at 2.2, usually associated with income multipliers.

Minnesota IMPLAN Group, Inc., "2004-2007 WA State IMPLAN Modeling Data Multipliers Reports," MIG, Stillwater, MN, 2007. Agriculture and food processing VA multipliers in the 1.4 to 2.4 range, not including dairy processing.

Numerous technical articles on I/O Model multipliers, such as Irrigation Association, "Economic Impact of the Irrigation Services Industry," 2021, IA. National employment multipliers in the 2.3 range (usually associated with income multipliers).

IMPLAN Blog, Understanding IMPLAN Multipliers, 2020, IMPLAN, Blog.IMPLAN.com, and other regional economic impact articles on internet sites.

Table 3. Estimated Market Irrigated Land Values and Benchmark County Property Tax Values

County Area	Market Values for 2018-2022 Sales, $/Acre Estimated Range $	Est. Index Value	Focus Area Acres	Total Est. Value	Land Value 50% Impaired Use Value	Est. Tax Rate Per $100 Taxable Value	Est. County Tax Revenue @ 100%	Est. County Tax Revenue @ 50%
Multi-County Area	$10,500-16,500	$11,500	150,000	$1,725,000,000	$862,500,000	1.75%	$30,187,500	$15,093,750
		(weighted est.)					------	------
Bigham						2.16%	------	------
Bonneville						4.60%	------	------
Clark						1.03%	------	------
Jefferson						1.63%	------	------
Power						2.21%	------	------
TOTAL:	$10,500-16,500	$11,500	150,000	$1,725,000,000	$862,500,000	1.75%	$30,187,500	$15,093,750
		(weighted est.)						

Estimated market value range indicates $10,150-16,500 per acre. Approximately 50 market transactions reviewed for the 2018-2022 period.
Irrigated transactions reviewed as land with some infrastructure included (irrigation, farm buildings), no residential structures.
Irrigated transactions reviewed as land not in development path of existing communities and commercial development (location proximity considered).
Estimated irrigated land values above assume adequate crop water duties; index value should be considered relatively conservative estimate, given active demand for agricultural lands (for various production needs).

Sources include: Idaho Land Sales & Prices, Acre-Value, "Sold Land," https://www.acrevalue.com/sales/ID (covers 2018-2022 period).
Several state-wide real estate office listings, "Land and Farm" and "Landsearch" web sites; and Ag. Census data from NASS sites (conservative values).
Https://www.tax-rates.org/idaho/property-tax; data from Associated Tax Payers of Idaho, www.ati-taxinfo.com and personal communications with county Treasurers' Offices and online site information, November-December 2022.

Figure-Map 1. Groundwater Focus Districts.

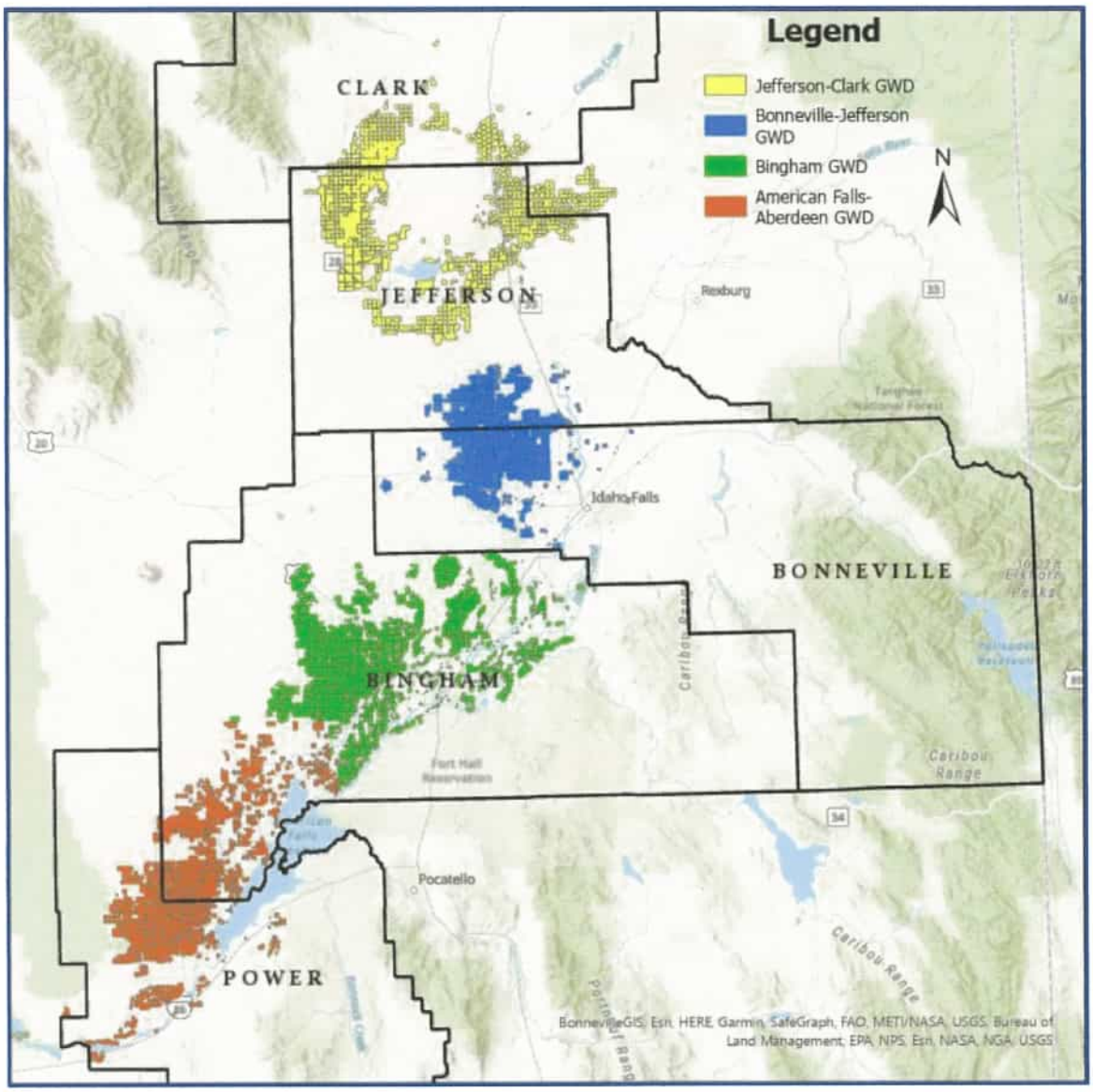


Figure-Map 2. Eastern Snake Plain Aquifer Area-1.

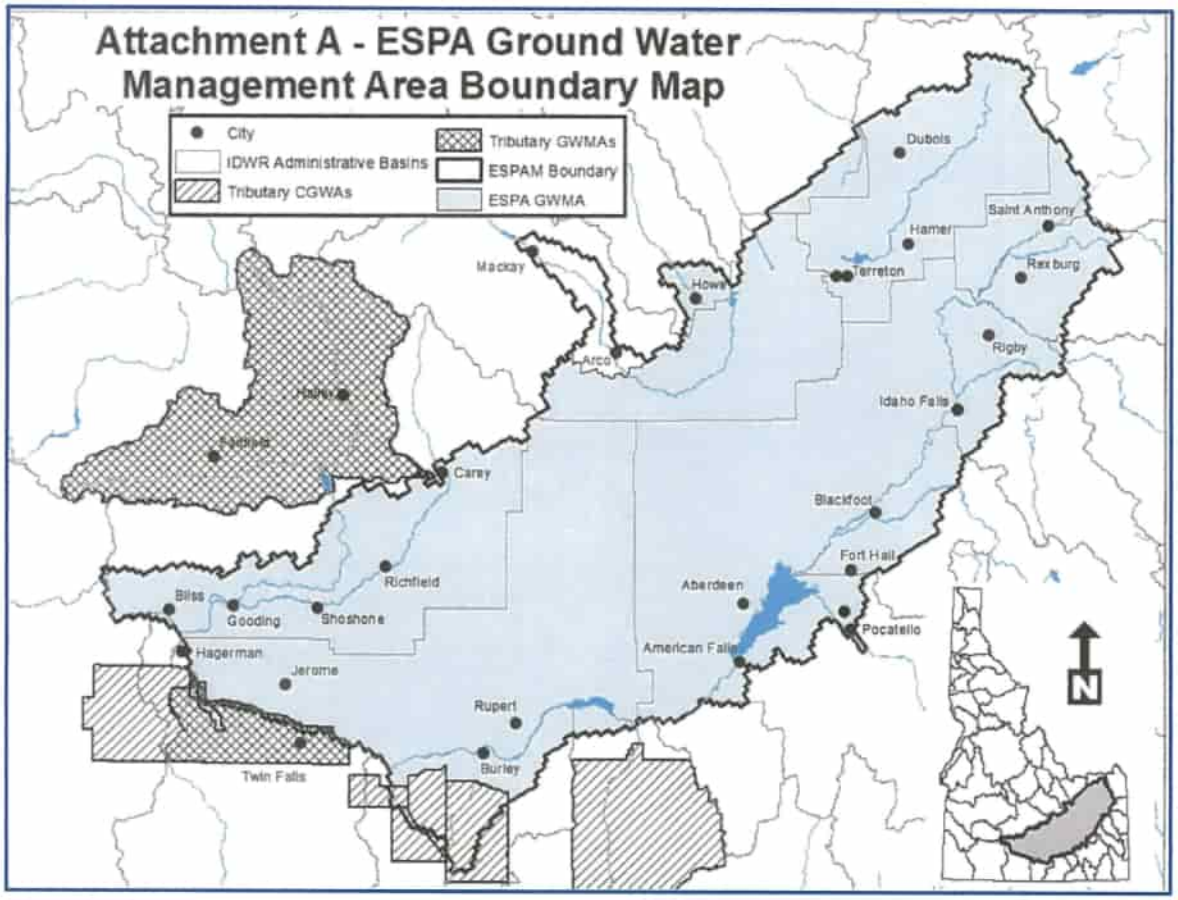


Figure-Map 3. Eastern Snake Plain Aquifer Area-2.

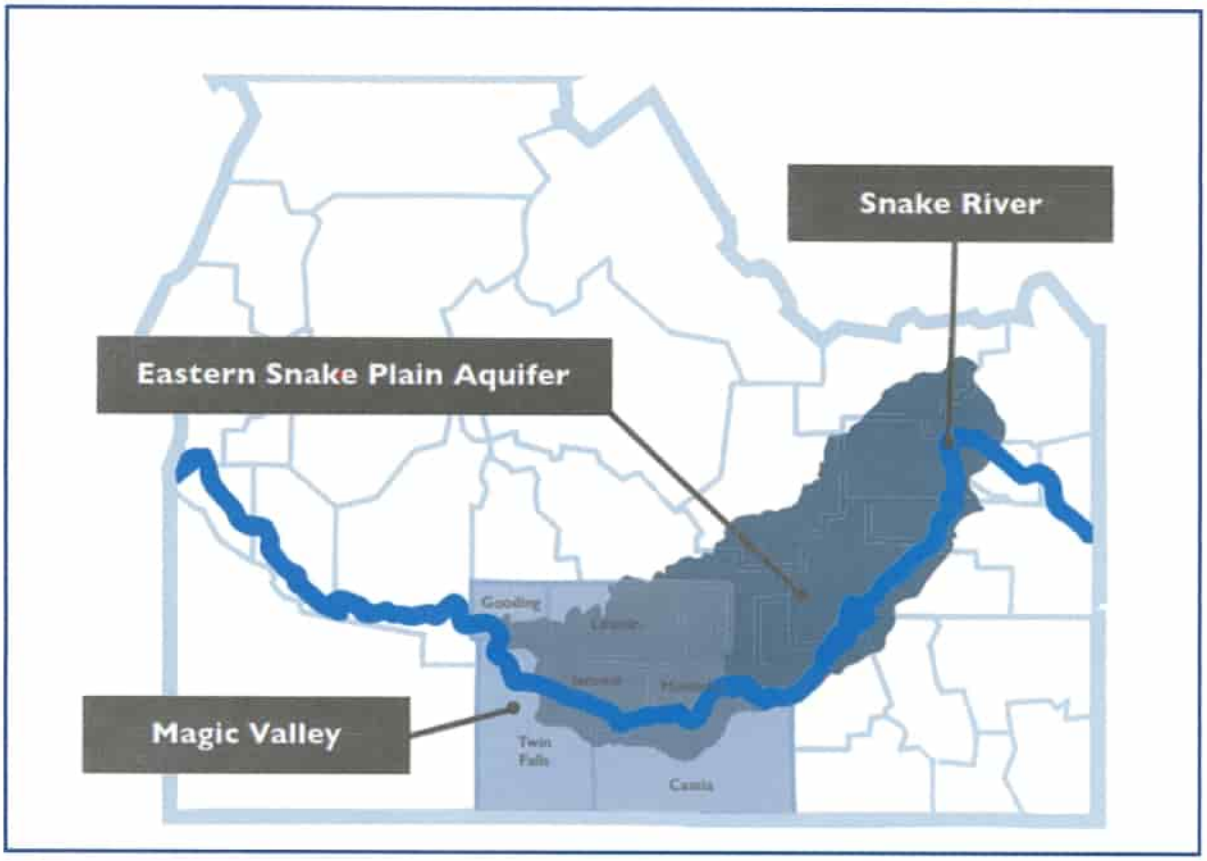


Figure 4. Climate Analysis of Blackfoot to Neeley Reach Gain/Loss.

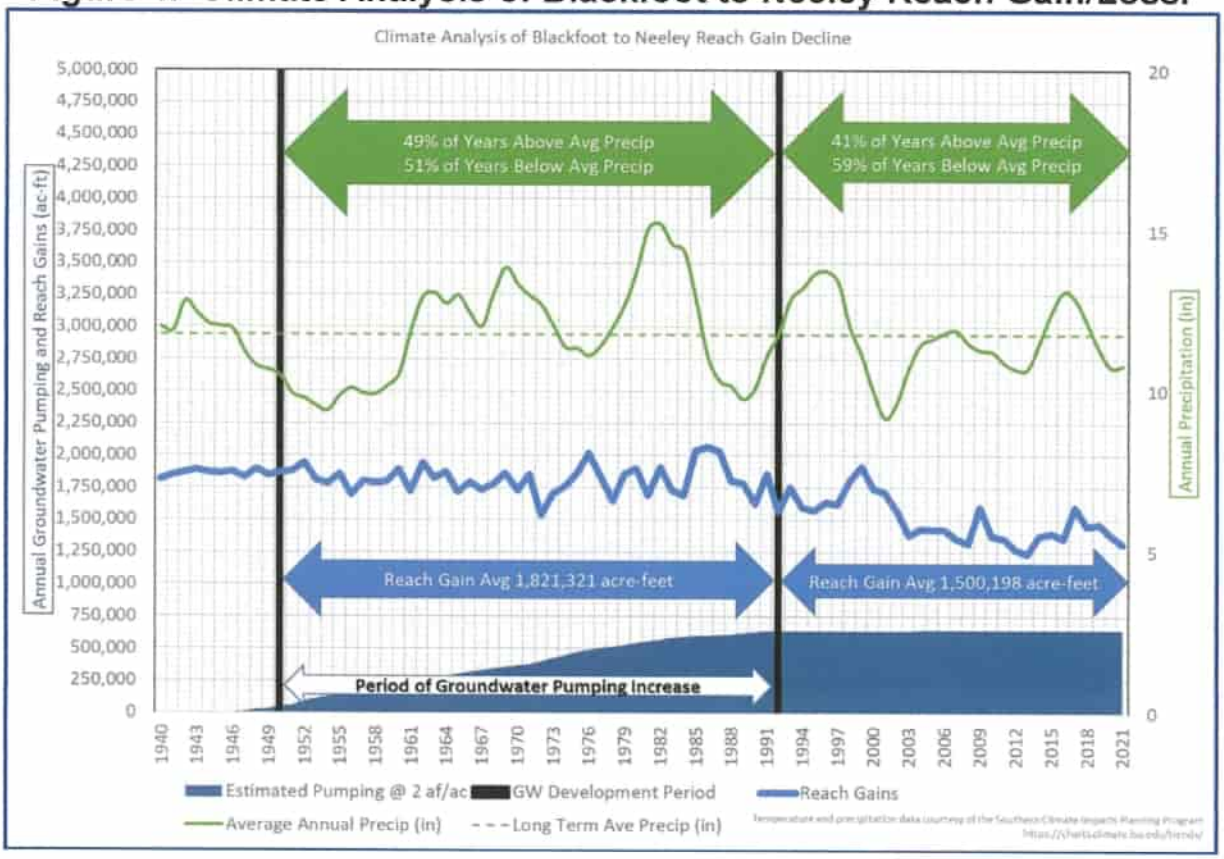
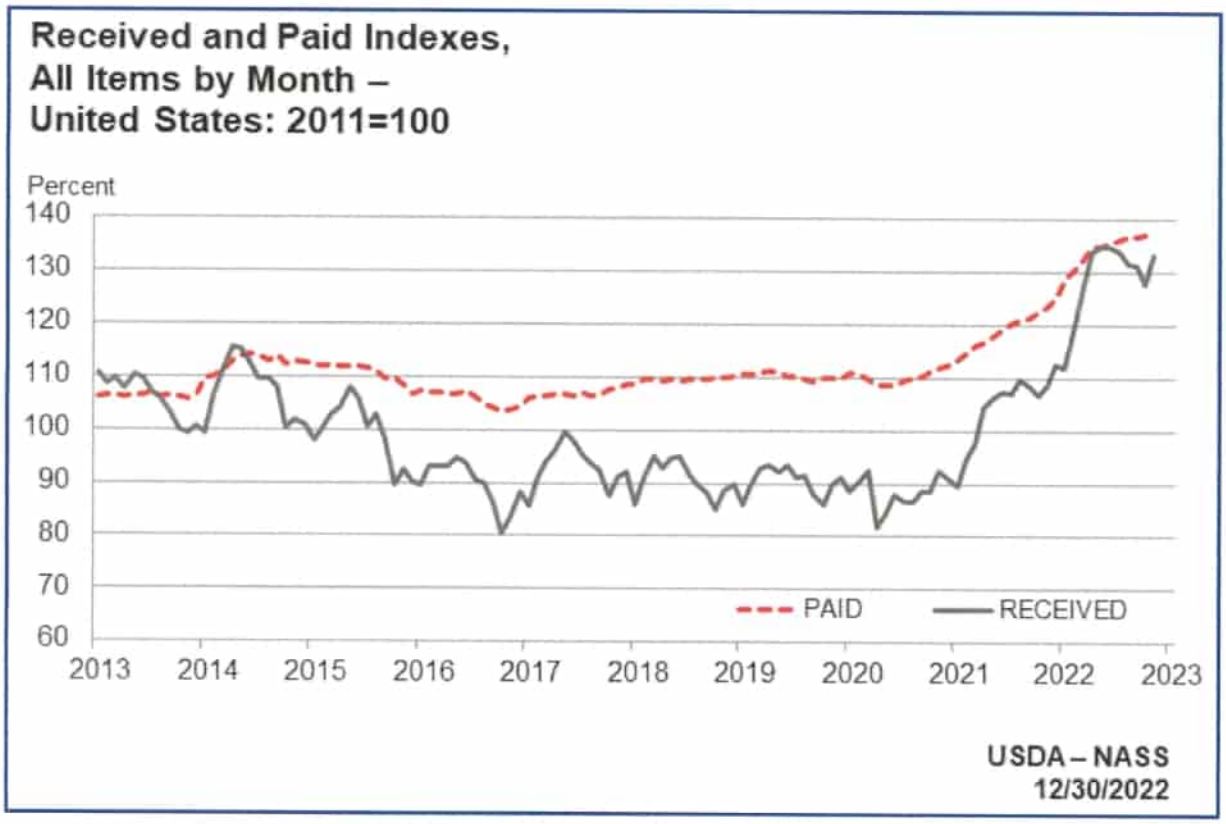


Figure 5. U.S. Agricultural Production, Prices Received and Costs Index.



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WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB. No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BONNEVILLE-JEFFERSON'S WITNESS AND EXHIBIT LIST**

The Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson"), acting for and on behalf of its respective members, through counsel, submits its *Proposed Witness and Exhibit List* pursuant to the Director's S*cheduling Order and Order Authorizing Remote Appearance at Hearing*, issued on May 2, 2023.

EXPERT WITNESS

Bonneville-Jefferson has retained Bryce Contor, Senior Hydrologists at Rocky Mountain Environmental Associates, Inc., 482 Constitution Way STE 303, Idaho Falls, ID 83402, for the

purpose of offering expert testimony in the above-captioned matter at the June 6, 2023, hearing. Mr. Contor may testify as an expert regarding technical aspects of transient modeling and steady state modeling; the implementation of and changes to Enhanced Snake River Plain Aquifer (ESPAM); possible application of source water fraction methods in the methodology order; and the use of transient and steady-state modeling in applications of the Fifth Methodology Order. A complete statement of the expert opinions Mr. Contor may express at trial as well as the basis and reasons for his opinions are contained in his Expert Report attached to this document as Exhibit "A."

Data and other information Mr. Contor considered in forming his opinions as well as the exhibits he intends to use as a summary or in support of his opinions are referenced in his Expert Report, identified in the Exhibit List below, and are available at the Dropbox link provided to the parties.

Mr. Contor's qualifications as an expert witness in this matter, including a list of all publications authored by him in the preceding ten (10) years are contained in his Curriculum Vitae attached to this document as Exhibit "B."

A schedule of the compensation to be paid to Mr. Contor for his work and testimony in this matter is attached to this document as Exhibit "C."

A list of cases in which Mr. Contor has testified as an expert at trial or by deposition is contained in his Curriculum Vitae previously referred to as Exhibit B.

Bonneville-Jefferson reserves the right to amend or supplement this disclosure in the event the June 6, 2023, hearing date is continued.

LAY WITNESSES

Bonneville-Jefferson reserves the right to call or re-call any witness identified by any party in the above-caption matter. Bonneville-Jefferson identifies the following lay witnesses that it may call at trial:

Jay Barlogi
Manager of Twin Falls Canal Company
357 6th Ave W
Twin Falls, ID 83301

Bonneville-Jefferson reserves the right to examine or cross-examine Mr. Barlogi regarding any material identified by a party in the above-captioned matter.

Bonneville-Jefferson may call Mr. Barlogi to testify regarding the aspects of his job as the Manager of the Twin Falls Canal Company. As manager of one of the Surface Water Companies making the water delivery call against Bonneville-Jefferson and other ground water users, Mr. Barlogi has information relevant to the water call, generally, and the implementation of the Director's current and previous methodology orders. He also has information relevant to any demand shortfall his company has experienced. Further, he can speak to information his company provides the Idaho Department of Water Resources each year prior to the calculation of any demand shortfall in this water delivery call. Jay can specifically discuss the irrigated acreage and crop water needs for his company and the efficiency of his system in meeting water delivery demands. He may testify regarding diversions, measurement, and application of surface water that is the subject of the instant water delivery call. Mr. Barlogi has also participated extensively in the 2015 IGWA/SWC Settlement Agreement and can testify to matters pertaining to that agreement.

Bonneville-Jefferson reserves the right to amend or supplement this list in the event the June 6, 2023, hearing date is continued.

EXHIBIT LIST

Following are a list of exhibits Bonneville-Jefferson intends to present at trial:

Ex. No.	Ex. Name
500	Expert Report Regarding Selected Technical Aspects of the Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover, Bryce Contor
50	Fifth Amended Methodology Order
50	Snake River Plain Aquifer Model Scenario, 2006
50	Curtailment Charts
50	Staff memorandum in response to expert reports submitted for Rangen Delivery Call (In the Matter of Distribution for Water to Water Right Nos. 36-02551 and 36-07694), 2013
505	Description of the IDWR/UI Snake River Plain Aquifer Model (SRPAM), 1999
50	Enhance Snake Plain Aquifer Model Final Report, 2006
50	Etransfer 3.2 image
50	Etransfer 3.4 image
50	ESPAM 2.1 Tool
5 0	ESPAM 2.1 Final Report, 2013
5	Table 1 Settlement 2000-22
5	Model Calibrations 2022
5	ESHMC-White-Paper, 2007
5	Eastern Idaho Water Rights Coalition Letter, 2012
5 5	Determination of Source of Irrigation Water for Calibration of Eastern Snake Plain Aquifer Model Version 2, 2008
5	Deposition Transcript of Jennifer Sukow, 2023
5	Fourth Amended Methodology Order
5	April 2023 As-Applied Order
5	E22 SSRF image
5 0	IDWR contribution to the uncertainty white paper, 2012
5	Technical Report on ESPAM 2.0 Modeling Issues, 2012
5	Idaho Code § 42-233b
5	Ground Water Banking in Aquifers that Interact with Surface Water: Aquifer Response Functions and Double-Entry Accounting, 2009 Article
5	Deposition of Jay Barlogi, 2023
5 5	First Deposition of Matt Anders
5	Second Deposition of Matt Anders

Bonneville-Jefferson reserves the right to amend or supplement this list in the event the June 6, 2023, hearing date is continued.

DATED: May 30, 2023

OLSEN TAGGART PLLC

/s/ *Skyler C. Johns*
SKYLER C. JOHNS

CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of May 2023, I served the foregoing document on the persons below via email as indicated:

/s/ Skyler C. Johns
Attorney for Bonneville-Jefferson

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org
Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

Expert Report Regarding Selected Technical Aspects of the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*

May 31, 2023
Bryce A. Contor
Principal Hydrologist
Rocky Mountain Environmental Associates, Inc.

Introduction

To aid in an administrative hearing concerning the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* (Fifth Order), Rocky Mountain Environmental Associates Inc. (RMEA) provides this expert report regarding technical topics. This is not an exhaustive report, but is confined to the following technical issues:

- Technical arguments used by the Idaho Department of Water Resources (IDWR) to justify the use of transient modeling as opposed to stead state modeling;
- Purposes of the Enhanced Snake River Plain Aquifer Model (ESPAM) and technical opinions regarding its use;
- Possible application of source water fraction methods to parse out supplemental water use by the Surface Water Coalition;
- Logical consistency in the use of transient and steady-state modeling.

In this report, all references to Finding(s) of Fact or Conclusion(s) of law are to the Fifth Order unless explicitly stated otherwise.

Technical Arguments for use of Transient Modeling

Perhaps the most influential change in the Fifth Order is the change from steady-state modeling to transient-state modeling in determining a priority date for curtailment. The Fifth Order provides the following technical rationale for the change to transient modeling:

1. Page 2, last paragraph of the "Background" section states, *"the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling…."*
2. Also on page 2, the Fifth Order states *"The first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version [of ESPAM] was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling…"*
3. Finding of Fact #83 quotes the Merriam-Webster dictionary for a plain-language meaning of the term "steady state," then asserts that *"A steady-state ESPAM simulation can only model [effects]… resulting from continuous curtailments of an identical magnitude and location until the effects of curtailment are fully realized."* Finding of Fact #84 states: *"For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved."*

Each of these stated rationales is discussed in turn, followed by a general conclusion.

Multiple Years of Experience

Concerning the stated reason that "*the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling,"* the Snake River Plain Aquifer Model Scenario: Hydrologic Effects of Curtailment of Ground-water Pumping Using Snake Plain Aquifer Model Version 1.1 "Curtailment Scenario" (Scenario) presented to IDWR in 2006 all of the implications of steady-state modeling vs transient described in the Fifth Order, that are correct. No data or modeling advances since 2006 have qualitatively changed the results of the Scenario. In the following excerpts, quotes from the Scenario are in italics, with square brackets *[ ]* showing clarifications that are compatible with the original text and analysis. Non-italic type not set off with brackets is commentary added with this report:

> *Page3: "It is important to recognize that even after curtailment of ground-water rights, there is a residual impact to river reaches due to previous years of ground-water pumping. The magnitude and timing of this residual impact can also be evaluated using these scenario simulations.*
>
> *Page 3: "The specific objectives [of the Scenario] are to:*
> *1) Determine the magnitude of increase in spring discharges and river gains over time for each sub-reach of the Snake River.*
> *2) Determine the seasonal magnitude of the expected increases.*
> *3) Determine the predicted impacts to aquifer water levels."*
>
> *Page 3 and page 4: "Initially, ground-water pumping removes water from aquifer storage, causing a localized cone of depression. As pumping continues, the effects propagate until a hydraulically connected boundary is reached. A recharge boundary will act as a source for the water being removed via ground-water pumping. Changes in*

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aquifer water levels will impact the amount of water being recharged or discharged from a hydraulically connected recharge or discharge boundary. For example, in a hydraulically connected river reach, the relationship between river stage and aquifer water level will determine the amount of water moving between the aquifer and the river. For a gaining river reach, a decrease in aquifer water level will result in a decrease in the rate of ground-water discharge to the river....

As time passes and the collective impacts of ground-water pumping on the eastern Snake River Plain propagate throughout the aquifer system, less of the removed water is coming out of aquifer storage and more is coming from the river, either in the form of reduced spring discharges, decreased aquifer discharges to the river, or increased losses from the river. Ultimately, however, all of the ground water pumped and consumptively used for irrigation will come from the Snake River. It is difficult to quantify the volume and timing of these impacts to the river reaches. A numerical ground-water model is the best available tool for such an estimation."

Page 5 and 6: "The numerical superposition version of the ESPA model [used in the Scenario] is very similar to the fully populated ESPA model with all recharge and discharge terms removed and with a zero initial gradient. The numerical superposition model uses the concepts of superposition as detailed in Reilly and others (1987). The fundamental basis of superposition theory is that, for a strictly linear system, a complex problem can be decomposed into more simple sub-problems. The sum of the solutions of the sub-problems will be the same as the solution to the whole, more complex problem....

Confined aquifer model representations are strictly linear; unconfined aquifer model representations are non- linear due to the fact that aquifer transmissivity changes as aquifer water levels change. In the eastern Snake River Plain aquifer, the changes in water levels are very small relative to the total saturated thickness, so these nonlinearities are considered negligible. A comparison of the confined version of the ESPA model versus the unconfined version has been done by IWRRI and is published in ESPAM Design Document DDM-019, Comparison of Unconfined and Confined Aquifer Representation. Similarly, a comparison of model results using the fully populated model versus the numerical superposition model has been done by IWRRI and will also be documented in a report. The results of these evaluations support the conclusion that the non- linearities of the ESPAM are negligible. These results have been presented to the ESHMC [Eastern Snake Hydrologic Modeling Committee]....

The results from this [superposition] simulation represent the impacts from the particular aquifer stress being evaluated in isolation of all other recharge and discharge."

Page 6: "Evaluation of the impacts of curtailment of ground-water pumping was greatly facilitated by using the numerical superposition model. The numerical superposition model is not restricted to the 22-year period of the fully populated model and the effects of curtailment can be evaluated in isolation of all other recharge and discharge, yielding an estimate of expected changes in river gains and spring discharges due to curtailment. Evaluations of the results of these scenarios using numerical superposition can be used

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to estimate expected future impacts to river gains due to curtailment and the residual impacts to river gains from ground-water pumping after ground-water curtailment. Using superposition allows analysis of the future impacts of a specified stress (in this case, ground-water pumping) without requiring knowledge of other future conditions such as weather" (emphasis in original).

Page 7: "For the long-term curtailment assessment, the annual averages of precipitation and evapotranspiration were used. For the seasonal curtailment assessment, summer and winter (corresponding to irrigation season and non- irrigation season) averages were used."

Page 8: "Additionally, Table 1 lists the time for each reach to come within 10% of the steady state value. For example, in Table 1, curtailment of all ground water is predicted to cause a 298 cfs accrual in the Devil's Washbowl to Buhl reach. Transient simulation results indicate that it would take approximately 59 years for the recovery to reach 90% of the steady state value. Similarly, curtailment of ground water junior to January 1, 1973 is predicted to cause an 88 cfs recovery in the same reach. Ninety percent of this recovery would be realized in 51 years."

Page 9: "Table 2 summarizes the predicted reach accrual after one year of curtailment for each reach for each cutoff date." Unfortunately, the units of Table 1 are "cfs" and the units of Table 2 are "acre feet," so it would take some calculation to perceive the difference between the first-year results and the total result.

Page 10: "Figures 18 through 28 show the seasonal predictions of reach accruals for the 11 reaches of the Snake River for each of the five cutoff priority dates....

Many of the reaches... show a winter decline almost back to the river reach gain levels of the previous year. Some of the reaches, however, show a smaller decline relative to the predicted accruals. This would indicate that the curtailed areas are more distant from the reach and that the accruals are taking longer to get to the reach...." Figure 18 also shows single-year results for two of the cutoff dates.

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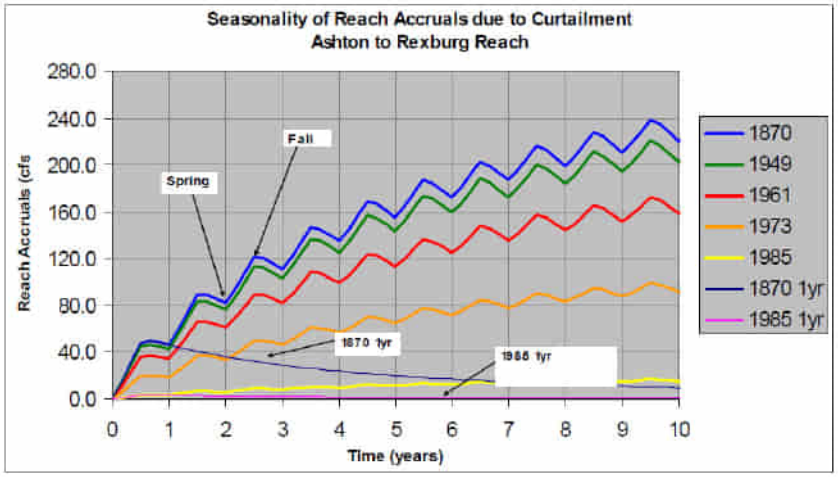

Figure 18. Seasonality of Reach Accruals due to Curtailment of Ground-Water Pumping for Ashton-Rexburg Reach (generated using ESPAM v1.1).

Figure R1: Figure 18 reproduced from Scenario.

Page 11: "Just as curtailment of ground-water pumping will cause increases in river gains, curtailment will also cause a recovery of aquifer water levels. Figures 29 through 34 show predicted changes in water levels at six locations throughout the plain due to curtailment of all ground-water pumping." Page 11 also states *"The magnitude of the rise is driven by how proximal the curtailed ground-water irrigated lands are to the river reach under evaluation."* This is incorrect and should read "how proximal... to the location where water-level changes were considered."

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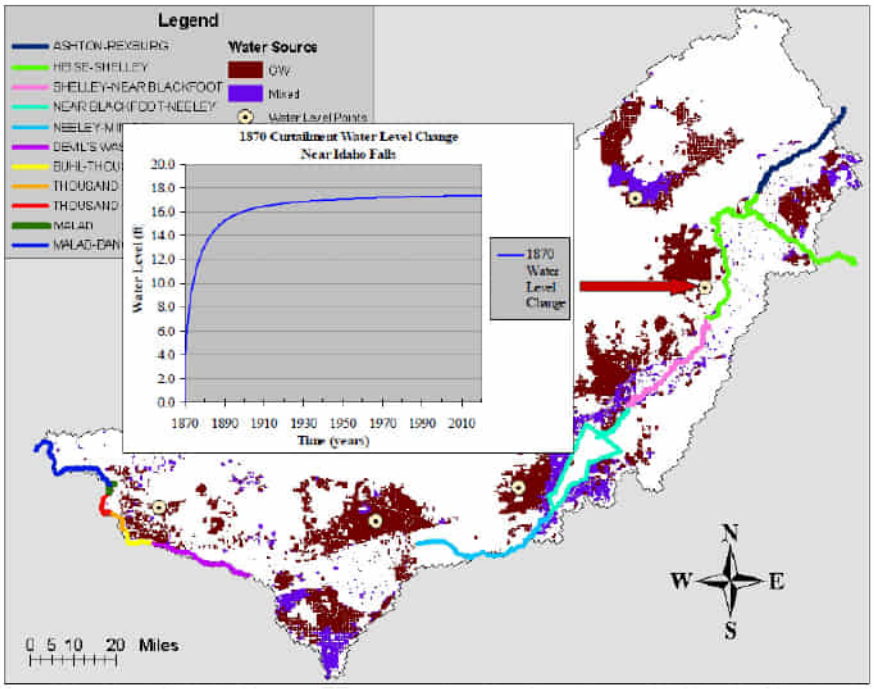

Figure 30. Predicted change in ground water level near Idaho Falls due to curtailment of ground water pumping junior to 1870 (generated using ESPAM v1.1).

Figure R2: Figure 30 reproduced from Scenario.

Page 11: "For the temporary, 1-year simulation, maximum realizable accruals are relatively small but the benefits last for several years."

These excerpts show the state of knowledge that has been available to IDWR since 2006. It could be argued that a 2006 report is so old that no IDWR personnel who were familiar with it were involved with technical input to the Fifth Order. However, a 2013 staff memo from Jennifer Sukow to Gary Spackman indicates that in 2012 Sukow repeated the curtailment scenario exercise using both ESPAM2.0 and ESPAM2.1. It is clear that in 2012 Sukow was aware of the 2006 work, and that Spackman had an opportunity to be aware of it at least as early as 2013. Both still are employed at IDWR and could have applied this knowledge at any time in approximately the last decade.

Modeling Time Scale

The second stated reason is that the *"first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version [of ESPAM] was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling…."* A stress period in modeling parlance is a representation of a period of time during which model inputs (recharge and

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discharge data, and calibration targets) are held constant. Table 1 in this report shows the date of release and stress period lengths used in the various versions of the model discussed above. The timing of events shown in Table R1 is different than intimated by the statement in the Fifth Order.

Table R1. Model Versions, Report Dates, and Stress-Period Lengths

Model	Report Year	Stress-Period Length
SRPAM	1999	15.2 days
ESPAM1.0	(no report)	6 months
ESPAM1.1	2006	6 months
ESPAM2.0	(no report)	1 month
ESPAM2.1	2013	1 month
ESPAM2.2	2021	1 month

In addition to the fact that ESPAM modeling with one-month stress periods precedes the 2016 Fourth Methodology order by three years, the notion that earlier versions did not facilitate *"in-season transient modeling"* should be considered in light of the following:

- The 1999 SRPAM stress period was shorter even than the ESPAM2.2 stress period.
- The 2005 – 2006 ESPAM1.0 and ESPAM1.1 stress periods were approximately the length of an irrigation season and were assigned to winter and summer months in a fashion that facilitates evaluation of effects upon surface-water irrigation supplies.
- As illustrated by the Scenario, the ESPAM1.0 and ESPAM1.1 models not only were explicitly designed to represent seasonal effects of activities, they were used for that purpose at least as early as 2006.
- It is not necessary for the stress-period length in model application to match the stress-period length in calibration, as demonstrated by all versions of the IDWR transfer tool (ETRAN).

It is acknowledged that generally it is not considered good modeling practice to apply the model with shorter stress periods than used in calibration, though this guideline was not adhered to in the first single-cell versions of IDWR's transfer tool.

Time constraints precluded more robust analysis, and precluded analysis using ESPAM2.2. However, a limited analysis was conducted using a monthly version and a trimester version of ESPAM2.1, at three of the points shown in Figure R3. These points were not selected to be representative but rather to fully explore differences across the aquifer.

The monthly version of ESPAM2.1 is referred to as "RSP_E2_1." It is a proprietary tool developed by Rocky Mountain Environmental Associates that uses a mathematical modeling procedure called *convolution* to apply a table of input stresses to a large database (approximately two gigabytes) of transient response functions that provide responses from each of approximately 11,000 model cells to each of approximately 60 modeled spring and river reaches. The trimester version is IDWR's "ETRAN3.3" transfer tool.

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For each point, the model was applied three times; once with ETRAN3.3, and twice with RSP_E2_1. Results are illustrated in Figure R4 through Figure R6. Only the first two years of results are shown, and only for the Near Blackfoot to Minidoka reach. All three applications represented a curtailment event that would produce 100 acre feet of reduction at the modeled point. For the results labeled "Trimester," the 100 acre feet were applied uniformly across one four-month trimester, and results modeled on a trimester stress period. For results labeled "Monthly 1," the 100 acre feet were applied uniformly across the first four months, so the application of effect was identical to the "Trimester" rendition. However, the modeling used one-month stress periods. The "Monthly 2" results also reflect 100 acre feet of relief modeled using one-month stress periods, but the relief was applied variably across six months in an effort to simulate the approximate timing of relief from an actual curtailment event.

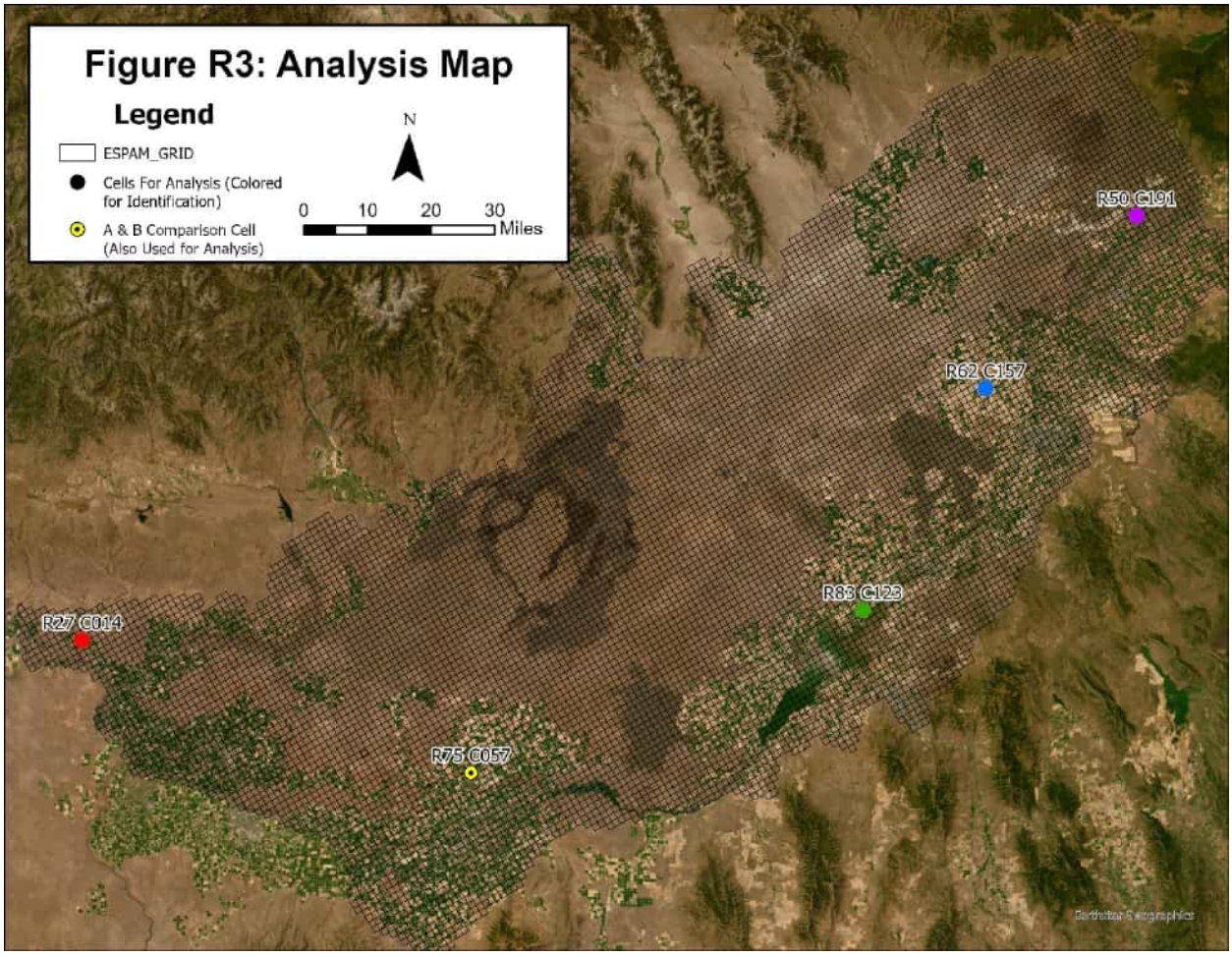

Figure R3.

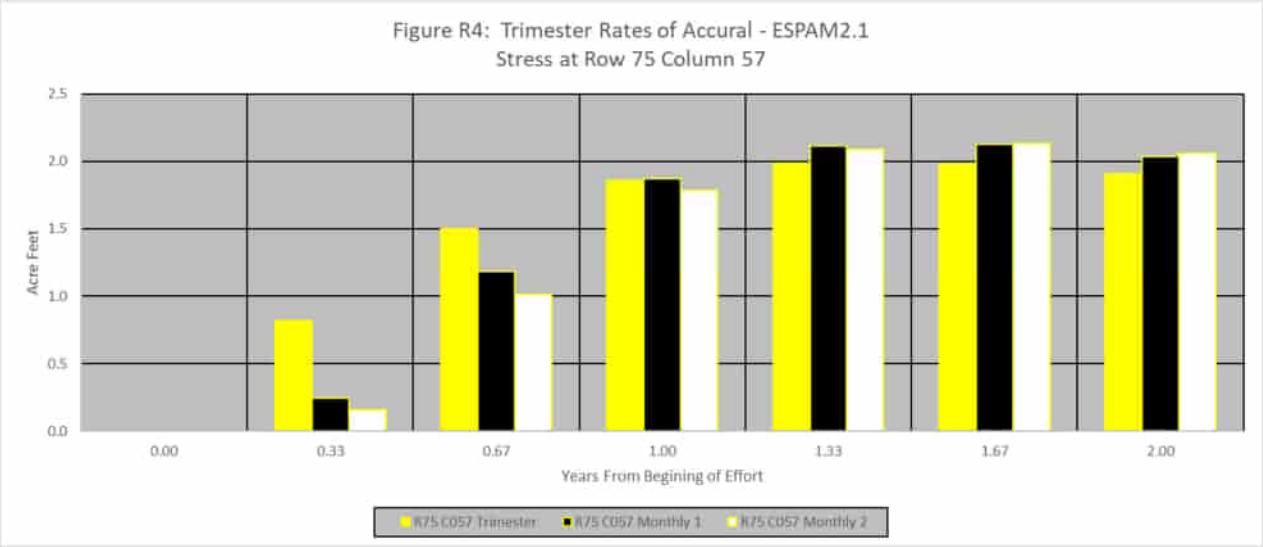

Figure R4.

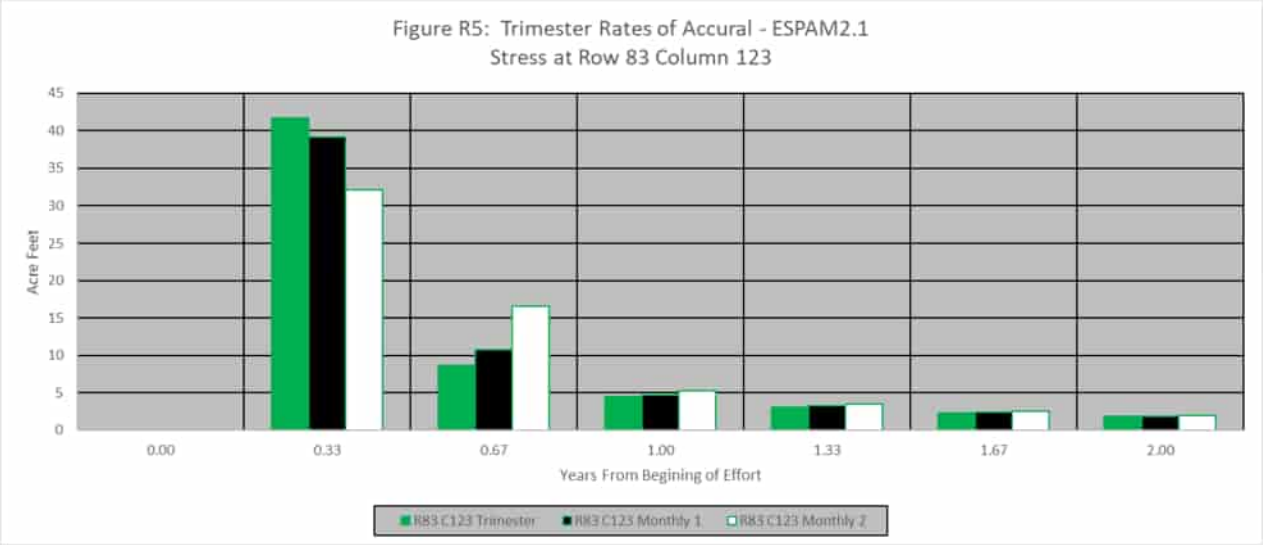

Figure R5.

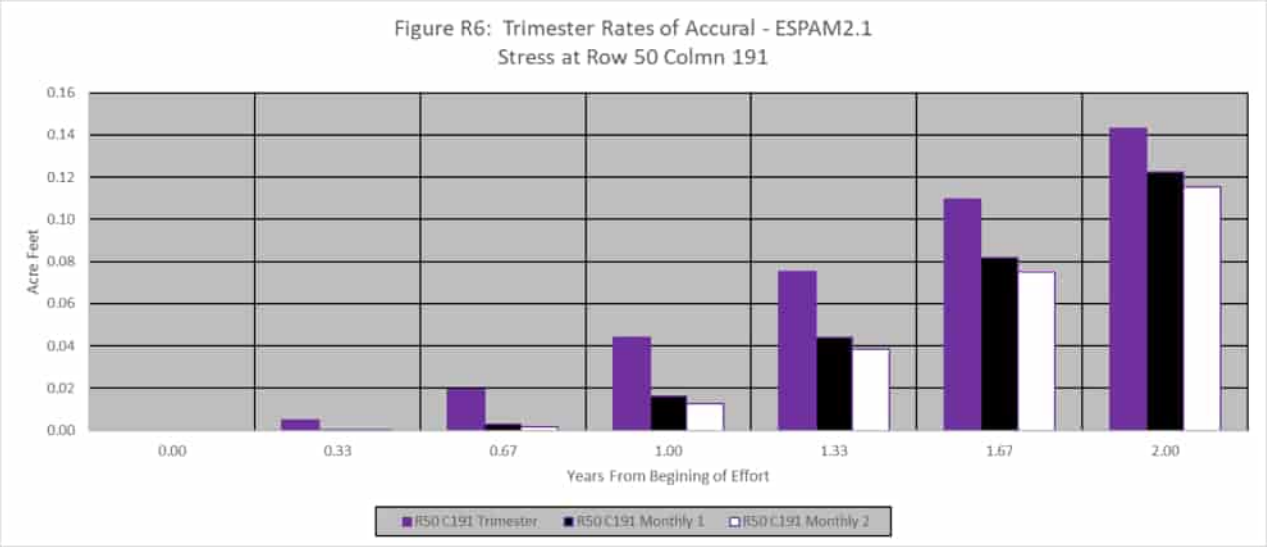

Figure R6.

Conclusions from this limited exercise are as follows:

- Within the first two years, results are qualitatively similar but not quantitatively identical.
- The differences resulting from stress-period length and temporal description of the effect of curtailment subjectively appear to be smaller than the differences between successive versions of the model, as discussed later in this report.
- The largest discrepancies, in terms of percent difference between model outputs, were observed in the point that showed the smallest overall response to the Near Blackfoot to Minidoka reach. Time constraints precluded exploration of whether this is a general result.

The results may be somewhat misleading; the model can be set to produce results as of the beginning of a stress period, or as of the end. Time constraints did not allow exploration of whether the RSP_E2_1 and ETRAN3.3 were consistent in this setting. If they were not, the discrepancies may be smaller than the figures suggest. Nevertheless, the overall conclusion is that monthly stress periods are somewhat different, and perhaps "better," than longer stress periods, but that four month stress periods and by extension probably six month stress periods can be used for evaluation on the time frame of individual irrigation seasons, as intended and practiced with ESPAM models prior to 2013.

The Nature of Steady-state Modeling

The third stated technical reason to adopt transient modeling is that *"A steady-state ESPAM simulation can only model [effects]… resulting from continuous curtailments of an identical magnitude and location until the effects of curtailment are fully realized."* It is true that permanent curtailment *could* be a presumption of steady-state analysis, and this could be the

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presumption that was made in constructing the Scenario in terms of cubic feet per second, as suggested by the following quote:

> *Page 8: "The steady state analysis presumes the unlikely case that pumping has been permanently curtailed."*

If this was meant to apply generally to steady state modeling, it is incorrect, though it may be a reasonable explanation for a model run whose input and output values were contemplated in terms of flow rate (cfs). If the input and output values were contemplated in terms of acre feet (as is done in assigning a curtailment date), a more correct statement would have been that "Steady state analysis estimates only where the effects of curtailment will accrue and provides no information on the timing of curtailment or accrual." The most striking example of this fact is that steady-state modeling has been used to calculate curtailment date under all prior methodology orders, and is used in the Fifth Order to partition mitigation responsibility.

Despite the incorrect, or at best unfortunate, wording in the Scenario, its results did show that at long time periods, transient modeling very closely approximates time-agnostic steady-state modeling:

> *Page 9: "Figures 7 through 17 show the predicted reach accruals over a long period of time for each modeled reach, for each cutoff date..... Each figure also shows the steady state value for predicted accruals for each of the cutoff dates."*

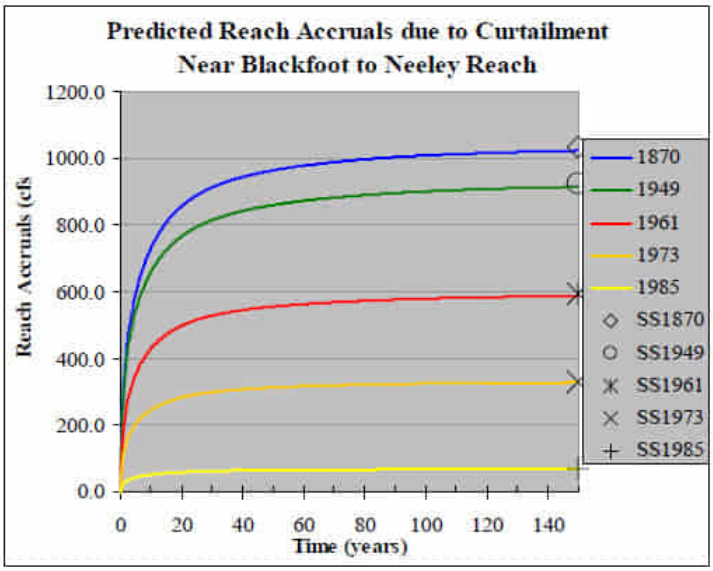

Figure 10. Predicted Reach Accruals due to Curtailment of Ground-Water Pumping for Near Blackfoot-Neeley Reach (generated using ESPAM v1.1).

Figure R7: Figure 10 reproduced from Scenario.

Intuitively, and as explained in the Scenario in 2006, if the modeling period is sufficiently long

relative to the duration of the event and the proximity of it to springs and rivers, transient results will begin to approach steady-state results and would equal them if the transient simulation could be run to infinite time.

A technically-correct Finding of Fact #83 could read:

> *Merriam-Webster's Dictionary defines steady-state as "a state or condition of a system or process … that does not change in time." Steady state, Merriam-Webster.com, https://www.merriam-webster.com/dictionary/steady-state (April 19, 2023). A steady-state ESPAM simulation based on input values of acre feet of curtailment can only ~~model increases in aquifer discharge~~ indicate total acre feet of accrual to modeled reaches of the Snake River and tributary springs resulting ~~from continuous curtailments of an identical magnitude and location until the impacts~~ after the effects of curtailment ~~are~~ have fully been realized. For example, a steady-state analysis of the curtailment of 1,000 acre feet would indicate where the 1,000 acre feet of accrual eventually would be expressed, but would not describe the timing of arrival of accruals. ~~acres, assumes that irrigation of the same 1,000 acres is curtailed every year at the same rate of consumptive use, until the impacts of that curtailment reach a steady state, or no longer change from year to year~~.*

A technically-correct Finding of Fact #84 could read in part:

> *Steady-state analysis does not calculate the time to reach steady-state conditions nor describe the seasonal timing of the impacts, but only estimates the spatial distribution of accruals. To estimate the timing of accruals, transient modeling must be employed. ~~For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved. The assumption of continuous curtailment does not reflect reality in the SWC Delivery Call~~* [SWC refers to the Surface Water Coalition].

Conclusions Regarding Technical Justification for Adopting Transient Modeling

It is my professional opinion that the Fifth Order's technical arguments for adoption of transient modeling are not factually sound:

- IDWR has had access to the current understanding of the general implications of transient vs. steady-state modeling since at least 1999, and access to the specific implications of a curtailment context since 2006;
- The 1999 SRPAM model had stress periods even shorter than the current model;
- Though its stress periods were longer than the current model, the 2006 ESPAM1.1 model was designed and deployed to represent effects on an irrigation-season time scale;
- The 2013 ESPAM2.1 model had identical stress periods to the current ESPAM2.2 model.
- The transient version of the model can be used to represent temporary curtailment of water rights.

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Since the technical rational presented is not factually correct, it is my professional opinion that the Fifth Order does not reveal the true rationale for the change from steady-state to transient. I therefore am unable to comment on the technical merit of the actual rationale.

Purposes and Use of ESPAM Modeling

The 1999 SRPAM model was stated "*to be a planning and management tool for use by both agencies [IDWR and US Bureau of Reclamation].* The subsequent ESPAM model reports have indicated the stated purpose of informing *"conjunctive management,"* a misnomer that has been used for decades in Idaho for conjunctive *administration* of groundwater and surface-water rights. Curtailment is a conjunctive-administration activity, and in all likelihood, curtailment calculations always have been a consideration of IDWR. However, the ESPAM reports have cautioned that model use should correspond to its regional nature; for instance, from the ESPAM2.2 report: "*The [model] is a regional groundwater model. For this reason, the model is best used for broad-scale predictions. The user should avoid the temptation to model localized phenomena…. This limitation exists in part because the input data used to compute the agricultural impacts are still coarse."*

In 2007 and again in 2012, many members of the Eastern Snake Plain Hydrologic Modeling Committee (ESHMC) responded to invitations to participate in drafting of "white papers," which in reality were compilations of individual statements on model use. Opinions ranged widely, from: "*It is our professional opinion that the current model has no technical credibility as a tool for water rights administration*" (2007 White Paper) to: *"[I]nformation from the model can be used to estimate the effects of curtailment of ground water pumping on aggregated river reaches."* (2007 White Paper).

An especially insightful comment elaborates on the caution regarding coarse data: *"The effects of temporal imprecision are analogous to the effects of spatial imprecision, but are compounded with concerns about the difficulty the calibrators have had in matching seasonal amplitude in some target springs. These suggest to us that while the model <u>can</u> be used to estimate effects on a monthly basis, it <u>should not</u> be used to make administrative decisions that hinge on monthly distribution of effects"* (2012 White Paper contribution from Eastern Idaho Water Rights Coalition, emphasis in original).

Implicit in using any tool for any purpose is a determination that the tool satisfies the minimum criteria for its use. Establishing criteria is a policy question, and whether criteria are met is a technical question. The Fifth Order does not describe the policy criterion for the model's ability to match month-to-month variation, nor the rationale for the criterion. However, a metric is available; the ESPAM2.2 report provides an R^2 score for each model reach, shown in the bottom right panel of the corresponding figure of calibration results. The R^2 statistic can be described as a score of the fraction of variability in a data set that are described by an algorithm and its input data. Figure 119 shows an R^2 value of 0.4232 (i.e. the model and its input data can explain approximately 42% of monthly variability) for the Near Blackfoot to Neeley reach, and Figure

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120 shows an R^2 value of 0.0079 (under 1%) for the Neeley to Minidoka reach. The bottom center panel provides an indication of when in the year discrepancies generally occur; these are the months when the blue and orange lines are most disparate. In both cases, the average results are worst during the irrigation season.

It is my professional opinion that unless the criterion for the ability to match monthly values is very low, ESPAM2.2 likely should not be considered appropriate for estimating month-by-month effects for the combined Near Blackfoot to Minidoka model reach when substantial consequences depend on decisions made on its basis.

Technical work that could inform the policy decision of establishing a criterion would explore the ratio of the potential relief of curtailment to the known cost. Additional technical defensibility could be gained by holistically considering all the hydrologic implications of the fundamental differences in spatial and temporal responses between groundwater systems and surface-water systems, as discussed later in this report.

It is my professional opinion that the use of ESPAM modeling is technically defensible when ratios of relief to cost are considered in light of modeling precision and imprecision, and when policy adjusts for spatial and temporal responses. This is true for both steady-state and transient modeling analysis.

Supplemental Water Use by SWC

Finding of Fact #23 states: *"There are lands within the service areas of SWC entities that are irrigated with supplemental groundwater. Exhibit 3007. Supplemental groundwater is a factor the Director can consider in the context of a delivery call…. At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities."*

My professional opinion is that because this statement is not factually correct, the true rational for this decision has not been disclosed. Therefore, I cannot respond to the technical content of the actual rationale. The basis for this opinion is:

- Since the initial development of ESPAM1.0 in the early 2000s, the extent and effect of supplemental groundwater irrigation has been calculated for the parts of the SWC Service Areas that are within the ESPAM model boundary.
- The data and methods that have been used in the ESPAM model are readily available and applicable to the parts of the SWC Service Areas that are outside the ESPAM model boundary.
- As a result of measurement orders, the measurement and report of well discharge data, and the availability of these data in IDWR's Water Measurement Information System (WMIS) are much more robust than in the early 2000s when these calculations first were undertaken and the methods developed.

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- IDWR has known, or could have known, since at least 2015 that these data would be important to a correct calculation of Reasonable In Season Demand. The intervening eight years would have been sufficient time to apply the existing data and methods, or to improve them, for purposes of the methodology.

Because of the existence of these methods and data, it is my professional opinion that a defensible adjustment for supplemental groundwater use within the SWC Service Areas is reasonably within reach, on a technical basis. The existence of these methods and data is documented in accompanying documents:

- Cosgrove, D.M., B.A. Contor and G.S. Johnson. 2006 Enhanced Snake Plain Aquifer Model Final Report, pages 50 – 54.
- Contor, Bryce A. and Paul L. Pelot. April, 2008. Draft 2. Determination of Source of Irrigation Water for Calibration of Eastern Snake Plain Aquifer Model Version 2.
- Idaho Department of Water Resources. 2013. Enhanced Snake Plain Aquifer Model Version 2.1 Final Report, pages 50 – 52.
- Sukow, Jennifer. 2021. Model Calibration Report Eastern Snake Plain Aquifer Model Version 2.2, pages 15 – 17.

In addition, substantially more acre feet of diversion are required to support a surface-water irrigated acre than a groundwater-irrigated acre because the curtailment requirement is multiplied by the following:

- An acre of groundwater irrigation requires fewer acre feet of gross diversion than does an acre of surface-water irrigation supplied by a long canal.
- For most groundwater-irrigated lands, more accrual from curtailment arrives at non-target reaches than arrives at the Near Blackfoot to Minidoka Reach
- The curtailment requirement again is multiplied by the fact that more accruals from curtailment occur in future years than in the year of need.

Thus, it is my professional opinion that neglecting a single acre of supplemental irrigation within the SWC Service Area results in needless curtailment of many groundwater-irrigated acres. Therefore, strictly on a technical basis, the refinement of quantifying the effect of supplemental irrigation within the Surface Water Coalition service area could provide substantial relief to a broad constituency of Idaho water users.

Logical Consistency

This section of the report addresses logical consistency in application of modeling, from a technical viewpoint. It also lays groundwork for an attempt to address a hearing officer's complaint from a number of years ago that expert reports tend to focus on what *cannot* be done, without providing a hearing officer any input on what could be done from a technical standpoint. In response to that complaint, this report concludes with a conceptual discussion of a technical

approach that is logically consistent and coherent, that could be considered as foundation for policy deliberations.

Accruals beyond the Irrigation Season

Finding of Fact #86 indicates that: *"Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year,"* indicating that the bulk of accruals from curtailment do not arrive during the time period of indicated shortfall. Time constraints prevented confirmation of the numerical values, but conceptually this matches my understanding. However, the actual response time is independent of modeling and is governed by the physical properties of the aquifer/river system. While 9% to 15% probably is a reasonable estimate, whatever the true value is, it applies identically to any curtailment regardless of whether it was calculated using steady-state or transient modeling. The only difference is that the transient modeling produces an estimate of the delay in accrual.

The delay in accrual depends on the spatial relationship of the well curtailed and the reach for which accruals are desired. The spatial distribution of the delayed response from curtailment is illustrated using evaluation of the sample points illustrated in Figure R3, presented earlier. Spatial distribution is illustrated using results from the ETRAN3.4 Transfer Tool realization of the transient ESPAM2.2 model.

Time constraints precluded duplicating the five-month May 1 to September 30 period considered important in Finding of Fact #86. However, the ETRAN3.4 Transfer Tool four-month period is not too different, and allows conceptual discussion of the results shown in Figure R8 through Figure R13. Though the transfer tool assigns its summer trimester to July, August, September, and October, from my involvement in the development of the original transfer tool I know that this assignment is arbitrary and that it is valid to consider that the figures illustrate the results of a four-month curtailment beginning in May.

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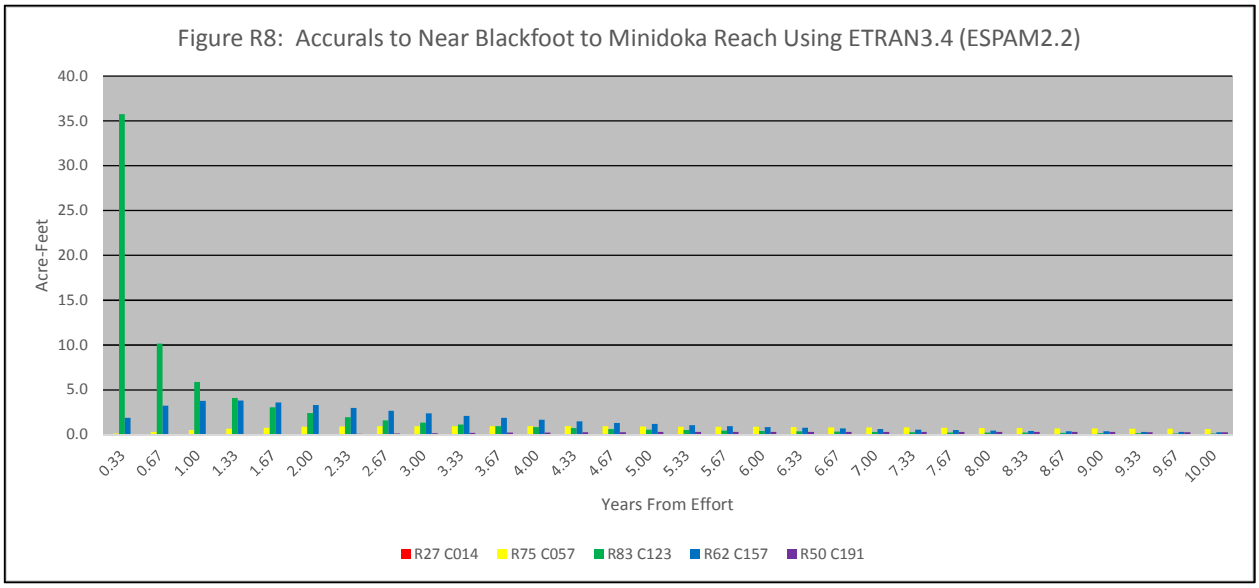

Figure R8.

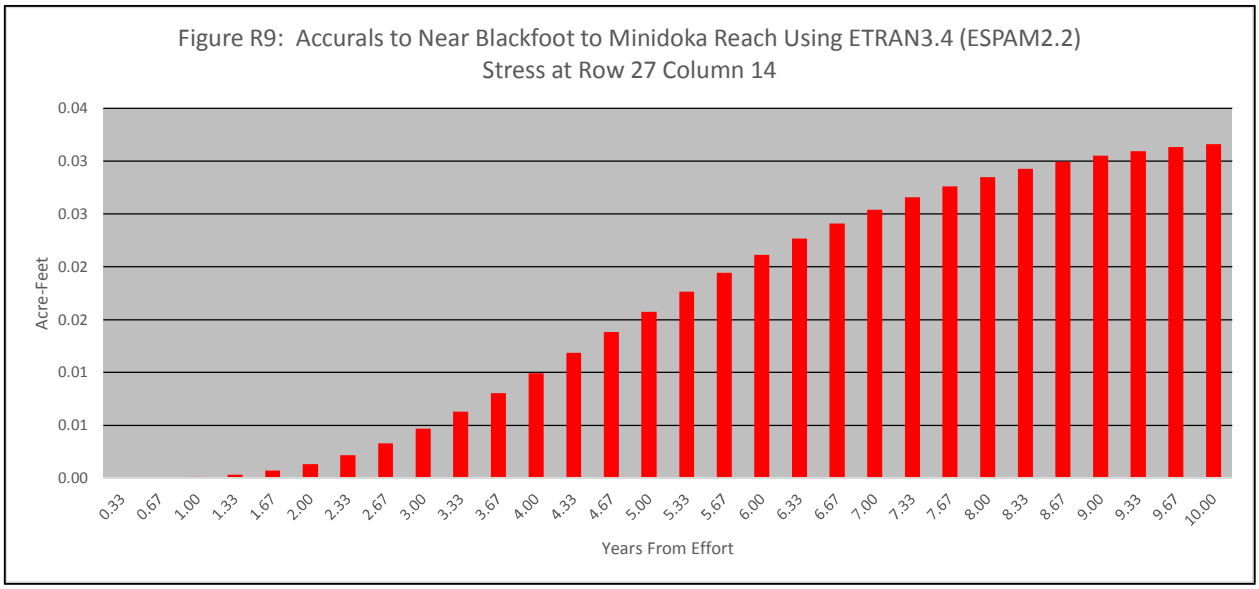

Figure R9.

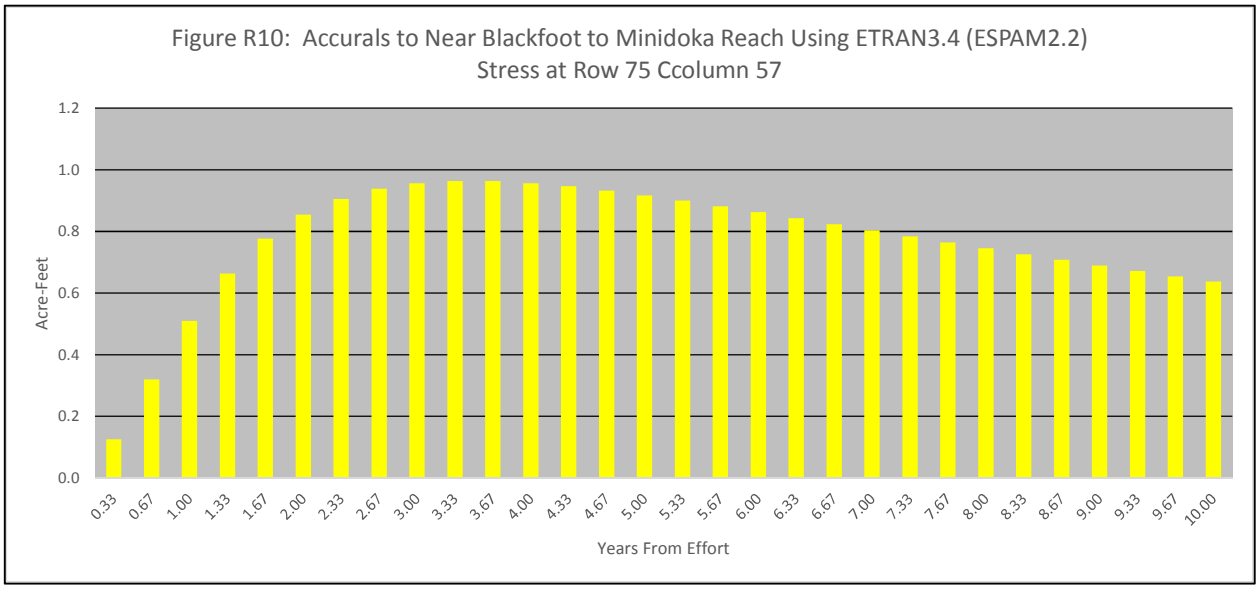

Figure R10.

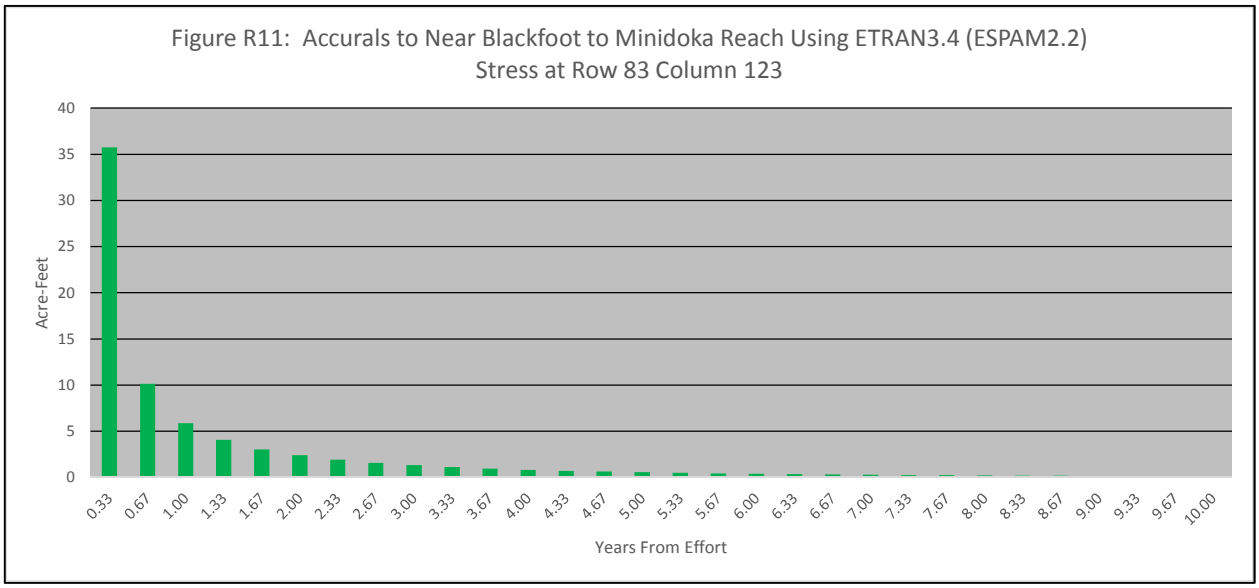

Figure R11.

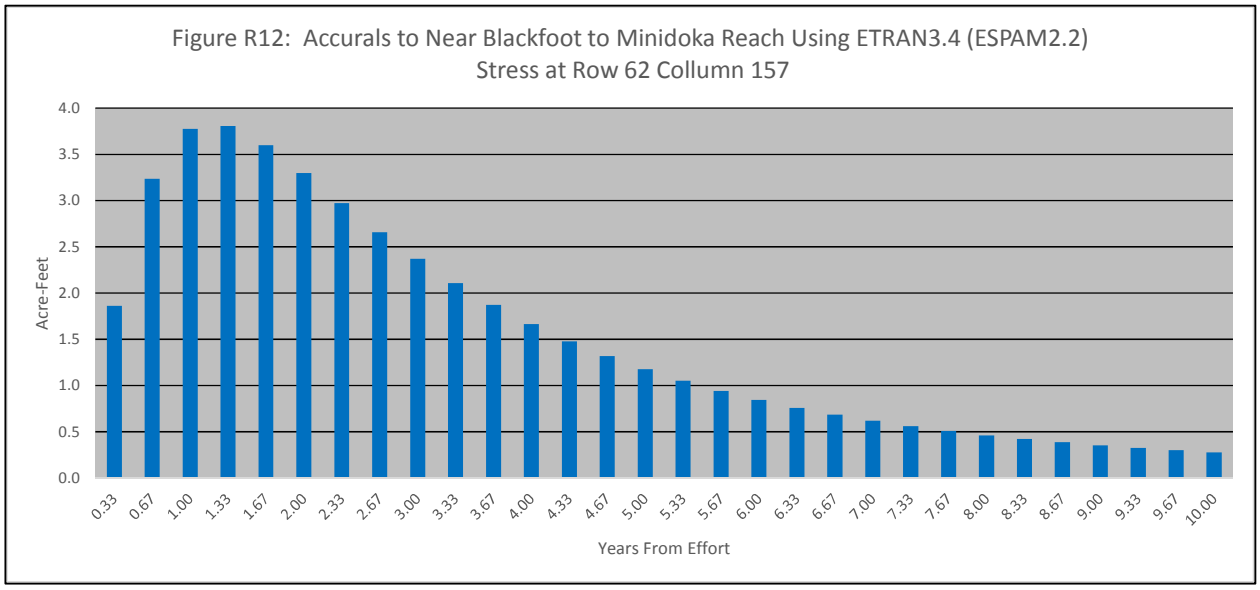

Figure R12.

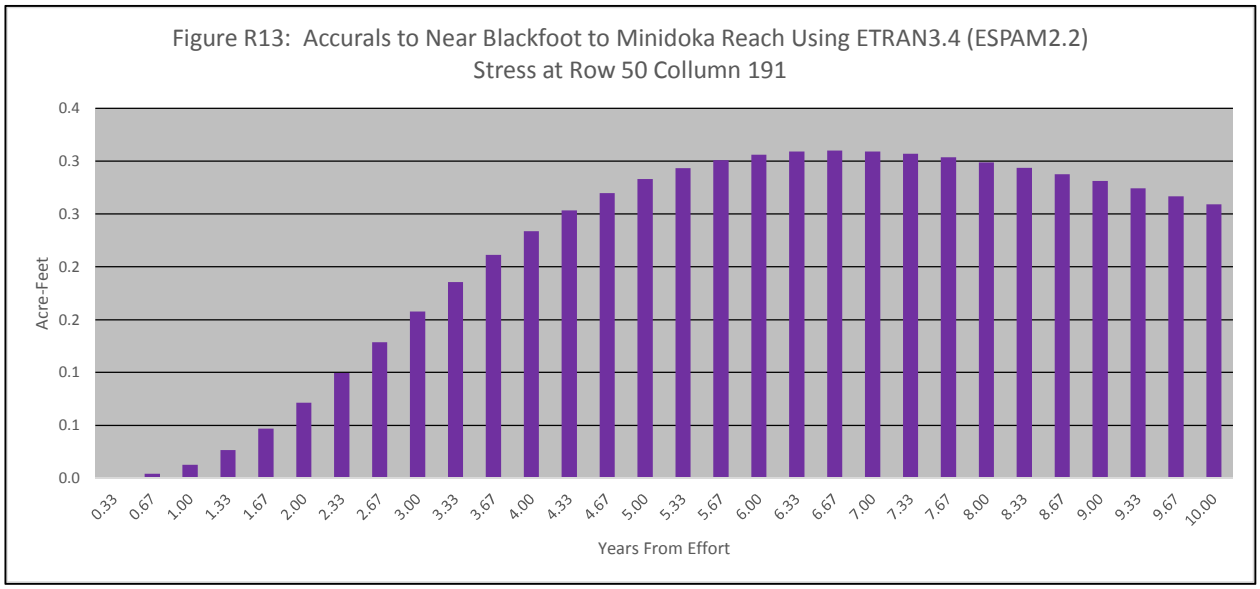

Figure R13.

Qualitatively, these figures can be summed up with the statement that: "Accruals from curtailment predominantly arrive in years later than the curtailment event, except for curtailment that occurs very near the river in the Near Blackfoot to Minidoka reach."

In deposition testimony in May, 2023, Jennifer Sukow of IDWR indicated her opinion that model-indicated future accruals to irrigation-season reach gains could be applied to offset future calculated shortfalls. This is logically consistent with the physical nature of propagation of effects, and with the modeling. However, because this carry-forward does not appear to be specified in the Fifth Order it is not clear whether such a carry-forward would be authorized. Additionally, earlier orders' Step 10, using transient modeling in relationship to reasonable

carryover, was remanded by the court (Fourth Methodology Order page 3). Time constraints preclude exploration of the arguments and rationale behind this remand, and without this understanding, it is difficult to assess whether Sukow's proposed carry-forward would survive judicial review. Regardless, even if the Fifth Order does would allow it, and even if it would survive judicial review, its omission from the Fifth Order leaves it as a mechanism that cannot be relied upon.

Sukow also indicated that the effect of curtailment on future carryover calculations would be implicit in the data relied upon. Though time constraints preclude a robust analysis, it appears that the assumption of the methodology calculations is that the data represent a single snapshot of time within a dynamic equilibrium. If this is true, then for Sukow's argument to be logically consistent, the implicit effect of prior curtailment on the well that is used in calculations would be expected to be dynamically stable, meaning that water level in said well would be relatively consistent over time. However, this is not the case following a one-time curtailment event, and the departure of the assumption from reality depends on the temporal and spatial distance of the curtailment event from the well, and also on its magnitude. Considering that modeled reach gains are a manifestation of aquifer heads in model river cells, the temporal aspects of effects on the well can be qualitatively compared to the model results summarized in Figure R8 through R13.

In Figure R11, early accruals are greater than subsequent accruals. This scenario reflects a curtailment that occurred relatively near the well, much as cell R83 C123 is relatively near the Near Blackfoot to Minidoka reach. Sukow's implicit assumption would overestimate accruals during the second year after curtailment. Overestimates, such as this one, hurt the SWC by providing less during the second year than the model would suggest. Conversely, Figures R9, R10, and R13 show scenarios for locations more distant, where subsequent accruals exceed the initial accruals. In this case, Sukow's implicit assumption would underestimate accruals during the second year after curtailment, harming potentially-curtailed water users by requiring more curtailment than is necessary to meet the need of a call. A solution would be to explicitly model and account for all future accruals, much as Sukow proposed for in-season demand calculations.

Accruals to Non-Target Reaches

The Fifth Order does not discuss the fact that curtailment would result in greater accruals to non-target reaches than it would to the Near Blackfoot to Minidoka Reach. Time constraints did not allow exploration of ESPAM2.2 results, but they would be qualitatively similar to the ESPAM1.1 results from Table 1 of the Scenario, reproduced here.

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Table 1. Predicted steady state reach accruals for each curtailment period (using ESPAM v1.1).

Cutoff Date	All Pumping		Post January 1, 1949		Post January 1, 1961		Post January 1, 1973		Post January 1, 1985	
Reach Name	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain
Ashton to Rexburg	316	20	290	20	222	19	128	19	22	19
Heise to Shelley	211	18	195	18	141	17	78	17	15	17
Sum of Reaches Above Shelley	**526**		**484**		**363**		**206**		**37**	
Shelley to Near Blackfoot	406	30	368	30	240	28	132	25	26	28
Near Blackfoot to Neeley	1035	35	925	36	593	33	331	29	69	32
Neeley to Minidoka	158	62	134	65	84	61	46	55	10	60
Sum of Reaches Shelley to Milner	**1598**		**1427**		**917**		**509**		**105**	
Devil's Washbowl to Buhl	298	59	257	61	160	57	88	51	18	60
Buhl to Thousand Springs	137	49	122	50	81	43	47	37	8.0	51
Thousand Springs	89	48	79	48	54	42	31	35	5.6	47
Thousand Springs to Malad	10	45	9	46	6.4	38	3.7	32	0.74	42
Malad	77	50	68	51	47	43	29	35	5.5	44
Malad to Bancroft	5.8	38	5.2	38	3.8	34	2.4	31	0.59	36
Sum of Thousand Springs Reaches	**617**		**541**		**352**		**201**		**38**	
Total (cfs)	**2741**		**2453**		**1633**		**916**		**180**	
Total (acre-feet/year)	**1,984,659**		**1,775,637**		**1,182,086**		**663,362**		**130,506**	

Figure R14: Table 1 reproduced from Scenario.

Extracting the Near Blackfoot to Neeley and Neeley to Minidoka results, and comparing them to the total results, indicates the relationships show in Table R2.

Table R2: Summary of ESPAM1.1 results from Scenario

	Near Blackfoot to Neeley Accrual (cfs)	**Neeley to Minidoka Accrual (cfs)**	**Near Blackfoot to Minidoka Accrual (cfs)**	**Total Accrual (cfs)**	**Percentage of Accrual to Near Blackfoot to Minidoka**
All Pumping	1,035	158	1,193	2,741	44%
Junior to January 1, 1949	925	134	1,059	2,453	43%
Junior to January 1, 1961	593	84	677	1,633	41%
Junior to January 1, 1973	331	46	377	916	41%
Junior to January 1, 1985	69	10	79	180	44%

Depending on viewpoint, the fact that more than half the accruals from curtailment arrive at non-target reaches is either a windfall or is collateral damage. Regardless, the Fifth Order is silent on the fact of the accrual and on the technical ability to assess and report its timing and magnitude

for potential application to needs that might arise in non-target reaches, such as the small amounts of additional accrual that sometimes are needed to facilitate a Point of Diversion transfer of a groundwater right.

Consistency between Calculation of Priority Date and Partition of Responsibility

In deposition testimony in May, 2023, Jennifer Sukow indicated that the partition of responsibility for mitigation in lieu of curtailment is done on a steady-state basis on the rationale that all users bear responsibility for cumulative effects of past pumping that have been propagating toward the reach for decades. Whether this is valid rationale is a policy question beyond the scope of this report, but use of steady-state modeling is consistent with the rationale.

Use of steady-state partitioning of responsibility would be logically consistent with steady-state calculation of curtailment date, as would the use of transient partitioning be consistent with transient calculation of curtailment. The linkages are a result of the concept that mitigation in lieu of curtailment is both defined and constrained by the alternate relief that curtailment would provide.

Time constraints preclude analysis using correct spatial distributions of irrigated lands and consumptive use, but the concept can be explored hypothetically. If each of the five points illustrated in Figure R3 represented an equal number of acre feet of consumptive use from groundwater, the assignment of responsibility could be made based on model-indicated contributions to the Near Blackfoot to Minidoka reach. Using the IDWR-generated steady-state models reflected in accompanying file "E2_SSRF.csv," the steady-state assignment to Row 27 Column 14 would be 1.8% of the total obligation. The four-month contribution of curtailment at that location is represented in Figure R9. Conversely, calculating percentages to three significant figures, the four-month transient contribution of curtailment at that location using ETRAN3.4 is 0.000%. This does not mean that there is *no* benefit, but that if mitigation in lieu of curtailment were to be defined and constrained by the accruals estimated per a transient curtailment, the technically-correct mitigation would be substantially less than the steady-state partition of responsibility.

It is my professional opinion that partitioning responsibility using a different modeling framework than was used to calculate curtailment can result in some users being held responsible for more mitigation than the relief that their curtailment would have provided.

Consistency between Precision and Burden

Conclusion of Law #21 articulates understanding of the fundamental difference between groundwater hydrology and surface-water hydrology, yet the unenviable burden of IDWR is to administer the connected resources conjunctively. To frame and provide context to the technical discussion of consistency between precision and burden, the following rhetorical questions are posed for surface-water Points of Diversion:

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- Would prior appropriation require curtailment of junior whose Point of Diversion was adjacent to the senior Point of Diversion, given that curtailment of the junior could make water immediately available to the senior?
- Would prior appropriation require curtailment of a junior whose Point of Diversion was on a stream not tributary to the senior's source?

In essence, there is a continuum comprised of the ratio between the relief afforded the senior and the cost to the junior. In a surface-water context, results tend to fall on one end of the continuum or the other. In the first hypothetical, the ratio of benefit to burden is one to one. In the second, it is zero.

Some groundwater scenarios fall on the "zero" end of the spectrum; curtailment of a well in Rathdrum likely would not provide relief to the Surface Water Coalition. A few fall close to the "full and immediate relief" end of the spectrum; for instance, modeling indicates that curtailment at the location represented by Figure R11 would produce 35% accrual to Near Blackfoot to Minidoka within four months, and 45% within eight months.

The legal meaning of the Conclusions of Law #4, #5 and #6 is beyond the scope of this report but a plain-language reading suggests that priority is not the only factor to consider. The Rathdrum example indicates that a continuum exists for groundwater, as it does for surface water. Conclusion of Law #7 indicates that IDWR requires knowledge of *"how, when, where and to what extent the diversion and use of water from one source impacts the water flows in... other sources"* (emphasis added). If knowledge of something is required, the implication is that the knowledge must be utilized in making some decision. Under that assumption, *where* the cutoff is located is a policy decision, and once the decision is made, technical work can quantify where efforts fall in relation to it.

Conclusion of Law #21 states:

> *"Rule 43 of the CM Rules mandates that when the Director evaluates a mitigation plan, the mitigation plan must ensure that water is delivered to holders of senior priority surface water rights in both the quantity and at the time and place required by the senior. In considering a proposed mitigation plan pursuant to Rule 43, the Director must evaluate:*
>
> > ***b.*** *Whether the mitigation plan will provide replacement water, at the time and place required by the senior-priority water right, sufficient to offset the depletive effect of ground water withdrawal on the water available in the surface or ground water source at such time and place as necessary to satisfy the rights of diversion from the surface or ground water source. Consideration will be given to the history and seasonal availability of water for diversion so as not to require replacement water at times when the surface right historically has not received a full supply, such as during annual low-flow periods and extended drought periods.*
> > ***c.*** *Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right when needed during*

> *a time of shortage even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for multi-season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior-priority right in the event the mitigation water source becomes unavailable* (emphasis in Fifth Order).

Time constraints, the scope of this report and the expertise of the author preclude full exploration of the implications of this excerpt, in context of the full Conjunctive Management rules. The importance here is the explicit recognition of fundamental difference between time frames of surface-water processes and the effects of groundwater activities upon surface-water processes.

Within the context of both the magnitude of expected relief and the requirement that relief be timely, an added complexity of groundwater is that the linkages are not always apparent, nor are the methods to discern them infallible. An additional policy decision that could be articulated would be a specification of if or how precision of the knowledge of the degree of hydrologic connection might inform the policy decision of where the cutoff point is on the continuum between ratios of zero and one-to-one. If that decision were to be undertaken, it could be informed by technical knowledge of the precision of the model. IDWR's contribution to the 2012 white paper discussed above could be a starting point for analysis of the precision of the model, and such analyses may already have been performed. Qualitative insight into the relative quality of the model can be gleaned from comparisons of successive models, each in their time deemed to be the best available science.

Figure R17 shows a map of points that were used for such a qualitative view of ESPAM2.0, with graphical output provided in Figure R18. Figure R18 attempts to inform both quantity and timing issues. The top three panels, with blue-colored bars, show the fraction of accruals from the three points that the models indicate would be captured by a particular reach. The bottom panels, with red-colored bars, represent the differences in modeled timing of accrual. The metric is the number of months for the model to indicate that half of the captured accruals have arrived at the reach of interest.

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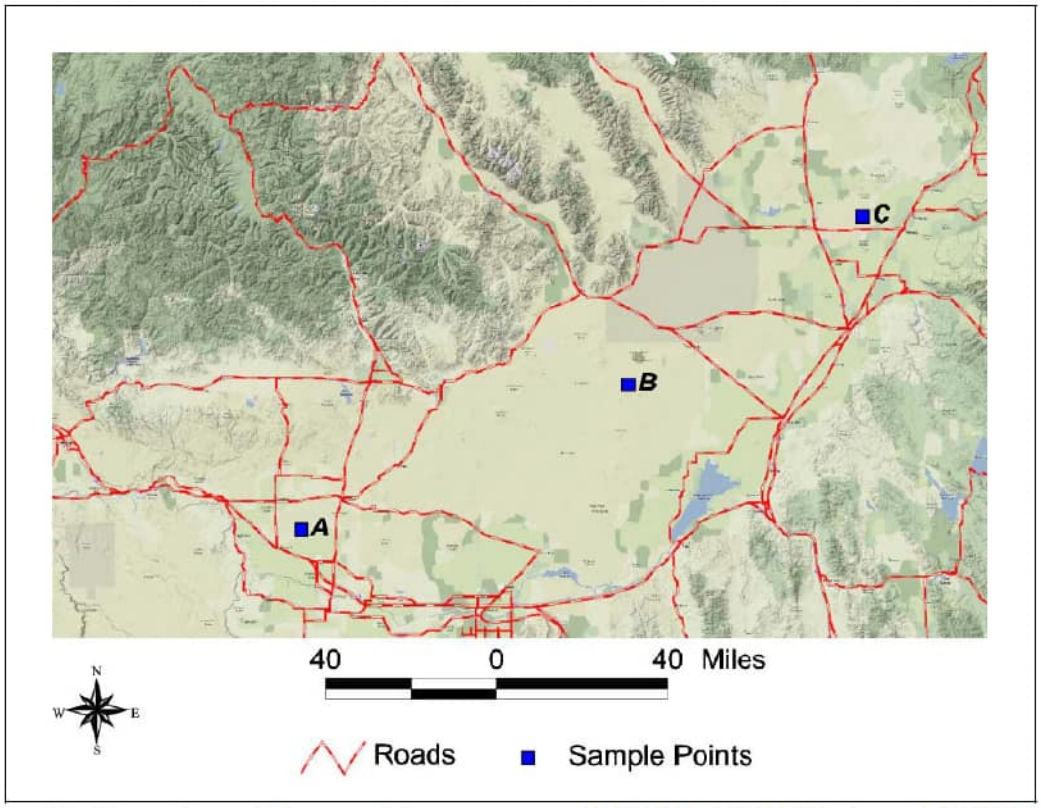

Figure 7. Sample points used to compare SRPAM, ESPAM1.1 and ESPAM2.0.

Figure R17: Figure 7 reproduced from Technical Report on ESPAM2.0 Modeling Issues

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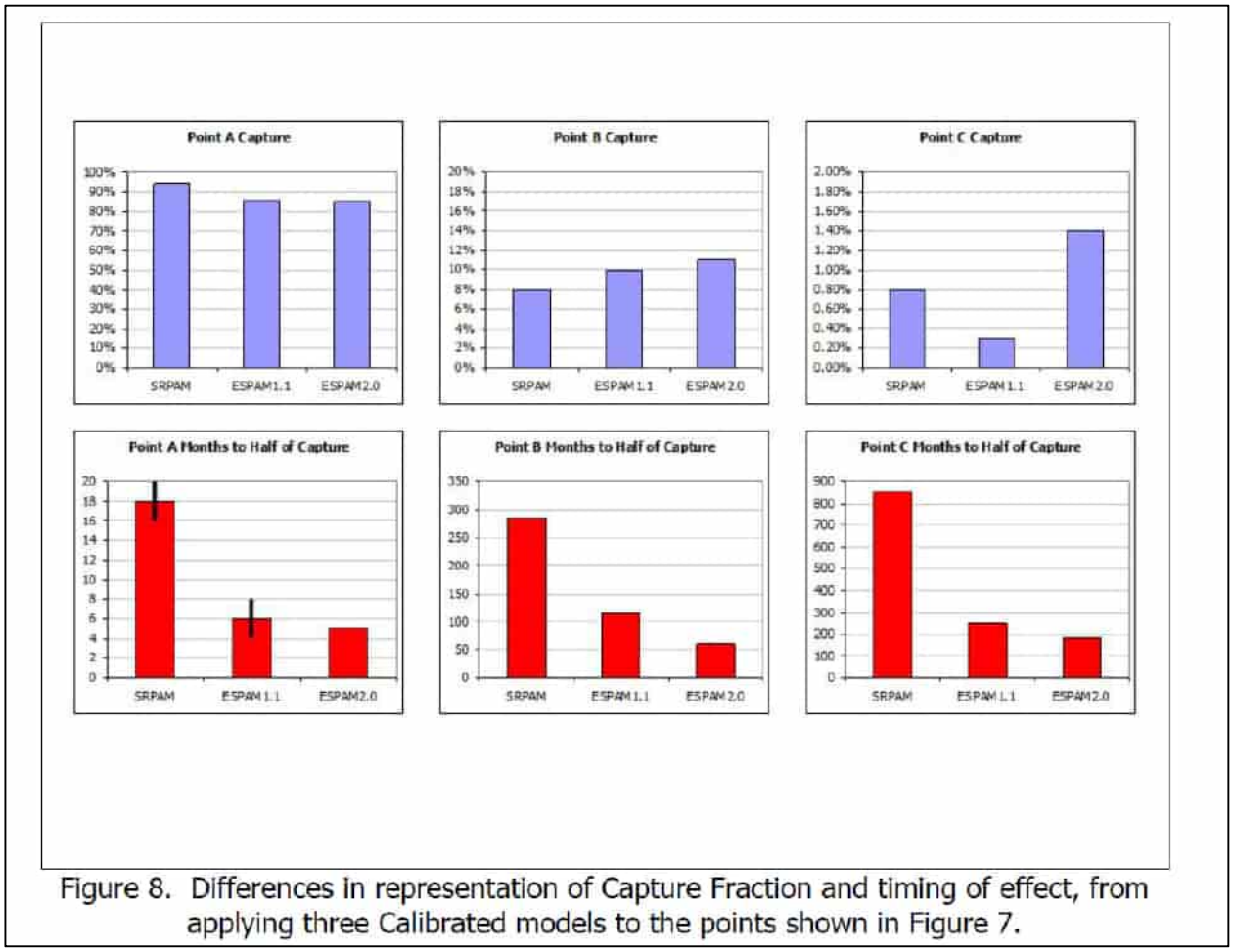

Figure 8. Differences in representation of Capture Fraction and timing of effect, from applying three Calibrated models to the points shown in Figure 7.

Figure R18: Figure 8 reproduced from Technical Report on ESPAM2.0 Modeling Issues.

Time constraints preclude comparison of ESPAM2.0 with ESPAM2.1, but Figure R19, Figure R20 and Figure R21 allow qualitative assessment of the differences between ESPAM2.1 as realized in the ETRAN3.3 Transfer Tool, and ESPAM2.2 as realized in the ETRAN3.4 transfer tool. Table R3 summarizes qualitative comparisons of the two models for these three points. The points intentionally are of disparate character and are not intended to be representative of the plain as a whole.

Table R3. Qualitative Comparison of ESPAM2.1 and ESPAM2.2 via Figures R19, R20 and R21

Point	General Location	ESPAM2.1 Years to Peak	ESPAM2.2 Years to Peak	Subjective Comparison of 10-year Sum of Accruals
R75 C57	A&B Irrigation District	1.67	3.67	ESPAM2.1 slightly higher
R83 C123	Very close to Near Blackfoot to Neeley	0.33	0.33	Very similar
R50 C191	Near Henry's Fork	5.00	6.67	Very similar

These results underscore Eastern Idaho Water Right Coalition's 2012 observation that:

> All of these uncertainties are a function of the spatial scale at which answers are sought. If the question is asked: "How much pumping at location X will propagate to river and spring reaches?" the answer can be determined with very little uncertainty, and independently of the limitations described above.
>
> If refined estimates of above-Milner vs. below-Milner effects are required, the uncertainty depends on the location of the well. For wells distant from Milner, none of these conceptual simplifications are likely to materially affect the answer. For wells near to Milner, all of these affect the results and a different set of assumptions would be expected to produce a markedly different result.
>
> Similarly, refining the question to include some understanding of the timing of effect begins to introduce additional uncertainty. The answer to "How much will propagate in time period Y" is less certain than "How much will eventually propagate," and results are sensitive to changes in conceptual simplifications.

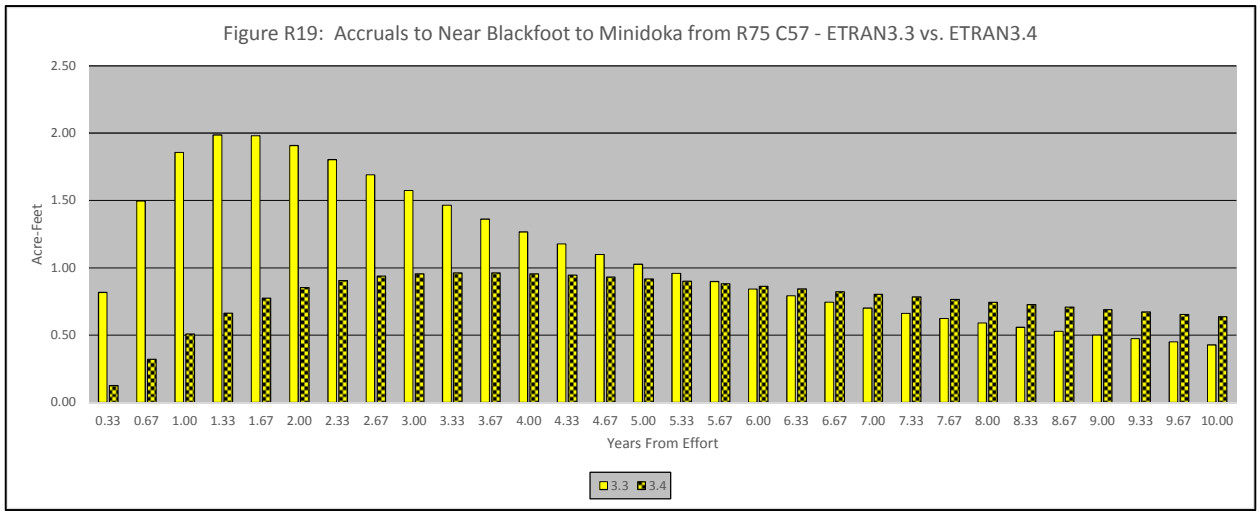

Figure R19.

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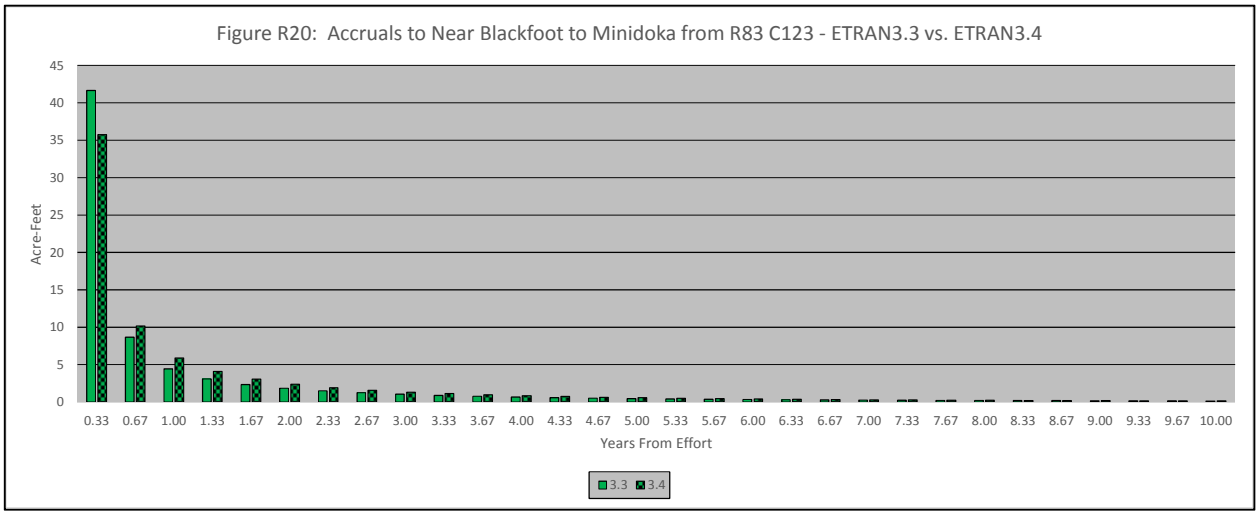

Figure R20.

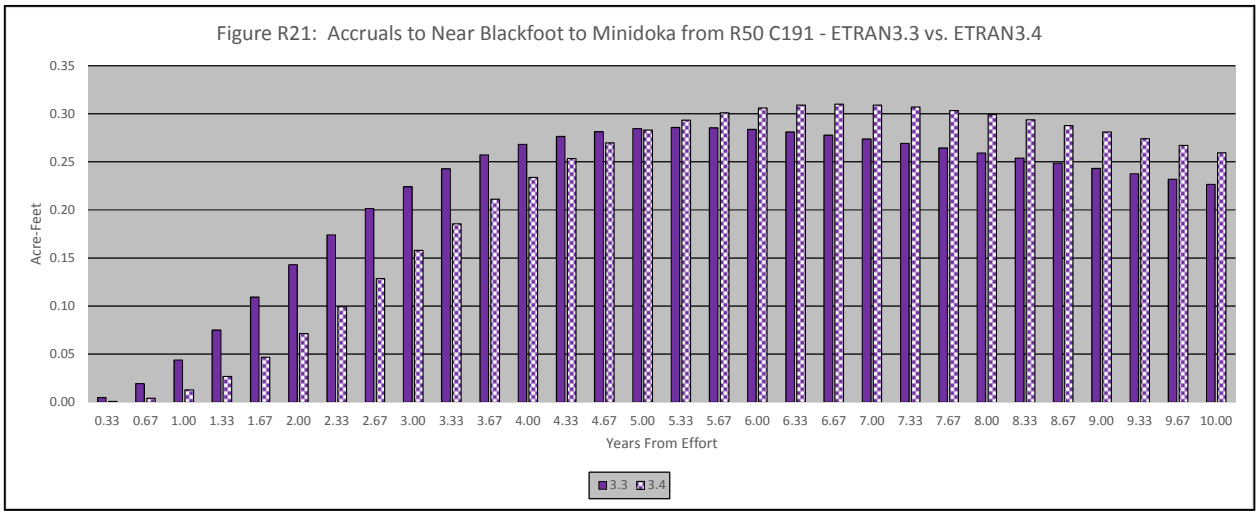

Figure R21.

A thoughtful reader might ask a policy question such as: "Is it fair to the SWC to use the model to estimate timing of accruals in the trimester of curtailment, when the two most recent best-available-science models differ by approximately a factor of six?" Technical analysis could inform policy deliberations about such a question.

Discussion of Technically-consistent Options

As indicated earlier, this report attempts to remedy a shortcoming identified by the hearing officer in another case, that expert reports offer no solutions. While implementation of a solution is a policy decision, technical work can help frame the understanding of what is possible, and what the implications of alternatives might be.

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Alignment of Modeling Time Frame with Policy. In deposition in May 2023, Jennifer Sukow stated that she was *"told by Allan Wylie that [former Director] Karl Dreher did not want to use a transient analysis, because he did not like the additional volume of water that would accrue to the reach in future years."* This may have been how the decision was communicated, but it is likely that rather than not "liking" the result, the former Director deliberately selected steady-state analysis as a policy response to some of the temporal issues that have been explored above. However, applying the steady-state values only in years of shortfall still was technically inconsistent with the temporal delay in accrual. The Fifth Order methodology attempts to address that inconsistency but brings others, discussed above. The current methodology produces results such as seen in 2023, with curtailment of most groundwater irrigation threatened in a season of abundant snowpack and local flooding in some areas.

Visual inspection of Figure R16 suggests a cyclical pattern with a period of a few years. Robust time series analysis likely could quantify the periodicity. The periodicity likely could be partitioned into components of different periodicity, such as natural flow, return flows from surface-water irrigation, and groundwater contribution. Both time-series analysis and water-budget analysis could contribute to this understanding. Additionally, if the zeros in the hindcast were replaced by numerical values of surpluses that occurred, a statistical distribution of supply could be derived that would allow calculation of an appropriate level of conservatism to protect the SWC interests.

Similarly, as shown by Figures R8 through R13 and R19 through R20, the transient ESPAM model could be used to explore the characteristic time of response for curtailment of zones of similar hydraulic distance from the reach in question.

Combined, these two analyses could inform a curtailment scheme and a frequency of adaptive management that allowed the temporal pattern of need to be matched to the temporal response of reach gains to curtailment activities.

It is my professional opinion that a technically- and logically-coherent curtailment strategy could be constructed using either steady-state or transient analysis. The key would be to align the calculation and expectations of relief to the physical time frame of aquifer response. Something akin to Sukow's proposal for considering future accruals likely would be an important element.

Accounting for Non-Target Accruals. The key to accounting for non-target accruals is to be sure that the accounting decay of accruals, and the spatial assignment, match reality. A possible method is described in the Journal of the American Water Resources Association (Contor, 2009) that links transient *"aquifer response functions with double-entry accounting technologies"* and *"honors the hydrologic realities of groundwater/surface water interaction, the legal requirements of prior appropriation water law, and the economic requirements for equitable and efficient allocation of resources."*

Summary and Conclusions

My professional opinions regarding the Fifth Order are as follows:

- The arguments presented for transition to transient modeling are not factually correct, and therefore the true rationale has not been revealed.
    - Because I do not have access to the true rationale, I cannot assess it technically.
- Unless the criteria for accuracy and precision are very low, ESPAM2.2 is not sufficiently precise for monthly estimation of effects to the Near Blackfoot to Minidoka reach, for decisions that precipitate large financial burdens.
- The use of ESPAM modeling is technically defensible when ratios of relief to cost are considered in light of modeling precision, and when policy adjusts for spatial and temporal differences in response.
- The arguments presented against considering supplemental groundwater use within the SWC are not factually correct, and therefore I cannot technically assess the unrevealed true rationale.
- It is technically possible and reasonably achievable to assess and address supplemental groundwater use within the SWC.
- The following factors multiply the effect of ignoring supplemental groundwater use within the SWC:
    - Because of inherent characteristics of surface-water delivery systems, supplying one acre with surface water requires substantially more water than supplying an acre with groundwater.
    - Not all effects of curtailment of groundwater propagate to the Near Blackfoot to Minidoka reach, so more than one acre foot of curtailment is required to produce one acre foot of accrual.
    - When obligations are calculated on a transient basis, the temporal delay in propagation creates an additional multiplier of effort.
- Partitioning responsibility using a different modeling framework than was used to calculate curtailment can result in some users being held responsible for more mitigation than the relief that their curtailment would have provided.
- Technical methods exist to inform a coherent plan under either a transient or a steady-state paradigm.

Signature



Bryce A. Contor
Principal Hydrologist

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Curriculum Vitae

Bryce A. Contor
5223 Steele Avenue, P.O. Box 94
Iona, Idaho 83427
208-681-9100

Summary Statement

Mr. Contor has worked in the hydrology field since 1996, including ten years with the Idaho Water Resources Research Institute where he served as a research hydrologist, and five years with Idaho Department of Water Resources where he served as a Senior Water Resource Agent. Prior to that he farmed and served on the board of directors of a small canal company.

With the Institute, Mr. Contor served as principal investigator on hydrologic projects as diverse as preparing water budgets for large numerical aquifer models, investigating remote sensing of evapotranspiration on irrigated lands, developing tools to calculate the economic demand for irrigation water, and investigating managed recharge of aquifers. He has published in national peer-reviewed scientific journals and has authored numerous technical completion reports for the Idaho Water Resources Research Institute. At Idaho Department of Water Resource, Mr. Contor measured flow in pipelines and open channels, investigated water-right claims and made water-right recommendations in the Snake River Basin Adjudication.

Mr. Contor holds an M.S. Degree in hydrology from the University of Idaho. His hydrologic specialties include groundwater/surface-water interactions and MODFLOW aquifer modeling, water-budget analysis, pipeline and open-channel flow measurement, and statistics. GIS specialties include aerial land photography interpretation and manipulation of remote-sensing data. Economics specialties are water banking and economic demand for irrigation water. He has extensive experience with water-budget preparation and with collaboration as a member of the development team for Enhanced Snake Plain Aquifer Models (ESPAM) versions 1.0 through 2.1, and the Spokane Valley – Rathdrum Prairie Model. Contor has served as an expert witness in water-related matters.

Education

University of Idaho, Idaho Falls, Idaho, 2005, M.S., Hydrology
Brigham Young University, Provo, Utah, 1994, B.S., Agricultural Economics. Cum Laude.
Ricks College, Rexburg, Idaho, 1980, A.S., Farm Crops Management

Work Experience

Hydrologist at Rocky Mountain Environmental Associates, Inc., Idaho Falls, Idaho, 2010 to Present. Currently serving as Principal Hydrologist.

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Position includes aquifer modeling, hydrologic field investigation, hydrologic analysis, GIS and expert-witness work in support of Idaho water-rights transactions, negotiations and proceedings. For approximately two years, Mr. Contor reduced his work at Rocky Mountain Environmental Associates while doing landowner-outreach and technical work for the Henry's Fork Foundation and Friends of the Teton River.

Research Hydrologist of Idaho Water Resources Research Institute, University of Idaho, Idaho Falls, Idaho, 2001-2010

Position included serving as a principle investigator on a ground water banking project in cooperation with U.S. Bureau of Reclamation, as principle investigator in water-budget preparation for aquifer modeling projects, and field investigation in support of managed aquifer recharge. The position included GIS analysis and supervision of hydrologists and data technicians. During this period Mr. Contor sub-contracted field exams for the Snake River Basin Adjudication for Idaho Department of Water Resources.

Senior Water Resource Agent, Idaho Department of Water Resources and North Water Measurement District, 1996-2001

Duties included field and office evaluation of water-right claims, including flow measurements and characterization of conveyance and diversion structures, making water-right recommendations in the Snake River Basin Adjudication, and the measurement of water discharge and power consumption of irrigation wells for documentation of ground water withdrawal volumes.

Worked in irrigated agriculture from 1980 through 1995 as irrigation supervisor, farm manager, tenant farmer, farm owner, seed-company field representative, and Idaho Department of Agriculture chemigation inspector. In the late 1980s through early 1990s served as a board member and then as secretary of a small canal company.

Experience Testifying/Giving Depositions

Circa 2005: Deposed in matters related to the calibration of Enhanced Snake Plain Aquifer Model Version 1.0 and 1.1.

Circa 2012: Deposed and testified at hearing before IDWR regarding aquifer-modeling issues related to the Rangen Aquifer Delivery Call.

2016: Testified in behalf of the plaintiff in a civil case related to filling in of an irrigation ditch.

Circa 2019: Deposed and testified at hearing before IDWR regarding creation of the Eastern Snake Plain Aquifer Ground Water Management Area.

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B.A. Contor, P.L. Pelot, G.L. Moore. 2008. The Potential Application of Additional Surface Water to Irrigated Lands Having Both Surface-water and Groundwater Irrigation Rights. IWRRI Technical completion report 200902.

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D. M. Cosgrove, B. A. Contor, G. S. Johnson. 2006. Enhanced Snake Plain Aquifer Model Final Report. Idaho Water Resources Research Institute Technical Report 06-002 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document Number DDM-019.

N. Erickson, D. Nelson, B. Contor. 2006. Non-Snake River Diversions and Perched River Seepage. Idaho Water Resources Research Institute Technical Report 06-003 Eastern Snake Plain Aquifer Model Enhancement Project Water Budget Design Document Number DDW-024 Draft As-Built.

B.A. Contor. 2004. Traditional Evapotranspiration Calculations. Idaho Water Resource Research Institute Technical Report 04-009 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DWS-010 Final As-built.

B.A. Contor. 2004. Fixed Point Pumping and Offsite Ground Water Pumping. Draft. Idaho Water Resources Research Institute Technical Report 04-027. Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document Number DDW-026. Eastern

EXHIBIT "B"
Page No. 4 of 7

Snake Plain Aquifer Model Enhancement Project Water Budget Design Document Number DDW- As-built.

B.A. Contor. 2004. Recharge on Non-Irrigated Lands. Idaho Water Resource Research Institute Technical Report 04-006 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DDW-00.

B.A. Contor. 2004. Percolation, Runoff, and Deficit Irrigation. Idaho Water Resource Research Institute Technical Report 04-004 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DDW-002 Final As-Built.

B.A. Contor. 2004. Irrigation Conveyance Loss. Idaho Water Resource Research Institute Technical Report 04-008 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DDW-020 Final As-built.

B.A. Contor. 2004. Determining Source of Irrigation Water for Recharge Calculation. Idaho Water Resource Research Institute Technical Report 04-010 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DDW-017 Final As-built.

B.A. Contor. 2004. Delineation of Sprinkler and Gravity Application Systems. Idaho Water Resource Research Institute Technical Report 04-005 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DDW-022.

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B.A. Contor. 2002. Land Use. Idaho Water Resource Research Institute Technical Report 04-007 Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document DDW-015Final As-Built.

B.A. Contor. 2002. Ground Water Irrigation Polygons for Recharge Calculation. Idaho Water Resource Research Institute. Eastern Snake Plain Aquifer Model Enhancement Project Water Budget Design Document Number DDW-009.

EXHIBIT "B"
Page No. 5 of 7

Other Selected Publications pre-2013

B.A. Contor. 2011. Adaptation of the Glover/Balmer/Jenkins Analytical Stream-Depletion Methods for No-Flow and Recharge Boundaries. IWRRI Technical Completion Report 201101

G. Taylor, B. Contor and J. Hamilton. 2010. *The ABC's of Apples, Bees and Connections Hydrologic.* Choices Magazine, Agricultural and Applied Economics Association. Volume 25 No. Article 144. http://www.choicesmagazine.org/magazine/article.php?article=144

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Paul A. Hsieh, Michael E. Barber, Bryce A. Contor, Md. Akram Hossain, Gary S. Johnson, Joseph L. Jones, and Allan H. Wylie. 2007. Ground-water Flow Model for the Spokane Valley-Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. Scientific Investigations Report 2007-5044, US Geological Survey.

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B.A. Contor and R. G. Taylor. 2016. *A Framework for Assessing the Effect of Irrigation Improvements: Economic Rivalry, Irrigation Abstraction, and Partition to Fates.* Water Economics and Policy, Vol. 3, Issue 3. doi: 10.1142/S2382624X16500181

R. Garth Taylor, R.D. Schmidt, L. Stodick and B. Contor. 2014. *Modeling Conjunctive Water Use as a Reciprocal Externality.* American Journal of Agricultural Economics, Vol. 94, Issue 6, pp 753-768. doi 10:1093/ajae/aat095

EXHIBIT "B"
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EXHIBIT "B"
Page No. 7 of 7

Statement regarding compensation

Bryce A. Contor serves as a Principal Hydrologist at Rocky Mountain Environmental Associates, Inc. (RMEA), in Idaho Falls, Idaho. RMEA invoices Bonneville Jefferson Ground District for Contor's services per the attached rate schedule.

EXHIBIT "C"
Page No. 1 of 2

2023 Labor & Equipment Rates

PROFESSIONAL RATE SCHEDULE	
Principal Engineer/Geologist/Hydrologist	$170.00 per hour
Senior Geologist/Water Right Analyst/GIS Analyst	$152.00 per hour
Geologist 3/Water Right Analyst 3/GIS Analyst 3	$135.00 per hour
Geologist 2/Water Right Analyst 2/GIS Analyst 2	$120.00 per hour
Geologist 1/ Water Right Analyst 1/GIS Analyst 1	$105.00 per hour
Geoscience Technician/GIS-Drafting/Field Assistant	$80.00 per hour
Clerical or Secretary	$65.00 per hour
Expert Witness Testimony	Base rate x 2
Laboratory Analysis	Cost plus 15%
Subcontracted Services (drilling, excavation)	Cost plus 15%
All other direct expenses	Cost plus 15%
RMEA-OWNED EQUIPMENT RENTAL	
Drone and Camera	$175.00 per day
GPS Unit	$30.00 per day
Soil Sampling and Decontamination Equipment	$30.00 per day
Photoionization Detector (PID)	$110.00 per day
Multi Gas Meter (LEL, H2S, CO)	$110.00 per day
Hand Auger Soil Sampling Kit	$45.00 per day
Electronic Water Level Meter	$55.00 per day
YSI (pH, Conductivity, DO, &Temp)	$160.00 per day
Turbidity Meter	55.00 per day
Downhole Datalogger	$110.00 per month
Portable DC Submersible Pump	$110.00 per day
Peristaltic Pump	$55.00 per day
Schoenstadt Magnetic Locator	$30.00 per day
NON-RMEA OWNED EQUIPMENT RENTAL	Cost plus 15%
TRAVEL & SHIPPING	
Mileage	$0.75 per mile
Per Diem (if applicable)	$160.00 per day
4-wheeler	$160.00 per day
Airfare or other purchased travel	Cost plus 15%
Sample Shipment (overnight via courier on ice)	$110.00 per cooler

482 CONSTITUTION · IDAHO FALLS, IDAHO 83402-3537 · (208) 524-2353 · FAX (208) 524-1795
www.rockymountainenvironmental.com

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Jun 01, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB #7928
Maximilian C. Bricker, ISB #12283
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com
Attorneys for the City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities")

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **CITY OF IDAHO FALLS, CITY OF POCATELLO, AND COALITION OF CITIES' AMENDED JOINT DISCLOSURE OF PROPOSED EXHIBITS FOR HEARING**

The City of Idaho Falls, the City of Pocatello, and the Coalition of Cities[1] (collectively, "Cities") submit this *Amended Joint Disclosure of Proposed Exhibits for Hearing* ("Amended Joint Exhibit Disclosure") in compliance with the Director of the Idaho Department of Water Resources Department's May 2, 2023 *Scheduling Order and Order Authorizing Remote Appearance at Hearing* (p. 3), and use the exhibit numbers assigned to the City of Pocatello (300-399) rather than file separate lists which would contain multiple duplicates of exhibits.

[1] The Coalition of Cities includes the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

The Amended Joint Exhibit Disclosure includes several documents that were not included on the Sharefile link disclosed with the Cities' Joint Disclosure of Proposed Exhibits for Hearing filed and served on May 30, 2023 ("Cities' May 30th List") or that were omitted from both the Cities' May 30th List and the Sharefile. *See*, items in **bold** text below.

Cities' Exhibit No.	Exhibit Description
	ORDERS
300	4/21/2023 Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover
301	4/21/2023 Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)
302	11/30/2022 Final Order Establishing 2022 Reasonable Carryover (Methodology Step 9)
303	8/18/2022 Order Revising July 2022 Forecast Supply (Methodology Steps 7-8)
304	7/20/2022 Order Revising April 2022 Forecast Supply and Amending Curtailment Order (Methodology Steps 5 & 6)
305	4/20/2022 Final Order Regarding April 2022 Forecast Supply (Methodology Steps 1-3)
306	4/19/2016 Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover
	DEPOSITION NOTICES & TRANSCRIPTS
307	5/4/2023 Joint Notice of Deposition Duces Tecum of Jennifer Sukow, P.E., P.G. (Sukow Depo Ex. 1)
308	5/4/2023 Joint Notice of Deposition of Matthew Anders, P.G. (Anders Depo Ex. 10)
309	5/10/2023 Deposition Transcript of Jennifer Sukow, P.E., P.G.
310	5/12/2023 Deposition Transcript of Matthew Anders, P.G., Volume 1
311	5/22/2023 Cities' Amended I.R.C.P. 30(b)(6) Notice of Taking Deposition Duces Tecum of Twin Falls Canal Company (Barlogi Ex. 20)
312	5/23/2023 GWD Notice of Taking Deposition Duces Tecum of TFCC- (Barlogi Ex 28)
313	5/25/2023 Amended Notice of Deposition of Matthew Anders, P.G.
314	5/25/2023 Deposition Transcript of Twin Falls Canal Company (Barlogi)
315	5/26/2023 Deposition Transcript of Matthew Anders, P.G., Volume 2

Cities' Exhibit No.	Exhibit Description
	DEPOSITION EXHIBITS
316	12/23/2022 IDWR Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the SWC, by Kara Ferguson & Matt Anders (Sukow Depo Ex. 4)
317	4/25/2023 Surface Water Coalition Delivery Call, Amended 5th Methodology and April 2023 As-Applied Orders, FAQs (Sukow Depo Ex. 5)
318	11/28/2022 IDWR, SWC Methodology - Calculation of Priority Dates for Curtailment of Junior Ground Water Users, Presented to the SWC Methodology Technical Working Group (Sukow Depo Ex. 6)
319	11-12/2022 Table 1 - Summary of Hindcast SWC Delivery Call Demand Shortfall Calculations 2000-2022 (Sukow Depo Ex. 7)
320	5/23/2023 Email to TJ Budge from Garrick Baxter, Subject: Request to Delineate Proportionate Shares of Mitigation Obligation (Sukow Depo Ex. 8)
321	1/2013 Enhanced Snake Plain Aquifer Model, Version 2.1, Final Report, (Sukow Depo Ex. 9)
322	1/16/2023 Spronk Water Engineers, Inc., Comments on Behalf of the Coalition of Cities and the City of Pocatello on the IDWR Recommendation SWC Methodology Update (Anders Depo Ex. 11)
323	Color Photograph of Thumb Drive Directories (Anders Depo Ex. 12)
324	2/19/2015 Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition (Anders Depo Ex. 13)
325	12/1/2022 Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC (Anders Depo Ex. 14)
326	1/16/2023 Comments on 2022 IDWR Staff Recommendations Memorandum (Anders Depo Ex. 15)
327	11/17/2022 Evaluation of Method for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: April and July Forecast Supply (Anders Depo Ex. 16)
328	12/1/2022 Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of Near Real Time METRIC. Presented by Ethan Geisler, Kara Ferguson, & Matt Anders (Anders Depo Ex.17)
329	IDAPA 37.03.11 Rules for Conjunctive Management of Surface and Ground Water Resources (Anders Depo Ex. 18)

Cities' Exhibit No.	Exhibit Description
330	5/24/2023 Screenshot of 2023 SWC-IGWA Legal Folders (Barlogi Ex. 21)
331	5/24/2023 Screenshot of Folders within the Deposition Folder (Barlogi Ex. 22)
332	1990-2022 Water Delivery Schedule Spreadsheets (Barlogi Ex. 23)
333	10/14/2005 Sample Amended Agreement for Sprinkler Installation (Barlogi Ex. 24)
334	5/24/2023 Twin Falls County Census Bureau Population Graph (Barlogi Ex. 25)
335	5/10/2023 SWC Data Requested by C. Brockway – (Barlogi Ex. 26)
336	5/22/2023 S. Tschohl Email Response to Brockway Request (Barlogi Ex. 27)
337	3/29/2013 A-B et al Response to 2.21.2013 Letter re Step 1 Methodology Order(Barlogi Ex. 29)
338	10/31/2022 TFCC Profit & Loss 11.2014 through 10.2022 (Barlogi Ex. 30)
339	1/26/2012 TFCC Operation Policy (Barlogi Ex. 31)
340	6/21/2022 Settlement Agreement Small Group Meeting Main Discussion Points (Anders Depo Ex. 40)
341	7/13/2022 Surface Water Coalition Steering Committee Meeting Methodology Outline v.2 (Anders Depo Ex. 41)
342	7/13/2022 Surface Water Coalition Steering Committee Meeting Speaking Outline (Revisions_Methodology_Outline) (Anders Depo Ex. 42)
343	9/30/2022 (9:07:27 AM) Email from G. Baxter re Methodology Order Technical Work Group (Anders Depo Ex. 43)
344	9/30/2022 (1:44:07 PM) Email from G. Baxter re Methodology Order Technical Work Group (Anders Depo Ex. 44)
345	9/30/2022 (2:38:10 PM) Email from G. Baxter re Methodology Order Technical Work Group (Anders Depo Ex. 45)
346	1/3/2023 (12:18:22 PM) Email from M. Weaver re FW: 4th Amended Methodology Order (Anders Depo Ex. 47)
	OTHER DOCUMENTS
347	5/30/2023 Expert Report of Gregory K. Sullivan, P.E. on Behalf of the Cities of Pocatello, Idaho Falls, and the Coalition of Cities
348	City of Pocatello – Summary of Water Rights
349	**City of Idaho Falls – Summary of Water Rights**
350	**Coalition of Cities – Summary of Water Rights**
351	3/17/2023 Letter from BWCC/AFRD2 to IDWR re: Shapefile
352	3/10/2023 Marten Law Letter to IDWR re: Shapefile

Cities' Exhibit No.	Exhibit Description
353	3/2/2023 Email from Minidoka Irr. Dist. to IDWR re: Shapefile
354	2/21/2023 Email from G. Spackman FW Discussion on Amended Methodology#4
355	2/2/2023 Letter from AFRD2 to IDWR re: Shapefile
356	1/30/2023 Letter from IDWR to SWC Managers re: Annual Shapefile Submission
357	12/20/2022 (8:54 AM) Email from M. Anders re TWG Data
358	Opinion, *State v. Twin Falls Canal Co.*, 21 Idaho 410 (June 15, 1911)
359	Opinion, *State v. Twin Falls Land & Water Co.*, 37 Idaho 73 (April 2, 1923
360	Opinion, *Twin Falls Land & Water Co. v Twin Falls Canal Co.*, 79 F.2d 431 (September 9, 1935)
361	**Figure 1-1 to 5/30/2023 Expert Report of Gregory K. Sullivan, P.E. on Behalf of the Cities of Pocatello, Idaho Falls, and the Coalition of Cities**

DATED this 1st day of June, 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

MCHUGH BROMLEY, PLLC

By___/s/ Candice M. McHugh_____
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

HOLDEN KIDWELL HAHN & CRAPO

By___/s/ Robert L. Harris_____
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 1st day of June, 2023, I caused to be filed a true and correct copy of the foregoing document to be filed and served via electronic mail to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP
P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah A. Klahn, ISB #7928

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Jun 01, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley, ISB # 6530
MCHUGH BROMLEY, PLLC
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

Skyler C. Johns (ISB# 11033)
Nathan M. Olsen (ISB# 7373)
Steven L. Taggart (ISB# 8551)
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

Dylan Anderson (ISB# 9676)
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	IDWR Docket No. CM-DC-2010-001 **MOTION FOR DIRECTOR TO ISSUE SUBPOENAS**

COME NOW, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities"), by and through their attorneys of record, Candice M. McHugh and Chris M. Bromley, the City of Idaho Falls, by and through its attorney of record, Robert L. Harris, and the City of Pocatello by and through its attorney of record Sarah A. Klahn (collectively the "Cities"), Idaho Ground Water Appropriators ("IGWA") by and through its attorney of record Thomas J. Budge, Bingham Ground Water District by and through its attorney, Dylan Anderson and Bonneville-

Jefferson Ground Water District, by and through its attorney Skyler Jones, (collectively the "Parties'), pursuant to Rules 523 and 220 of the Rules of Procedure of the Idaho Department of Water Resources (found at IDAPA 37.01.01), as well as I.R.C.P. 45, hereby moves Director Gary Spackman, the Hearing Officer in the above-entitled action, to issue subpoenas to the following individuals to appear and testify at the hearing currently scheduled for June 6-10, 2023, concerning the *Fifth Amended Methodology Order Regarding Methodology for Determining material Injury to Reasonable In-Season Demand And Reasonable Carryover* (the "*Fifth Methodology Order*") and a *Final Order Regarding April 2023 Forecast Supply* (the "*As-Applied Order*"):

1. **Mathew Weaver, P.E.**
   Deputy Director
   Idaho Department of Water Resources
   322 E. Front Street
   Boise, ID 83702

2. **Tony Olenichak**
   Water District 01 Watermaster
   900 N. Skyline Dr., Ste. A
   Idaho Falls, ID 83402-1718

The Parties intend to question Mr. Weaver as a lay witness on matters related to the Department's preparation and issuance of the *Fifth Methodology Order* and the *As-Applied Order*, including all information the Director considered in developing the orders. Additionally, the Parties intend to question Mr. Olenichak about water distribution and water supply in Water District 01, including availability of natural flow and storage water.

The Parties understand that Mr. Weaver is out of the country on a planned vacation, but consistent with other attorneys and hearing witnesses who are unavailable to participate in person because of planned vacations, Mr. Weaver can participate remotely. Mr. Olenichak should be required to appear in person given his presence in the State of Idaho, unless extenuating circumstances exist, in which case, Mr. Olenichak could also appear remotely. The Parties request

that Mr. Weaver and Mr. Olenichak be put on notice by the Director that they may be called as witnesses at any time during June 6-10 hearing, although the Parties anticipate discussing order of witnesses at the commencement of the hearing where the anticipated date and time of each witnesses' anticipating testimony will be discussed. As of the date of this filing, the Parties initially anticipate—which is subject to change—that both Mr. Weaver and Mr. Olenichak will testify on either Friday, June 9th, or Saturday, June 10th.

Dated this 1st day of June, 2023.

/s/ Sarah Klahn
_____
Sarah A. Klahn
SOMACH SIMMONS & DUNN
Attorneys for City of Pocatello

/s/ Candice M. McHugh
_____
Candice M. McHugh
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Robert Harris
_____
Robert L. Harris
HOLDEN KIDWELL HAHN & CRAPO
Attorneys for City of Idaho Falls

/s/ Chris M. Bromley
_____
Chris M. Bromley
MCHUGH BROMLEY
Attorneys for Coalition of Cities

/s/ Thomas J. Budge
_____
Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

/s/ Skyler C. Johns
_____
Skyler C. Johns
OLSEN TAGGART PLLC
Attorneys for Bonneville-Jefferson Ground Water District

/s/ Dylan Anderson
_____
Dylan Anderson
DYLAN ANDERSON LAW
Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I hereby certify that on this 1st day of June, 2023, I served a true and correct copy of the following described pleading or document on the attorneys and/or individuals listed below by the method(s) indicated.

DOCUMENT SERVED: **MOTION FOR DIRECTOR TO ISSUE SUBPOENAS**

ATTORNEYS AND/OR INDIVIDUALS SERVED:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Sarah A. Klahn
Maximilian C. Bricker
SOMACH SIMMONS & DUNN
1155 Canyon Blvd., Ste. 110
Boulder, CO 80302
sklahn@somachlaw.com
mbricker@somachlaw.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

/s/ Robert L. Harris
Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, P.L.L.C.

RECEIVED
Jun 01, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
(208) 232-6109 – fax
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Amended Notice of Mitigation**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, Henry's Fork Ground Water District, Bonneville-Jefferson Ground Water District, and Bingham Ground Water District (collectively, the "Districts"), through their respective counsel, hereby provides notice that the Districts can mitigate for their proportionate share of the demand shortfall predicted in the *Final Order Regarding April Forecast Supply (Methodology Steps 1-3)* ("*April 2023 As-Applied Order*") issued April 21, 2023, in this matter.

Background

The *April 2023 As-Applied Order* applies steps 1-3 of the Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. It predicts that the Surface Water Coalition ("SWC") will experience an in-season demand shortfall of 75,200 acre-feet in the absence of mitigation by junior-priority groundwater users. The order states: "On or before May 5, 2023, ground water users holding consumptive water

rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan." (*April 2023 As-Applied Order*, p. 6.) "IGWA's proportionate share of the predicted DS of 75,200 acre-feet is 63,645 acre-feet." *Id*. at 5, fn 5.

IGWA has three approved mitigation plans. Its "Storage Water Plan" authorizes its member ground water districts to provide mitigation via the delivery of storage water to the SWC. (Order Approving Mitigation Plan, *In the Matter of the Idaho Ground Water Appropriators, Inc.'s Mitigation Plan in Response to the Surface Water Coalition's Water Delivery Call*, IDWR Docket No. CM-MP-2009-007, June 3, 2010, p. 10.) Under this plan, "IGWA must provide proof of rental or an option to rent storage water and of a commitment of the storage water to the SWC within the deadlines provided by the Methodology Order and any order of the Director implementing the Methodology Order for a given year." *Id*.

IGWA's "Aquifer Enhancement Plan" authorizes its member ground water districts to obtain mitigation credit for reach gains that accrue to the SWC as a result of (a) conversions of farmland from groundwater to surface water irrigation; (b) fallowing of groundwater-irrigated acres through the Conservation Reserve Enhancement Program (CREP), Agricultural Water Enhancement Program (AWEP), or other voluntary program; and (c) groundwater recharge." (Order Approving Mitigation Plan, *In the Matter of the Idaho Ground Water Appropriators, Inc.'s Mitigation Plan for Conversions, Dry-Ups, and Recharge*, IDWR Docket No. CM-MP-2009-006, May 14, 2010, p. 1.) Under this plan, "[i]f mitigation credit is sought by IGWA, the Director shall determine the appropriate credit, if any, to provide." *Id*. at 2.

IGWA's "Settlement Agreement Plan" authorizes its member ground water districts to obtain mitigation protection by complying with a settlement agreement entered into between them and the SWC in 2015. (Final Order Approving Stipulated Mitigation Plan, *In the Matter of IGWA's Settlement Agreement Mitigation Plan*, IDWR Docket No. CM-MP-2016-001, May 2, 2016; Final Order Approving Amendment to Stipulated Mitigation Plan, *In the Matter of IGWA's Settlement Agreement Mitigation Plan*, IDWR Docket No. CM-MP-2016-001, May 9, 2017.) Under this plan, each district is required to conserve its proportionate share of 240,000 acre-feet of groundwater and collectively deliver 50,000 acre-feet of storage annually to the SWC as set forth in the *Amended Final Order Regarding Compliance with Approved Plan* issued April 24, 2023.

On May 5, 2023, IGWA filed a *Notice of Ground Water District Mitigation* stating that some of its member ground water districts would mitigate under IGWA's Storage Water Plan and others would mitigate under IGWA's Settlement Agreement Plan, in accordance with their respective proportionate mitigation obligations under each plan. On May 23, 2023, the Director issued an *Order Determining Deficiency in IGWA's Notice of Secured Water* which ruled that IGWA is not allowed to apportion mitigation obligations under the Storage Water Plan or the Settlement Agreement Plan based on each ground water district's proportionate share. In effect, the order requires ground water districts to mitigate under one plan only. Based on the May 23 order, IGWA files this amended notice of mitigation.

Notice of Mitigation

IGWA will mitigate under the Storage Water Plan in 2023. The *April 2023 As-Applied Order* states that IGWA's share of the total predicted demand shortfall of 75,200 acre-feet is 63,645 acre-feet. (*April 2023 As-Applied Order*, p. 5, fn 5.) Attached hereto as Appendix A are copies of storage lease contracts secured by IGWA's member ground water districts totaling 77,714 acre-feet.

The *Order Determining Deficiency in IGWA's Notice of Secured Water* orders, for the first time, that the Districts not only provide contracts showing the water they have secured, but that they pay the Water District 1 fees in addition. The Districts object to this because the order approving the Storage Water Plan does not require IGWA to pay the Water District 1 fees before the date that storage water is committed to the SWC. (Order Approving Mitigation Plan, *In the Matter of Idaho Ground Water Appropriators, Inc.'s Mitigation Plan In Response To The Surface Water Coalition's Water Delivery Call*, IDWR Docket No. CM-MP-2009-007, June 3, 2010.) To the contrary, the order allows IGWA to "provide proof of rental or an option to rent storage water," and that "proof of rental or an option to rent storage water shall consist of fully executed and irrevocable contracts with holders of Snake River storage." By the nature of option contracts, fees due to Water District 1 cannot be paid until the option is exercised. It is also significant that IGWA has never failed to pay the Water District 1 fees due under any storage contract for mitigation water delivered to the SWC.

Without waiving IGWA's objection to the prepayment of Water District 1 fees, IGWA's member districts have gone ahead and paid the Water District 1 fees for 2023. IGWA reserves the right to secure storage water in future years and pay Water District 1 fees at the time such storage is transferred to the SWC.

Dated this 1st day of June, 2023.

RACINE OLSON, PLLP

By:_____
Thomas J. Budge
Attorneys for IGWA

OLSEN & TAGGART PLLC

By:_____
Signed for: Skyler C. Johns
Attorneys for Bonneville-Jefferson Ground Water District

DYLAN ANDERSON LAW

By:_____
Signed for: Dylan Anderson
Attorney for Bingham Ground Water District

APPENDIX A

Storage Leases

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Idaho Irrigation District (lessor) agrees to lease 6,678 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature | Date | Title, Canal Company

5-1-23 | Idaho Irrigation District

Lessee Signature | 5/5/23 | Date | BGWD | Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Snake River Valley Irrigation District (lessor) agrees to lease 5,009 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

5-1-23 Manager SRVID

Lessor Signature Date Title, Canal Company

5-1-23 BGWD Manager

Lessee Signature Date Canal Company or Diversion Name

==========

(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

New Sweden Irrigation District (lessor) agrees to lease 5,009 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Kent Lloyd 5-1-23 MANAGER NSID

Lessor Signature Date Title, Canal Company

[illegible] 5/5/23 BGWD

Lessee Signature Date Canal Company or Diversion Name

==========

(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Enterprize Canal Company (lessor) agrees to lease 1,670 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lesso ignature

Title C na Comp ny

5/3/23

Lessee Signature Date

Canal Company or Diversion Name

5/5/23 BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Sunnydell Irrigation District (lessor) agrees to lease 334 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Compan
		V.P Summydell canal

Lessee Signature	Date	Canal Company or Diversion Name
	5/5/23	BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Aberdeen-Springfield Canal Co (lessor) agrees to lease 3,500 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

5/5/23	General Manager	
Lessor Signature	Date	Title, Canal Company
5/5/23	BGWD	
Lessee Signature	Date	Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Blackfoot Irrigation Company (lessor) agrees to lease 500 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company	
Lessee Signature	5/5/23 Date	BGWD Canal Company or Diversion Name	

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Corbett Slough Ditch Company (lessor) agrees to lease 750 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

5-5-2023		Corbett VP
Lessor Signature	Date	Title, Canal Company
5/5/23		BGWD
Lessee Signature	Date	Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Parsons Ditch Company (lessor) agrees to lease 100 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

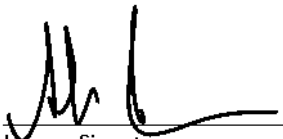
Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
	5/5/23	BGWD
Lessee Signature	Date	Canal Company or Diversion Name

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Peoples Canal & Irrigation Co (lessor) agrees to lease 2,514 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature | Date | Title, Canal Company

5/5/23

Lessee Signature | Date | Canal Company or Diversion Name

BGWD

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Riverside Canal Company (lessor) agrees to lease 50 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
Lessee Signature	5/5/23 Date	BGWD Canal Company or Diversion Name

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

The United Canal Company (lessor) agrees to lease 400 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company	
Lessee Signature	5/5/23 Date	BGWD Canal Company or Diversion Name	

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Watson Canal Company (lessor) agrees to lease 50 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature	Date	Title, Canal Company
	5/5/23	BGWD
Lessee Signature	Date	Canal Company or Diversion Name

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WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Wearyrick Ditch Company (lessor) agrees to lease 150 acre-feet of storage to Bingham Ground Water District (lessee) for the 2023 irrigation season at a price of $[redacted] according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: TBD

Place of Use description: TBD

Water Right Appurtenant to Lands: TBD

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

☐ If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Lessor Signature | Date | Title, Canal Company

5/5/23

Lessee Signature | Date | Canal Company or Diversion Name

BGWD

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(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Enterprize Canal Co., whose mailing address is PO BOX 583, Ririe, ID 83443, ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease.** Lessor hereby leases to Bonneville Jefferson Ground Water District 4,000 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of $[redacted].

2. **Term.** The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent.** Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before May 1, of 2023, and the final installment on or before November 1, of 2023.

4. **Administrative Fees.** BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water.**
   5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1

and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor.** Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach.** If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment.** This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution.** Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

by a mediator designated by mutual Lease of the parties. The mediation will be held in Bonneville County, Idaho, unless the parties mutually agree to a different location. Mediator costs will be split equally between the parties.

9.3 Litigation. Litigation is allowed between the parties only: (i) if the dispute is not resolved by mediation, (ii) for the purpose of enforcing a settlement Lease entered into between the parties, or (iii) to seek temporary injunctive relief if a party deems such action necessary to avoid irreparable damage. The pursuit or granting of temporary injunctive relief does not excuse the parties from participating in good faith negotiation and mediation as set forth above. The prevailing party in any litigation is entitled to recover reasonable attorney fees and costs.

9.4 Governing Law, Jurisdiction, and Venue. This Lease will be construed and interpreted in accordance with the laws of the State of Idaho. The parties agree that the courts of Idaho shall have exclusive jurisdiction, and agree that Bonneville County is the proper venue.

9.5 Exclusive Procedures. The procedures specified in this section 9 are the exclusive procedures for the resolution of disputes between the parties. All applicable statutes of limitation shall be tolled while the negotiation and mediation procedures specified in section 9.3 are pending.

10. **Notices.** All notices given pursuant to this Lease must be in writing and shall be sent in one of the following manners: (a) by certified mail, return receipt requested, postage prepaid; (b) by recognized overnight courier such as Federal Express; (c) by facsimile transmission; (d) by email if the receiving party acknowledges receipt of the emailed notice. Notices shall be deemed received on the earlier of actual receipt, three days after mailing for certified mail and regular mail, the next business day if given by fax, or the date the receiving party acknowledges receipt of email notice.

ADDRESSES TO BE USED FOR NOTICES AND DELIVERY OF LEASE PAYMENTS SHALL BE AS FOLLOWS:

Lessor: Enterprize Canal Co.
PO BOX 583
Ririe, ID 83443

Lessee: Bonneville Jefferson Ground Water District:
PO Box 51121
Idaho Falls, ID 83405

Either party may change its designated address by providing written notice of such change to the other party.

11. **Binding Effect.** This Lease shall be binding upon the respective heirs, successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

4-21-23

By: Kirt Schwieder
Title: Treasurer Date

LESSOR:

Enterprize Canal Co.
PO BOX 583
Ririe, ID 83443

4/20/23

By: Darrel Kerr Date
Title: Chairman

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Idaho Irrigation District, whose address is 496 E 14th St, Idaho Falls, ID 83404, Idaho Falls, Idaho 83402 ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease.** Lessor hereby leases to Bonneville Jefferson Ground Water District 4,000 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of $[redacted].

2. **Term.** The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent.** Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before May 1, of 2023, and the final installment on or before November 1, of 2023. JULY 15

4. **Administrative Fees.** BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water.**

5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1

and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor.** Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach.** If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment.** This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution.** Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

11. **Binding Effect.** This Lease shall be binding upon the respective heirs, successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

4-21-23

By: Kirt Schwieder

Title: Treasurer Date

LESSOR:

Idaho Irrigation District
496 E 14th St.
Idaho Falls, ID 83404

4-18-2023

By: Alan Kelsch Date

Title: Chairman – Idaho Irrigation District

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Snake River Valley Irrigation District, whose address is 816 N. 700 E., with a mailing address at PO BOX 70, Basalt, ID 83218, ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease**. Lessor hereby leases to Bonneville Jefferson Ground Water District 4,000 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of $[redacted].

2. **Term**. The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent**. Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before May 1, of 2023, and the final installment on or before November 1, of 2023.

4. **Administrative Fees**. BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water**.

   5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1 and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor**. Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach**. If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment**. This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution**. Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

by a mediator designated by mutual Lease of the parties. The mediation will be held in Bonneville County, Idaho, unless the parties mutually agree to a different location. Mediator costs will be split equally between the parties.

9.3 Litigation. Litigation is allowed between the parties only: (i) if the dispute is not resolved by mediation, (ii) for the purpose of enforcing a settlement Lease entered into between the parties, or (iii) to seek temporary injunctive relief if a party deems such action necessary to avoid irreparable damage. The pursuit or granting of temporary injunctive relief does not excuse the parties from participating in good faith negotiation and mediation as set forth above. The prevailing party in any litigation is entitled to recover reasonable attorney fees and costs.

9.4 Governing Law, Jurisdiction, and Venue. This Lease will be construed and interpreted in accordance with the laws of the State of Idaho. The parties agree that the courts of Idaho shall have exclusive jurisdiction, and agree that Bonneville County is the proper venue.

9.5 Exclusive Procedures. The procedures specified in this section 9 are the exclusive procedures for the resolution of disputes between the parties. All applicable statutes of limitation shall be tolled while the negotiation and mediation procedures specified in section 9.3 are pending.

10. **Notices**. All notices given pursuant to this Lease must be in writing and shall be sent in one of the following manners: (a) by certified mail, return receipt requested, postage prepaid; (b) by recognized overnight courier such as Federal Express; (c) by facsimile transmission; (d) by email if the receiving party acknowledges receipt of the emailed notice. Notices shall be deemed received on the earlier of actual receipt, three days after mailing for certified mail and regular mail, the next business day if given by fax, or the date the receiving party acknowledges receipt of email notice.

ADDRESSES TO BE USED FOR NOTICES AND DELIVERY OF LEASE PAYMENTS SHALL BE AS FOLLOWS:

Lessor: Snake River Valley
Irrigation District
816 N. 700 E.
PO Box 70
Basalt, ID 83218

Lessee. Bonneville Jefferson Ground Water District:
PO Box 51121
Idaho Falls, ID 83405

Either party may change its designated address by providing written notice of such change to the other party.

successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

4-21-23

By: Kirt Schwieder
Title: Treasurer Date

LESSOR:

Snake River Valley
Irrigation District
816 N. 700 E.
PO Box 70
Basalt, ID 83218

4-20-23

By:
Title: President Date

STORAGE WATER LEASE

This Storage Water Lease ("Lease") is entered into between Idaho Irrigation District, whose address is 496 E 14th St, Idaho Falls, ID 83404, Idaho Falls, Idaho 83402 ("Lessor"), and the Bonneville Jefferson Ground Water District whose mailing address is P.O. Box 51121, Idaho Falls, Idaho 83204.

RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to BONNEVILLE JEFFERSON GROUND WATER DISTRICT, and BONNEVILLE JEFFERSON GROUND WATER DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. **Storage Water Lease.** Lessor hereby leases to Bonneville Jefferson Ground Water District 2500 acre feet of storage water for 2023 only, at which the Bonneville Jefferson Ground Water District is required to pay rent at a rate of [redacted] per acre-foot ([redacted] total).

2. **Term.** The initial term of this Lease shall be for a period of one (1) year, commencing January 1, 2023, and ending December 31, 2023.

3. **Payment of Rent.** Bonneville Jefferson Ground Water District will pay the rent to Lessor in two equal installments. The first installment on or before July 1, of 2023, and the final installment on or before November 1, of 2023.

4. **Administrative Fees.** BONNEVILLE JEFFERSON GROUND WATER DISTRICT will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. **Use of Leased Water.**
   5.1 The assignment, delivery, and use of leased storage water will be determined by BONNEVILLE JEFFERSON GROUND WATER DISTRICT and is subject to the final accounting for the year by the Watermaster of Water District 1

and any applicable Water District 1 Rental Pool Rules.

5.2 This Lease does not include any right to use storage water below Milner Dam.

5.3 The storage water available to Bonneville Jefferson Ground Water District under this Lease may be assigned and delivered by Bonneville Jefferson Ground Water District to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.

5.4 Any storage water not used or assigned by Bonneville Jefferson Ground Water District by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.

5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. **Representations by Lessor.** Lessor covenants and represents that:

6.1 It will provide to Bonneville Jefferson Ground Water District all storage water leased under this Lease.

6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering into this Lease.

7. **Breach.** If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect to pursue remedies for breach of contract in district court.

8. **Assignment.** This Lease may not be assigned by Bonneville Jefferson Ground Water District without the express written consent of Lessor, but the storage water leased by Bonneville Jefferson Ground Water District under this Lease may be assigned or otherwise made available to any other person or entity.

9. **Dispute Resolution.** Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.

9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation

by a mediator designated by mutual Lease of the parties. The mediation will be held in Bonneville County, Idaho, unless the parties mutually agree to a different location. Mediator costs will be split equally between the parties.

9.3 Litigation. Litigation is allowed between the parties only: (i) if the dispute is not resolved by mediation, (ii) for the purpose of enforcing a settlement Lease entered into between the parties, or (iii) to seek temporary injunctive relief if a party deems such action necessary to avoid irreparable damage. The pursuit or granting of temporary injunctive relief does not excuse the parties from participating in good faith negotiation and mediation as set forth above. The prevailing party in any litigation is entitled to recover reasonable attorney fees and costs.

9.4 Governing Law, Jurisdiction, and Venue. This Lease will be construed and interpreted in accordance with the laws of the State of Idaho. The parties agree that the courts of Idaho shall have exclusive jurisdiction, and agree that Bonneville County is the proper venue.

9.5 Exclusive Procedures. The procedures specified in this section 9 are the exclusive procedures for the resolution of disputes between the parties. All applicable statutes of limitation shall be tolled while the negotiation and mediation procedures specified in section 9.3 are pending.

10. **Notices.** All notices given pursuant to this Lease must be in writing and shall be sent in one of the following manners: (a) by certified mail, return receipt requested, postage prepaid; (b) by recognized overnight courier such as Federal Express; (c) by facsimile transmission; (d) by email if the receiving party acknowledges receipt of the emailed notice. Notices shall be deemed received on the earlier of actual receipt, three days after mailing for certified mail and regular mail, the next business day if given by fax, or the date the receiving party acknowledges receipt of email notice.

ADDRESSES TO BE USED FOR NOTICES AND DELIVERY OF LEASE PAYMENTS SHALL BE AS FOLLOWS:

Lessor: Idaho Irrigation District
496 E 14th St
Idaho Falls, ID 83404

Lessee: Bonneville Jefferson Ground Water District:
PO Box 51121
Idaho Falls, ID 83405

Either party may change its designated address by providing written notice of such change to the other party.

11. **Binding Effect.** This Lease shall be binding upon the respective heirs, successors, and assigns of the parties.

LESSEE:

Bonneville Jefferson Ground Water District
PO Box 51121
Idaho Falls, ID 83405

Kirt Schwieder

By: Kirt Schwieder

Title: Treasurer Date

LESSOR:

Idaho Irrigation District
496 E 14th St.
Idaho Falls, ID 83404

Alan Kelsch

By: Alan Kelsch Date

Title: Chairman – Idaho Irrigation District

WATER DISTRICT #1 RENTAL POOL - PRIVATE LEASE AGREEMENT

Idaho Irrigation District (lessor) agrees to lease 2500 acre-feet of storage to Bonneville Jefferson Ground Water District (lessee) for the 2023 irrigation season at a price of $325,000.00 according to the rules and regulations contained in the Water District #1 Rental Pool Procedures.

Description of Lease:

Name of River or Stream from which lease is diverted: Snake River

Canal or Pump Name and location: To be determined

Place of Use description: To be determined

Water Right Appurtenant to Lands: To be determined

An Idaho Water Resources Board surcharge (10% of the purchase price) plus a $1.30 per acre-foot administrative fee must be received by Water District #1 prior to the approval of the storage lease).

If the reservoir storage system fails to fill in the season following the year leased, the lessor's storage allocation shall be reduced by the amount leased to offset any impacts to other spaceholders' storage accruals according to the approved Water District #1 Rental Pool Procedures pursuant to Idaho Code Section 42-1765. The lessor understands the net effect of this rule is to make an amount of the lessor's space (equal to the amount leased) last-to-fill in the reservoir system for the irrigation season following the lease.

[X] If the lease is for irrigation purposes, the Applicant, by checking this box, certifies that the use of this leased storage water complies with the moratorium on new consumptive uses as outlined in Rental Pool Procedure 3.4. Failure to meet the conditions contained in Rental Pool Procedure 3.4 may be grounds for denying the application.

If the leased storage is diverted by a diversion outside the area regulated by Water District #1, the applicant, by signing this agreement agrees to report to the Watermaster of the water district containing the diversion, the daily amounts of leased storage diverted during the year. The Watermaster of that district, according to Rental Pool Procedure 4.3.108, must then report to the Water District #1 Watermaster the daily rental diverted by November 30th. Failure to report the daily rental diversion may result in the rental not being delivered in Water District #1's final rental delivery records.

Alan Kelsch
Alan Kelsch (May 9, 2023 07:25 MDT)

Lessor Signature | Date | Title, Canal Company

Lessee Signature | Date | Canal Company or Diversion Name

(official use only)

Date Lease Accepted by Watermaster: _____

Watermaster Signature: _____

2023.05 Idaho Irrigation WaterLease 2500 AF

Final Audit Report 2023-05-09

Created:	2023-05-08
By:	Brad Buttars (brad@bjgwdistrict.com)
Status:	Signed
Transaction ID:	CBJCHBCAABAAP7PyKRz1fh-VptwGFvO5n297fMbHBDzB

"2023.05 Idaho Irrigation WaterLease 2500 AF" History

Document created by Brad Buttars (brad@bjgwdistrict.com)
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Document emailed to Kirt Schwieder (idahosod@gmail.com) for signature
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Email viewed by Kirt Schwieder (idahosod@gmail.com)
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Document e-signed by Kirt Schwieder (idahosod@gmail.com)
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Document emailed to alankelsch@icloud.com for signature
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Signer alankelsch@icloud.com entered name at signing as Alan Kelsch
2023-05-09 - 1:25:10 PM GMT

Document e-signed by Alan Kelsch (alankelsch@icloud.com)
Signature Date: 2023-05-09 - 1:25:12 PM GMT - Time Source: server

Agreement completed.
2023-05-09 - 1:25:12 PM GMT

Adobe Acrobat Sign

MULTI-YEAR TRIBAL WATER LEASE AGREEMENT

This WATER LEASE ("**Lease Agreement**") is made and entered into by and between the SHOSHONE-BANNOCK TRIBES of the Fort Hall Reservation ("Tribes"), acting through the Tribal Rental Pool Committee in the operation of the Tribal Water Supply Bank and the Fort Hall Business Council, and the IDAHO GROUND WATER APPROPRIATORS, INC., a non-profit corporation, acting for and on behalf of North Snake Ground Water District, Magic Valley Ground Water District, Southwest Irrigation District, American Falls – Aberdeen Ground Water District and Carey Valley Ground Water District, (collectively "IGWA") and is effective on the date executed by both parties hereto.

RECITALS

A. Pursuant to *The 1990 Fort Hall Indian Water Rights Agreement*, the Tribes are entitled to federal storage contract rights, held in trust for the Tribes by the United States, in an amount of 2.8059% of the storage space in American Falls Reservoir and 6.9917% of the storage space in Palisades Reservoir. These contract storage rights are equivalent to full capacity volumes of 46,931 acre-feet in American Falls Reservoir and 83,900 acre-feet in Palisades Reservoir, and those water rights and the associated volumes of water are referred to herein as the "**Tribal Water Supply Bank**." Due to sedimentation, the maximum annual volumes accrued to each of the contract storage rights are less than the stated capacity volumes.

B. The Shoshone-Bannock Tribes have adopted the Shoshone-Bannock Tribal Water Supply Bank Rules, which have been duly approved by the Idaho Water Resources Board, for the purposes of leasing storage water held by the Tribes in American Falls Reservoir for delivery and use in the Snake River Basin anywhere within Idaho, and for leasing storage water held by the Tribes in Palisades Reservoir for delivery and use in the Snake River Basin above Milner Dam.

C. IGWA is a non-profit corporation which was established to represent its membership, which is currently comprised of eight groundwater districts, two irrigation districts, and numerous other municipal, commercial, and industrial groundwater users in Idaho. IGWA has entered into an agreement with the Surface Water Coalition to resolve disputes related to the impacts of groundwater use on surface water rights. IGWA desires to lease storage water from the Tribes based on the terms herein for use as mitigation flow in the Snake River and for use in meeting other aspects of the agreement.

Now, therefore, and in consideration of the covenants, obligations, and other valuable consideration referred to herein, the Tribes and IGWA agree as follows:

1. Quantity of Leased Water. The water that is the subject of this Lease Agreement is referred to herein as the "**Rental Volume**". The quantity of Rental Volume shall be defined under the terms below.

   a. Each year of the Lease Agreement, the Tribes will commit to provide and IGWA will commit to rent from the Tribes a volume of up to 25,000 acre-feet, subject to the terms and conditions provided below.

b. The Rental Volume will be supplied from the Tribal Water Supply Bank, which is comprised of the Tribes' federal contract storage rights in American Falls and Palisades Reservoirs, as defined in the *1990 Fort Hall Indian Water Rights Agreement* and decreed in the Snake River Basin Adjudication. Subject to Section 1.f below, the Tribal Water Supply Bank water that will be available for the Rental Volume excludes all other water rights and water assets of the Tribes, and such water rights and assets are not a part of this Lease Agreement.

c. The Tribes and IGWA agree that the Tribes' obligation to deliver water under this Lease Agreement is contingent on the availability of water from the Tribal Water Supply Bank for rental. Each year, the Tribes will declare the quantity of water in the Tribal Water Supply Bank available as Rental Volume to IGWA within 5 business days of the Water District 1 publication date of storage allocation.

d. The quantity of water in the Tribal Water Supply Bank available as Rental Volume will be calculated by the Tribes as the Tribal Water Supply Bank storage allocation remaining after satisfaction of: (1) the estimated Michaud Unit irrigation demands, (2) an additional volume of storage water, not to exceed 5,000 acre-feet, to mitigate uncertainty, and (3) other lease contracts, separate from this Lease Agreement, entered into by the Tribes for use of the Tribal Water Supply Bank that carry a higher annual lease price as described in Section 1.e below. The quantity of available water may also be limited by court orders or other regulatory enforcement of applicable laws and regulations applicable to the Tribal Water Supply Bank water.

e. Nothing in this Lease Agreement shall operate to prevent the Tribes from leasing additional water from the Tribal Water Supply Bank to another party or parties. The total annual water supplies available to satisfy lease contracts from the Tribal Water Supply Bank will be determined as stated in Section 1.d above and allocated to each lease contract, which is active on the publication date of storage allocation, as follows: (1) the lease contract with the highest lease price ($/acre-foot) will be satisfied in full up to its annual contract volume, (2) the lease contract with the second-highest lease price will next be satisfied in full up to its annual contract volume, and (3) additional lease contracts will be satisfied in a similar fashion with priority for supply given to lease contracts based on lease prices. The allocation of annual supplies to active lease contracts does not apply to Carryover Volume and Additional Volume described below.

f. The Tribes hold a "**Reserve Supply**" equal to 25,276 acre-feet that was secured under a 2015 settlement agreement. The Tribes may request delivery of the Reserve Supply each year up to an annual volume of 10,000 acre-feet and the Reserve Supply is administered as Tribal storage allocation in American Falls Reservoir. Each year of this Lease Agreement, the Tribes, in their sole discretion, may elect to use the Reserve Supply to fulfill Rental Volume commitments defined in Section 1.a above. The Reserve Supply will be provided through the Tribal Water Supply Bank.

g. Subject to reservoir space being available in the Tribal Water Supply Bank and approval by the Tribes, IGWA may elect to hold and carryover a portion of the Rental Volume in storage and not take delivery of that carryover water in the same year that it was declared available by the Tribes. This volume of water is referred to herein as "**Carryover Volume**". The Carryover Volume shall be accounted for as an independent volume of water within the Tribal Water Supply Bank, such that the annual Rental Volume calculation and other Tribal uses of its federal contract storage rights identified in Section 1.d shall not be drawn from the Carryover Volume. The Carryover Volume shall be annually reduced based on a pro-rata portion of the annual evaporative losses applied to the Tribal Water Supply Bank. The total Carryover Volume accumulated in previous years shall not exceed 10,000 acre-feet.

h. The Carryover Volume shall be reset to zero when the Tribal Water Supply Bank refills, indicated by a combined allocation of at least 128,000 acre-feet to the Tribes' federal contract storage rights in American Falls and Palisades Reservoirs. No repayment or reimbursement shall be due to IGWA for lost Carryover Volume due to a reset. The Carryover Volume shall reset to zero at the end of this Lease Agreement term, unless otherwise agreed to in a separate writing by the Parties.

i. IGWA will have the option to lease additional water from the Tribal Water Supply Bank, in excess of 25,000 acre-feet, if it is made available for rental by the Tribes. This volume of water is referred to herein as "**Additional Volume**". It is understood and acknowledged by IGWA and the Tribes that Additional Volume rentals may impact the availability of water as Rental Volume in future years. IGWA shall communicate to the Tribes an interest in leasing Additional Volume by April 1 of the year in which the Additional Volume is requested. The Tribes' approval of Additional Volume leases shall be at the sole discretion of the Tribes and shall not be subject to the calculations defined in Section 1.d.

2. Water Delivery and Administration. Delivery of the Rental Volume shall occur when the Rental Volume has been released from either Palisades or American Falls Reservoir, and appropriately deducted from the Tribes' storage account in these reservoirs. The Tribes and IGWA shall cooperatively work together to ensure the delivery of the Rental Volume to IGWA and the appropriate administration of such water.

a. The quantity of water to be leased under this Lease Agreement under Paragraph 1 has been reviewed by the Tribal Rental Pool Committee as required by the Shoshone-Bannock Tribal Water Supply Bank Rules.

b. Any carriage or other losses of Rental Volume that may occur downstream from American Falls Reservoir or Palisades Reservoir, as the source of water, shall be the responsibility of IGWA.

c. The scheduling of releases of the Rental Volume shall be in the sole discretion of IGWA, provided however, that IGWA will notify and cooperate with the Tribes and the U.S. Bureau of Reclamation (Reclamation) to implement any storage release request. The

Tribes and IGWA will cooperate with Reclamation and Water District 1 in measuring and accounting for the Rental Volume at the outflow of American Falls Reservoir and/or Palisades Reservoir.

d. The Rental Volume, Carryover Volume, and Additional Volume leases shall only be available for use by IGWA or assignment to the Surface Water Coalition to satisfy IGWA's obligations, and shall not otherwise be available for re-marketing or assignment to a third party, unless such re-marketing or assignment is agreed upon in writing by the Tribes.

3. Term. The term of this Lease Agreement shall be for five (5) years commencing on April 1, 2021 and terminating on October 31, 2025.

   a. After the initial term, the Lease Agreement will be automatically renewed on an annual basis, unless a termination letter is sent by the Tribes or IGWA six (6) months prior to the desired termination date of the Lease Agreement.

4. Agreement Contingencies. This Lease Agreement, and obligations hereunder, are expressly contingent upon:

   a. Acquiring all approvals that may be required for the rental, release, delivery, and use of the Rental Volume by IGWA;

   b. Payment by IGWA pursuant to Paragraph 5 below;

   c. Delivery of the Rental Volume by the Tribes to IGWA prior to October 31 of each year during the term of this agreement, subject to the provisions of Paragraphs 5-7 below.

5. Payment. The "**Annual Lease Payment**" shall be calculated as the Rental Volume declared and made available for lease by the Tribes multiplied by the Lease Price. The Lease Price during the 5-year term shall be calculated as follows:

Year	Lease Price Adjustment ($/acre-foot)	Lease Price ($/acre-foot)
2021	$0	$[redacted]
2022	Maximum of $1 per acre-foot or % change in Consumer Price Index for All Urban Consumer (CPI) from January 1, 2021 to December 31, 2021 multiplied by the 2021 Lease Price, rounded to the nearest dollar.	2021 Lease Price + 2022 Adjustment
2023	Maximum of $1 per acre-foot or % change in CPI from 1/1/2022 to 12/31/2022 multiplied by the 2022 Lease Price, rounded to the nearest dollar	2022 Lease Price + 2023 Adjustment
2024	Maximum of $1 per acre-foot or % change in CPI from 1/1/2023 to 12/31/2023 multiplied by the 2023 Lease Price, rounded to the nearest dollar	2023 Lease Price + 2024 Adjustment
2025	Maximum of $1 per acre-foot or % change in CPI from 1/1/2024 to 12/31/2024 multiplied by the 2024 Lease Price, rounded to the nearest dollar	2024 Lease Price + 2025 Adjustment

a. If the full Rental Volume is not available in any particular year, IGWA shall pay the dollar per acre-foot Lease Price stated above for that year for the Rental Volume available.

b. IGWA shall be obligated to make the Annual Lease Payment each year whether or not IGWA takes delivery of any amount of the Rental Volume by October 31 of each year.

c. IGWA shall make payments for the Carryover Volume in the year that the water is first declared available as Rental Volume by the Tribes, and shall not make a second payment for the water in subsequent years when it is delivered for use.

d. The annual lease price adjustment shown in the table above shall be applied in each subsequent year that the Lease Agreement is renewed under Section 3.a after the initial 5-year term.

e. Payments for Additional Volume leases shall be based on the lease price stated above for the year in which the Additional Volume lease takes place, and such payments shall represent an addition to the Annual Lease Payment due to the Tribes.

6. Payment Schedule. The lease payments shall be payable by IGWA as follows:

a. 50% of the total Annual Lease Payment is due by July 1 of each year of the Lease Agreement;

b. The balance of the total Annual Lease Payment is due by November 1 of each year of the Lease Agreement;

c. Payments for Additional Volume leases shall follow the payment schedule defined above for the Rental Volume leases.

d. All payments are payable by wire transfer to the Tribes within five (5) business days of due date stated above.

7. Termination. Either the Tribes or IGWA may terminate this Lease Agreement in accordance with the provisions below:

a. Either the Tribes or IGWA may terminate this Lease Agreement:

i. For any violation or breach of the terms of this Lease Agreement; or
ii. If any of the terms and conditions of any approval of the lease arrangement, or other applicable state or federal law, rule, or regulation, or the administration of the leased water, are inconsistent with the terms of this Lease Agreement.

b. Termination shall be effective within 30 days of provision of written notice to the other party detailing the basis for such termination. The party against whom such termination

is asserted shall have 30 days to cure the violation or breach that is the basis for the termination.

c. Termination may be subject to the Conflict Resolution provisions of Section 8.e, if the party against whom termination is sought disagrees with the basis of the termination.

d. In the event of any such termination, there shall be an accounting of lease payments paid by IGWA and leased water delivered by the Tribes as of the termination date. IGWA shall pay for all leased water delivered. In the event IGWA has submitted payment for leased water that remains undelivered by the termination date, the Tribes shall refund any lease payments received for leased water that remains undelivered, and the Tribes will not be obligated to provide such water unless the parties otherwise agree in writing.

8. Miscellaneous Provisions.

a. Amendments. No amendment or modification of this Lease Agreement or its provisions shall be effective unless documented in writing and approved and executed by all parties with the same formality as this Lease Agreement.

b. Force Majeure. Delays or inability to perform any of the requirements of this Lease Agreement within the term or time limits prescribed herein shall be excused to the extent that performance is rendered impossible by any event beyond the control of either party including but not limited to drought, governmental acts or orders or restrictions, existing legal obligations, failure of suppliers, war, terrorism or any other reason where failure to perform is beyond the reasonable control of and is not caused by the conduct of the non-performing party. A force majeure event shall not include financial inability to complete performance of an obligation.

c. Notices. All notices and other communications under this Lease Agreement shall be in writing. Notices shall be deemed as duly received on the date of service, if served personally on the party to whom notice is to be given. Notices shall also be deemed as duly received five (5) days from the date said notice is mailed to the party to whom notice is to be given, either by first class mail, registered or certified, postage prepaid or by express delivery with handling prepaid, and properly addressed as follows:

If to the Shoshone-Bannock Tribes:

Chairman, Fort Hall Business Council
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203

With a Copy to:

Tribal Water Engineer
Shoshone-Bannock Tribes Water Resources Department
P.O. Box 306

Fort Hall, Idaho 83203
Phone: (208) 239-4580

If to IGWA:

President
Idaho Ground Water Appropriators, Inc.
%Racine Olson, PLLC
Pocatello, ID 83204

With a Copy to:

Randall Budge, T.J. Budge, Counsel
Racine Olsen, PLLC
P.O. Box 1391
Pocatello, ID 83204
Phone: (208) 232-6101

d. Compliance with Laws and Usage. The Parties, at their own expense, will comply with all federal, state, and tribal laws, ordinances, rules, and regulations applicable to this Lease Agreement and the business conducted pursuant thereto.

e. Conflict Resolution. In the event of any dispute, claim, question, or disagreement arising from or relating to the Lease Agreement or the breach thereof, the Tribes and IGWA agree as follows:

   i. The Tribes and IGWA agree to initially submit such dispute to non-binding mediation in an effort to resolve the same.
   ii. In the event that formal legal proceedings are commenced in connection with this Agreement, the parties agree that the Shoshone-Bannock Tribal Court shall be the sole, proper and exclusive forum and venue for such proceedings.
   iii. The laws and regulations of the Shoshone-Bannock Tribes shall govern the interpretation of this Lease Agreement and/or any formal legal proceedings commenced regarding this Lease Agreement.

f. Attorneys' Fees. In any action concerning the terms or enforcement of this Lease Agreement, the prevailing party shall be entitled to recover reasonable costs and attorneys' fees, including any costs and attorneys' fees incurred in appellate proceedings.

g. Binding Effect. All of the covenants, conditions, and provisions of this Lease Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

h. Entire Agreement. This Lease Agreement constitutes the entire agreement between the parties and supersedes any prior understandings or oral or written agreements between the parties respecting the within subject matter.

i. Severability. If any provision of this Lease Agreement shall ever be held to be invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision of this Lease Agreement, but such other provisions shall continue in full force and effect.

j. Headings. The headings of paragraphs and sections in this Lease Agreement are inserted only as a matter of convenience and for reference purposes, and they do not define, limit, or describe the scope of this Lease Agreement or the intent of any of the provisions thereof.

k. Sovereign Immunity. Neither the execution of this Lease Agreement, nor any provision contained herein shall be interpreted to act as a waiver of the Shoshone-Bannock Tribes' sovereign immunity. The Shoshone-Bannock Tribes hereby specifically reserves and retains its sovereign immunity and any rights appurtenant thereto. The Shoshone-Bannock Tribes' sovereign immunity from suit may only be waived by resolution of the Fort Hall Business Council.

l. Contract Interpretation. The parties have participated jointly in the negotiation and drafting of this Lease Agreement. In the event an ambiguity or question of intent or interpretation arises, this Lease Agreement shall be construed as if drafted jointly by the parties and no presumption or burden of proof shall arise favoring or disfavoring any party by virtue of the authorship of any of the provisions of this Lease Agreement.

m. No Third Party Beneficiary. This Lease Agreement is exclusively for the benefit of and governs only the parties hereto. The Tribes and IGWA are the only parties to this Compact and are the only parties entitled to enforce the terms of this Lease Agreement. Nothing in this Lease Agreement gives, or is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly or otherwise, to third persons.

n. Indemnification. IGWA indemnifies the Tribes and its officers, subsidiaries, agents, and employees (the "Indemnitees") and IGWA shall hold the Indemnitees harmless for any damages, claims, demands, personal injury, illness, death, property damage, or other loss resulting in any manner in connection with IGWA's use of the water leased pursuant to this Lease Agreement.

o. No Waiver. Forbearance in enforcing any right or remedy under this Lease Agreement shall not be deemed a wavier nor shall it be the basis for an inference that any party hereto has waived any provision hereof or that a party has waived any right hereunder.

This Lease Agreement shall be signed in triplicate and shall be effective when signed by both the Tribes and IGWA.

SHOSHONE-BANNOCK TRIBES:

Date: 10-6-20 By: _____

Devon Boyer, Chairman
Fort Hall Business Council

IDAHO GROUND WATER APPROPRIATORS, INC.

Date: 10-27-2020 By: _____

Tim Deeg, President

STORAGE WATER LEASE
This Storage Water Lease ("Agreement") is entered into between North Fork Reservoir Company, ("Lessor"), and Henry's Fork Groundwater District (the "District").
RECITALS

A. Lessor has the right to use, lease, and assign storage water allocated and available to Lessor as a space holder in the Idaho Water District 1 reservoir system pursuant to Lessor's Storage Water Contracts with the United States Bureau of Reclamation ("Reclamation").

B. THE DISTRICT desires to lease storage water to satisfy mitigation obligations determined by the Director of the Idaho Department of Water Resources ("Department") and related purposes, such as aquifer recharge and converting farmland from ground to surface water irrigation.

C. Lessor desires to lease storage water to the DISTRICT, and the DISTRICT desires to lease storage water from Lessor, pursuant to the terms of this Lease.

LEASE

1. Storage Water Lease. Lessor hereby leases to the DISTRICT storage water for 2021-2025 only, at which the DISTRICT is required to pay rent as follows:

1,500 acre-feet at $20.00 per acre-foot. IGWA will pay $1.30 acre-foot Water District 01 administrative fee and $2.00 State Water Supply Bank Fee for a total payment of $3.30 per acre-foot.
2. Term. The initial term of this Lease shall commence March 13, 2021, and end November 30, 2025.

3. Payment of Rent. The DISTRICT will pay the rent to Lessor in one installment, on or before 1st day October, of each year.

4. Administrative Fees. IGWA will pay all administrative fees imposed by Water District 1 and the Idaho Water Resource Board.

5. Use of Leased Water.

5.1 The assignment, delivery, and use of leased storage water will be determined by the DISTRICT and is subject to the final accounting for the year by the Water-master of Water District 1 and any applicable Water District 1 Rental Pool Rules.
5.2 This Lease does not include any right to use storage water below Milner Dam.
5.3 The storage water available to the DISTRICT under this Lease may be assigned and delivered by the DISTRICT to any of its members or to any other person or entity for the authorized uses of recharge, mitigation, irrigation, or other lawful use at any time up to December 1 each year.
5.4 Any storage water not used or assigned by the DISTRICT by December 1 shall remain in Lessor's Water District 1 storage account and then belong only to Lessor.
5.5 Lessor understands that any storage water leased may be subject to the Water District 1 Rental Pool Rules.

6. Representations by Lessor. Lessor covenants and represents that:

6.1 It will provide to the DISTRICT all storage water leased under this Lease.
6.2 It is the true and lawful owner of the storage water and that nothing restricts or precludes Lessor from entering this Lease.

7. Breach. If either party defaults in the performance of its obligations under this Lease, and such default is not cured within thirty (30) days after receipt of written notice thereof, the non-breaching party, at its option, may elect any or all of the following cumulative remedies:

(a) Terminate this Lease.
(b) Seek specific performance of this Lease;

8. Assignment. This Lease may not be assigned by the DISTRICT without the express written consent of Lessor, but the storage water leased by the DISTRICT under this Lease may be assigned or otherwise made available to any other person or entity.

9. Dispute Resolution. Any substantial dispute between the parties shall be resolved in accordance with the following provisions.

9.1 Good Faith Negotiation. Upon written notice from one party to the other, authorized representatives of the parties will attempt in good faith to resolve the dispute by negotiation.
9.2 Mediation. If the dispute cannot be resolved by good faith negotiation, either party may demand that the dispute be subjected to mediation by a mediator designated by mutual Lease of the parties. The mediation will be held in **Fremont** County, Idaho, unless the parties mutually agree to a different location. Mediator costs will be split equally between the parties.
9.3 Litigation. Litigation is allowed between the parties only: (i) if the dispute is not resolved by mediation, (ii) for the purpose of enforcing a settlement Lease entered into between the parties, or (iii) to seek temporary injunctive relief if a party deems such action necessary to avoid irreparable damage. The pursuit or granting of temporary injunctive relief does not excuse the parties from participating in good faith negotiation and mediation as set forth above. The prevailing party in any litigation is entitled to recover reasonable attorney fees and costs.
9.4 Governing Law, Jurisdiction, and Venue. This Lease will be construed and interpreted in accordance with the laws of the State of Idaho. The parties agree that the courts of Idaho shall have exclusive jurisdiction and agree that **Fremont** County is the proper venue.
9.5 Exclusive Procedures. The procedures specified in this section 9 are the exclusive procedures for the resolution of disputes between the parties. All applicable statutes of limitation shall be tolled while the negotiation and mediation procedures specified in section 9.1 and 9.2 are pending.

10. Notices. All notices given pursuant to this Lease must be in writing and shall be sent in one of the following manners: (a) by certified mail, return receipt requested, postage prepaid; (b) by recognized overnight courier such as Federal Express; (c) by facsimile transmission; (d) by email if the receiving party acknowledges receipt of the emailed notice. Notices shall be deemed received on the earlier of actual receipt, three days after mailing

for certified mail and regular mail, the next business day if given by fax, or the date the receiving party acknowledges receipt of email notice.

ADDRESSES TO BE USED FOR NOTICES AND DELIVERY OF LEASE PAYMENTS SHALL BE AS FOLLOWS:
Lessor: North Fork Reservoir Company
Michael Rasmussen, President
Address: PO Box 250
Rexburg, Idaho 83201

DISTRICT: Henry's Fork Groundwater District
Aaron Dalling, Secretary
Address: PO BOX 15 St. Anthony, Idaho 83445
Phone: 208-403-8474
Email: aaron.fmid@myidahomail.com
Either party may change its designated address by providing written notice of such change to the other party.

11. Binding Effect. This Agreement shall be binding upon the respective heirs, successors, and assigns of the parties.

DATED this 26 day of Aug 2022.

LESSEE:
Henry's Fork Groundwater District

By: _____
Aaron Dalling-Secretary

DATED this 26 day of Aug, 2022.

LESSOR:
North Fork Reservoir Company
PO Box 250
Rexburg, ID 83440

By: _____
Michael Rasmussen-President

January 5, 2023

ONE-YEAR TRIBAL WATER LEASE AGREEMENT

This One-Year Tribal Water Lease Agreement ("Lease Agreement") is entered into between the SHOSHONE-BANNOCK TRIBES of the Fort Hall Reservation ("Tribes"), acting through the Tribal Lease Pool Committee in the operation of the Tribal Water Supply Bank and the Fort Hall Business Council, and the following three groundwater districts: North Snake Ground Water District, Magic Valley Ground Water District, and American Falls-Aberdeen Ground Water District (collectively, "Districts"). The Tribes and Districts may be referred to herein collectively as the "parties" and individually as a "party." This Lease Agreement shall be effective on the date executed by both parties.

RECITALS

A. Pursuant to *The 1990 Fort Hall Indian Water Rights Agreement*, the Tribes are entitled to federal storage contract rights, held in trust for the Tribes by the United States, in an amount of 2.8059% of the storage space in American Falls Reservoir and 6.9917% of the storage space in Palisades Reservoir. These contract storage rights are equivalent to full capacity volumes of 46,931 acre-feet in American Falls Reservoir and 83,900 acre-feet in Palisades Reservoir. These water rights and associated volumes of storage water are referred to herein as the "Tribal Water Supply Bank." Due to sedimentation, the maximum annual volumes accrued to each of the contract storage rights are less than the stated capacity volumes.

B. The Shoshone-Bannock Tribes have adopted the Shoshone-Bannock Tribal Water Supply Bank Rules, which have been duly approved by the Idaho Water Resources Board, for the purposes of leasing storage water held by the Tribes in American Falls Reservoir for delivery and use in the Snake River Basin anywhere within Idaho, and for leasing storage water held by the Tribes in Palisades Reservoir for delivery and use in the Snake River Basin above Milner Dam.

C. The Districts are members of the Idaho Ground Water Appropriators, Inc. ("IGWA") which has entered into an agreement with the Surface Water Coalition to resolve disputes related to the impacts of groundwater use on surface water rights. The Districts desire to lease storage water from the Tribes based on the terms herein for use in meeting aspects of that agreement.

AGREEMENT

Now, therefore, and in consideration of the covenants and obligations set forth herein, and for other good and valuable consideration, the Tribes and Districts agree as follows:

1. **Leased Water.** The Tribes will provide to the Districts, and the Districts will rent from the Tribes, a volume of 10,000 acre-feet (the "Lease Volume"), subject to the following terms and conditions:

   1.1 The Lease Volume will be supplied from the Tribal Water Supply Bank. Water available for the Lease Volume excludes all other water rights and water assets of the Tribes, and such water rights and assets are not a part of this Lease Agreement.

   1.2 The Tribes hold a "Reserve Supply" equal to 25,276 acre-feet that was secured under a 2015 settlement agreement. The Tribes may request delivery of the Reserve Supply each year up to an annual volume of 10,000 acre-feet to be administered as Tribal storage allocation in American Falls Reservoir. The Tribes, in their sole discretion, may elect to use the Reserve Supply to fulfill Lease Volume commitment defined in Section 1 above. The Reserve Supply will be provided through the Tribal Water Supply Bank.

2. **Water Delivery and Administration.** Delivery of the Lease Volume shall occur when the Lease Volume has been released from either Palisades or American Falls Reservoir, and appropriately deducted from the Tribes' storage account in these reservoirs. The Tribes and Districts shall cooperatively work together to ensure the delivery of the Lease Volume to the Districts and the appropriate administration of such water.

   2.1 The quantity of water to be leased under this Lease Agreement under Paragraph 1 will be reviewed by the Tribal Rental Pool Committee as required by the Shoshone-Bannock Tribal Water Supply Bank Rules.

   2.2 Any carriage or other losses of Lease Volume that may occur downstream from American Falls Reservoir or Palisades Reservoir shall be the responsibility of the Districts.

   2.3 The scheduling of releases of the Lease Volume shall be in the sole discretion of the Districts; provided however, that the Districts will notify and cooperate with the Tribes and the U.S. Bureau of Reclamation (Reclamation) to implement any storage release request. The Tribes and Districts will cooperate with Reclamation and Water District 1 in measuring and accounting for the Lease Volume at the outflow of American Falls Reservoir and/or Palisades Reservoir.

   2.4 The Lease Volume shall only be available for use by the Districts or assignment to the Surface Water Coalition to satisfy IGWA's obligations and shall not otherwise be available for re-marketing or assignment to a third party, unless such re-marketing or assignment is agreed to in writing by the Tribes.

3. **Term.** The term of this Lease Agreement shall be for one (1) year commencing April 1, 2023, and terminating on October 31, 2023.

4. **Agreement Contingencies.** This Lease Agreement, and all obligations hereunder, are expressly contingent upon:

   4.1 Payment by the Districts pursuant to Section 5 below;

   4.2 Delivery of the Lease Volume by the Tribes to the Districts prior to October 31, 2023, subject to the provisions of Paragraphs 5-7 below.

5. **Payment.** The "Lease Payment" shall be [redacted]. The Districts shall be obligated to make the Lease Payment whether or not the Districts take delivery of any amount of the Lease Volume by October 31, 2023. Provided, however, that if the Tribes are unable to make available for delivery the full Lease Volume, the Districts shall pay [redacted] per acre foot of water the Tribes make available for delivery.

6. **Payment Schedule.** The Lease Payment shall be payable by the Districts as follows:

   6.1 50% of the Lease Payment is due by July 15, 2023;

   6.2 The balance of the Lease Payment is due by November 1, 2023;

   6.3 All payments are payable by wire transfer to the Tribes within five (5) business days of due date stated above.

7. **Termination.** Either the Tribes or the Districts may terminate this Lease Agreement in accordance with the provisions below:

   7.1 The Tribes or Districts may terminate this Lease Agreement:

   (a) For any uncured violation or breach of the terms of this Lease Agreement; or

   (b) If any of the terms and conditions of any approval of the lease arrangement, or other applicable state or federal law, rule, or regulation, or the administration of the leased water, are inconsistent with the terms of this Lease Agreement.

   7.2 Termination shall be effective within 30 days of provision of written notice to the other party detailing the basis for such termination. The party against whom such termination is asserted shall have 30 days to cure the violation or breach that is the basis for the termination.

   7.3 Termination may be subject to the Conflict Resolution provisions of Section 10 if the party against whom termination is sought disagrees with the basis of the termination.

   7.4 In the event of any such termination, there shall be an accounting of the Lease Payment paid by the Districts and the Lease Water delivered by the Tribes as of the termination date. The Districts shall pay for all Lease Water delivered. If the Districts have submitted payment for Lease Water that remains undelivered by the termination date, the Tribes shall refund the portion of the Lease Payment received for water that remains undelivered, and the Tribes will not be obligated to provide such water unless the parties otherwise agree in writing.

8. **Miscellaneous Provisions.**

   8.1 Amendments. No amendment or modification of this Lease Agreement or its provisions shall be effective unless documented in writing and approved and executed by all parties with the same formality as this Lease Agreement.

   8.2 Force Majeure. Delays or inability to perform any of the requirements of this Lease Agreement within the term or time limits prescribed herein shall be excused to the extent that performance is rendered impossible by any event beyond the control of either party including but not limited to drought, governmental acts or orders or restrictions, war, terrorism or any other reason where failure to perform is beyond the reasonable control of and is not caused by the conduct of the non-performing party. A force majeure event shall not include financial inability to complete performance of an obligation.

   8.3 Notices. All notices and other communications under this Lease Agreement shall be in writing. Notices shall be deemed as duly received on the date of service, if served personally on the party to whom notice is to be given. Notices sent by mail shall be deemed as duly received five (5) days from the date said notice is mailed to the party to whom notice is to be given, either by first class mail, registered or certified, postage prepaid or by express delivery with handling prepaid. Notices sent by email shall be deemed delivered when the intended recipient acknowledges receipt via reply email. Either party may change its address for notices by sending written notice to the other party in accordance herewith. Notices shall be addressed as follows:

If to the Shoshone-Bannock Tribes:

Chairman, Fort Hall Business Council
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203

With a Copy to:

Tribal Water Resources Director
Shoshone-Bannock Tribes Water Resources Department
P.O. Box 306
Fort Hall, Idaho 83203
Phone: (208) 239-4580

With a Copy to:

T.J. Budge
Racine Olson
201 E. Center Street
Pocatello,ID 83204
(208) 232-6101
tj@racineolson.com

9. **Compliance with Laws and Usage.** The parties, at their own expense, will comply with all federal, state, and tribal laws, ordinances, rules, and regulations applicable to this Lease Agreement and the business conducted pursuant thereto.

10. **Conflict Resolution.** In the event of any dispute, claim, question, or disagreement arising from or relating to the Lease Agreement or the breach thereof, the Tribes and Districts agree as follows:

    (a) The parties will initially engage in good faith negotiation in an attempt to resolve the conflict cooperatively.

    (b) If the conflict is not resolved to the satisfaction of either party through good faith negotiation, the parties agree to submit such dispute to non-binding mediation in an effort to resolve the same.

    (c) If formal legal proceedings are commenced in connection with this Lease Agreement, the parties agree that the Shoshone-Bannock Tribal Court shall be the sole, proper, and exclusive forum and venue for such proceedings.

(d) The laws and regulations of the Shoshone-Bannock Tribes shall govern the interpretation of this Lease Agreement and/or any formal legal proceedings commenced regarding this Lease Agreement.

11. **Attorneys' Fees.** In any action concerning the interpretation or enforcement of this Lease Agreement, the prevailing party shall be entitled to recover reasonable costs and attorneys' fees and costs incurred, including any costs and attorneys' fees incurred in appellate proceedings.

12. **Binding Effect.** All of the covenants, conditions, and provisions of this Lease Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

13. **Entire Agreement.** This Lease Agreement constitutes the entire agreement between the parties and supersedes any prior understandings or oral or written agreements between the parties respecting the subject matter hereof.

14. **Severability.** If any provision of this Lease Agreement is held to be invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision of this Lease Agreement, and such other provisions shall continue in full force and effect, unless Sections 1, 5 or 6 are held to be invalid or unenforceable.

15. **Headings.** The headings of paragraphs and sections in this Lease Agreement are inserted only as a matter of convenience and for reference purposes, and they do not define, limit, or describe the scope of this Lease Agreement or the intent of any of the provisions thereof.

16. **Sovereign Immunity.** Neither the execution of this Lease Agreement, nor any provision contained herein shall be interpreted to act as a waiver of the Shoshone-Bannock Tribes' sovereign immunity. The Shoshone-Bannock Tribes hereby specifically reserves and retains its sovereign immunity and any rights appurtenant thereto. The Shoshone-Bannock Tribes' sovereign immunity from suit may only be waived by resolution of the Fort Hall Business Council.

17. **Contract Interpretation.** The parties have participated jointly in the negotiation and drafting of this Lease Agreement. If an ambiguity or question of intent or interpretation arises, this Lease Agreement shall be construed as if drafted jointly by the parties and no presumption or burden of proof shall arise favoring or disfavoring any party by virtue of the authorship of any of the provisions of this Lease Agreement.

18. **No Third-Party Beneficiary.** This Lease Agreement is exclusively for the benefit of and governs only the parties hereto. The Tribes and Districts are the only parties to this Lease Agreement and are the only parties entitled to enforce the terms of this Lease Agreement. Nothing in this Lease Agreement gives, or is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly or otherwise, to third persons.

19. **Indemnification.** The Districts indemnify the Tribes and its officers, subsidiaries, agents, and employees (the "Indemnitees") and the Districts shall hold the Indemnitees harmless for any damages, claims, demands, personal injury, illness, death, property damage, or other loss resulting in any manner in connection with the Districts' use of the water leased pursuant to this Lease Agreement.

20. **No Waiver.** Forbearance in enforcing any right or remedy under this Lease Agreement shall not be deemed a wavier nor shall it be the basis for an inference that any party hereto has waived any provision hereof or that a party has waived any right hereunder.

January 5, 2023

This Lease Agreement shall be effective when signed by both the Tribes and the Districts.

SHOSHONE-BANNOCK TRIBES:

Date: _____ By: _____

Chairman
Fort Hall Business Council

GROUNDWATER DISTRICTS:

Date: 1/17/23 By: _____

Lynn Carlquist, Chairman, North Snake Ground Water District

Date: _____ By: _____

Dean Stevenson, Chairman, Magic Valley Ground Water District

Date: 1-17-2023 By: Timothy P. Deeg

Tim Deeg, Chairman, American Falls-Aberdeen Ground Water District

This Lease Agreement shall be effective when signed by both the Tribes and the Districts.

SHOSHONE-BANNOCK TRIBES:

Date: 5/4/23 By: Nathan Small

Chairman
Fort Hall Business Council

GROUNDWATER DISTRICTS:

Date: _____ By: _____

Lynn Carlquist, Chairman, North Snake Ground Water District

Date: 1.14.2023 By: _____

Dean Stevenson, Chairman, Magic Valley Ground Water District

Date: _____ By: _____

Tim Deeg, Chairman, American Falls-Aberdeen Ground Water District

RESOLUTION

WHEREAS, the Fort Hall Business Council has the ultimate responsibility for budget approvals and overseeing the administration of all Tribal funding as well as those funds awarded to the Shoshone-Bannock Tribes through contracts, grants and cooperative agreements, regardless of the source; and

WHEREAS, the Tribal Water Bank was established for the benefit of the Shoshone-Bannock Tribes, pursuant to the "1990 Fort Hall Indian Water Rights Agreement", that utilizes the Tribes' contract storage rights in the American Falls and Palisades Reservoirs; and

WHEREAS, in 2015 the Tribes negotiated a Settlement Agreement for 25,276 acre-feet of storage water with the Committee of Nine for impacts that the Water District 01 Common Rental Pool had to the Tribes' storage supplies, of which 15,276 acre-feet is available and 10,000 acre-feet can be used annually; and

WHEREAS, three water districts: North Snake Ground Water District, Magic Valley Ground Water District and the American Falls-Aberdeen Ground Water District (Districts) have applied to rent 10,000 acre-feet of storage water for one-year from the Tribal Water Bank; and

WHEREAS, the Tribes have an adequate supply for 2023 to provide an additional 10,000 acre-feet of storage water; and

WHEREAS, the Tribal Water Resources Department (TWRD) is recommending that the Tribes' enter into a one-year Tribal lease agreement with the Districts for 10,000-acre feet; now

THEREFORE, BE IT RESOLVED BY THE BUSINESS COUNCIL OF THE SHOHONE-BANNOCK TRIBES, that the Tribal Water Resources Department is hereby approved to enter into one-year Tribal lease agreement with the North Snake Ground Water District, Magic Valley Ground Water District and the American Falls-Aberdeen Ground Water District for a 10,000 acre-feet at a rate of [redacted] dollars per acre-feet; and

BE IT FURTHER RESOLVED, that monies derived from this one-year Tribal lease agreement will be utilized to assist with costs associated with monitoring programs, water projects and TWRD costs towards the implementation and administration of the "1990 Fort Hall Indian Water Rights Agreement"; and

BE IT FURTHER RESOLVED, that the Tribal Chairman or official designee is authorized to sign the one-year Tribal lease agreement between the Tribes and the water districts: North Snake Ground Water District, Magic Valley Ground Water District, and the American Falls-Aberdeen Ground Water District; and

BE IT FURTHER RESOLVED, that the Interim TWRD Director is authorized to sign a letter to Water District 01 and Committee of Nine stating that the Tribes are electing to use 10,000 acre-feet of Settlement Water for 2023, if necessary.

Authority for the foregoing resolution is found in the Indian Reorganization Act of June 18, 1934 (48 Stat., 984), as amended, and in the Shoshone-Bannock Tribes Constitution and Bylaws of the Fort Hall Reservation, as amended, including, but not limited to the authority found in the Constitution, Article VI.

Dated this 31st day of January 2023

Nathan Small, Chairman
Fort Hall Business Council

S E A L

CERTIFICATION

I HEREBY CERTIFY, that the foregoing resolution was passed while a quorum of the Business Council was present by a vote of 5 in favor, 1 absent (DKT) and 1 not voting (NS) on the date this bears.

Claudia J. Washakie, Tribal Secretary
Fort Hall Business Council

CTRT-2023-0076

CERTIFICATE OF SERVICE

I hereby certify that on this 1st day of June, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
Jun 02, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc.

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Amended Witness and Exhibit Lists**

Idaho Ground Water Appropriators, Inc., ("IGWA"), acting for and on behalf of North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, American Falls-Aberdeen Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, submits the following witness and amended exhibit lists.

WITNESSES

1. **Sofia Sigstedt.** Sofia Sigstedt is expected to testify as to her expert report, technical aspects of the Fifth Methodology Order and the April 2023 As-Applied Order, communications with the Department's technical working group, and other matters involving the Fifth Methodology Order and the April 2023 As-Applied Order.

2. **Jaxon Higgs.** Jaxon Higgs intended to testify as to his expert report, the proportionate mitigation obligations of IGWA's member ground water districts under the April 2023 As-Applied Order, irrigated acreage within Twin Falls Canal Company, conveyance efficiency of Twin Falls Canal Company, and other matters involving the Fifth Methodology Order and the April 2023 As-Applied Order. Mr. Higgs is not able to participate in the hearing scheduled June 6-10, 2023, due to a previously scheduled

family vacation out of the country.

3. **Mathew Weaver.** Mathew Weaver is expected to testify regarding information considered by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order, the Department's application of the futile call doctrine, and other matters involving the Fifth Methodology Order and the April 2023 As-Applied Order.

4. **Tony Olenichak.** Tony Olenichak is expected to testify regarding the Department's distribution of water to members of the Surface Water Coalition and the Department's application of the futile call doctrine.

5. **Jennifer Sukow.** Jennifer Sukow is expected to testify regarding information considered and technical analyses performed by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order.

6. **Matt Anders.** Matt Anders is expected to testify regarding information considered and technical analyses performed by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order.

7. **Kara Ferguson.** Kara Ferguson is expected to testify regarding information considered and technical analyses performed by Department personnel in developing the Fifth Methodology Order and the April 2023 As-Applied Order.

8. **Other Department Staff.** IGWA reserves the right to call any other Department staff having information considered and technical analyses performed in connection with the development of the Fifth Methodology Order and the April 2023 As-Applied Order.

9. **Jay Barlogi.** Jay Barlogi is expected to testify regarding Twin Falls Canal Company's water delivery system, conveyance efficiencies, hydropower plants served by the Company's delivery system, Company policies, and others matters involving the Company.

10. **Lynn Carlquist.** Lynn Carlquist is expected to testify regarding the consequences for IGWA member districts and their patrons of the Fifth Methodology Order and the April 2023 As-Applied Order, and other matters involving the administration of water rights under the SWC delivery call related to the Fifth Methodology Order and the April 2023 As-Applied Order.

11. **Tim Deeg.** Tim Deeg is expected to testify regarding the consequences for IGWA member districts and their patrons due to the decisions contained within the Fifth Methodology Order and the April 2023 As-Applied Order, and other matters involving the administration of water rights under the SWC delivery call related to the Fifth Methodology Order and the April 2023 As-Applied Order.

12. **Kirk Jacobs.** Kirk Jacobs is expected to testify regarding the consequences for IGWA member districts and their patrons due to the decisions contained within the Fifth Methodology Order and the April 2023 As-Applied Order, and other matters involving the administration of water rights under the SWC delivery call related to the Fifth

Methodology Order and the April 2023 As-Applied Order.

13. Any witness identified by any other party.

14. Any witness needed to authenticate any exhibit.

15. Any witness needed for rebuttal purposes.

EXHIBITS

Attached herewith as ***Appendix A*** is IGWA's **Amended** Exhibit List and the Common Exhibit List. Attached herewith as ***Appendix B*** is IGWA's Amended Exhibit List and Common Exhibits, with changes between IGWA's original exhibit list marked. In addition, IGWA reserves the right to utilize as exhibits (a) any document listed in the exhibit list of any other party to this proceeding; (b) water right records kept by the Department in its ordinary course of business; (c) any exhibit, pleading, or order filed previously with the Department in this matter; (d) transcripts of testimony proffered previously in this matter; (e) exhibits created for illustrative purposes; (f) exhibits utilized for rebuttal purposes; (g) subsequently disclosed exhibits for which the Director approves late disclosure; and (h) documents of which the Director takes official notice per IDAPA 30.01.01.602.

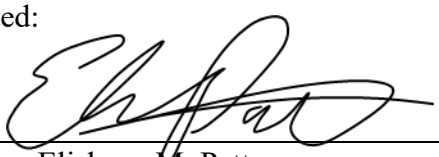
DATED this 2nd day of June, 2023.

RACINE OLSON, PLLP

By: _____
Elisheva M. Patterson
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 2nd day of June, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Elisheva M. Patterson

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

Appendix A

IGWA's Hearing Exhibits	
#	Description
100	20150310 IGWA Comments on Draft IDWR Staff Memo
101	20150310 Pocatello Comments on Draft IDWR Staff Memo
102	20150310 SWC Comments on Draft IDWR Staff Memo
103	20150316 SWC Staff Recommendations Memo (CM-DC-2010-001)
118	20230116 SWC Comments to IDWR re Methodology Update
124	Depo Ex. 6 - 20221119 ESPAM_SWC_TWG_11-28-22
126	Depo Ex. 8 - 20230503 Baxter email re GWD mitigation obligations
132	Depo Ex. 16 - 20221117 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides (Numbered)
135	Depo Ex. 19 - 20160419 Fourth Methodology Order
144	Depo Ex. 28 - GWD Depo Notice to TFCC
154	Depo Ex. 48 - Attmt to 1.3.23 email to M.Weaver - 20160419_SWC RevisedMethodologyLC-MA-EB-Gary-EB3
156	ESPAM21FinalReportAppendixA
157	ESPAM21FinalReportAppendixB
158	ESPAM21FinalReportAppendixC
159	ESPAM21FinalReportFiguresSize8.5x11
160	ESPAM21FinalReportFiguresSize11x17
161	ESPAM21FinalReportTables
163	ModelCalibration22_FinalAppendixA
164	CurtScen22_FinalwApp
165	ESPAM2 Recharge Tools Documentation_ Processing Steps
166	Super_FullyPop_Final
167	E22PredUnc_Final
168	E22PredUnc_FinalAppendixA
169	E22PredUnc_FinalAppendixB
170	20060428 Affidavit of Scott N. King (SWC Dist Ct Agency Record 3427)
171	20070320 Expert Report of Scott King (Irr Acres Analysis TFCC)
172	20070926 Direct Testimony of Scott King (SWC Dist Ct Agency Record 5205)
173	Exhibit 4166 TFCC Water Management Plan 1999
174	Exhibit 4166A
175	Exhibit 4167 TFCC Operation Policy
176	Exhibit 4607 TFCC Meeting 2005
177	Exhibit 4608 TFCC Meeting Minutes 2004
178	Exhibit 4610 TFCC Ditch Writer 2005
179	01-00209 SRBA SF5
180	20071107 Spronk Water Engineers Expert Rebuttal Report (SWC Dist Ct Agency Record 5371)

181	20080616 Spronk Water Engineering Expert Report (A&B ISC Agency Record Ex 301)
182	20080716 Direct Test. of Charles Brendecke (A&B Dist Ct Agency Record)
183	20080827 Rebuttal Test of Charles Brendecke (A&B ISC Agency Record Ex 460)
184	20120406 Jt Stip to Withdraw Objs TFCC
185	20221001 Budge.Baxter email string RE_ Methodology Order TWG
187	20230425 IDWR Press Release
191	CM-DC-2010-001_20150316_SWC_Staff_Recommendations_Memo
192	CM-MP-2014-007-20150123-Staff-Memo-Cities-2nd
193	CurtScen22_FinalwApp
194	Hindcast BLY v Nov Actual DS chart
196	Transient State Benefits by GWD 2023
197	Attachment 1 - IGWA Proportionate Share Modeling
198	Attachment 2 - Model Cells by District
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802	Figure 2-4 Sum of Heise natural flow and storage allocation for Snake River above Milner 1992-2021
803	Figure 2-5 Reference ET for Twin Falls with both AgriMet and ETIdaho data 1992-2021
804	Figure 2-6 Growing Degree Days for Twin Falls AgriMet Site 1992-2021
805	Figure 2-7 Growing Season Precip Twin Falls Weather Station 1992-2021
806	Figure 2-8 Normal Distribution of SWC Total Diversions over POR 2000-2014
807	Figure 2-9 Normal distribution of SWC Total Diversion over POR 2000-2021
808	Figure 2-10 IDWR hindcast analysis annual carryover volumes for TFCC 1995-2022 4MO v 5MO
809	Figure 3-1 Excerpts from Ralston 2008 Fence Diagrams
810	Figure 3-2 Excerpt from Ralston 2008 geologic map
811	Figure 3-3 Tranmissivity changes ESPAM 1.1 vs 2.1 vs. 2.2
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814	Figure 3-6 Changes in steady state response function BF to Minidoka reach ESPAM 2.1 vs 2.2
815	Figure 3-7 Annual volume net aquifer recharge 1981 to 2018
816	Figure 3-8 Storage and Transmissivity distribution using alt METRIC processing
817	Figure 3-9 Comparison water budget components pre and post calibration using METRIC

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819	Table 2-1 Summary of SWC irrated acres 2015 TWG
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825	Table 2-7 Maximum Projected Carryover Need Fourth MO Compared to Fifth MO
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827	Table 2-9 IDWR Hindcast of Nov Actual DS based on IDWR RISD comparing TFCC acre changes
828	Table 2-10 April Reduction to FS models for natural flow available to SWC entities
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836	Expert Report of Jaxon Higgs
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901	20221117 Forecast_Supply_SWC_TWG
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903	20221119 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides
904	20221119 BLY_SWC_TWG_11-16-22_with supplemental slides
905	20221119 ESPAM_SWC_TWG_11-28-22
906	20221119 Project Efficiency_SWC_TWG_11-28-22_with supplemental slides
907	20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)
908	NRT_METRIC_SWC_TWG_12-1-22
909	NRT_METRIC_SWC_TWG_12-9-22_v.2
910	20221209 BLY_reasonable carryover
911	20221209 NRT METRIC_SWC_TWG
912	20221214 Forecast_Supply_SWC_TWG_12-14-2022_V2 (Numbered)
913	20221221 SWC Diversions and CWN Charts
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917	Depo Ex. 1 - 20230504 Joint Notice of Deposition Duces Tecum - J. SUKOW
918	Depo Ex. 2 - 20230421 Fifth Amended Final Order Regarding Methodology

919	Depo Ex. 3 - 20230421 Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)
920	Depo Ex. 4 - 20221223_SWC_TWG_Summary
921	Depo Ex. 5 - 20230425 FAQ on new Methodology and SWC delivery call
922	Depo Ex. 7 - Hindcast_Table1_Settlement_20221221
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925	Depo Ex. 11 - 20230116 Cities Comments on SWC Metholodogy Recommendation
926	Depo Ex. 14 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)
927	Depo Ex. 15 - 20230116 MEMORANDUM_630PM_Lynker
928	Depo Ex. 17 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)
929	Depo Ex. 18 - CM Rules
930	Depo Ex. 20 - Cities Amended Notice of Deposition of TFCC
931	Depo Ex. 21 - Screenshot of 2023 SWC-IGWA Legal Folders
932	Depo Ex. 22 - Screenshot of Folders within the Deposition Folder
933	Depo Ex. 23 - TFCC Water Delivery Schedule 1990 to 2022 Spreadsheets
934	Depo Ex. 24 - Amended Agreement for Sprinkler Installation
935	Depo Ex. 25 - Census Bureau Population in Twin Falls County Graph
936	Depo Ex. 26 - SWC data requested by Chuck Brockway
937	Depo Ex. 27 - Email from Sarah Tschohl to multiple parties dated 5-22-23
938	Depo Ex. 29 - Ltrs from Thompson to Spackman 2013 to 2022
939	Depo Ex. 30 - TFCC Profit and Loss 2014 to 2022
940	Depo Ex. 31 - TFCC Operating Policy
941	Depo Ex. 40 - 20220621 - Small Group Discussion Points - 4Bedke
942	Depo Ex. 41 - 2022.7.13 SWC Methodology Outline_v2
943	Depo Ex. 42 - 2022.7.13 Revisions_Methodology_Outline
944	Depo Ex. 45- GBaxter_RE_ Methodology Order Technical Work Group_20220930_3_Redacted (002)
945	Depo Ex. 46 - 2022.12.20 Anders Email re TWG Data (002)
946	Depo Ex. 47 - 2023.1.3 Email FW_ 4th Amended Methodology Order (002)
947	ESPAM21FinalReport
948	ModelCalibration22_Final

Appendix B

IGWA's Hearing Exhibits		
#	Description	Change Notes
100	20150310 IGWA Comments on Draft IDWR Staff Memo	
101	20150310 Pocatello Comments on Draft IDWR Staff Memo	
102	20150310 SWC Comments on Draft IDWR Staff Memo	
103	20150316 SWC Staff Recommendations Memo (CM-DC-2010-001)	
~~104~~	~~20221116 SWC Delivery Call Overview~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~105~~	~~20221117 Forecast_Supply_SWC_TWG~~	Common with Cities Ex. 327 and provided by Dept.; Removed from IGWA's Exhibit list and added to Common Exhibits
~~106~~	~~20221119 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~107~~	~~20221119 BLY_SWC_TWG_11-16-22_with supplemental slides~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~108~~	~~20221119 ESPAM_SWC_TWG_11-28-22~~	Common with Cities Ex. 318 and provided by Dept.; Removed from IGWA's Exhibit list and added to Common Exhibits
~~109~~	~~20221119 Project Efficiency_SWC_TWG_11-28-22_with supplemental slides~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~110~~	~~20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~111~~	~~20221209 BLY_reasonable carryover~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~112~~	~~20221209 NRT METRIC_SWC_TWG~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~113~~	~~20221214 Forecast_Supply_SWC_TWG_12-14-2022_V2 (Numbered)~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~114~~	~~20221221 SWC Diversions and CWN Charts~~	Provided by Dept. pursuant to order; Removed from IGWA's Exhibit list and added to Common Exhibits
~~115~~	~~20221223 IDWR Preliminary Recommendations~~	Common with Cities Ex. 316; Removed from IGWA's Exhibit list and added to Common Exhibits
~~116~~	~~20230116 Cities Comments on SWC Metholodogy Recommendation~~	Common with Cities Ex. 322; Removed from IGWA's Exhibit list and added to Common Exhibits
~~117~~	~~20230116 Lynker Memo re IDWR Staff Recommendations~~	Common with Cities Ex. 326; Removed from IGWA's Exhibit list and added to Common Exhibits
118	20230116 SWC Comments to IDWR re Methodology Update	

~~119~~	~~Depo Ex. 1 - 20230504 Joint Notice of Deposition Duces Tecum - J. SUKOW~~	Common with Cities Ex. 307; Removed from IGWA's Exhibit list and added to Common Exhibits
~~120~~	~~Depo Ex. 2 - 20230421 Fifth Amended Final Order Regarding Methodology~~	Common with Cities Ex. 300 and BJGWD Ex. 501; Removed from IGWA's Exhibit list and added to Common Exhibits
~~121~~	~~Depo Ex. 3 - 20230421 Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)~~	Common with Cities Ex. 301 and BJGWD Ex. 518; Removed from IGWA's Exhibit list and added to Common Exhibits
~~122~~	~~Depo Ex. 4 - 20221223_SWC_TWG_Summary~~	Common with Cities Ex. 316; Removed from IGWA's Exhibit list and added to Common Exhibits
~~123~~	~~Depo Ex. 5 - 20230425 FAQ on new Methodology and SWC delivery call~~	Common with Cities Ex. 317; Removed from IGWA's Exhibit list and added to Common Exhibits
124	Depo Ex. 6 - 20221119 ESPAM_SWC_TWG_11-28-22	
~~125~~	~~Depo Ex. 7 - Hindcast_Table1_Settlement_20221221~~	Common with Cities Ex. 319 and BJGWD Ex. 511; Removed from IGWA's Exhibit list and added to Common Exhibits
126	Depo Ex. 8 - 20230503 Baxter email re GWD mitigation obligations	
~~127~~	~~Depo Ex. 9 - ESPAM V.2.1 Final Report~~	Common with Cities Ex. 321; Removed from IGWA's Exhibit list and added to Common Exhibits
~~128~~	~~Depo Ex. 10 - 20230504 Joint Notice of Deposition Duces Tecum - M. ANDERS~~	Common with Cities Ex. 308; Removed from IGWA's Exhibit list and added to Common Exhibits
~~129~~	~~Depo Ex. 11 - 20230116 Cities Comments on SWC Metholodogy Recommendation~~	Common with Cities Ex. 322; Removed from IGWA's Exhibit list and added to Common Exhibits
~~130~~	~~Depo Ex. 14 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)~~	Common with Cities Ex. 325; Removed from IGWA's Exhibit list and added to Common Exhibits
~~131~~	~~Depo Ex. 15 - 20230116 MEMORANDUM_630PM_Lynker~~	Common with Cities Ex. 326; Removed from IGWA's Exhibit list and added to Common Exhibits
132	Depo Ex. 16 - 20221117 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides (Numbered)	
~~133~~	~~Depo Ex. 17 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)~~	Common with Cities Ex. 328; Removed from IGWA's Exhibit list and added to Common Exhibits
~~134~~	~~Depo Ex. 18 - CM Rules~~	Common with Cities Ex. 329; Removed from IGWA's Exhibit list and added to Common Exhibits
135	Depo Ex. 19 - 20160419 Fourth Methodology Order	
~~136~~	~~Depo Ex. 20 - Cities Amended Notice of Deposition of TFCC~~	Common with Cities Ex. 311; Removed from IGWA's Exhibit list and added to Common Exhibits
~~137~~	~~Depo Ex. 21 - Screenshot of 2023 SWC IGWA Legal Folders~~	Common with Cities Ex. 330; Removed from IGWA's Exhibit list and added to Common Exhibits

~~138~~	~~Depo Ex. 22 - Screenshot of Folders within the Deposition Folder~~	Common with Cities Ex. 331; Removed from IGWA's Exhibit list and added to Common Exhibits
~~139~~	~~Depo Ex. 23 - TFCC Water Delivery Schedule 1990 to 2022 Spreadsheets~~	Common with Cities Ex. 332; Removed from IGWA's Exhibit list and added to Common Exhibits
~~140~~	~~Depo Ex. 24 - Amended Agreement for Sprinkler Installation~~	Common with Cities Ex. 333; Removed from IGWA's Exhibit list and added to Common Exhibits
~~141~~	~~Depo Ex. 25 - Census Bureau Population in Twin Falls County Graph~~	Common with Cities Ex. 334; Removed from IGWA's Exhibit list and added to Common Exhibits
~~142~~	~~Depo Ex. 26 - SWC data requested by Chuck Brockway~~	Common with Cities Ex. 335; Removed from IGWA's Exhibit list and added to Common Exhibits
~~143~~	~~Depo Ex. 27 - Email from Sarah Tschohl to multiple parties dated 5-22-23~~	Common with Cities Ex. 336; Removed from IGWA's Exhibit list and added to Common Exhibits
144	**Depo Ex. 28 - GWD Depo Notice to TFCC**	
~~145~~	~~Depo Ex. 29 - Ltrs from Thompson to Spackman 2013 to 2022~~	Common with Cities Ex. 337; Removed from IGWA's Exhibit list and added to Common Exhibits
~~146~~	~~Depo Ex. 30 - TFCC Profit and Loss 2014 to 2022~~	Common with Cities Ex. 338; Removed from IGWA's Exhibit list and added to Common Exhibits
~~147~~	~~Depo Ex. 31 - TFCC Operating Policy~~	Common with Cities Ex. 339; Removed from IGWA's Exhibit list and added to Common Exhibits
~~148~~	~~Depo Ex. 40 - 20220621 - Small Group Discussion Points - 4Bedke~~	Common with Cities Ex. 340; Removed from IGWA's Exhibit list and added to Common Exhibits
~~149~~	~~Depo Ex. 41 - 2022.7.13 SWC Methodology Outline_v2~~	Common with Cities Ex. 341; Removed from IGWA's Exhibit list and added to Common Exhibits
~~150~~	~~Depo Ex. 42 - 2022.7.13 Revisions_Methodology_Outline~~	Common with Cities Ex. 342; Removed from IGWA's Exhibit list and added to Common Exhibits
~~151~~	~~Depo Ex. 45- GBaxter_RE_ Methodology Order Technical Work Group_20220930_3_Redacted (002)~~	Common with Cities Ex. 345; Removed from IGWA's Exhibit list and added to Common Exhibits
~~152~~	~~Depo Ex. 46 - 2022.12.20 Anders Email re TWG Data (002)~~	Common with Cities Ex. 357; Removed from IGWA's Exhibit list and added to Common Exhibits
~~153~~	~~Depo Ex. 47 - 2023.1.3 Email FW_ 4th Amended Methodology Order (002)~~	Common with Cities Ex. 346; Removed from IGWA's Exhibit list and added to Common Exhibits
154	**Depo Ex. 48 - Attmt to 1.3.23 email to M.Weaver - 20160419_SWC RevisedMethodologyLC-MA-EB-Gary-EB3**	
~~155~~	~~ESPAM21FinalReport~~	Common with BJGWD Ex. 510; Removed from IGWA's Exhibit list and added to Common Exhibits

156	ESPAM21FinalReportAppendixA	
157	ESPAM21FinalReportAppendixB	
158	ESPAM21FinalReportAppendixC	
159	ESPAM21FinalReportFiguresSize8.5x11	
160	ESPAM21FinalReportFiguresSize11x17	
161	ESPAM21FinalReportTables	
~~162~~	~~ModelCalibration22_Final~~	Common with BJGWD Ex. 512; Removed from IGWA's Exhibit list and added to Common Exhibits
163	ModelCalibration22_FinalAppendixA	
164	CurtScen22_FinalwApp	
165	ESPAM2 Recharge Tools Documentation_ Processing Steps	
166	Super_FullyPop_Final	
167	E22PredUnc_Final	
168	E22PredUnc_FinalAppendixA	
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~~186~~	~~20230425 FAQ on new Methodology and SWC delivery call~~	Common with Cities Ex. 317 and duplicative; Removed from IGWA's Exhibit list
187	20230425 IDWR Press Release	
~~188~~	~~20230503 Baxter email re GWD mitigation obligations~~	Common with Cities Ex. 320; Removed from IGWA's Exhibit list and added to Common Exhibits
~~189~~	~~20230504 Baxter emails re deposition of Weaver~~	Duplicate of IGWA Ex. 188; Removed from IGWA's Exhibit List
~~190~~	~~20230504 CM-DC-2010-001 Joint Notice of Deposition Duces Tecum - M. ANDERS (00151692xD2C75)~~	Common with Cities Ex. 308 and duplicative; Removed from IGWA's Exhibit list
191	CM-DC-2010-001_20150316_SWC_Staff_Recommendations_Memo	
192	CM-MP-2014-007-20150123-Staff-Memo-Cities-2nd	
193	CurtScen22_FinalwApp	

194	**Hindcast BLY v Nov Actual DS chart**	
~~195~~	~~**Table1_Settlement_20221221**~~	Common with Cities Ex. 319 and duplicative; Removed from IGWA's Exhibit list
196	**Transient State Benefits by GWD 2023**	
197	**Attachment 1 - IGWA Proportionate Share Modeling**	
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~~819~~	~~**Figure 3-11**~~	Listed on IGWA's Exhibit List but not provided on shared link, and so removed from list
~~820~~	~~**Figure 3-12**~~	Listed on IGWA's Exhibit List but not provided on shared link, and so removed from list
~~821~~	~~**Figure 3-13**~~	Listed on IGWA's Exhibit List but not provided on shared link, and so removed from list
~~822~~	~~**Figure 3-14**~~	Listed on IGWA's Exhibit List but not provided on shared link, and so removed from list
~~823~~	~~**Figure 3-15**~~	Listed on IGWA's Exhibit List but not provided on shared link, and so removed from list
~~824~~	~~**Figure 3-16**~~	Listed on IGWA's Exhibit List but not provided on shared link, and so removed from list
819	**Table 2-1 Summary of SWC irrated acres 2015 TWG**	

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836	Expert Report of Jaxon Higgs	
837	Expert Report of Sofia Sigstedt	

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902	Forecast_Supply_SWC_TWG_12-14-22	Provided by Dept. pursuant to order
903	20221119 NRT METRIC_SWC_TWG_11-17-22_with supplemental slides	Provided by Dept. pursuant to order
904	20221119 BLY_SWC_TWG_11-16-22_with supplemental slides	Provided by Dept. pursuant to order
905	20221119 ESPAM_SWC_TWG_11-28-22	Common with Cities Ex. 318
906	20221119 Project Efficiency_SWC_TWG_11-28-22_with supplemental slides	Provided by Dept. pursuant to order
907	20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)	Provided by Dept. pursuant to order
908	NRT_METRIC_SWC_TWG_12-1-22	Provided by Dept. pursuant to order
909	NRT_METRIC_SWC_TWG_12-9-22_v.2	Provided by Dept. pursuant to order
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912	20221214 Forecast_Supply_SWC_TWG_12-14-2022_V2 (Numbered)	Provided by Dept. pursuant to order
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921	Depo Ex. 5 - 20230425 FAQ on new Methodology and SWC delivery call	Common with Cities Ex. 317 and IGWA's Ex. 186
922	Depo Ex. 7 - Hindcast_Table1_Settlement_20221221	Common with Cities Ex. 319 and BJGWD Ex. 511
923	Depo Ex. 9 - ESPAM V.2.1 Final Report	Common with Cities Ex. 321

924	Depo Ex. 10 - 20230504 Joint Notice of Deposition Duces Tecum - M. ANDERS	Common with Cities Ex. 308
925	Depo Ex. 11 - 20230116 Cities Comments on SWC Metholodogy Recommendation	Common with Cities Ex. 322
926	Depo Ex. 14 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)	Common with Cities Ex. 325
927	Depo Ex. 15 - 20230116 MEMORANDUM_630PM_Lynker	Common with Cities Ex. 326
928	Depo Ex. 17 - 20221201 NRT METRIC_SWC_TWG_12-1-22_with supplemental slides (Numbered)	Common with Cities Ex. 328
929	Depo Ex. 18 - CM Rules	Common with Cities Ex. 329
930	Depo Ex. 20 - Cities Amended Notice of Deposition of TFCC	Common with Cities Ex. 311
931	Depo Ex. 21 - Screenshot of 2023 SWC-IGWA Legal Folders	Common with Cities Ex. 330
932	Depo Ex. 22 - Screenshot of Folders within the Deposition Folder	Common with Cities Ex. 331
933	Depo Ex. 23 - TFCC Water Delivery Schedule 1990 to 2022 Spreadsheets	Common with Cities Ex. 332
934	Depo Ex. 24 - Amended Agreement for Sprinkler Installation	Common with Cities Ex. 333
935	Depo Ex. 25 - Census Bureau Population in Twin Falls County Graph	Common with Cities Ex. 334
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940	Depo Ex. 31 - TFCC Operating Policy	Common with Cities Ex. 339
941	Depo Ex. 40 - 20220621 - Small Group Discussion Points - 4Bedke	Common with Cities Ex. 340
942	Depo Ex. 41 - 2022.7.13 SWC Methodology Outline_v2	Common with Cities Ex. 341
943	Depo Ex. 42 - 2022.7.13 Revisions_Methodology_Outline	Common with Cities Ex. 342
944	Depo Ex. 45- GBaxter_RE_ Methodology Order Technical Work Group_20220930_3_Redacted (002)	Common with Cities Ex. 345
945	Depo Ex. 46 - 2022.12.20 Anders Email re TWG Data (002)	Common with Cities Ex. 357
946	Depo Ex. 47 - 2023.1.3 Email FW_ 4th Amended Methodology Order (002)	Common with Cities Ex. 346
947	ESPAM21FinalReport	Common with BJGWD Ex. 510
948	ModelCalibration22_Final	Common with BJGWD Ex. 512

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Jun 05, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S RESPONSE TO IGWA'S AMENDED NOTICE OF MITIGATION**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby submits the following response to *IGWA's Amended Notice of*

Mitigation.

On June 1, 2023, the Idaho Ground Water Appropriators, Inc. ("IGWA), acting on behalf of its member Ground Water Districts ("Districts") filed an amended notice ("Notice") that claims to provide "notice that the Districts can mitigate for their proportionate share of the demand shortfall predicted in the *Final Order Regarding April forecast Supply (Methodology Step 1-3)("April 2023 As-Applied Order")* issued April 21, 2023, in this matter." IGWA claims that it has 77,714 acre-feet of storage water rented that can be used for mitigation. The Coalition submits that the Notice is deficient and does not provide adequate notice of mitigation for the 2023 irrigation season.

IGWA is attempting to mitigate using the mitigation plan it refers to the "Storage Water Plan." In an earlier attempt to demonstrate mitigation through the Storage Water Plan, the Director held "the plan clearly states that IGWA will mitigate for all ground water users, not just its members and non-member participants." *See Order Determining Deficiency in IGWA's Notice of Secured Water* at 3. Despite this finding issued on May 23, 2023, IGWA claims that it is only mitigating for its "proportionate share of the demand shortfall", see Notice at 1, and "[t]he *April 2023 As-Applied Order* states that IGWA's share of the total predicted demand shortfall of 75,200 acre-feet is 63,645 acre feet." *See* Notice at 3. IGWA's Notice creates uncertainty concerning the amount of water it proposes to provide – is it 75,200 acre-feet as would be required by the Storage Water Plan or what IGWA determines to be its proportionate share of 75,200 acre-feet - 63,645 acre-feet?

Further, the Notice does not address all of IGWA's storage water mitigation obligations for 2023. The Director found that IGWA breached the mitigation plan IGWA refers to as the "Settlement Agreement Plan" in 2021, and to prevent curtailment in 2022, the Coalition and

IGWA entered into a Settlement Agreement in which IGWA promised to advise the Coalition of its ability to deliver 30,000 acre-feet of storage by April 1, 2023. IGWA has not done so. If IGWA wants to rely on the Storage Water Plan to mitigate its storage water obligations in 2023, it must demonstrate that it can rent the injury amounts of 75,200 acre-feet plus 30,000 acre-feet for a total of 105,200 acre-feet. It has not done so, and it is not entitled to the protections provided by the mitigation orders.

By attempting to mitigate pursuant to the Storage Water Plan, if IGWA believes or hopes that its 2023 obligation will be reduced by the next step Order under the Methodology, and if IGWA does not deliver 50,000 acre-feet required by the Settlement Agreement Plan, then IGWA is subjecting all of its Ground Water Districts, including those who are otherwise complying with the Settlement Agreement Plan, to a claim of breach of that Plan. If IGWA mitigates pursuant to the Settlement Agreement Plan, it is required to deliver 50,000 acre-feet of storage water. This amount and the additional 30,000 acre-feet required by the 2021 breach settlement totals 80,000 acre-feet. It is the Coalition's position that the minimum amount of storage water that is required to be delivered in 2023 in order to comply with IGWA's existing obligations is 80,000 acre-feet, and IGWA has not demonstrated that it can deliver that amount to date.

Finally, it is implied by IGWA's filing that it believes that can deliver storage water pursuant to the Storage Water Plan and that is all that is required to mitigate in 2023. Storage water is but one component of the Settlement Agreement Plan. The *Second Addendum to Settlement Agreement* dated December 14, 2016 and adopted by the Director in *that Final Order Approving Amendment to Stipulated Mitigation Plan* dated May 9, 2017, states that "Prior to April 1 annually the Districts will submit to the Steering Committee….their proposed actions to be taken for the upcoming irrigation season, together with supporting information compiled by

the Districts' consultants." IGWA has not done so, and therefore has not complied with its mitigation obligations for 2023.

IGWA has not demonstrated that it can comply with its existing 2023 mitigation obligations pursuant to either the Storage Water Plan or the Settlement Agreement Plan. Further, IGWA cannot rely solely on the delivery of storage water to satisfy its mitigation obligations – it must comply with the terms of the Settlement Agreement Plan and the 2021 Settlement Agreement. For all of the foregoing reasons the Coalition requests that the Director enter an order determining that IGWA's Amended Notice of Mitigation is deficient and does not comply with the orders of the Director.

DATED this 5th day of June, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of June, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only Tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Max C. Bricker Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

RECEIVED
Jun 05, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S MOTION TO LIMIT SCOPE OF HEARING**

COME NOW A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Company (collectively hereafter referred to as the "Surface Water Coalition," "SWC," or "Coalition"), by and through counsel of record, hereby submit this Motion to Limit the Scope of Hearing pursuant to Department Rules of Procedure 220 (Motions) and 600 (Evidence). *See* IDAPA 37.01.01.220 and 600.

INTRODUCTION

After reviewing the various witness and exhibit lists filed by the parties last week, the Coalition files this *Motion to Limit the Scope of Hearing* for the upcoming hearing on the Director's *Fifth Amended Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fifth Methodology Order*") and the *Final Order Regarding April 2023 Forecast Supply* ("*April As-Applied Order*") issued on April 21, 2023. The Coalition requests an order clarifying that the scope of issues to be raised at the hearing will be limited to the Department's updates in the Methodology Order, consideration of updated data, and the implementation of that methodology as set forth in the *April As-Applied Order*. Stated another way, this hearing should not be viewed as an opportunity to re-litigate the Coalition's delivery call and previously denied defenses, including the overall framework of the methodology that has been subject to a final judgment on the merits.

ARGUMENT

I. The Director Should Limit the Scope of the Administrative Hearing.

The parties have previously participated in: 1) a 2008 hearing regarding initial IDWR orders regarding the SWC delivery call and juniors' defenses thereto; 2) a 2010 hearing concerning additional data used in the methodology and whether the methodology was properly followed in the April As Applied Order; 3) district and supreme court judicial review of the 2008 case; *A&B Irr. Dist. et al. v. Spackman*, 155 Idaho 640 (2013); and 4) district court judicial review of the Director's first *Methodology Order* and other orders implementing the same; *Memorandum Decision and Order on Petitions for Judicial Review*, *IGWA et al. v. Spackman*, Gooding County Dist. Ct., Fifth Jud. Dist., Consolidated Case No. CV-2010-382 (Sept. 26,

2014).[1] *See* **Ex. A**. In other words, the fundamental aspects and merits of the Coalition's call have already been litigated. Consequently, the Director should limit the scope of this hearing so that it does not turn into an overly broad proceeding that attempts to readdress issues already decided on judicial review.[2] The Director is authorized to preclude testimony and evidence that is irrelevant, unduly repetitious, or unnecessary if it is already part of the overall case record. *See* Rule 600 ("The presiding officer, with or without objection, may exclude evidence that is irrelevant, unduly repetitious, inadmissible on constitutional or statutory grounds, or on the basis of any evidentiary privilege provided by statute, rule or recognized in the courts of Idaho."). Further, as evidenced by recent court filings, certain parties may continue with their efforts to broaden the scope of inquiry beyond what the Director has already authorized. *See Notice of Materials Department Witnesses May Rely Upon at Hearing and Intent to Take Official Notice* (identifying IDWR witnesses and topics they may testify about); *Order Limiting Scope of Depositions* at 4 ("the deposition process is not an opportunity for parties to question Department employees about the Director's deliberative process related to legal and policy considerations") (the same reasoning should apply to testimony by IDWR staff at the hearing).

To that end the Director should also deny the motion to subpoena witnesses and evidence beyond the scope of this proceeding. *See Motion for Director to Issue Subpoenas* (June 1, 2023). Since neither Mr. Weaver or Mr. Olenichak have been identified as Department witnesses in

[1] No party appealed the district court's decision and final judgment. Any individual parties that did not participate in these prior proceedings were provided with an opportunity to appear or participate.

[2] Amalgamated Sugar Co. and McCain Foods USA, Inc. also appear intent on expanding the scope of the hearing to mitigation and process issues not relevant to the *Fifth Methodology Order* and *April As Applied Order*. *See Amalgamated Sugar Company's Identification of Witnesses and Exhibits* at 2 ("Mr. Delorey may testify about Amalgamated's water rights, its effort to try and mitigate and its option for mitigation, including the process imposed in the above captioned matter"); *McCain Foods USA, Inc.'s Identification of Witnesses and Exhibits* at 2 ("Mr. King may testify about McCain's water rights, its effort to mitigate and its options for mitigation . . . the process and timelines and the timelines and process imposed in the above captioned matter.").

Director's May 5, 2023 *Notice*, the requests for subpoenas go beyond the scope of information and witnesess relevant to this proceeding. The Director has previously limited the scope of such hearings in this proceeding to ensure efficiency and preclude repetitive or irrelevant evidence. *See Order Limiting Scope of Evidence and Offering Witnesses (Methodology Order)* (May 21, 2010); *Order Limiting Hearing Evidence and Offering Witnesses* (May 21, 2010).[3] For the same reasons the Director should deny the Ground Water Users' requests to subpoena Deputy Directro Mat Weaver and Water District 01 Watermaster Tony Olenichak for the hearing, as well as their attempt to call Kara Ferguson and "Other Department Staff."

In addition, the Director should deny any attempts to expand the scope of this hearing to address issues that have already been litigated. For example, it appears the Ground Water Users will attempt to address a multitude of subjects that go beyond the updates to the *Fifth Methodology Order* and its implementation in the *April As Applied Order*. Bingham Ground Water District proposes to call a witness to address a "Southeastern Idaho Water Resources Management Impacts Surface-Groundwater Irrigation Demands / A Policy White Paper Review" regarding claimed economic impacts from curtailment. IGWA previously submitted economic information as part of the 2008 hearing. Subsequent to the hearing the Idaho Supreme Court issued the following decision that addresses economic issues in water right administration:

> The Groundwater Users' argument that full economic development means that priority of right is taken into consideration in managing the Aquifer only as necessary to prevent over-drafting of the Aquifer is not consistent with Idaho law. It would, in essence, preclude conjunctive management of the Aquifer. . . . As we held in *Musser v. Higginson*, 125 Idaho 392, 871 P.2d 809 (1994), hydrologically connected surface and ground waters must be managed conjuctively.
>
> * * *

[3] In those orders the Director denied IGWA's and Pocatello's attempts to call Lyle Swank, Tony Olenichak, Allan Wylie, and Liz Cresto on the hearing on the 2008 data for the Methodology Order as well as Lyle Swank and Tony Olenichak on the 2010 April As Applied Order.

> The policy of securing the maximum use and benefit, and least wasteful use, of the State's water resources applies to both surface and underground waters, and it requires that they be managed conjunctively.
>
> * * *
>
> The Rule requires impact upon the exercise of a water right. It does not require showing an impact on the profitability of the senior appropriator's business. Such a holding would conflict with Artcie XV, § 3 of the Idaho Constitution, which states that "[p]riority of appropriation shall give the better right as between those using the water." It would also require the Director or watermaster to examine the businesses of the senior and junior appropriators to determine which one could make the greater profit from the use of the water when there is a shortage. If business profitability was the basis for appropriation, decreed water rights would become meaningless. The issue would be which appropriator at the time could make the greater profit by using the water.

See Clear Springs Foods, Inc. v. Spackman, 150 Idaho 790, 808, 810, 252 P.3d 71, 89, 91 (2011).

In addition, certain parties apparently seek to re-litigate the methodology itself. *See e.g., Pocatello's Statement of Issues* at 2 (issues d, e, h, i, j, l, and m); *BJGWD Statement of Issues* at 2-3 (1, 2, 4, 11, 12, 13); *Coalition of Cities' Statement of Issues* at 2-3 (4, 7, 8, 9, 10, 11, 14); *City of Idaho Falls Statement of Issues* at 2-3 (2, 3, 4, 7, 8, 9, 10, 11, 12, 13). Again, the parties already fully litigated issues regarding the determination of material injury in the SWC call. The parties also challenged the Director's methodology on judicial review in consolidated case CV-2010-382. Judge Wildman issued a final order and judgment that was not appealed. *See* **Ex. A**. The hearing on the updates to the *Fifth Methodology Order* and implementation in the *April As Applied Order* is not a forum to re-litigate those issues.

Finally, certain parties attack the validity and use of ESPAM 2.2 in the Director's methodology and its implementation. Although the transient use for identifying a curtailment date in the update to the *Fifth Methodology Order* is a subject that will be addressed in this hearing, the use and science behind the groundwater model was fully addressed in the 2008

hearing. The Hearing Officer adopted the use of the model in this case and that decision was not overturned on judicial review:

> **9. It was appropriate to use the ESPAM in making the conjunctive management decisions in this case.** The ESPAM versions used by the former Director were the best science available. Decisions had to be made and will have to be made. The limitations of the model are identifiable and important, but they do not preclude reliance upon it. It has an acceptable level of reliability based on peer reviewed science.
>
> **10. As improvements are made that lead to a more reliable model those results should be utilized.** Doubtless the science of the relationship between the Snake River and the aquifer has not been exhausted. If study and application of the model leads to refinements or revelations, those improvements should be applied as they occur.

Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation at 33-34 (emphasis in original).[4]

As such, any issues and proposed testimony and evidence that go beyond the updates to the *Fifth Methodology* and whether the Director properly applied the methodology in *April As Applied Order* should be excluded. The Director properly limited the scope of similar hearings and there is no reason to deviate from that reasoning at this time. Moreover, as explained further below, the parties are barred from relitigating such issues by the doctrine of *res judicata* because they have been previously litigated to a final judgment that cannot be undone through this hearing.

Res judicata is comprised of claim preclusion (true *res judicata*) and issue preclusion (collateral estoppel). *See Waller v. State, Dep't of Health & Welfare*, 146 Idaho 234, 237, 192 P.3d 1058, 1061 (2008). Issue preclusion protects litigants from litigating an identical issue with the same party or its privy. *See id*., (quoting *Ticor Title Co*., 144 Idaho at 123, 157 P.3d at 617).

[4] The ESPAM was also upheld by the Idaho Supreme Court in the Spring Users' delivery call appeal. *See Clear Springs Foods, Inc.*, 150 Idaho at 813-14; 252 P.3d at 94-95 ("[Groundwater Users] have failed to show that the Director abused his discretion in relying upon the model. . . . The district court did not err in upholding the Director's reliance upon the model").

The general rule is that once a judgment is entered it is *res judicata* with respect to all issues which were or could have been litigated. *Id*., (citing *Compton v. Compton*, 101 Idaho 328, 333, 612 P.2d 1175, 1180 (1980)). Five factors are required for collateral estoppel to bar re-litigation of an issue decided in an earlier proceeding:

> (1) the party against whom the earlier decision was asserted had a full and fair opportunity to litigate the issue decided in the earlier case; (2) the issue decided in the prior litigation was identical to the issue presented in the present action; (3) the issue sought to be precluded was actually decided in the prior litigation; (4) there was a final judgment on the merits in the prior litigation; and (5) the party against whom the issue is asserted was a party or in privity with a party to the litigation.

Id., (citing *Ticor Title Co*., 144 Idaho at 124, 157 P.3d at 618).

Applying those factors to the matter at hand, (1) the parties actively (or had a full and fair opportunity to) litigate these issues in the first hearing case and appeal (Case No. CV-2009-551) as well as the consolidated appeals in case no. CV-2010-382 which resolved challenges to the original Methodology Order in the *Memorandum Decision and Order on Petitions for Judicial Review* (Sept. 26, 2014); (2) the issues previously decided are identical to many of those raised in the Statements of Issues; (3) those issues were decided in the prior appeal, *A&B Irr. Dist.*, 155 Idaho 640; or the District Court's 2014 decision and final judgment; and (5) the groundwater entities were party to the previous litigation or were in privity with a party or parties to the litigation. Certainly the agency and the parties do not have to re-address the Coalition's delivery call and defenses as if the prior cases never existed. Yet that is the result of what the Ground Water Users' seek by listing various issues beyond the scope of the *Fifth Methodology Order* and the *April As Applied Order*.

Whereas IGWA's counsel estimated that this hearing could cost the parties' between $200,000 and $300,000 at last week's court hearing, allowing irrelevant testimony and evidence

beyond the proper scope of the hearing to take up unnecessary time and effort would only add to that potential expense, further burdening the agency and the parties.

CONCLUSION

For the reasons set forth above, the Director should issue an Order Limiting the Scope of Hearing. The issues that go beyond the Director's prior notice or that were raised and previously litigated should not be raised and argued at the hearing because they are barred by the doctrine of *res judicata*.

DATED this 5th day of June, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of June, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Max C. Bricker Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

Exhibit A

District Court - SRBA
Fifth Judicial District
In Re: Administrative Appeals
County of Twin Falls - State of Idaho
SEP 26 2014
By
Deputy Clerk

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF GOODING

IDAHO GROUND WATER APPROPRIATORS, INC., Petitioner, vs. CITY OF POCATELLO, Petitioner, vs. TWIN FALLS CANAL COMPANY, NORTH SIDE CANAL COMPANY, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, and MINIDOKA IRRIGATION DISTRICT, Petitioners, vs. GARY SPACKMAN, in his capacity as Director of the Idaho Department of Water Resources, and THE DEPARTMENT OF WATER RESOURCES, Respondents. IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF	Case No.: CV-2010-382 (consolidated Gooding County Cases CV-2010-382, CV-2010-383, CV-2010-384, CV-2010-387, CV-2010-388, Twin Falls County Cases CV-2010-3403, CV-2010-5520, CV-2010-5946, CV-2012-2096, CV-2013-2305, CV-2013-4417 and Lincoln County Case CV-2013-155) **MEMORANDUM DECISION AND ORDER ON PETITIONS FOR JUDICIAL REVIEW**

A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY AND TWIN FALLS CANAL COMPANY	)

Appearances:

Travis Thompson of Barker Rosholt & Simpson, LLP, Twin Falls, Idaho, attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

W. Kent Fletcher of Fletcher Law Office, Burley, Idaho, attorney for American Falls Reservoir District #2 and Minidoka Irrigation District.

Randall Budge of Racine Olson Nye Budge & Bailey, Chartered, Pocatello, Idaho, attorneys for the Idaho Ground Water Appropriators, Inc.

Mitra Pemberton of White & Jankowski, LLP, Denver, Colorado, attorneys for the City of Pocatello.

Michael Orr and Garrick Baxter, Deputy Attorneys General of the State of Idaho, Idaho Department of Water Resources, Boise, Idaho, attorneys for the Idaho Department of Water Resources and Gary Spackman.

I.

STATEMENT OF THE CASE

A. Nature of the Case.

This matter involves a dispute between senior surface water users and junior ground water users over the conjunctive administration of water in the Snake River Basin. The dispute arises in the context of a delivery call initiated by the A&B Irrigation District, American Falls Reservoir District No. 2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company and Twin Falls Canal Company (collectively, "Coalition" or "SWC") against certain junior ground water rights located in the Eastern Snake Plain Aquifer ("ESPA"). At issue is the methodology utilized by the Director of the Idaho Department of Water Resources ("Department") for determining material injury to reasonable in-

season demand and reasonable carryover to Coalition members, and his subsequent application of that methodology. The Coalition, Idaho Ground Water Appropriators, Inc. ("IGWA") and the City of Pocatello seek judicial review of the Director's methodology and his application of that methodology. Those parties ask this Court to set aside and remand various aspects of the Director's final orders.

B. Course of proceedings and statement of facts.[1]

1. This judicial review proceeding involves a number of *Petitions for Judicial Review*. They seek review of a series of final orders issued by the Director in relation to the Coalition's delivery call. What follows is a recitation of those final orders, the resulting *Petitions for Judicial Review*, and the subsequent proceedings on those *Petitions* before this Court.

2. On June 23, 2010, the Director issued his *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). 382 R., pp.564-604. *Petitions* seeking judicial review of the *Methodology Order* were filed by the Coalition in Gooding County Case No. CV-2010-384, IGWA in Gooding County Case No. CV-2010-383, and the City of Pocatello in Gooding County Case No. CV-2010-388.

3. On June 24, 2010, the Director issued his *Final Order Regarding April 2010 Forecast Supply (Methodology Steps 3 & 4); Order on Reconsideration* ("*As-Applied Order*"). 382 R., pp.605-625. *Petitions* seeking judicial review of the *As-Applied Order* were filed by the Coalition in Twin Falls County Case No. CV-2010-3403, IGWA in Gooding County Case No. CV-2010-382, and the City of Pocatello in Gooding County Case No. CV-2010-387.

4. The six *Petitions for Judicial Review* previously mentioned were reassigned to this Court.[2]

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[1] **Footnote Re: Citations to Agency Record.** The agency record in this proceeding consists of two subparts: (1) the previously-compiled record for the judicial review proceeding under Gooding County Case No. CV-2008-551, and (2) the more recently compiled record for the judicial review petitions consolidated under Gooding County Case No. CV-2010-382. For clarity and convenience, citations of the former record will use form "551 R., p. ___," while citations to the latter record will use the form "382 R., p.___."

[2] The reassignments were made pursuant to the Idaho Supreme Court's *Administrative Order* dated December 9, 2009, issued *In the Matter of the Appointment of the SBRA District Court to Hear All Petitions for Judicial Review from the Department of Water Resources Involving Administration of Water Rights.*

5. On July 29, 2010, pursuant to the unopposed request of the parties, the Court entered an *Order* consolidating the six *Petitions for Judicial Review* into Gooding County Case No. CV-2010-382 ("Consolidated 382 Case").

6. On September 17, 2010, the Director issued his *Final Order Revising April 2010 Forecast Supply (Methodology Step 7)*. 382 R., pp.636-645. A *Petition* seeking judicial review of that *Final Order* was filed by the Coalition in Twin Falls County Case No. CV-2010-5520. The *Petition* was reassigned to this Court.

7. On November 30, 2010, the Director issued his *Final Order Establishing 2010 Reasonable Carryover (Methodology Step 9)*. 382 R., pp.684-692. A *Petition* seeking judicial review of that *Final Order* was filed by the Coalition in Twin Falls County Case No. CV-2010-5946. The *Petition* was reassigned to this Court.

8. On December 13, 2010, the Court issued an *Order* staying proceedings in the Consolidated 382 Case pending the Idaho Supreme Court's issuance of its written decision in Idaho Supreme Court Docket No. 38193-2010. The stay was entered pursuant to the request and agreement of the parties.

9. On January 3, 2011, pursuant to the unopposed request of the parties, the Court entered an *Order* consolidating the Coalition's *Petitions* in Twin Falls County Case Nos. CV-2010-5520 and 2010-5946 into consolidated the Consolidated 382 Case.

10. On April 13, 2012, the Director issued his *Final Order Regarding April 2012 Forecast Supply (Methodology Steps 1-8)*. 382 R., pp.728-742. On May 9, 2012, the Director issued his *Order Denying Petition for Reconsideration; Denying Motion to Authorize Discovery; Denying Request for Hearing (Methodology Steps 1-8)*. 382 R., pp.753-757. A *Petition* seeking judicial review of that *Final Order* and *Order Denying Petition for Reconsideration* was filed by the Coalition in Twin Falls County Case No. CV-2012-2096. The *Petition* was reassigned to this Court.

11. On April 17, 2013, the Director issued his *Final Order Regarding April 2013 Forecast Supply (Methodology 1-4)*. 382 R., pp.829-846. On May 22, 2013, the Director issued his *Order Denying Petition for Reconsideration; Denying Request for Hearing; Denying Motion to Authorize Discovery (Methodology Steps 1-4)*. 382 R., pp.888-893. A *Petition* seeking judicial review of that *Final Order* and *Order Denying Petition for Reconsideration* was filed by

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III.

STANDARD OF REVIEW

Judicial review of a final decision of the director of IDWR is governed by the Idaho Administrative Procedure Act, Chapter 52, Title 67, Idaho Code § 42-1701A(4). Under IDAPA, the Court reviews an appeal from an agency decision based upon the record created before the agency. Idaho Code § 67-5277; *Dovel v. Dobson,* 122 Idaho 59, 61, 831 P.2d 527, 529 (1992). The Court shall not substitute its judgment for that of the agency as to the weight of the evidence on questions of fact. Idaho Code § 67-5279(1); *Castaneda v. Brighton Corp.,* 130 Idaho 923, 926, 950 P.2d 1262, 1265 (1998). The Court shall affirm the agency decision unless the court finds that the agency's findings, inferences, conclusions, or decisions are:

(a) in violation of constitutional or statutory provisions;

(b) in excess of the statutory authority of the agency;

(c) made upon unlawful procedure;

(d) not supported by substantial evidence on the record as a whole; or,

(e) arbitrary, capricious, or an abuse of discretion.

Idaho Code § 67-5279(3); *Castaneda,* 130 Idaho at 926, 950 P.2d at 1265. The petitioner must show that the agency erred in a manner specified in Idaho Code § 67-5279(3), and that a substantial right of the party has been prejudiced. I.C. § 67-5279(4). Even if the evidence in the record is conflicting, the Court shall not overturn an agency's decision that is based on substantial competent evidence in the record.[3] *Barron v. IDWR,* 135 Idaho 414, 417, 18 P.3d 219, 222 (2001). The Petitioner also bears the burden of documenting and proving that there was not substantial evidence in the record to support the agency's decision. *Payette River Property Owners Assn. v. Board of Comm'rs.*, 132 Idaho 552, 976 P.2d 477 (1999).

IV.

HISTORY AND PRIOR DETERMINATIONS

The *Petitions for Judicial Review* filed in this case arise in the context of an ongoing delivery call. Before the Court is the methodology established by the Director for determining

[3] Substantial does not mean that the evidence was uncontradicted. All that is required is that the evidence be of such sufficient quantity and probative value that reasonable minds *could* conclude that the finding – whether it be by a jury, trial judge, special master, or hearing officer – was proper. It is not necessary that the evidence be of such quantity or quality that reasonable minds *must* conclude, only that they *could* conclude. Therefore, a hearing officer's findings of fact are properly rejected only if the evidence is so weak that reasonable minds could not come to the same conclusions the hearing officer reached. *See eg. Mann v. Safeway Stores, Inc.* 95 Idaho 732, 518 P.2d 1194 (1974); *see also Evans v. Hara's Inc.*, 125 Idaho 473, 478, 849 P.2d 934, 939 (1993).

material injury to the Coalition's reasonable in-season demand and reasonable carryover caused by junior ground water rights, and his subsequent application of that methodology. Consideration of the issues requires a review of the prior administrative and judicial proceedings undertaken in relation to this call.

A. 2005 Delivery call.

The delivery call at issue here was filed by the Coalition in 2005. 551 R., pp.1-52. On May 2, 2005, the Director issued an *Amended Order* finding that junior ground water diversions from the ESPA were materially injuring the Coalition's natural flow and storage rights. 551 R., pp.1359-1424. The Director's *Amended Order* utilized a "minimum full supply" methodology in determining material injury. 551 R., pp.1382-1385. That methodology relied upon a baseline analysis to determine material injury based upon shortfalls to a chosen baseline quantum of the Coalition's in-season irrigation and reasonable carryover needs. *Id.*

Various parties sought an administrative hearing before the Department on the *Amended Order*. *See e.g.,* 551 R., pp.1642-1657; 551 R., pp.1704-1724. However, that was put on hold while members of the Coalition filed a declaratory judgment action challenging the constitutionality of the Conjunctive Management Rules ("CM Rules").[4] The declaratory judgment action culminated in the Idaho Supreme Court's written decision in *American Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, 143 Idaho 862, 154 P.3d 433 (2007) ("*AFRD#2*"), which upheld the CM Rules as facially constitutional. Thereafter, the Department proceeded with an administrative hearing on the *Amended Order*. The Director appointed the Honorable Gerald F. Schroeder as the presiding hearing officer ("Hearing Officer").

B. Director's *2008 Final Order.*

The Hearing Officer issued his *Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation* on April 29, 2008. 551 R., pp.7048-7118. The Hearing Officer's *Recommendation* analyzed the Director's use of a minimum full supply methodology in determining material injury to the Coalition. 551 R., pp.7086-7095. The Hearing Officer generally approved the Director's use of a minimum full supply methodology, including his use

[4] The term "Conjunctive Management Rules" or "CM Rules" refers to the *Rules for Conjunctive Management of Surface and Ground Water Resources,* IDAPA 37.03.11.

of a baseline as a starting point for the consideration of the call and in determining material injury. *Id.* But, the Hearing Officer noted that "[t]here have been applications of the concept of a minimum full supply that should be modified if the use of the protocol is to be retained," and that "there must be adjustments as conditions develop if any baseline supply concept is to be used." 551 R., pp.7091 & 7093. Exceptions to the Hearing Officer's *Recommendation* were subsequently filed with the Director by various parties. *See e.g.,* 551 R., pp.7126-7134; 551 R., pp.7141-7197.

On September 5, 2008, the Director issued his *Final Order Regarding the Surface Water Coalition Delivery Call* ("*2008 Final Order*"). 551 R., pp.7381-7395. The *2008 Final Order* adopted the findings of fact and conclusions of law of the Hearing Officer's *Recommendation* except as specifically modified therein, including his recommendation that certain refinements be made to the minimum full supply methodology for determining material injury. 551 R., p.7387. Of significance to the instant proceeding, the Director abandoned the "minimum full supply" methodology in his *2008 Final Order* in favor of a "reasonable in-season demand" methodology. 551 R., p.7386. Although the Director adopted the Hearing Officer's recommendation that refinements be made, he did not address those refinements or the details of his new "reasonable in-season demand" methodology in his *2008 Final Order*, stating:

> Because of the need for ongoing administration, the Director will issue a separate final order . . . detailing his approach for predicting material injury to reasonable in-season demand and reasonable carryover for the 2009 irrigation season.

551 R., p.7386. *Petitions* seeking judicial review of the Director's *2008 Final Order* were subsequently filed in Gooding County Case No. CV-2008-551.

C. District court decision in Gooding County Case No. CV-2008-551 and Director's orders on remand.

The district court entered its *Order on Petition for Judicial Review* in Gooding County Case No. CV-2008-551 on July 24, 2009. 551 R., pp.10075-10108. The district court upheld the Director's adoption of a baseline methodology for determining material injury. It held that "[t]he Director did not abuse discretion or act outside his authority in utilizing a 'minimum full supply' or 'reasonable in-season demand' baseline for determining material injury." 551 R., p.10099. However, the court did find that the Director abused his discretion by waiting to issue a separate

final order detailing his approach for determining material injury to reasonable in-season demand and reasonable carryover. The case was therefore remanded to the Director. 551 R., pp.10106-10107. On remand, the Director complied with the district court's instruction. On June 23, 2010, the Director issued his *Methodology Order*, which by its terms provides the Director's methodology for determining material injury to reasonable in-season demand and reasonable carryover. 382 R., pp.564-604. Additionally, on June 24, 2010, the Director issued his *As-Applied Order*, wherein he applied his methodology to determine material injury to members of the Coalition in 2010. 382 R., pp.605-625. Both *Orders* are presently before the Court in this proceeding.

D. Idaho Supreme Court's decision in *In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A&B Irr. Dist.*

Meanwhile, the Coalition appealed the District Court's *Order on Petition for Judicial Review* in Gooding County Case No. CV-2008-551. On December 17, 2013, the Idaho Supreme Court issued its written decision in *In the Matter of Distribution of Waters to Various Water Rights Held by or for the Benefit of A&B Irr., Dist.,* 155 Idaho 640, 315 P.3d 828 (2013) ("*2013 SWC Case*"). In that decision, the Court held that the Director may employ a baseline methodology for management of water resources, and as a starting point in administration proceedings for considering material injury. *2013 SWC* Case, 155 Idaho at 650, 315 P.3d at 838. Although the Director's *Methodology Order* had been issued prior to the Supreme Court's consideration of the *2013 SWC Case*, the Court in its opinion made clear that "since the district court did not review this final methodology order, the findings of fact that shape that methodology and any modifications to the methodology are not properly before this Court." *2013 SWC Case*, 155 Idaho at 649, 315 P.3d at 837.

V.

METHODOLOGY ORDER ANALYSIS

The stated purpose of the Director's *Methodology Order* "is to provide the methodology by which the Director will determine material injury to [reasonable in-season demand] and reasonable carryover to members of the SWC." 382 R., p.591. Section II of the *Methodology Order* details the Director's approach for determining material injury to reasonable in-season

demand. 382 R., pp.565-585. Section III of the *Methodology Order* details the Director's approach for determining material injury to reasonable carryover. 382 R., pp.585-590. The *Methodology Order* then sets forth a ten step process to be undertaken annually for purposes of determining material injury. 382 R., pp.597-601. The Coalition, IGWA and the City of Pocatello seek judicial review of various aspects of the Director's methodology.

A. The *Methodology Order* fails to provide a proper remedy for material injury to reasonable in-season demand when taking into account changing conditions.

The Coalition argues that the signature flaw of the *Methodology Order* is its failure to properly remedy material injury to reasonable in-season demand based on changing conditions during the irrigation season. It asserts that if material injury to its reasonable in-season demand is greater than originally determined by the Director, the *Methodology Order's* failure to remedy that injury through either curtailment or the requirement of a mitigation plan is contrary to Idaho law. For the reasons set forth below, this Court agrees.

i. Overview of the Director's methodology for determining material injury to reasonable in-season demand.

Reasonable in-season demand is defined under the *Methodology Order* as "the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the beneficial use of growing crops within the service area of the entity." 382 R., p.575. Under steps 1 and 2 of the *Methodology Order,* the Director calculates the crop water needs of the Coalition for that year.[5] However, the Director's initial determination of reasonable in-season demand is not based on those calculations, but rather is based on a historic demand baseline analysis. The *Methodology Order* makes this clear, providing that reasonable in-season demand is initially "equal to the historic demands associated with a baseline year or years ("BLY") as selected by the Director, but will be corrected during the season to account for variations in the climate and water supply between the BLY and actual conditions." 382 R., p.568. The *Methodology Order* uses the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination. 382 R., p.574.

[5] The term "crop water need" is defined in the *Methodology Order* as "the project wide volume of irrigation water required for crop growth, such that crop development is not limited by water availability, for all crops supplied with surface water by the surface water provider." 382 R., p.579.

Under step 3, the Director makes his initial determination of water supply. Step 3 occurs after the United States Bureau of Reclamation ("USBOR") and the United States Corps of Engineers ("USACE") issue their Joint Forecast predicting unregulated inflow volume at the Heise Gage. 382 R., p.598. The Joint Forecast is typically released within the first two weeks of April. *Id.* Thereafter, the Director issues an April Forecast Supply for the water year. *Id.* The Director also determines in step 3 whether a demand shortfall to any member of the Coalition will occur in the coming season. *Id.* Demand shortfall is the difference between reasonable in-season demand and the April Forecast Supply. *Id.* If reasonable in-season demand is greater that the April Forecast Supply, a demand shortfall exists. *Id.*

Under step 4, if the demand shortfall is greater than the reasonable carryover shortfall from the previous year,[6] material injury exists or will exist, and junior users are required to establish their ability to mitigate that injury to avoid curtailment. 382 R., pp.598-599. To mitigate, junior users only need establish their ability to secure mitigation water to be provided to the Coalition at a later date, which the Director refers to as the "Time of Need." The Director then makes adjustments to his calculations throughout the irrigation season as conditions develop. These adjustments are provided for in steps 6 and 7 of the *Methodology Order*, which provide that at various times throughout the irrigation season, the Director will recalculate reasonable in-season demand and adjust demand shortfall for each member of the Coalition. 382 R., pp.599-600. The Director's recalculations are based on actual crop water need up to that point and a revised Forecast Supply, among other things. *Id.*

Step 8 addresses the obligations of junior water users after the Director makes his in-season recalculations and adjustments. These obligations generally trigger when Coalition members have exhausted their storage water rights to where all that remains in the reservoirs is an amount of water equal to their reasonable carryover. The Director refers to this as the "Time of Need."[7] Step 8 provides:

> Step 8: At the Time of Need, junior ground water users are required to provide the lesser of the two volumes from Step 4 (May 1 secured water) and the

[6] Junior water users will have previously mitigated for any reasonable carryover shortfall from the previous year under step 9 of the *Methodology Order*. 382 R., pp.600-601.

[7] The *Methodology Order* provides that "[t]he calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover, or the difference between the 06/08 average demand and the 02/04 supply. The Time of Need will not be earlier than the Day of Allocation." 382 R., p.584 fn.9.

[reasonable in-season demand] volume calculated at the Time of Need. **If the calculations from steps 6 or 7 indicate that a volume of water necessary to meet in-season projected demand shortfalls is greater than the volume from Step 4, no additional water is required.**

382 R., p.600. While junior user's original mitigation obligation for material injury to reasonable in-season demand may be adjusted downward under the plain language of step 8, it may not be adjusted upward.

ii. Idaho law requires that out-of-priority diversions can only be permitted pursuant to a properly enacted mitigation plan.

The Coalition takes issue with step 8 of the *Methodology Order*. They assert that it unlawfully permits out-of-priority water use to occur without remedy of curtailment or a properly enacted mitigation plan. This Court agrees. In the *2013 SWC Case*, the Idaho Supreme Court held that the CM Rules "require that out-of-priority diversions only be permitted pursuant to a properly enacted mitigation plan." *2013 SWC Case*, 155 Idaho at 653, 315 P.3d at 841. Further, that when the Director responds to a delivery call "the Director shall either regulate and curtail the diversions causing injury or approve a mitigation plan that permits out-of-priority diversion." *Id.* at 654, 315 P.3d at 842. The Court's holding in this respect was based on the plain language of Rule 40 of the CM Rules, which provides that once the Director makes a determination of material injury, the Director shall:

> a. Regulate the diversion and use of water in accordance with the priorities of rights of the various surface or ground water users whose rights are included within the district . . .; or
>
> b. Allow out-of-priority diversion of water by junior-priority ground water users pursuant to a mitigation plan that has been approved by the Director.

IDAPA 37.03.11.040.01.a, b.

This Court finds that step 8 of the *Methodology Order* is inconsistent with Rule 40 of the CM Rules and the precedent established in the *2013 SWC Case*. Step 8 effectively caps junior users' mitigation obligations for material injury to reasonable in-season demand to that amount determined in step 4. This determination is made in or around April. The cap remains in place even if changing conditions during the irrigation season establish that material injury to reasonable in-season demand is greater than originally determined. When that scenario arises,

step 8 provides that junior users are required to deliver to the Coalition the water they previously secured as mitigation under step 4. Even though that amount of water will be insufficient to remedy the full extent of material injury, the plain language of step 8 provides that "no additional water is required." The result is that material injury to reasonable in-season demand is realized by the Coalition, out-of-priority junior water use occurs, and no remedy of curtailment or the requirement of a mitigation plan exists to address that injury. The endorsement of such unmitigated out-of-priority water use is contrary to Idaho's doctrine of prior appropriation.

The Director justifies his decision as follows. First, he states that "the purpose of predicting need is to project an upper limit of material injury at the start of the season." 382 R., p.569. He then provides:

> Just as members of the SWC should have certainty at the start of the irrigation season that junior ground water users will be curtailed, in whole or in part, unless they provide the required volume of mitigation water, in whole or in part, junior ground water users should also have certainty entering the irrigation season that the predicted injury determination will not be greater than it is ultimately determined at the Time of Need . . . . **If it is determined at the time of need that the Director under-predicted the demand shortfall, the Director will not require that junior ground water users make up the difference, either through mitigation or curtailment. This determination is based upon the Director's discretion and his balancing of the principle of priority of right with the principles of optimum utilization and full economic development of the State's water resources. Idaho Const. Art XV, § 3; Idaho Const. Art. XV, § 7; Idaho Code § 42-106; Idaho Code § 42-226.**

382 R., p.594 (emphasis added).

The justifications relied upon by the Director do not permit out-of-priority water use in contravention of CM Rule 40 and the *2013 SWC Case*. Neither Article XV, Section 3, nor Article XV, Section 7 of the Idaho Constitution permits such water use to occur under the circumstances presented. The Idaho Supreme Court has held that nothing in Article XV, § 7 "grants the legislature or the Idaho Water Resource Board the authority to modify that portion of Article XV, §3, which states, 'Priority of appropriation shall give the better right as between those using the water [of any natural stream].'" *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 807, 252 P.3d 71, 88 (2011). With respect to Idaho Code § 42-226, the Idaho Supreme Court has directed that it, and its reference to "full economic development," has no application in delivery calls between senior surface water users and junior ground water users, such as the one at issue here. *A&B Irr. Dist. v. Idaho Dept. of Water Res.*, 153 Idaho 500, 509,

284 P.3d 225, 234 (2012). The Court therefore finds that the legal justifications expressly relied upon by the Director do not support his determination to refrain from requiring further mitigation or curtailment from junior users if material injury to reasonable in-season demand is greater than originally determined in step 4 due to changing conditions.

iii. The Director's "total water supply" argument does not justify out-of-priority diversions without a properly enacted mitigation plan.

In briefing and at oral argument, counsel for the Department asserts another justification for step 8 of the *Methodology Order*. Counsel argues that under a "total water supply" theory, "the Director is not required to determine material injury to in-season demand and 'reasonable carryover' separately, nor is he required to order separate mitigation for each."[8] Counsel suggests that if material injury to reasonable in-season demand is greater than originally determined under step 4, the Department need not curtail or require a mitigation plan to make up the difference. Rather, it can require Coalition members to exhaust their reasonable carryover to cure the material injury. Then, at a point later in the year, make a subsequent determination as to material injury to reasonable carryover and mitigation at that time. In so arguing, counsel refers to steps 9 and 10 of the *Methodology Order*, wherein the Director in or around November 30th determines material injury to reasonable carryover and establishes the mitigation obligations of the juniors. This Court rejects this argument.

As an initial matter, counsel's total water supply argument appears contrary to the plain language of the Director's *Methodology Order*. The *Methodology Order* itself contains separate and unique methodologies for determining material injury to reasonable in-season demand (Section II) and reasonable carryover (Section III).[9] 382 R., pp.565 & 585. The methodologies described in Sections II and III of the *Methodology Order* establish that a determination of material injury will be conducted for both reasonable in-season demand and for reasonable carryover, and that such determinations will be conducted and mitigated separately. *Id.* For

[8] The Court notes that this justification was not set forth by the Director in his *Methodology Order*. Notwithstanding, the Court will address the argument.

[9] Section II of the *Methodology Order* is entitled "Methodology for Determining Material Injury to Reasonable In-Season Demand." 382 R, p.565. Section III of the *Methodology Order* is entitled "Methodology for Determining Material Injury to Reasonable Carryover." 382 R., p.585.

example, when detailing his methodology for determining material injury to reasonable in-season demand in Section II, the Director sets forth his calculation of demand shortfall and directs:

> The amount calculated represents the volume that junior ground water users will be required to have available for delivery to members of the SWC found to be materially injured by the Director. The amounts will be calculated in April, **and if necessary, at the middle of the seasons and at the time of need.**

382 R., p.585 (emphasis added). The argument is also contrary to steps 3 and 4 of the *Methodology Order*, wherein the Director mitigates for material injury to reasonable in-season demand by requiring junior users to establish their ability to secure mitigation water or face curtailment. 382 R., pp.598-599.

More importantly, the total water supply argument is contrary to law. The concept of a "total water supply" arises out of Rule 42 of the CM Rules. The Rule permits the Director to consider the Coalition's natural flow and storage rights in conjunction with one another when determining material injury. IDAPA 37.03.011.042.g. Indeed, the Director does so in his *Methodology Order* when determining material injury to reasonable in-season demand as well as in determining the Coalition's "Time of Need." However, problems arise when the Coalition is required to deplete its reasonable carryover, *in addition to its other storage water*, to address its material injury to reasonable in-season demand. Under Idaho law the holder of a surface water storage right is entitled to maintain a reasonable amount of carryover-over storage to assure water supplies for future dry years. IDAPA 37.03.011.042.g; *AFRD#2*, 143 Idaho at 880, 154 P.3d at 451. Counsel's argument fails to address what happens if the Coalition's reasonable carryover is insufficient to address the full extent of material injury to reasonable in-season demand. Additionally, while the Coalition will have been required to deplete its reasonable carryover under counsel's argument, out-of-priority water use will have occurred without curtailment or the enactment of a mitigation plan. If junior users are unable to secure all or part of their mitigation obligation in November due to cost, scarcity or unwillingness, the remedy of curtailment is lost, as the out-of-priority water use will have already occurred. In that scenario, there is no contingency to protect senior rights as required by the *2013 SWC Case*. Such a result is not contemplated by the CM Rules, and is in contravention of the plain language of CM Rule 40 and the Idaho Supreme Court's precedent in the *2013 SWC Case*.

iv. The Director may require use of reasonable carryover pursuant to a properly enacted mitigation plan that contains appropriate contingency provisions to protect senior rights.

In conjunction with step 8, if the Director determines a greater volume of water is necessary than the previously determined to address material injury to reasonable in-season demand, the ability of junior users to secure additional in-season water during what is typically the most water intensive stage of the irrigation season is problematic. Further problematic is that curtailment at that stage would not only have a devastating impact on junior users but may not timely provide sufficient water to the Coalition. Accordingly, curtailment may still not prevent the Coalition from relying on its reasonable carryover to help get through the remainder of the irrigation season. Nonetheless, a viable mitigation plan is still possible.

In conjunction with a properly enacted and approved mitigation plan, the Director could require the Coalition to rely on its reasonable carryover provided that: 1) existing carryover storage allocations meet or exceed the additional shortfall to the revised reasonable in-season demand; and 2) junior users secure a commitment at that time for a volume of water equal to the shortfall to the revised reasonable in-season demand to be provided the following season if necessary. This could be accomplished through an option or lease to provide water. The water would provide mitigation for any shortfalls to reasonable carryover determined to exist at the end of the season. If no shortfall is determined to exist due to changing conditions, then the option or lease need not be exercised. If a shortfall is determined to exist, then the option or lease is in place to be exercised in whole or in part as required to mitigate for any shortfall. The water would be secured but not have to be provided until such time as it can be determined whether or not the storage allocations will fill next season. This process eliminates the risk of the Director not being able to compel junior users to secure water at the end of the season in lieu of curtailment the following season. And, curtailment the following season may not provide sufficient water in storage to remedy the injury to storage, particularly if curtailment will also be required as a result of a demand shortfall to reasonable in-season demand the following season.

The process is consistent with the requirement set forth in the *2013 SWC Case* "that out-of-priority diversions only be permitted pursuant to a properly enacted mitigation plan." *2013 SWC Case*, 155 Idaho at 653, 315 P.3d at 841. It also eliminates the problem of securing water that will not be put to beneficial use because the water is being secured for the next season and

the amount secured can be adjusted down at the end of the instant season thereby leaving plenty of time for the unneeded water to be used elsewhere. Following any adjustment at the end of the instant season the amount of water that ultimately be secured would be the same as is currently required under Step 9.

B. The *Methodology Order's* use of the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination is supported by substantial evidence.

The Coalition argues that the Director's use of the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination is not supported by substantial evidence and must be set aside. 382 R., p.574. The Idaho Supreme Court has already approved the Director's employment of a baseline methodology as a starting point in administration proceedings and for determining material injury. *2013 SWC Case*, 155 Idaho at 648-653, 315 P.3d at 836-841. The Court finds that the Director's use of the values of 2006 and 2008 to arrive at an average baseline year is supported by substantial evidence.

The *Methodology Order* explains that a baseline year is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) irrigation practices. 382 R., p. 569. To capture current irrigation practices, the *Methodology Order* limits the identification of a baseline year to 1999 and beyond. *Id.* Additionally, the *Methodology Order* instructs as follows:

> [A] BLY should represent a year(s) of above average diversions, and should avoid years of below average diversions. An above average diversion year(s) selected as the BLY should also represent a year(s) of above average temperatures and ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other factors. In addition, actual supply (Heise natural flow and storage) should be analyzed to assure that the BLY is not a year of limited supply.

382 R., p.570. The Director found that "using the values of 2006 and 2008 (06/08) to arrive at an average BLY fits the selection criteria for all members of the Coalition."[10] 382 R., p.574. In so holding, the Director made findings that the 06/08 average has below average precipitation, near average ET, above average growing degree days, and represents years in which diversions were not limited by availability of water supply. *Id.* These findings are supported by the record.

[10] The Director determined that using values from a single year would not fit the selection criteria for all members of the Coalition. 382 R., p.574.

See 551 R., Ex. 8000, Vol. IV, Appdx. AS-1-8. Therefore, the Court finds that the Director's decision in this respect was reached through an exercise of reason, is within the limits of his discretion and must be affirmed.

Furthermore, the Court's holding regarding step 8 of the *Methodology Order* should alleviate the concerns raised by the Coalition on this issue. The baseline year should only be used as a starting point. As set forth above, it cannot result in the implementation of a cap on junior users' mitigation obligations. If changing conditions establish that material injury is greater than originally determined pursuant to the baseline analysis, then adjustments to the mitigation obligations of the juniors must be made when the Director undertakes his mid-season recalculations. The Coalition's concerns should be addressed since the mid-season adjustments include recalculating reasonable in-season demand for each member of the Coalition based on, among other things, actual crop water need to that point. 382 R., p.599.

C. The *Methodology Order's* provision for the consideration of supplemental ground water does not violate Idaho law. However, the Director's finding regarding ground water fractions is not supported by substantial evidence and must be remanded.

Step 1 of the *Methodology Order* provides in part that "[i]n determining the total irrigated acreage [of Coalition members], the Department will account for supplemental ground water use." 382 R., p.597. The Coalition argues that the *Methodology Order's* consideration of supplemental ground water use violates Idaho law and has no relevance to the administration of the Coalition's senior rights. This Court disagrees. The Idaho Supreme Court has directed that in responding to a delivery call, the Director has the authority "to consider circumstances when the water user is not irrigating the full number of acres decreed under the water right." *AFRD#2*, 143 Idaho at 876, 154 P.3d at 447. If it is established that acreage accounted for under the Coalition's senior surface water rights is being irrigated from a supplemental ground water source, that is a factor the Director has the authority to consider in the context of a delivery call. If the supplemental ground water rights being used are themselves subject to curtailment under the senior call, (as suggested may be the case here by the Hearing Officer[11]), that factor should also be accounted for by the Director. However, the *Methodology Order's* instruction that the Department will consider supplemental ground water use when determining the total irrigated

[11] 551 R., p.7507

acreage of Coalition members does not violate Idaho law. The Director's decision to include that instruction in the *Methodology Order* is affirmed.

That said, the Court finds that the Director's assignment of an entity wide split for each member of the Coalition of the ground water fraction to the surface water fraction is not supported by substantial evidence in the record. In the *Methodology Order*, the Director makes the following finding:

> All acres identified as receiving supplemental ground water within the boundaries of a single SWC entity will initially be evaluated by assigning an entity wide split of the ground water fraction to the surface water fraction as utilized in the development of the ESPA Model. *See Ex. 8000 Vol. II, Bibliography at II,* referencing *Final ESPA Model, IWRRI Technical Report 06-002 & Design Document DDW-017.* For each entity the ground water fraction to the surface water fraction is as follows: A&B 95:5; AFRD2 30:70; BID 30:70; Milner 50:50; Minidoka 30:70; NSCC 30:70; & TFCC 30:70. If these ratios change with a subsequent version of the ESPA Model, the Department will use the values assigned by the current version of the ESPA Model.

382 R., p.576 fn.6. The Coalition argues that there is no factual support in the record justifying these ground water fractions, and that the Director's finding is arbitrary and capricious. The Department, IGWA and the City of Pocatello do not respond to the Coalition's argument in this respect.

A review of the record supports the Coalition's position. The record does not contain evidence that acres accounted for under the Coalition's senior surface water rights are being irrigated from a supplemental ground water source. Or that the ground water fractions utilized by the *Methodology Order* reflect such supplemental ground water use. If the Director is going to administer to less than the full amount of acres set forth on the face of the Coalition's *Partial Decrees*, such a determination must be supported by clear and convincing evidence. *See. e.g., A&B Irr. Dist., v. Idaho Dept. of Water Res.*, 153 Idaho 500, 524, 284 P.3d 225, 249 (holding, "Once a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence"). Here, the parties fail to cite the Court to anything submitted before the Department in either written form or via oral testimony establishing the use of supplemental ground water by individual irrigators within the Coalition. That such was the case is illustrated by the Hearing Officer's limited findings on the issue. He found only that "an undetermined number of individual irrigators within SWC *may hold supplemental ground water rights. . . .*" and that "[i]t would seem that any

such ground water rights would be junior to the surface irrigations rights and subject to curtailment." 551 R., p.7507 (emphasis added). The Director did not address the Hearing Officer's findings in his *Methodology Order*, or include any further analysis on his findings. Rather, to support his ground water fraction finding, the Director cites to a document entitled *Final ESPA Model, IWRRI Technical Report 06-002 & Design Document DDW-017*, which is not in the record. Therefore, the Court finds the Director's finding is not supported by substantial evidence in the record. The Director's ground water fractions as set forth in the *Methodology Order* are hereby set aside and remanded for further proceedings as necessary.

D. The *Methodology Order's* reliance upon the Joint Forecast, and its use of the Heise Gage, to determine the available water supply for the Twin Falls Canal Company is set aside and remanded for further proceedings as necessary.

The Coalition argues that the Director's reliance upon the Joint Forecast, and its focus on the Heise Gage, to predict the available water supply for the Twin Falls Canal Company is arbitrary and capricious and not supported by substantial evidence. In response to this argument, the Department concedes the following in its briefing:

> The Department recognizes that while the Joint Forecast is a "good indicator" for predicting the supplies of most Coalition members, it is "not the best evidence" for purposes of predicting TFCC's supply. *SWC Methodology Brief* at 36. The Director has "previously expressed to TFCC that the Department is willing to work with the TFCC to improve the predictors for TFCC for future application in the Methodology Order and Department staff have even met with TFCC consultants on this issue."

Corrected Br. of Respondents, p.37 fn.30 (July 30, 2014). As a result, the Coalition's argument on this issue is unopposed. Therefore, the Director's decision in this respect is set aside and remanded for further proceedings as necessary.

E. The Director in his discretion may use the U.S. Department of Agriculture's National Agriculture Statistics Service data as a factor in determining crop water need, but should also take in account available data reflecting current cropping patterns.

Under steps 1 and 2 of the *Methodology Order*, the Director calculates the crop water needs of the Coalition for that year. In determining crop water need, the *Methodology Order* instructs that among other things the Director "will utilize crop distributions based on

distributions from the United States Department of Agriculture's National Agricultural Statistics Service ("NASS")." 382 R., p.580. The *Methodology Order* goes onto provide:

> NASS reports annual acres of planted and harvested crops by county. NASS also categorizes harvested crops by irrigation practice, i.e., irrigated, non irrigated, non irrigated following summer fallow, etc. *Crop distribution acreage will be obtained from NASS by averaging the "harvested" area for "irrigated" crops from 1990-2008.* Years in which harvested values were not reported will not be included in the average. In the future, the NASS data may not be the most accurate source of data. The Department prefers to rely on data from the current season if and when it becomes usable.

Id. (emphasis added). The Coalition argues that the *Methodology Order's* designation of NASS data for 1990-2008 average crop distribution fails to capture current cropping patterns, resulting in under-determined crop water need. Specifically, that changes in cropping patterns have resulted in the planting of more water intensive crops such as corn and alfalfa in recent years which is not reflected in the 1990-2008 data.

The Court finds that the Director's decision to use NASS data as a factor in determining the Coalition's crop water need is a matter within his discretion. That said, while the Director may use historic cropping data as a starting point in determining crop water need, he should also take into account available data reflecting current cropping patterns. The *Methodology Order* provides that "the Department prefers to rely on data from the current season if and when it becomes usable." 382 R., p.580. Likewise, the Hearing Officer in addressing the issue of crop water need made the following recommendation which was adopted by the Director:

> **If there have been significant cropping changes resulting in either greater or less need for water, those factors should be factored.** This is an area of caution. Cropping decisions are matter for the irrigators acting within their water rights. Those decisions should be driven by the market. The fact that a particular crop may take less water does not dictate that it be planted.

551 R., p.7099. Taking in account available data reflecting current cropping patterns also addresses the Coalition's concerns regarding the Director's decision to factor in only "harvested" area when considering historic NASS data. Since the *Methodology Order* already provides that the Director prefers to use data from the current seasons if and when it becomes usable, no remand is necessary on this issue.

iv. The Director may require use of reasonable carryover pursuant to a properly enacted mitigation plan that contains appropriate contingency provisions to protect senior rights.

In conjunction with step 8, if the Director determines a greater volume of water is necessary than the previously determined to address material injury to reasonable in-season demand, the ability of junior users to secure additional in-season water during what is typically the most water intensive stage of the irrigation season is problematic. Further problematic is that curtailment at that stage would not only have a devastating impact on junior users but may not timely provide sufficient water to the Coalition. Accordingly, curtailment may still not prevent the Coalition from relying on its reasonable carryover to help get through the remainder of the irrigation season. Nonetheless, a viable mitigation plan is still possible.

In conjunction with a properly enacted and approved mitigation plan, the Director could require the Coalition to rely on its reasonable carryover provided that: 1) existing carryover storage allocations meet or exceed the additional shortfall to the revised reasonable in-season demand; and 2) junior users secure a commitment at that time for a volume of water equal to the shortfall to the revised reasonable in-season demand to be provided the following season if necessary. This could be accomplished through an option or lease to provide water. The water would provide mitigation for any shortfalls to reasonable carryover determined to exist at the end of the season. If no shortfall is determined to exist due to changing conditions, then the option or lease need not be exercised. If a shortfall is determined to exist, then the option or lease is in place to be exercised in whole or in part as required to mitigate for any shortfall. The water would be secured but not have to be provided until such time as it can be determined whether or not the storage allocations will fill next season. This process eliminates the risk of the Director not being able to compel junior users to secure water at the end of the season in lieu of curtailment the following season. And, curtailment the following season may not provide sufficient water in storage to remedy the injury to storage, particularly if curtailment will also be required as a result of a demand shortfall to reasonable in-season demand the following season.

The process is consistent with the requirement set forth in the *2013 SWC Case* "that out-of-priority diversions only be permitted pursuant to a properly enacted mitigation plan." *2013 SWC Case*, 155 Idaho at 653, 315 P.3d at 841. It also eliminates the problem of securing water that will not be put to beneficial use because the water is being secured for the next season and

procedural background of the *Methodology Order* makes clear that it was issued in response to the Coalition's 2005 call. In his 2008 *Final Order*, the Director explained he would be issuing a separate final order because of the need for ongoing administration. 551 R., p.7386. The stated purpose of the *Methodology Order* is "to set forth the Director's methodology for determining material injury to RISD and reasonable carryover to members of the SWC." 382 R., p.565. Therefore, the Court finds that the *Methodology Order's* baseline methodology is used in an administrative context "in determining material injury in the context of a water call." *2013 SWC Case*, 155 Idaho at 650, 315 P.3d at 838.

The Idaho Supreme Court has directed that "[w]hile there must be a timely response to a delivery call, neither the Constitution nor statutes place any specific timeframes on this process," and that it is "vastly more important that the Director have the necessary and pertinent information and the time to make a reasoned decision based on the available facts." *AFRD#2*, 143 Idaho at 875, 154 P.3d at 446. In this case, the Director found that it is necessary to wait until the Joint Forecast is issued to make the initial determinations at issue here. 382 R., p.572. He held that "given current forecasting techniques, the earliest the Director can predict material injury to RISD 'with reasonable certainty' is soon after the Joint Forecast is issued." 382 R., p.582. In so finding, the Director held that the Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." 382 R., p.572. And, that it is "a good indicator of the total available irrigation water supply for a season." *Id.* The Director's holding is supported by the record. *See. e.g.*, 551 R., p.1379. Therefore, the Court finds that the Director's decision in this respect was reached through an exercise of reason, is within the limits of his discretion and must be affirmed.

G. The Director's use of the ESPA Model boundary to determine a curtailment priority date in steps 4 and 10 of the *Methodology Order* is set aside and remanded.

The Coalition argues that steps 4 and 10 of the *Methodology Order* unlawfully and arbitrarily reduce junior ground water acres subject to administration in the event of curtailment. Step 4 provides in part as follows:

> If junior ground water users fail or refuse to provide this information by May 1, or within fourteen (14) days from issuance of the values set forth in Step 3, whichever is later in time, the Director will issue an order curtailing junior ground water users. Modeled curtailment shall be consistent with previous Department

> efforts. The ESPA Model will be run to determine the priority date necessary to produce the necessary volume within the model boundary of the ESPA. However, because the Director can only curtail junior ground water rights within the area of common ground water supply, CM Rule 50.01, junior ground water users will be required to meet the volumetric obligation within the area of common ground water supply, not the full model boundary.

382 R., p.598-599.

The plain language of step 4 directs that the Director will use the ESPA Model to determine the curtailment priority date necessary to remedy material injury "within the model boundary of the ESPA." *Id.* Step 4 then notes that under the CM Rules, the Director "can only curtail junior ground water rights within the area of common ground water supply." *Id.* Thus, step 4 recognizes a conflict between the model boundary of the ESPA and the area of common ground water supply. The conflict arises from the fact that the ESPA Model boundary and the boundary of the area of common ground water supply – as it is defined by the CM Rules – are not consistent with one another. The ESPA Model boundary is larger, and contains ground water rights that are not within the area of common ground water supply. This fact is undisputed by the parties. It is the Coalition's position that the *Methodology Order* wrongly uses the ESPA Model boundary, instead of the boundary of the area of common water supply, to determine a curtailment priority date. And, that the Director's practice in this respect results in unmitigated material injury contrary to law. This Court agrees.

When a senior water user seeks the conjunctive administration of ground water rights under the CM Rules, the senior user is seeking administration within the area of common ground water supply. The plain language of CM Rules make this clear. The Rules prescribe the procedures for responding to a delivery call made "in an area having a common ground water supply."[12] IDAPA 37.03.11.001. Likewise, the Rules provide for administration when a delivery call is made by the holder of a senior-priority water right "alleging that by reason of diversion of water by the holders of one (1) or more junior-priority ground water rights ... from

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[12] An "area having a common ground water supply" is defined as:

> A ground water source within which the diversion and use of ground water or changes in in ground water recharge affect the flow of water in a surface water source or within which the diversion and use of water by a holder of a ground water right affects the ground water supply available to the holders of other ground water rights.

IDAPA 37.03.11.010.01

Under step 3, the Director makes his initial determination of water supply. Step 3 occurs after the United States Bureau of Reclamation ("USBOR") and the United States Corps of Engineers ("USACE") issue their Joint Forecast predicting unregulated inflow volume at the Heise Gage. 382 R., p.598. The Joint Forecast is typically released within the first two weeks of April. *Id.* Thereafter, the Director issues an April Forecast Supply for the water year. *Id.* The Director also determines in step 3 whether a demand shortfall to any member of the Coalition will occur in the coming season. *Id.* Demand shortfall is the difference between reasonable in-season demand and the April Forecast Supply. *Id.* If reasonable in-season demand is greater that the April Forecast Supply, a demand shortfall exists. *Id.*

Under step 4, if the demand shortfall is greater than the reasonable carryover shortfall from the previous year,[6] material injury exists or will exist, and junior users are required to establish their ability to mitigate that injury to avoid curtailment. 382 R., pp.598-599. To mitigate, junior users only need establish their ability to secure mitigation water to be provided to the Coalition at a later date, which the Director refers to as the "Time of Need." The Director then makes adjustments to his calculations throughout the irrigation season as conditions develop. These adjustments are provided for in steps 6 and 7 of the *Methodology Order*, which provide that at various times throughout the irrigation season, the Director will recalculate reasonable in-season demand and adjust demand shortfall for each member of the Coalition. 382 R., pp.599-600. The Director's recalculations are based on actual crop water need up to that point and a revised Forecast Supply, among other things. *Id.*

Step 8 addresses the obligations of junior water users after the Director makes his in-season recalculations and adjustments. These obligations generally trigger when Coalition members have exhausted their storage water rights to where all that remains in the reservoirs is an amount of water equal to their reasonable carryover. The Director refers to this as the "Time of Need."[7] Step 8 provides:

> Step 8: At the Time of Need, junior ground water users are required to provide the lesser of the two volumes from Step 4 (May 1 secured water) and the

[6] Junior water users will have previously mitigated for any reasonable carryover shortfall from the previous year under step 9 of the *Methodology Order*. 382 R., pp.600-601.

[7] The *Methodology Order* provides that "[t]he calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover, or the difference between the 06/08 average demand and the 02/04 supply. The Time of Need will not be earlier than the Day of Allocation." 382 R., p.584 fn.9.

area of common water supply. The Director's decision in this respect is set aside and remanded for further proceedings as necessary.

H. The Coalition's argument that mitigation water for material injury to reasonable carryover must be provided up front has previously been addressed and will not be revisited.

With respect to the issue of mitigation of material injury to reasonable carryover, the Coalition argues that the *Methodology Order* is contrary to Idaho law in that it does not require the transfer of actual mitigation water to the Coalition's storage space up front to "carryover" for use in future years. This Coalition's argument in this respect has previously been addressed and rejected. In Gooding County Case No. CV-2008-551, the district court held that as long as assurances are in place, such as an option for water, that mitigation water could be acquired and transferred the following irrigation season, then junior users need not transfer that mitigation water up front to be carried over:

> In this regard, although the Director adopted a "wait and see" approach, the Director did not require any protection to assure senior right holders that junior ground water users could secure replacement. ... *This does not mean that juniors must transfer replacement water in the season of injury,* however, the CMR require that assurances be in place such that replacement water can be acquired and will be transferred in the event of a shortage. An option for water would be such an example. Seniors can therefore plan for the future the same as if they have the water in their respective accounts and juniors may avoid the threat of curtailment.

Order on Petition for Judicial Review, Gooding County Case No. CV-2008-551, p.19 (July 24, 2009) (emphasis added). Given that the decision of the district court in this respect was not overturned by the Idaho Supreme Court in the *2013 SWC Case*, this Court sees no reason to revisit the issue. The Director's decision in this respect is affirmed.

I. The *Methodology Order's* process for determining reasonable carryover does not violate the CM Rules.

The CM Rules provide that in determining reasonable carryover, "the Director shall consider the average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system." IDAPA 37.03.11.042.g. The Coalition argues that the Director's *Methodology Order* fails to consider

these factors in its process for determining reasonable carryover, and asks this Court to set aside and remand the same. Section III of the *Methodology Order* sets forth the Director's methodology for determining material injury to reasonable carryover. 382 R., pp.585-590. A review of Section III reveals that the Director does consider and analyze, consistent with CM Rule 42.g, the projected water supply, average annual rate of fill and average annual carryover of the Coalition members. The *Methodology Order* first considers the projected water supply. 382 R., pp.585-586. It uses the values of Heise Gage natural flow data for the years 2002 and 2004 to establish a projected typical dry year supply as the projected water supply. 382 R., p.585. In so doing, the Director notes that "[t]he Heise natural flow, for the years 2002 and 2004, were well below the long term average . . . ." *Id.* The *Methodology Order* then considers and sets forth the annual percent fill of storage volume by Coalition members from 1995 to 2008. 382 R., pp.586-587. Last, the *Methodology Order* considers and sets forth actual average carryover of Coalition members from 1995-2008. 382 R., pp.587-588.

The CM Rules do not limit the Director's determination of reasonable carryover to consideration of the factors enumerated in CM Rule 42.g, but only require that the Director consider those enumerated factors. The Court finds based on a review of the *Methodology Order* that the Director's process for determination reasonable carryover does consider the enumerated factors. Therefore, the Court finds that the Director's process was reached through an exercise of reason, is within the limits of his discretion and must be affirmed.

J. Step 10 of the *Methodology Order* is set aside and remanded for further proceedings.

The Coalition argues that the transient modeling provision of step 10 of the *Methodology Order* is contrary to law. Step 10 provides in part as follows:

> As an alternative to providing the full volume of reasonable carryover shortfall established in Step 9, junior ground water users can request that the Department model the transient impacts of the proposed curtailment based on the Department's water rights data base and the ESPA Model. The modeling effort will determine total annual reach gain accruals due to curtailment over the period of the model exercise. In the year of injury, junior ground water users would then be obligated to provide the accrued volume of water associated with the first year of the model run. In each subsequent year, junior ground water users would be required to provide the respective volume of water associated with reach gain accruals for that respective year, until such time as the reservoir storage space held by members of the SWC fills, or the entire volume of water from Step 9 less any previous accrual payments is provided.

382 R., p.601 (internal citations omitted). The Director justifies his determination in this respect as follows:

> Because of the uncertainty associated with this prediction, and in the interest of balance priority of right with optimum utilization and full economic development of the State's water resources, Idaho Const. Art. XV, § 3; Idaho Const. Art. XV, § 7; Idaho Code § 42-106; Idaho Code § 42-226, the Director will use the ESPA Model to simulate transient curtailment of the projected reasonable carryover shortage.

382 R., pp.596-597. For reasons stated elsewhere in this decision (see Section V.A.ii above), the Court finds that the articles and code sections relied upon by the Director do not justify his decision. The Department acknowledges as much in its briefing, providing that "the Director did not have the benefit of the guidance in *Clear Springs* and the 2012 and 2013 *A&B* decisions when the *Methodology Order* was issued."[13] *Corrected Brief of Respondents*, p.68. The Department thus suggests that "a remand to the Director with instructions to apply the Idaho Supreme Court's guidance is the appropriate remedy if this Court determines that the *Methodology Order* does not provide an adequate explanation of the basis for the transient modeling provision of Step 10." *Id.*

This Court agrees that the transient modeling provision of step 10 must be set aside and remanded for further proceedings. Counsel for the Department argues that the provision is supported by the CM Rules' provisions for phased-in curtailment. However, this justification was not contemplated or detailed by the Director in the *Methodology Order*. Rather, it is being raised for the first time on judicial review. The Court does question the viability of phased curtailment as a justification for the practice outlined in step 10. Reasonable carryover is surface water "which is retained or stored for future use in years of drought or low-water." *AFRD#2*, 143 Idaho at 878, 154 P.3d at 449. As the *Methodology Order* is currently constituted, the out-of-priority use resulting in the material injury to the Coalition's reasonable carryover will have already occurred by the time the Director reaches step 10 of the *Methodology Order*. It is questionable whether after-the-fact phased curtailment, as contemplated by the CM Rules, would be consistent with Idaho law or satisfies the purpose of reasonable carryover. For the reasons set

[13] Counsel refers to the Idaho Supreme Court's decisions in *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 252 P.3d 71 (2011), *A&B Irr. Dist. v. Idaho Dept. of Water Resources*, 153 Idaho 500, 284 P.3d 225 (2012), and *In the Matter of Distribution of Waters to Various Water Rights Held by or for the Benefit of A&B Irr., Dist.*, 155 Idaho 640, 315 P.3d 828 (2013), respectively.

forth in this section, the transient modeling provision of step 10 will be set aside and remanded for further proceedings as necessary.

K. The *Methodology Order's* procedures for determining Coalition members' reasonable in-season demand are consistent with Idaho law.

The City of Pocatello and IGWA both argue that the Director's methodology for determining the Coalition's reasonable in-season demand, as set forth in the *Methodology Order*, are contrary to law. They assert several arguments in support of their position. Each will be addressed in turn.

i. The Director did not act contrary to law or abuse his discretion in considering the Coalition's historic use in determining reasonable in-season demand.

The primary argument asserted by IGWA and the City of Pocatello is that the *Methodology Order* unlawfully considers the Coalition's historic use in initially determining reasonable in-season demand. As discussed above, the Director uses a historic demand baseline analysis that utilizes the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination. 382 R., p.574. However, the *Methodology Order* also provides that the initial reasonable in-season demand determination "will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions." 382 R., p.568. Further, that "[g]iven the climate and system operations for the year being evaluated will likely be different from the BLY, the BLY must be adjusted for those differences." 382 R., p.575. The Director's consideration of the Coalition's historic use in this context is not contrary to law. The Idaho Supreme Court has already affirmed "the Director's use of *a predicted baseline of a senior water right holders' needs* as a starting point in considering the material injury issue in a water call." *2013 SWC Case*, 155 Idaho at 656, 315 P.3d at 844 (emphasis added). Therefore, the Court finds that the *Methodology Order's* use of a baseline analysis as the starting point in determining the Coalition's reasonable in-season demand is not contrary to law.

In conjunction with their argument, the City of Pocatello and IGWA assert that the *Methodology Order's* process for determining reasonable in-season demand fails to consider

various contemporary factors. IGWA argues that it fails to consider acres that are no longer irrigated, crop needs, water diverted by the Coalition for use by others, and water leased by the Coalition to other water users. IGWA and the City of Pocatello additionally argue that it fails to consider certain factors listed in CMR Rule 42, including the rate of diversion compared to the acreage of land served, the annual volume of water diverted, the system diversion and conveyance efficiency, and the method of irrigation water application. This Court disagrees.

A review of the *Methodology Order* reveals that the Director's calculation of reasonable in-season demand provides for the consideration of all the factors raised by IGWA and the City of Pocatello. For instance, the Director's consideration of project efficiency and crop water need includes the following:

> Monthly irrigation entity diversion ("Q_D") will be obtained from Water District 01's diversion records. Ex. 8000, Vol. II, at 8-4, 8-5. *Raw monthly diversion values will then be adjusted to remove any water diversions that can be identified to not directly support the beneficial use of crop development within the irrigation entity.* Examples of adjustments include the removal of diversions associated with in-season recharge *and diversion of irrigation water on the behalf of another irrigation entity.* Adjustments, as they become known to the Department, will be applied during the mid-season updates and in the reasonable carryover shortfall calculation. Examples of adjustments that can only be accounted for later in the season include SWC deliveries for flow augmentation, SWC Water placed in the rental pool, and SWC private leases. *Adjustments are unique to each irrigation season and will be evaluated each year. Any natural flow or storage water deliveries to entities other than the SWC for purposes unrelated to the original right will be adjusted so that the water is not included as a part of the SWC water supply or carryover volume.* Water that is purchased or leased by a SWC member may become part of IGWA's shortfall obligation; to the extent that member has been found to have been materially injured. . . . *Conversely, adjustments will be made to assure that water supplied to private leases or to the rental pool will not increase the shortfall obligation.*

382 R., p.578 (emphasis added). Therefore, the Court finds that the *Methodology Order* takes into consideration acres that are no longer irrigated, crop needs, water diverted by the Coalition for use by others, and water leased by the Coalition to other water users. Furthermore, both the Hearing Officer and the Director found, in considering the Rule 42 factors, that the Coalition members operate reasonable and efficient irrigation projects. The Director found that "as found by the hearing officer in his recommended order, members of the SWC operate reasonably and without waste," and that he will not "impose greater project efficiencies upon members of the SWC than have been historically realized." 382 R., p.551; 551 R., pp.7102-7104.

In conjunction with IGWA's and the City of Pocatello's argument in this respect, it is necessary to reiterate the presumptions and evidentiary standards that apply to a delivery call. *See e.g., 2013 SCW Case*, 155 Idaho at 650, 315 P.3d at 838 (providing, "when utilizing the baseline in the administration context, the Director must abide by established evidentiary standards, presumptions, and burdens of proof"). First, when a call is made "the presumption under Idaho law is that the senior is entitled to his decreed water right." *AFRD#2*, 143 Idaho at 878, 154 P.3d at 449. Then, "[o]nce a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence." *A&B Irr., Dist.*, 153 Idaho at 524, 284 P.3d at 249. Finally, "[o]nce the initial determination is made that material injury is occurring *or will occur*, the junior then bears the burden of proving that the call would be futile or to challenge, in some other constitutionally permissible way, the senior's call." *AFRD#2*, 143 Idaho at 878, 154 P.3d at 449 (emphasis added).

These presumptions and evidentiary standards are instructive on this issue. The *Methodology Order* provides for the Director's consideration of the factors with which IGWA and the City of Pocatello are concerned. However, if the junior users believe for some reasons that the seniors will receive water they cannot beneficially use, it is their burden under the established evidentiary standards and burdens of proof to prove that fact by clear and convincing evidence. For example, the juniors may assert that the Director in their opinion is considering some, but not *all* acres that are no longer irrigated by the seniors. Or it may be their opinion that the Director is considering some, but not *the full extent* of water diverted by the seniors for use by others. In that scenario, it is then their burden under the established evidentiary standards and burdens of proof get evidence supporting their position before the Director in an appropriate fashion.

ii. The Director did not abuse his discretion or act contrary to law in declining to adopt a water budget methodology to determine the Coalition's water needs.

IGWA and the City of Pocatello argue that the Director's *Methodology Order* should have adopted a water budget methodology to determine the water needs of the Coalition. At the hearing before the Hearing Officer, the parties each proposed a water budget methodology for

determining the water needs of the Coalition. The Director declined to adopt any such methodology, favoring instead the use of a baseline demand analysis as the starting point in determining reasonable in-season demand. 382 R., pp.575-577. The Director's decision in this respect is supported by law, the record, and is within his discretion.

The Idaho Supreme Court has already affirmed "the Director's use of a predicted baseline of a senior water right holders' needs as a starting point in considering the material injury issue in a water call." *2013 SWC Case*, 155 Idaho at 656, 315 P.3d at 844. Furthermore, the Director's reasoning for declining to adopt a water budget method is supported by the record. The record establishes that both the Hearing Officer and the Director questioned the validity of using a water budget methodology under the facts and circumstances presented, recognizing the wildly differing results reached by the surface water and ground water experts under such an approach. In addressing the issue, the Hearing Officer stated:

> The irony in this case is that surface water and ground water expert testimony used much of the same information and in some respects the same approaches and came up with a difference of 869,000 acre-feet for an average diversion budget analysis of SWC districts for the period from 1990 through 2006. . . . The total under the SWC analysis is 3,274,948 acre-feet as compared to the Pocatello analysis of . . . 2,405,861[acre-feet].

551 R., p.7096. The Hearing Officer concluded that such results do "not promote much faith in the science of the water budget analysis," and declined to adopt any of the presented water budget approaches. 551 R., pp.7096-7097. The Director echoed these sentiments in his *Methodology Order* when making the determination to utilize a baseline methodology. 382 R., pp.576-577. As set forth in detail above, the Court finds that the Director's use of the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination is supported by substantial evidence. In reviewing the Director's assessment and rejection of the water budget methodology, this Court finds that the Director's decision was reached through an exercise of reason, is within the limits of his discretion and must be affirmed.

iii. The *Methodology Order's* use of the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination is not contrary to law.

The City of Pocatello and IGWA allege that the *Methodology Order* impermissibly overestimates the reasonable in-season demand of the Coalition. They point to the Director's use of the values of 2006 and 2008 to arrive at an average baseline year for purposes of a reasonable in-season demand determination. They assert that the Director's use of those values results in the selection of a baseline year of above average temperatures and evapotranspiration and below average precipitation, which in turn impermissibly results in overestimated reasonable in-season demand. It is their position that the Director must determine the needs of the Coalition based on historic use data associated with a year with average temperatures, evapotranspiration and precipitation. This Court disagrees.

The Director's adoption of a baseline year intentionally utilizes above average temperatures and evapotranspiration and below average precipitation. In selecting a baseline year, Director notes that "demand for irrigation water typically increases in years of higher temperature, higher evapotranspiration ("ET"), and lower precipitation." 382 R., p.569. He then explains that it is necessary to select a baseline year of above average temperatures and evapotranspiration and below average precipitation in order to protect senior rights:

> Equality in sharing the risk will not adequately protect the senior priority surface water right holder from injury. The incurrence of actual demand shortfalls by a senior surface water right holder resulting from pre-irrigation season predictions based on average data *unreasonably shifts the risk of shortage to the senior surface water right holder*. Therefore, a BLY should represent a year(s) of above average diversions, and should avoid years of below average diversions. An above average diversion year(s) selected as the BLY should also represent a year(s) of above average temperatures and ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other facts.

382 R., pp.569-570 (emphasis added). In his *Methodology Order*, the Director found that "using the values of 2006 and 2008 (06/08) to arrive at an average BLY fits the selection criteria for all members of the SWC." 382 R., p.574.

The Director did not err in his intentional adoption of a baseline year based on above average temperatures and evapotranspiration and below average precipitation. The Court agrees that use of such data is necessary to protect senior rights if the Director is going to administer to an amount less than the full decreed quantity of the Coalition's rights. The arguments set forth by the City of Pocatello and IGWA that the Director must use data associated with an average year fail to take into account the legal limitations placed on the Director in responding to a

delivery call. The senior is entitled to a presumption under Idaho law that he is entitled to his decreed water right. *AFRD#2*, 143 Idaho at 878, 154 P.3d at 449. If the Director is going to administer to less than the full quantity of the decreed water right, his decision must be supported by clear and convincing evidence in order to adequately protect the senior right. *A&B Irr. Dist.*, 153 Idaho at 524, 284 P.3d at 249.

If the Director determined the needs of the Coalition based on historic use data associated with an average year, any decision to administer to less than the full quantity of the Coalition's decreed rights based on that data would not adequately protect its senior rights. Using data associated with an average year by its very definition would result in an under-determination of the needs of the Coalition half of the time. The Director simply cannot rely upon such data if he is going to administer to less than the decreed quantity of the Coalitions' water rights as his analysis would not be supported by clear and convincing evidence.

The City of Pocatello and IGWA additionally argue that the Director's use of the values of 2006 and 2008 violates the law of case. Specifically, they argue that the use of such data violates the Hearing Officer's recommendation, which they interpret as requiring use of data associated with an average year. Whether this interpretation of the Hearing Officer's recommendation is accurate need not be addressed. What is important is that after the Hearing Officer issued his *Recommendation*, but before the Director issued his *Methodology Order*, case law developed instructing the Director concerning the significance of a decreed water right in a delivery call. *Memorandum Decision and Order on Petition for Judicial Review*, Minidoka County Case No. 2009-647 (May 4, 2010). In that case, the district court held that if the Director determines to administer to less than the decreed quantity of water, such a determination must be supported by clear and convincing evidence. *Id.* at 38. The Director in issuing his *Methodology Order* was bound to follow this case law.[14] As set forth above, using data associated with an average year in order to administer to less than the full decreed quantity of the Coalitions' water rights would not meet a clear and convincing evidence standard. Therefore, the arguments set forth by IGWA and the City of Pocatello are unavailing.

[14] The district court's decision in this regard was ultimately affirmed by the Idaho Supreme Court on appeal. *A&B Irr. Dist. v. Idaho Dept. of Water Resources*, 153 Idaho 500, 284 P.3d 225 (2012).

L. The *Methodology Order's* procedures for determining water supply are consistent with Idaho law.

IGWA and the City of Pocatello additionally argue that the Director wrongly underestimates the forecasted water supply in the *Methodology Order*. The *Methodology Order* explains that in determining water supply "[t]he actual natural flow volume that will be used in the Director's Forecast Supply will be one standard error below the regression line, which underestimates the available supply." 382 R., p.582. Further,

> By using one standard error of estimate, the Director purposefully underestimates the water supply that is predicted in the Joint Forecast. . . . The Director's prediction of material injury to RISD is purposefully conservative. While it may ultimately be determined after final accounting that less water was owed than was provided, this is an appropriate burden for the juniors to carry. Idaho Const. Art. XV, § 3, Idaho Code § 42-106.

382 R., p.594. IGWA and the City of Pocatello argue that the Director's intentional underestimation of the forecasted water supply is an abuse of discretion and contrary to Idaho law. This Court disagrees for the reasons set forth in the preceding section regarding the Director's use of the values of 2006 and 2008 to arrive at an average baseline year for purposes of the initial reasonable in-season demand determination. The analysis set forth in that preceding section is incorporated herein by reference. The Court finds that the Director did not abuse his discretion or act contrary to law in finding that the use of one standard error below the regression line is necessary to protect senior rights if the Director is going to administer to an amount less than the full decreed quantity of the Coalition's rights. The Court finds that the Director's decision to utilize such a regression analysis was reached through an exercise of reason, is within the limits of his discretion and must be affirmed.

M. Neither the City of Pocatello nor IGWA were denied due process.

The City of Pocatello and IGWA argue that the Director denied them due process by declining to allow them to present evidence challenging the *Methodology Order* after his issuance of that *Order*. This Court disagrees. Idaho Code Section 42-1701A provides in part that "any person aggrieved by any action of the director, including any decision, determination, order or other action . . . who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing

before the director to contest the action." In this case, the City of Pocatello and IGWA were previously afforded an opportunity for hearing. On January 16, 2008, a hearing was commenced before the Hearing Officer that resulted in the development and issuance of the *Methodology Order*. 551 R., p.7382. For approximately fourteen days, evidence and testimony was presented to the Hearing Officer by the parties, including IGWA and the City of Pocatello. Both IGWA and Pocatello had the opportunity at that hearing to present their theories and testimony on how material injury to the Coalition should be determined. Among other things, those parties had the opportunity to present their water budget analysis, which was rejected by the Hearing Officer and Director for reasons stated in the record. After considering the parties' evidence and arguments, the Director adopted the methodology for determining material injury set forth in the *Methodology Order*. The question of whether the *Methodology Order's* process for determining material injury is contrary to law, or inconsistent with the record, is a matter for judicial review. This Court has taken up those arguments in this decision. As a result, the IGWA and the City of Pocatello are not entitled to the relief they seek on this issue.

VI.
ANALYSIS OF METHODOLOGY AS APPLIED

The Director issued his *Methodology Order* in June 2010. Since that time, the Director has issued several final orders applying his methodology to subsequent water years. Those final orders have resulted in the filing of a number of *Petitions* seeking judicial review of the Director's applications.

A. The Director's application of the *Methodology Order* in 2013 failed to adjust the mitigation obligations of the juniors to take into account changing conditions.

The Coalition argues that the Director's application of the *Methodology Order* in 2013 was contrary to law. On April 17, 2013, the Director issued his *Final Order Regarding April 2013 Forecast Supply (Methodology Steps 1-4)*. 382 R., pp.829-846. In that *Order*, the Director concluded that the Twin Falls Canal Company would experience material injury to reasonable in-season demand in the amount of 14,200 acre-feet. 382 R., p.831. He also determined that the rest of the Coalition members would experience no material injury to reasonable in-season

Under step 3, the Director makes his initial determination of water supply. Step 3 occurs after the United States Bureau of Reclamation ("USBOR") and the United States Corps of Engineers ("USACE") issue their Joint Forecast predicting unregulated inflow volume at the Heise Gage. 382 R., p.598. The Joint Forecast is typically released within the first two weeks of April. *Id.* Thereafter, the Director issues an April Forecast Supply for the water year. *Id.* The Director also determines in step 3 whether a demand shortfall to any member of the Coalition will occur in the coming season. *Id.* Demand shortfall is the difference between reasonable in-season demand and the April Forecast Supply. *Id.* If reasonable in-season demand is greater that the April Forecast Supply, a demand shortfall exists. *Id.*

Under step 4, if the demand shortfall is greater than the reasonable carryover shortfall from the previous year,[6] material injury exists or will exist, and junior users are required to establish their ability to mitigate that injury to avoid curtailment. 382 R., pp.598-599. To mitigate, junior users only need establish their ability to secure mitigation water to be provided to the Coalition at a later date, which the Director refers to as the "Time of Need." The Director then makes adjustments to his calculations throughout the irrigation season as conditions develop. These adjustments are provided for in steps 6 and 7 of the *Methodology Order*, which provide that at various times throughout the irrigation season, the Director will recalculate reasonable in-season demand and adjust demand shortfall for each member of the Coalition. 382 R., pp.599-600. The Director's recalculations are based on actual crop water need up to that point and a revised Forecast Supply, among other things. *Id.*

Step 8 addresses the obligations of junior water users after the Director makes his in-season recalculations and adjustments. These obligations generally trigger when Coalition members have exhausted their storage water rights to where all that remains in the reservoirs is an amount of water equal to their reasonable carryover. The Director refers to this as the "Time of Need."[7] Step 8 provides:

> Step 8: At the Time of Need, junior ground water users are required to provide the lesser of the two volumes from Step 4 (May 1 secured water) and the

[6] Junior water users will have previously mitigated for any reasonable carryover shortfall from the previous year under step 9 of the *Methodology Order*. 382 R., pp.600-601.

[7] The *Methodology Order* provides that "[t]he calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover, or the difference between the 06/08 average demand and the 02/04 supply. The Time of Need will not be earlier than the Day of Allocation." 382 R., p.584 fn.9.

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until August 27, 2013. 382 R., pp.948-957. The Coalition argues the Director's delay in applying step 6 required its members to make water delivery decisions for the remainder of the irrigation season without the benefit of the revised forecast and any related mitigation obligation. The Coalition argues the Director acted arbitrarily and capriciously by delaying the application of step 6. This Court agrees.

The Director identifies the "irrigation season" as running from "the middle of March to the middle of November - an eight month span." 382 R., p. 1039. Therefore, mid-July is halfway through the irrigation season. The word "approximately" is defined as "almost correct or exact: close in value or amount but not precise." *See e.g.* www. merriam-webster.com /dictionary/ approximately. Although step 6 provides for some flexibility by not requiring the revision to be made precisely halfway through the irrigation season, a delay of close to a month and half does not even fit under a generous interpretation of the word "approximately." In this regard, the Director acted arbitrarily and capriciously. The Director should apply his established procedure as written or further define and/or refine the procedure so that Coalition members relying on the procedure know when to anticipate its application and are able to plan accordingly.

C. The Director's calculation of crop water need of the Minidoka Irrigation District, Burley Irrigation District, and the Twin Falls Canal Company in 2013, as set forth in his *Order Revising April 2013 Forecast Supply (Methodology Steps 6-8)* is set aside and remanded for further proceedings as necessary.

The Coalition asserts that the Director has erroneously refused to use certain irrigated acreage information provided by it when determining its crop water need under steps 1 and 2 of the *Methodology Order*. The Coalition's argument focuses primarily on the 2013 water year. Step 1 of the *Methodology Order* requires the Coalition "to provide electronic shape files to the Department delineating the total irrigated acres within their water delivery boundary or confirm in writing that the existing electronic shape file from the previous year has not varied by more than 5%" on or before April 1. 382 R., p.597. Step 2 provides that starting at the beginning of April, the Department will calculate the cumulative crop water need volume for all land irrigated with surface water within the boundaries of each member of the SWC. *Id.* It further provides that volumetric values of crop water need will be calculated "using ET and precipitation values

5. On July 29, 2010, pursuant to the unopposed request of the parties, the Court entered an *Order* consolidating the six *Petitions for Judicial Review* into Gooding County Case No. CV-2010-382 ("Consolidated 382 Case").

6. On September 17, 2010, the Director issued his *Final Order Revising April 2010 Forecast Supply (Methodology Step 7)*. 382 R., pp.636-645. A *Petition* seeking judicial review of that *Final Order* was filed by the Coalition in Twin Falls County Case No. CV-2010-5520. The *Petition* was reassigned to this Court.

7. On November 30, 2010, the Director issued his *Final Order Establishing 2010 Reasonable Carryover (Methodology Step 9)*. 382 R., pp.684-692. A *Petition* seeking judicial review of that *Final Order* was filed by the Coalition in Twin Falls County Case No. CV-2010-5946. The *Petition* was reassigned to this Court.

8. On December 13, 2010, the Court issued an *Order* staying proceedings in the Consolidated 382 Case pending the Idaho Supreme Court's issuance of its written decision in Idaho Supreme Court Docket No. 38193-2010. The stay was entered pursuant to the request and agreement of the parties.

9. On January 3, 2011, pursuant to the unopposed request of the parties, the Court entered an *Order* consolidating the Coalition's *Petitions* in Twin Falls County Case Nos. CV-2010-5520 and 2010-5946 into consolidated the Consolidated 382 Case.

10. On April 13, 2012, the Director issued his *Final Order Regarding April 2012 Forecast Supply (Methodology Steps 1-8)*. 382 R., pp.728-742. On May 9, 2012, the Director issued his *Order Denying Petition for Reconsideration; Denying Motion to Authorize Discovery; Denying Request for Hearing (Methodology Steps 1-8)*. 382 R., pp.753-757. A *Petition* seeking judicial review of that *Final Order* and *Order Denying Petition for Reconsideration* was filed by the Coalition in Twin Falls County Case No. CV-2012-2096. The *Petition* was reassigned to this Court.

11. On April 17, 2013, the Director issued his *Final Order Regarding April 2013 Forecast Supply (Methodology 1-4)*. 382 R., pp.829-846. On May 22, 2013, the Director issued his *Order Denying Petition for Reconsideration; Denying Request for Hearing; Denying Motion to Authorize Discovery (Methodology Steps 1-4)*. 382 R., pp.888-893. A *Petition* seeking judicial review of that *Final Order* and *Order Denying Petition for Reconsideration* was filed by

delivery call. The senior is entitled to a presumption under Idaho law that he is entitled to his decreed water right. *AFRD#2*, 143 Idaho at 878, 154 P.3d at 449. If the Director is going to administer to less than the full quantity of the decreed water right, his decision must be supported by clear and convincing evidence in order to adequately protect the senior right. *A&B Irr. Dist.*, 153 Idaho at 524, 284 P.3d at 249.

If the Director determined the needs of the Coalition based on historic use data associated with an average year, any decision to administer to less than the full quantity of the Coalition's decreed rights based on that data would not adequately protect its senior rights. Using data associated with an average year by its very definition would result in an under-determination of the needs of the Coalition half of the time. The Director simply cannot rely upon such data if he is going to administer to less than the decreed quantity of the Coalitions' water rights as his analysis would not be supported by clear and convincing evidence.

The City of Pocatello and IGWA additionally argue that the Director's use of the values of 2006 and 2008 violates the law of case. Specifically, they argue that the use of such data violates the Hearing Officer's recommendation, which they interpret as requiring use of data associated with an average year. Whether this interpretation of the Hearing Officer's recommendation is accurate need not be addressed. What is important is that after the Hearing Officer issued his *Recommendation*, but before the Director issued his *Methodology Order*, case law developed instructing the Director concerning the significance of a decreed water right in a delivery call. *Memorandum Decision and Order on Petition for Judicial Review*, Minidoka County Case No. 2009-647 (May 4, 2010). In that case, the district court held that if the Director determines to administer to less than the decreed quantity of water, such a determination must be supported by clear and convincing evidence. *Id.* at 38. The Director in issuing his *Methodology Order* was bound to follow this case law.[14] As set forth above, using data associated with an average year in order to administer to less than the full decreed quantity of the Coalitions' water rights would not meet a clear and convincing evidence standard. Therefore, the arguments set forth by IGWA and the City of Pocatello are unavailing.

[14] The district court's decision in this regard was ultimately affirmed by the Idaho Supreme Court on appeal. *A&B Irr. Dist. v. Idaho Dept. of Water Resources*, 153 Idaho 500, 284 P.3d 225 (2012).

iv. The Director may require use of reasonable carryover pursuant to a properly enacted mitigation plan that contains appropriate contingency provisions to protect senior rights.

In conjunction with step 8, if the Director determines a greater volume of water is necessary than the previously determined to address material injury to reasonable in-season demand, the ability of junior users to secure additional in-season water during what is typically the most water intensive stage of the irrigation season is problematic. Further problematic is that curtailment at that stage would not only have a devastating impact on junior users but may not timely provide sufficient water to the Coalition. Accordingly, curtailment may still not prevent the Coalition from relying on its reasonable carryover to help get through the remainder of the irrigation season. Nonetheless, a viable mitigation plan is still possible.

In conjunction with a properly enacted and approved mitigation plan, the Director could require the Coalition to rely on its reasonable carryover provided that: 1) existing carryover storage allocations meet or exceed the additional shortfall to the revised reasonable in-season demand; and 2) junior users secure a commitment at that time for a volume of water equal to the shortfall to the revised reasonable in-season demand to be provided the following season if necessary. This could be accomplished through an option or lease to provide water. The water would provide mitigation for any shortfalls to reasonable carryover determined to exist at the end of the season. If no shortfall is determined to exist due to changing conditions, then the option or lease need not be exercised. If a shortfall is determined to exist, then the option or lease is in place to be exercised in whole or in part as required to mitigate for any shortfall. The water would be secured but not have to be provided until such time as it can be determined whether or not the storage allocations will fill next season. This process eliminates the risk of the Director not being able to compel junior users to secure water at the end of the season in lieu of curtailment the following season. And, curtailment the following season may not provide sufficient water in storage to remedy the injury to storage, particularly if curtailment will also be required as a result of a demand shortfall to reasonable in-season demand the following season.

The process is consistent with the requirement set forth in the *2013 SWC Case* "that out-of-priority diversions only be permitted pursuant to a properly enacted mitigation plan." *2013 SWC Case*, 155 Idaho at 653, 315 P.3d at 841. It also eliminates the problem of securing water that will not be put to beneficial use because the water is being secured for the next season and

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It is against these legal presumptions, burdens of proof, and evidentiary standards that the Director's *Methodology Order* must be analyzed. In the *Methodology Order*, the Director recognizes that "[i]f the Director predicts that the SWC will be materially injured, the consequence of that prediction is an obligation that must be borne by junior ground water users." 382 R., p.593. And, that:

> By requiring that junior ground water users provide of have options to acquire water in place during the season of need, the Director ensures that the SWC does not carry the risk of shortage to their supply. By not requiring junior ground water users to provide mitigation water until the time of need, the Director ensures that junior ground water users provide only the amount of water necessary to satisfy the reasonable in-season demand.

Id. The Court finds that the Director's analysis in this respect protects senior rights in times of shortage by appropriately accounting for the legal presumptions, burdens of proof, and evidentiary standards required by Idaho law. Therefore, the Court finds that the Director's decision in this respect was reached through an exercise of reason, is within the limits of his discretion and must be affirmed.

The City of Pocatello next argues that in determining the reasonable in-season demand of the Coalition in his 2010 *As-Applied Order*, the Director failed to account for all water diverted by Coalition members for delivery to other entities (i.e., wheeled water). The *Methodology Order* provides that in calculating the Coalition's reasonable in-season demand, "any natural flow or storage water deliveries to entities other than the SWC for purposes unrelated to the original right will be adjusted so that the water is not included as a part of the SWC water supply or carryover volume." 382 R., p.578. The City argues that the Director erroneously failed to subtract all wheeled water from the Coalition's reasonable in season demand calculations. This Court disagrees. The City relies on Exhibit 3000 from the hearing on the *As-Applied Order* in 2010. That exhibit provides that "Wheeled water transactions for A&B, AFRD2, Minidoka, and TFCC *may have occurred*, but values were less than 1% of total demand and therefore were not considered." 382 Ex. 3000, *Hearing on the As-Applied Order*. That exhibit only establishes that wheeled water transactions "may have occurred." The fact that such transaction may have occurred is not is not sufficient if the Director is going to use that data to administer to less than the full amount of the Coalition's decreed rights. *A&B Irr. Dist.*, 153 Idaho at 524, 284 P.3d at 249 (holding, "Once a decree is presented to an administrating agency or court, all changes to

5. On July 29, 2010, pursuant to the unopposed request of the parties, the Court entered an *Order* consolidating the six *Petitions for Judicial Review* into Gooding County Case No. CV-2010-382 ("Consolidated 382 Case").

6. On September 17, 2010, the Director issued his *Final Order Revising April 2010 Forecast Supply (Methodology Step 7)*. 382 R., pp.636-645. A *Petition* seeking judicial review of that *Final Order* was filed by the Coalition in Twin Falls County Case No. CV-2010-5520. The *Petition* was reassigned to this Court.

7. On November 30, 2010, the Director issued his *Final Order Establishing 2010 Reasonable Carryover (Methodology Step 9)*. 382 R., pp.684-692. A *Petition* seeking judicial review of that *Final Order* was filed by the Coalition in Twin Falls County Case No. CV-2010-5946. The *Petition* was reassigned to this Court.

8. On December 13, 2010, the Court issued an *Order* staying proceedings in the Consolidated 382 Case pending the Idaho Supreme Court's issuance of its written decision in Idaho Supreme Court Docket No. 38193-2010. The stay was entered pursuant to the request and agreement of the parties.

9. On January 3, 2011, pursuant to the unopposed request of the parties, the Court entered an *Order* consolidating the Coalition's *Petitions* in Twin Falls County Case Nos. CV-2010-5520 and 2010-5946 into consolidated the Consolidated 382 Case.

10. On April 13, 2012, the Director issued his *Final Order Regarding April 2012 Forecast Supply (Methodology Steps 1-8)*. 382 R., pp.728-742. On May 9, 2012, the Director issued his *Order Denying Petition for Reconsideration; Denying Motion to Authorize Discovery; Denying Request for Hearing (Methodology Steps 1-8)*. 382 R., pp.753-757. A *Petition* seeking judicial review of that *Final Order* and *Order Denying Petition for Reconsideration* was filed by the Coalition in Twin Falls County Case No. CV-2012-2096. The *Petition* was reassigned to this Court.

11. On April 17, 2013, the Director issued his *Final Order Regarding April 2013 Forecast Supply (Methodology 1-4)*. 382 R., pp.829-846. On May 22, 2013, the Director issued his *Order Denying Petition for Reconsideration; Denying Request for Hearing; Denying Motion to Authorize Discovery (Methodology Steps 1-4)*. 382 R., pp.888-893. A *Petition* seeking judicial review of that *Final Order* and *Order Denying Petition for Reconsideration* was filed by

VII.

REMAINING *FINAL ORDERS*

The Coalition filed *Petitions* seeking judicial review of the Director's *Final Order Revising April 2010 Forecast Supply (Methodology Step 7)*, dated September 17, 2010, *Final Order Establishing 2010 Reasonable Carryover (Methodology Step 9)*, dated November 30, 2010, and *Order Releasing IGWA from 2012 Reasonable Carryover Shortfall Obligation (Methodology Step 5)*, dated June 13, 2013. The Coalition provided no briefing or argument specific to these *Final Orders* on judicial review. However, through these *Final Orders* the Director applied his methodology as set forth in the *Methodology Order*. To the extent these *Final Orders* applied the *Methodology Order* in a manner inconsistent with this Court's analysis and holdings regarding the *Methodology Order* as set forth herein, they are set aside and remanded for further proceedings as necessary.

VIII.

CONCLUSION AND ORDER OF REMAND

For the reasons set forth above, the actions taken by Director in this matter are affirmed in part and set aside in part. The case is remanded for further proceedings as necessary consistent with this decision.

IT IS SO ORDERED.

Dated September 26, 2014

ERIC J. WILDMAN
District Judge

CERTIFICATE OF MAILING

I certify that a true and correct copy of the MEMORANDUM DECISION AND ORDER ON PETITIONS FOR JUDICIAL REVIEW was mailed on September 26, 2014, with sufficient first-class postage to the following:

CITY OF POCATELLO
Represented by:
A. DEAN TRANMER
CITY OF POCATELLO
PO BOX 4169
POCATELLO, ID 83201
Phone: 208-234-6148

GARY SPACKMAN
Represented by:
GARRICK L BAXTER
DEPUTY ATTORNEY GENERAL
STATE OF IDAHO - IDWR
PO BOX 83720
BOISE, ID 83720-0098
Phone: 208-287-4800

A&B IRRIGATION DISTICT
BURLEY IRRIGATION DISTRICT
MILNER IRRIGATION DISTRICT
NORTH SIDE CANAL COMPANY
TWIN FALLS CANAL COMPANY
Represented by:
PAUL L ARRINGTON
195 RIVER VISTA PL STE 204
TWIN FALLS, ID 83301-3029
Phone: 208-733-0700

IDAHO GROUND WATERS
Represented by:
RANDALL C BUDGE
201 E CENTER ST STE A2
PO BOX 1391
POCATELLO, ID 83204-1391
Phone: 208-232-6101

CITY OF POCATELLO
Represented by:
SARAH A KLAHN
WHITE & JANKOWSKI LLP
KITTREDGE BUILDING
511 16TH ST STE 500
DENVER, CO 80202
Phone: 303-595-9441

A&B IRRIGATION DISTICT
BURLEY IRRIGATION DISTRICT
MILNER IRRIGATION DISTRICT
NORTH SIDE CANAL COMPANY
TWIN FALLS CANAL COMPANY
Represented by:
TRAVIS L THOMPSON
195 RIVER VISTA PL STE 204
TWIN FALLS, ID 83301-3029
Phone: 208-733-0700

AMERICAN FALLS RESERVOIR
MINIDOKA IRRIGATION DISTRICT
Represented by:
W KENT FLETCHER
1200 OVERLAND AVE
PO BOX 248
BURLEY, ID 83318-0248
Phone: 208-678-3250

DIRECTOR OF IDWR
PO BOX 83720
BOISE, ID 83720-0098

/S/ Julie Murphy
Deputy Clerk

JULIE MURPHY
Page 1 9/26/14

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Jun 05, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn, ISB #7928
Maximilian C. Bricker, ISB #12283
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com
Attorneys for the City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
P.O. Box 50130
Idaho Falls, ID 83405
208-523-0620
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
208-287-0991
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities")

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **CITY OF IDAHO FALLS, CITY OF POCATELLO, AND COALITION OF CITIES' <u>SECOND AMENDED</u> JOINT DISCLOSURE OF PROPOSED EXHIBITS FOR HEARING**

The City of Idaho Falls, the City of Pocatello, and the Coalition of Cities[1] (collectively, "Cities") submit this *<u>Second Amended</u> Joint Disclosure of Proposed Exhibits for Hearing* ("Second Amended Joint Exhibit Disclosure") in compliance with the Director of the Idaho Department of Water Resources Department's May 2, 2023 *Scheduling Order and Order Authorizing Remote Appearance at Hearing* (p. 3). This Second Amended Joint Exhibit Disclosure deletes Exhibit 347 and replaces it with Exhibit 347A, Expert Report of Gregory

[1] The Coalition of Cities includes the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

K. Sullivan, P.E. (rev. 6-4-2023) on Behalf of the Cities of Pocatello, Idaho Falls, and the Coalition of Cities.

DATED this 5th day of June, 2023.

SOMACH SIMMONS & DUNN

By_____
Sarah A. Klahn, ISB # 7928

Attorneys for City of Pocatello

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of June, 2023, I caused to be filed a true and correct copy of the foregoing document to be filed and served via electronic mail to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP
P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

Sarah A. Klahn, ISB #7928

EXHIBIT 347A
(Rev. 6-4-2023)

Expert Report

Surface Water Coalition Methodology Order

Prepared for:

City of Idaho Falls
City of Pocatello
Coalition of Cities

Prepared by:

Gregory K. Sullivan, P.E.



May 30, 2023

SWE Spronk Water Engineers, Inc.

Errata

Expert Report
Surface Water Coalition
Methodology Order

Gregory K. Sullivan, P.E.

Report Text

Section 1.0

P. 1, Paragraph 1, Line 6: Deleted text "The Fifth Methodology Order amends and replaces the Fourth Methodology Order that was issued in 2016."

P. 1, Paragraph 2, Line 1: Added text "The SWC members divert from the Snake River between Lake Walcott and Milner Dam under mostly senior natural flow water rights. They also have storage contracts in various upstream Bureau of Reclamation reservoirs. The following are the SWC members:

- A&B Irrigation District ("A&B")
- American Falls Reservoir District #2 ("AFRD2")
- Burley Irrigation District ("BID")
- Milner Irrigation District ("Milner")
- Minidoka Irrigation District ("Minidoka")
- North Side Canal Company ("NSCC")
- Twin Falls Canal Company ("TFCC")"

P. 1, Paragraph 3, Line 1: Added text "A more detailed summary of the SWC natural flow water rights and storage contracts is contained in SWE's 2007 expert report prepared for the 2008 hearing for the SWC delivery call (SWE 2007a)."

P. 2, Paragraph 1, Line 1: "The Fifth Methodology Order made" should read "The Fifth Methodology Order amends and replaces the Fourth Methodology Order that was issued in 2016, and makes"

P. 2, Bullet 3, Line 2: "Aquifer Groundwater Model" should read "Aquifer Model"

P. 2, Paragraph 2, Line 1: "Hearing Officer Schroeder's ruling" should read "April 29, 2008, Order from Hearing Officer Schroeder (former Chief Justice of the Idaho Supreme Court)"

P. 3, Paragraph 4, Line 3: "April-As Applied" should read "April As-Applied"

P. 3, Paragraph 2, Line 5: "technical working groups" should read "technical working groups ("TWG")"

P. 3, Paragraph 2, Line 7: "Technical Working Group ("TWG")" should read "TWG"

P. 4, Bullet 1, Line 5: "A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District,

North Side Canal Company, and Twin Falls Canal Company ["SWC"]" should read "the SWC"

P. 4, Bullet 6, Line 2: "Idaho Department of Resources" should read "Idaho Department of Water Resources"

Section 2.0

P. 6, Paragraph 2, Line 1: "The IDWR supports the average combined SWC diversions during 2000-2021 of 3,200,389 AF described in paragraph 27 and the reported backup file is the diversion data" should read "The IDWR support for the average combined SWC diversions during 2000-2021 of 3,200,389 AF in paragraph 27 is provided in a backup file of diversion data"

P. 6, Paragraph 3, Line 2: "Fourth Methodology" should read "Fourth Methodology Order"

P. 6, Paragraph 3, Line 3: "show" should read "shows"

P. 6, Paragraph 5, Line 1: Deleted text "difference between"

P. 7, Paragraph 4, Line 6: Added text "(Idaho 1903)"

Section 3.0

P. 8, Paragraph 1, Line 9: "IDWRIDWR" should read "IDWR"

P. 10, Paragraph 1, Line 1: "systems." should read "systems (blue line)."

P. 10, Paragraph 4, Line 6: "2008" should read "2008,"

P. 12, Paragraph 1, Line 4: Deleted text "also"

P. 12, Paragraph 1, Line 7: "It is not expected that the SWC members would at times operate at lower efficiencies than the reasonable values" should read "The SWC members may at times operate at lower efficiencies than the reasonable values when water supplies are plentiful"

P. 12, Paragraph 1, Line 10: "than" should read "that"

P. 13, Section Header, Line 1: "Fifth Methodology" should read "Fifth Methodology Order"

P. 13, Paragraph 1, Line 4: "Firth" should read "Fifth"

P. 16, Paragraph 1, Line 5: "shortfall" should read "shortfalls"

Section 4.0

P. 17, Paragraph 1, Line 1: "April 29, 2008," should read "2008"

P. 17, Paragraph 1, Line 1: Deleted text "(former Chief Justice of the Idaho Supreme Court)"

P. 17, Paragraph 2, Line 2: "IGW A" should read "IGWA"

P. 17, Paragraph 2, Line 4: "of75,152" should read "of 75,212"

P. 18, Inset Table:	Added highlights to methodology acres column for Burley, Minidoka, and TFCC
P. 18, Paragraph 3, Line 1:	Added text “for Burley, Minidoka, and TFCC”
P. 18, Paragraph 3, Line 2:	“proposed to be used” should read “used”

Section 6.0

P. 22, Paragraph 3, Line 1:	“right” should read “rights”
P. 22, Paragraph 4, Line 1:	“The Fifth Methodology asserts that it must now update” should read “IDWR now asserts in the Fifth Methodology Order that it must”
P. 22, Paragraph 4, Line 2:	“has” should read “it has”
P. 22, Paragraph 4, Line 3:	“halfmonth time step” should read “calibration using monthly stress periods and halfmonth time steps”
P. 23, Paragraph 2, Line 1:	“The Fifth Methodology asserts” should read “IDWR asserts in the Fifth Methodology Order”
P. 23, Paragraph 6, Line 1:	“The halfmonth timestep has” should read “Monthly stress period and halfmonth time steps have”
P. 23, Paragraph 6, Line 1:	“ESPAM 2.1” should read “ESPAM”
P. 23, Paragraph 6, Line 2:	“is not a new refinement” should read “are not new refinements”
P. 23, Paragraph 6, Line 2:	“Even with prior versions of ESPAM understanding the impact difference between steady-state modeling verses transient modeling was well understood by me and all members of the ESPAM modeling committee including the Department who frequently discussed and evaluated the different versions of the model.” should read “Prior to ESPAM 2.1, the differences between steady-state modeling and transient modeling were well understood by IDWR and the ESHMC members and were frequently discussed during meetings.”
P. 23, Paragraph 8, Line 3:	“the pre-moratorium” should read “pumping by pre-moratorium wells”
P. 24, Paragraph 1, Line 2:	“November 28, 2022” should read “November 28, 2022,”
P. 25, Paragraph 5, Line 4:	“November 28, 2022” should read “November 28, 2022,”

Section 7.0

P. 27, Bullet 3, Line 2:	“arbitrary, capricious, and unrealistic” should read “arbitrary and unreasonable”
P. 27, Bullet 3, Line 4:	“considered” should read “considered in computing the average annual diversions”
P. 27, Bullet 4, Line 2:	“monthly project efficiencies have declined.” should read “project efficiencies of most SWC members have declined.”

P. 27, Bullet 5, Line 1:	"conversions, advancements" should read "conversions and advancements"
P. 27, Bullet 5, Line 2:	Deleted text ", and reductions in irrigated area due to development and urbanization"
P. 27, Bullet 6, Line 1:	"Low" should read "Lower"
P. 28, Bullet 9, Line 1:	"show" should read "during the last 15 years show"
P. 28, Bullet 11, Line 1:	"crop" should read "SWC diversion"
P. 28, Bullet 12, Line 7:	Added text "The monthly efficiency values for September should be used for October."

Section 8.0

P. 30, Paragraph 1, Line 1:	Added text "The following information was relied upon in preparing this expert report."
P. 30, Paragraph 4, Line 1:	Added text "Idaho. 1903. Contract Between Idaho State Board of Land Commissioners and Twin Falls Land and Water Company. January 2, 1903."
P. 32, Paragraph 1, Line 4:	Added text ", and all references listed therein"
P. 32, Paragraph 3, Line 4:	Added text ", and all references listed therein"
P. 32, Paragraph 4, Line 1:	Added text "Sullivan, 2008a. Spronk Water Engineers, Inc. Expert Report Dated July 16, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein."
P. 32, Paragraph 5, Line 1:	Added text "Sullivan, 2008b. Spronk Water Engineers, Inc. Expert Rebuttal Report Dated August 27, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein."
P.32, Paragraph 6, Line 1:	Added text "Sullivan, 2008c. Spronk Water Engineers, Inc. Expert Sur-Rebuttal Report Dated September 16, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein."

Figures

P. 35:	Added Figure 1-1

Tables

P. 57, Table 3-1:	Values changed in column "CWN/Regression & Avg PE" in years 2008, 2011-2015, 2017, 2019, and 2020

P. 57, Table 3-1:	Values changed in column “CWN/Regression & 75% PE” in years 2012-2015, 2017, 2019, and 2020
P. 57, Table 3-1:	Value changed in column “Regression & Avg PE” in year 2015
P. 57, Table 3-1, Note 3:	“(min efficiency = historical average).” should read “(min efficiency = historical average; Oct PE = Sep PE).”
P. 57, Table 3-1, Note 4:	“(min efficiency = 75th percentile PE from historical data).” should read “(min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE).”
P. 58, Table 3-1:	Values changed in column “CWN/Regression & Avg PE” in years 2008-2015 and 2017-2020
P. 58, Table 3-1:	Values changed in column “CWN/Regression & 75% PE” in years 2008-2015 and 2017-2020
P. 58, Table 3-1:	Value changed in column “Regression & Avg PE” in year 2013 and 2015
P. 58, Table 3-1:	Value changed in column “Regression & 75% PE” in year 2013
P. 58, Table 3-2, Note 3:	“(min efficiency = historical average).” should read “(min efficiency = historical average; Oct PE = Sep PE).”
P. 58, Table 3-2, Note 4:	“(min efficiency = 75th percentile PE from historical data).” should read “(min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE).”

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1.0 INTRODUCTION

On April 21, 2023, the Director of the Idaho Department of Water Resources ("IDWR") issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury To Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") describing procedures for IDWR's administration of a delivery call by the Surface Water Coalition ("SWC") that was originally placed in 2005 and has been administered ever since under what is generically referred to herein as the "SWC Methodology."

The SWC members divert from the Snake River between Lake Walcott and Milner Dam under mostly senior natural flow water rights. They also have storage contracts in various upstream Bureau of Reclamation reservoirs. The following are the SWC members:

- A&B Irrigation District ("A&B")
- American Falls Reservoir District #2 ("AFRD2")
- Burley Irrigation District ("BID")
- Milner Irrigation District ("Milner")
- Minidoka Irrigation District ("Minidoka")
- North Side Canal Company ("NSCC")
- Twin Falls Canal Company ("TFCC")

A more detailed summary of the SWC natural flow water rights and storage contracts is contained in SWE's 2007 expert report prepared for the 2008 hearing for the SWC delivery call (SWE 2007a).

On April 21, 2023, the IDWR Director also issued the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("April As-Applied Order") describing the Director's implementation of Steps 1-3 of the Fifth Methodology Order in forecasting in-season water supply shortages to the SWC members in 2023. Based on the forecast shortages, the Director ordered that groundwater rights with priority dates junior to December 30, 1953, that are not part of an effectively operating mitigation plan will be subject to curtailment beginning on May 5, 2023.

Finally on April 21, 2023, the IDWR Director issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* that set a hearing on the SWC Methodology for June 6-10, 2023, in Boise, Idaho. According to a subsequent order on May 2, 2023, the deadline for submittal of expert reports from the parties is seven days before the first day of the hearing, which would be May 30, 2023.

The Fifth Methodology Order amends and replaces the Fourth Methodology Order that was issued in 2016, and makes several substantive changes to the SWC Methodology including the following:

- Change in the Baseline Year used to forecast the SWC member demands from an average of the member diversions during 2006, 2008, and 2012 to instead use the member diversions during 2018.
- Changes in the monthly project efficiencies for the SWC members that are used to compute monthly diversion demands for prior months when the shortage computations are updated mid-season (July), at the time of need, and after the irrigation season (November).
- Change in how the priority date for curtailment of groundwater rights is determined using the Eastern Snake Plain Aquifer Model ("ESPAM") from using steady-state curtailment runs to using transient curtailment runs.

It has been over 15 years since the 2008 hearing and April 29, 2008, Order from Hearing Officer Schroeder (former Chief Justice of the Idaho Supreme Court) that resulted in the Second Methodology Order issued in 2010. That was the last time the SWC Methodology was significantly scrutinized, and there are now 15 years of actual operating experience available to evaluate how the SWC Methodology has functioned. In addition, there have been numerous changed conditions over the last 15 years that may have affected surface water and groundwater use in the Upper Snake River Basin including the following:

- Urbanization of formerly irrigated parcels,
- Continued gravity to sprinkler conversions,
- Changes in crops,
- Canal lining,
- Advancements in remote sensing,
- Improved irrigation management,
- More and better measurements of water distribution and water use,
- More automation of irrigation facilities,
- Delivery of mitigation supplies to SWC members,
- Changes in WD01 accounting procedures, and
- Changes in WD01 rental pool rules.

Given these changed conditions and the substantive changes to the SWC Methodology included in the Fifth Methodology Order, now is an appropriate time to review all aspects of the SWC Methodology to determine whether the SWC members are operating with reasonable efficiencies and without waste, the SWC members are protected from material injury due to junior groundwater pumping, the groundwater users are protected

from excessive or undue curtailment and mitigation obligations, and the beneficial uses of the interconnected surface water and groundwater resources of the Snake River and the ESPA are maximized.

This expert report was prepared on behalf of the following entities who successfully petitioned to intervene in the SWC Methodology matter ("ESPA Cities"):

- City of Idaho Falls,
- City of Pocatello, and
- Coalition of Cities[1].

A map showing the locations of the ESPA Cities, the service area boundaries of the SWC members, and the ESPA Area of Common Groundwater is attached as **Figure 1-1**.

The compressed schedule established by the Director to complete discovery and prepare expert reports left insufficient time to perform all of the necessary work to thoroughly review the Fifth Methodology Order, the April As-Applied Order, and the historical operations of the SWC members during the last 15 years. The time limitations have necessitated that this report focus on certain key elements of the Fifth Methodology Order and eschew the more thorough review and analysis of the order that I would have performed had more time been made available prior to the expert report deadline and June hearing. Each section of this expert report describes my review, analysis, and expert opinions on a selected element of the Fifth Methodology Order. In addition to this expert report, I prepared and submitted two declarations in support of pre-hearing motions filed by the ESPA Cities. One of those declarations contains additional details regarding my prior work on the SWC Delivery Call and related matters.

My involvement in the SWC Delivery Call extends back to the original delivery call made by the SWC in 2005. In response to that delivery call, I compiled extensive data and analyzed the operations of the SWC irrigation systems. This included several weeks in the field observing diversion and conveyance facilities, irrigated farms, and irrigation application methods. In addition, I was present at the depositions of managers and staff of each of the SWC members regarding irrigation system operations, system losses and efficiencies, record keeping, and other related matters. Based on this information, I prepared analyses of the historical irrigation operations of each SWC member over the

[1] The Coalition of Cities includes the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell.

period from 1990 – 2006. The results of my work were documented in several expert reports and testimony presented at an IDWR hearing in February 2008.

Since the 2008 hearing regarding the SWC delivery call, I have reviewed the various amended methodology orders and the various as-applied orders concerning the SWC Methodology that have been issued over the years. In May 2010, I participated in a hearing on revisions to the SWC Methodology proposed by IDWR and testified at the hearing. I have also been involved in two technical working groups ("TWG") convened by IDWR to discuss potential changes to the SWC Methodology. The first was in early 2015 and the second in late 2022. I submitted comments to IDWR and the TWG in both instances.

I am incorporating into this Expert Report by reference the following expert reports and other information previously presented to IDWR and other parties:

- Franzoy, 2007. Franzoy Consulting, Inc. Expert Rebuttal Report Prepared in Rebuttal to Analyses and Conclusions of Experts for the Surface Water Coalition Dated November 7, 2007. Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC.
- Sullivan, 2007a. Spronk Water Engineers, Inc. Updated Expert Report Dated September 26, 2007 (revised December 2007). Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC.
- Sullivan, 2007b. Direct testimony of Gregory K, Sullivan, P.E. September 26, 2007 (Revised December 2007). Submitted on behalf of the City of Pocatello. In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the SWC.
- Sullivan, 2007c. Spronk Water Engineers, Inc. Expert Rebuttal Report. November 7, 2007 (Revised December 2007). Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC.
- Sullivan, 2015. Email to IDWR. Pocatello Comments on Draft Staff Memo. March 10, 2015.
- Sullivan and Netter, 2023. Spronk Water Engineers, Inc. Comments on behalf of the Coalition of Cities and the City of Pocatello on the Idaho Department of Water Resources Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to

Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition, by Kara Ferguson and Matt Anders on December 23, 2022. Comments Submitted on January 1, 2023.

- Sullivan, 2023a. Declaration of Gregory K, Sullivan, P.E. May 7, 2023. Case No. CM-DC-2010-0001.
- Sullivan, 2023b. Declaration of Gregory K, Sullivan, P.E. May 7, 2023. Case No. CM-DC-2010-001.

I stand by, reaffirm, and endorse my prior opinions and analyses described in the foregoing materials.

2.0 BASELINE YEAR

The Fifth Methodology Order changed the Baseline Year ("BLY") used to forecast the SWC diversion demands and reasonable carryover from the average diversions during 2006, 2008, and 2012 ("06/08/12") because the average diversions during these years reportedly no longer comply with a condition of the SWC Methodology that the BLY represent a year of above average diversions. Diversions of the SWC members reported in paragraph 27 of the Fifth Methodology Order indicated that the combined diversions of the SWC Members during 06/08/12 averaged 3,194,722 AF, which is 5,667 AF (0.18%) less than the combined diversions during 2000-2021 that averaged 3,200,389 AF. Annual diversions for the SWC members during 2000-2021 from the materials disclosed by Matt Anders (IDWR) during his deposition are summarized in **Table 2-1**.

The IDWR support for the average combined SWC diversions during 2000-2021 of 3,200,389 AF in paragraph 27 is provided in a backup file of diversion data disclosed by Matt Anders (IDWR) during his May 2023 deposition. However, the 06/08/12 average combined SWC diversions from the same data file are different than the figures reported in paragraph 27. The updated 06/08/12 combined diversions average 3,200,349 AF, which is only 40 AF (0.001%) less than the 2000-2021 average diversions.

The 06/08/12 average diversions in paragraph 27 are from the Fourth Methodology Order. Comparison of the backup data for the Fourth Methodology Order with the data disclosed by Mr. Anders shows that IDWR made some revisions to the prior data used for the Fourth Methodology Order. To be consistent, the same data should be used to compute and compare the 06/08/12 average and the 2000-2021 average.

To be sure, 3,200,349 AF is less than 3,200,389 AF, and so the 06/08/12 average is mathematically below average. However, this difference is insignificant and de minimis. Assuming a typical irrigation season from April 1 through October 31 (214 days), the combined diversions of the SWC members average approximately 15,000 AF/day. Therefore, the 40 AF that the 06/08/12 average diversions are below the 2000-2021 average represents less than five minutes of the combined amount that the SWC members divert on average.

The 40 AF that the 06/08/12 average diversions is below the 2000-2021 average is much less than the accuracy of the measuring flumes for the SWC member canals. Assuming the measurement accuracy of the SWC measuring devices is +/- 5%, the combined measurement error would be approximately 160,000 AF/year, which dwarfs the 40 AF that the 06/08/12 average diversions are below the 2000-2021 average. The Director's determination that the 06/08/12 average diversions no longer meet the above average

criteria appears arbitrary, and there is no clear and convincing evidence that this is the case.

Finally, the 22-year period from 2000-2021 that was used to compute the average diversions of the SWC members arbitrarily and conspicuously does not include the most recent year of diversion data, 2022. If the diversion data from 2022 are included, the average combined diversion for 2000-2022 is 3,189,818 AF, which is 10,530 AF less than the 06/08/12 average of 3,200,349 AF. In other words, the 06/08/12 average diversions are above the 2000-2022 average, and based on this comparison, 06/08/12 should still qualify as an above average figure.

The Director selected 2018 as the new BLY for the SWC Methodology because it reportedly met all of the BLY criteria, including being a year of above average diversions. The combined SWC member diversions during the proposed 2018 BLY (3,341,939 AF) are approximately 142,000 AF greater than the 06/08/12 average diversions (3,200,349 AF). So, the 40 AF (5,667 AF uncorrected) that the 06/08/12 average diversions are below the 2000-2021 average will translate into a much larger increase in the BLY combined diversions. In turn, this large increase will also result in substantially greater projected shortages to the SWC members under the Fifth Methodology Order than under the Fourth Methodology Order.

Review of the data in the Anders' spreadsheet indicates that the 06/08/12 average diversions are no longer above average because the diversions of six of the seven SWC members have actually increased since the Fourth Methodology Order was issued in 2016. Furthermore, the Anders spreadsheet does not factor in that the legally established delivery rate for TFCC is one cfs for each eighty acres of land, or five-eighths of a miner's inches for each acre of land (Idaho, 1903).

The diversion averaging period used for comparison to the BLY diversions in the Fourth Methodology Order was 2000 – 2014. Average combined diversions by the SWC members during 2000 – 2014 averaged 3,154,945 AF. During the recent 2015 – 2021 period, combined diversions by the SWC members increased by an average of 142,826 AF as shown in **Table 2-1**. IDWR performed no analyses to assess the reasonableness of the increased SWC member diversions since 2014 that prompted the need to change the BLY.

3.0 PROJECT EFFICIENCIES

Following the initial forecast of the shortages to the SWC members that is made in April based on the BLY estimate of the RISD, Step 6 of the Methodology Order specifies that the RISD will be updated approximately halfway through the irrigation season (~July) using the monthly figures for each SWC member of the Crop Water Need ("CWN") and the Project Efficiency ("PE") up to that point during the irrigation season, and monthly baseline demand figures from the BLY for the remaining months. Additional updates to the RISD's and shortages of the SWC members based on CWN and PE are made shortly before the Time of Need (Step 7) and following the end of the irrigation season (Step 9). The following is the formula that IDWR uses to compute the RISD at mid-season, Time of Need, and end of season (Fifth Methodology Order P. 16):

$$RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p.j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month j,
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j = index variable, and
m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

Monthly CWN values are computed for each SWC member based on Agrimet evapotranspiration data, precipitation data, and cropping information using the following formula (Fifth Methodology Order P. 14):

$$CWN = \sum_{i=1}^{n}(ET_i - W_e)A_i$$

Where,

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = effective precipitation,
A_i = total irrigated area of specific crop type,
i = index variable representing the different specific crop types grown within the irrigation entity, and
n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

The baseline project efficiencies for the monthly RISD calculation are computed for each SWC member for each month from April – October based on historical computations of CWN and historical monthly diversions adjusted to remove water not used for irrigation and to add water leased or rented to others. The following is the formula used to compute the monthly project efficiencies (Fifth Methodology Order P. 13):

$$E_p = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,
CWN = crop water need, and
Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

In the Fourth Methodology Order, monthly project efficiencies for each SWC member for the preceding 8 years that were within two standard deviations of the average were averaged to compute the monthly values used in the RISD calculations. In the Fifth Methodology Order, the averaging period was changed to use data from the preceding 15 years. The following are the average monthly project efficiencies for each SWC member that will be used for the Fifth Methodology Order (P. 14):

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.98	0.33	0.45	0.87	0.43	0.24	0.31	0.51
5	0.47	0.22	0.32	0.39	0.35	0.24	0.30	0.33
6	0.66	0.40	0.49	0.60	0.56	0.41	0.51	0.52
7	0.74	0.44	0.52	0.67	0.63	0.48	0.58	0.58
8	0.58	0.41	0.42	0.55	0.52	0.43	0.46	0.48
9	0.45	0.27	0.32	0.45	0.38	0.32	0.27	0.35
10	0.18	0.16	0.09	0.14	0.11	0.06	0.04	0.11
Season Avg.	0.58	0.32	0.37	0.52	0.43	0.31	0.35	

SWC Member Average Monthly Project Efficiencies from 2007-2021.[12]

Graphs illustrating monthly and annual average project efficiencies for 2007 – 2021 with values more than two standard deviations from the average removed are shown in **Figure 3-1** and **Figure 3-2**. **Figure 3-1** includes separate graphs of the monthly average efficiencies for each SWC member (solid black line) along with the seasonal average efficiency (dotted black line); both from the table in the Fifth Methodology Order. Also shown for comparison purposes is the reasonable annual efficiency for each SWC member

that I determined in 2007 as a part of my analysis of the SWC member irrigation systems (blue line). Additional discussion of the reasonable annual efficiencies is provided in Section 3.1 below.

Figure 3-2 shows the average monthly project efficiencies during 2007 – 2021 from the Fifth Methodology Order for each SWC member on the same graph. While the monthly project efficiencies for each SWC member vary from one another, the graph depicts a similar characteristic bell-shaped project efficiency curve for each SWC member. These characteristic curves are generally shifted up or down from one another due in part to differences in conveyance losses. A relatively long canal system like AFRD2 will generally have higher conveyance losses and lower project efficiencies than a relatively short canal system like A&B that will generally have lower conveyance losses and higher project efficiencies.

3.1 Reasonableness of Project Efficiencies

The monthly project efficiencies in the Fifth Methodology Order represent the actual efficiencies that result from dividing monthly CWN by monthly adjusted diversions for each SWC member. To my knowledge and per the deposition of Matthew Anders on May 12, 2023, IDWR has not attempted to assess whether the monthly project efficiencies are reasonable in comparison to industry standards for large, well-managed irrigation districts.

Reasonably attainable project efficiencies can be determined for each SWC member based on the conveyance efficiency in delivering water from the river heading to the farms (including allowances for reasonable operational waste) multiplied by a reasonable on-farm efficiency. This is essentially the procedure that IDWR used to analyze the delivery call of the Unit B pumping division of the A&B Irrigation District, and which resulted in the January 29, 2008, Order that found Unit B had not suffered injury because it was not short of water. In that analysis, IDWR determined that a reasonable project efficiency for the Unit B was 75% based on minimal conveyance losses (3.1% in 2006) and the following reported irrigation application efficiencies for sprinklers (Unit B is predominantly sprinkler irrigated):

47. Reported application efficiencies for various sprinkler irrigation systems are as follows:

Sprinkler System	Application Efficiency
stationary lateral (wheel or hand move)	60 – 75%
solid set lateral	60 – 85%
center pivot lateral	75 – 85%

Idaho Irrigation Water Conservation Task Force, 1994, p.38, and Report Regarding Evaluation of Irrigation Diversion Rates, Report to the SRBA District Court Prepared by the Idaho Department of Water Resources, January 14, 1999, p. 38.

This is also the same procedure that I employed in assessing the irrigation operations of the SWC members that is described in my expert reports and testimony presented at the 2008 hearing in the SWC Delivery Call.

Conveyance efficiencies for the SWC members are knowable and can be determined based on records of diversions and deliveries and based on the operational experience of the SWC managers and staff. Achievable on-farm irrigation efficiencies for various application methods (flood, furrow, sprinkler, drip, etc.) are also well established in the technical literature for the industry. The sprinkler efficiencies used in the A&B Order are examples of application efficiencies reported in the literature. Design irrigation application efficiencies generally represent the efficiencies that can be achieved assuming well managed irrigation systems. In my opinion, industry standard design efficiencies represent a level of performance that the SWC members should be expected to achieve before requiring curtailment of junior groundwater users because of computed irrigation water shortages.

My prior work on the SWC Delivery Call that is documented in the expert reports submitted along with testimony in 2008 found that several of the SWC members – A&B, AFRD2, Burley, Milner, and Minidoka – were generally operating with reasonable project efficiencies while others – NSCC and TFCC – were operating at less than reasonable levels.

I analyzed the operations of the SWC members during 1990 – 2006 and determined their actual project efficiencies for each year. In addition, reasonable project efficiencies were estimated based on reported conveyance efficiencies and industry standard application efficiencies weighted based on the mix of gravity and sprinkler irrigation at that time. A summary of the results from my 2007 expert report is provided in **Figure 3-3** along with averages of the monthly project efficiencies from paragraph 32 of the Fifth Methodology Order.

As seen in **Figure 3-3**, the maximum annual efficiencies of A&B, AFRD2, Burley, Milner, and Minidoka during the 1990 – 2006 period all reached the independently computed reasonable project efficiencies that were determined from analysis of the SWC systems. This validated the methodology used to determine the reasonable project efficiencies and showed that these five SWC members were capable of operating at the reasonable efficiency levels. The efficiencies lower than the maximums tended to occur in wetter years with more ample water supplies. The SWC members may at times operate at lower efficiencies than the reasonable values when water supplies are plentiful because it is generally easier to operate an irrigation system with an excess of diversions. However, the SWC should be held to a higher operational standard that they have shown they can achieve when junior groundwater users are being required to mitigate or be curtailed.

The maximum and average project efficiencies determined for NSCC and TFCC during 1990 – 2006 are well below the reasonable efficiencies determined for these two users based on their reported conveyance losses and irrigation application practices.

In my opinion, the analyses that I presented in expert reports and testimony during the 2008 Hearing on the SWC Methodology established reasonable annual project efficiencies that should be used in determining the SWC diversion requirements. These analyses showed that five of the seven SWC members had performed at the reasonable project efficiency levels, while NSCC and TFCC were operating at efficiencies well below reasonable levels. My opinions should not be construed as suggesting that the SWC members must operate at certain efficiency levels. However, when determining whether they are short of water, thus requiring mitigation or curtailment of junior groundwater users, reasonable project efficiencies using the procedures that I employed for my 2007 expert report should be used in determining the shortages.

Had there been time, I would have compiled the necessary information regarding the operations of the SWC members to update the operations analyses that I performed in 2007. Until these analyses can be updated, the reasonable project efficiency values that I determined in 2007 are reasonable for use in the SWC Methodology. This is because it is reasonable to expect that the reasonable project efficiencies for the SWC members should have increased during the last 15 years based on continued gravity to sprinkler conversions and general advancements in irrigation system operation and management.

Despite the expected advances in irrigation system efficiencies during the last fifteen years, comparison of the average project efficiencies determined by IDWR for 2007 – 2021 (black line in **Figure 3-3**) are lower than the average project efficiencies determined for 1990-2006 (red line in **Figure 3-3**). It appears that the declines in average project efficiencies since 2006 are due to these systems not being managed as well as they were in the past.

3.2 Proposed Adjustments to Fifth Methodology Order Efficiencies

If IDWR will not review and assess the reasonableness of the SWC member project efficiencies like it did in the A&B Delivery Call, and like I did in my expert reports and testimony presented in the 2008 hearing, I have developed an alternative proposal for assessing and revising the monthly project efficiencies used in the Fifth Methodology Order. This alternative builds upon the actual efficiencies that the SWC members have demonstrated they routinely achieve and conforms to the framework of the Fifth Methodology Order.

First, I offer the following opinions regarding the patterns of the actual monthly project efficiencies that are summarized in **Figure 3-1**:

- April: Efficiencies tend to be lower than mid-season efficiencies because of temporarily high conveyance losses during the initial period while the distribution system is "wetting." In addition, diversions may contribute to filling of soil moisture for crop use later in the season resulting in lower apparent efficiencies because the soil moisture filling is not included in the formula. Efficiencies are high for A&B and Milner, likely because their diversions tend to commence later in the month resulting in high CWNs use relative to diversions that are satisfied in part by soil moisture and possibly supplemental pumping.
- May: Similar to April, efficiencies tend to be lower than mid-season efficiencies because portions of the diversions are stored in soil moisture for later use. Also, spring precipitation events can reduce CWNs without a corresponding reduction in diversions.
- June-August: Efficiencies during June – August are highest when CWNs are peaking, and the systems are being operated most efficiently. The peak computed efficiencies may result from a portion of the CWNs being met from stored soil moisture and supplemental groundwater pumping.
- September: Efficiencies drop below mid-season values as CWNs decline due to harvesting and lower temperatures without a commensurate decline in diversions. In other words, the CWN declines are greater than the diversion declines.
- October: Efficiencies are typically very low because CWNs decline further due to harvesting and lower temperatures (including freezes) while relatively high diversions continue.

The low monthly average project efficiencies in April, May, September, and October can cause unreasonable spikes in the computed monthly diversion demand when the monthly

CWN is higher than average. This is because the actual efficiency in such a month would generally be higher than the monthly average value used in the demand calculation. This is demonstrated in the analyses presented below.

To further assess the project efficiencies used in the Fifth Methodology Order, graphs were prepared to assess the relationships between:

- Annual Adjusted Diversion vs. Annual CWN (**Figure 3-4**),
- Monthly Adjusted Diversion vs. Monthly CWN (**Figure 3-5 – Figure 3-11**),
- Annual Project Efficiency vs. Annual CWN (**Figure 3-12**), and
- Monthly Project Efficiency vs. Monthly CWN (**Figure 3-13 – Figure 3-19**).

The annual and monthly Adjusted Diversion vs. CWN graphs indicate that there is some correlation between adjusted diversion and CWN. The strength of the correlation indicated by the R-squared value varies by SWC member and by month. In addition to the scatter plots of adjusted diversion vs CWN, the graphs in **Figure 3-4 – Figure 3-11** also show the RISD predictor used in the Fifth Methodology Order (CWN/PE), plotted as a black line. In almost all graphs, the black line exhibits a greater slope than the linear trendline plotted through the data points. This indicates that the CWN/PE predictor is not a robust predictor of diversion demand. In many months, the monthly diversions appear relatively insensitive to changes in CWN. This is indicated in the plots with a relatively flat trendline juxtaposed with a relatively steep CWN/PE line.

The annual and monthly graphs of Project Efficiency vs. CWN in **Figure 3-12 – Figure 3-19** show moderate to strong positive correlations between project efficiency and CWN for the SWC members in many months. The months with moderate to strong PE to CWN correlations (R-squared > 50%) tend to be months with significant differences between the slopes of the diversion vs. CWN trendline and CWN/PE predictor (black line) in **Figures 3-4 through 3-10**. It generally appears that the greater the disparity between slopes of the Diversion to CWN trendline and the CWN/PE predictor, the stronger the correlation between PE and CWN. The following is a list of months for each SWC member in which this relationship exists:

- A&B – Jul, Aug, Sep, Oct;
- AFRD2 – May, Jul, Sep;
- BID – May, Jun, Aug, Sep, Oct;
- Milner – May, Oct;
- Minidoka – May, Jul, Aug, Sep, Oct;
- NSCC – May, Jun, Jul, Aug, Sep, Oct; and,
- TFCC – May, Jun, Jul, Aug, Sep, Oct.

In my opinion, months with strong PE to CWN correlations reflect months in which there tend to be over-diversions relative to the CWN. In such months, the CWN is easily met and months with greater CWN are months with greater project efficiency.

IDWR's use of fixed monthly project efficiencies for computing RISD from monthly CWN is inconsistent with the relationships in **Figures 3-13** through **3-19** that indicate for many months that project efficiencies vary with CWN. Rather than using the fixed monthly values for project efficiency in Paragraph 32 of the Fifth Methodology Order, the SWC Methodology would be improved in many months by using regression equations based on monthly CWN to compute the monthly project efficiencies that are used in the RISD calculations.

I propose that the regression equations be used in the months of April – September with R-squared values greater than 0.50. In the months in which the regression equation is used, I propose that a floor for the monthly efficiencies be specified based on the average monthly efficiency during 2007 – 2021. This will ensure that the demand calculations use monthly project efficiencies that are at or above average consistent with efficiencies that the historical operational data show they have routinely attained.

In the other May – September months with R-squared values less than 0.50, the regression equation is not a good predictor of the project efficiency. In these months, I propose that the 75th percentile efficiency be used (i.e., the value at which 25% of the monthly project efficiencies are greater). To simplify the procedure, the 75th percentile method could be used in all May – September months.

To avoid use of unreasonably low project efficiencies in October, I propose that the 75th percentile efficiency for September be used for computing the October demand for all SWC members.

The proposed revised procedure for determining the monthly project efficiencies used in computing the monthly diversion demands will result in efficiency values that are at or above the historical averages. This will help avoid unreasonably low efficiency values creating unreasonable shortages to the SWC members requiring undue mitigation or curtailment of junior groundwater users (that generally operate with relatively high irrigation efficiencies).

A hindcast analysis for TFCC and AFRD2 was performed to illustrate the effects of using alternate methods of computing project efficiencies. The project efficiencies were computed using (1) the proposed monthly averages from the Fifth Amended Methodology Order, (2) the regression equations shown on **Figure 3-14** and **Figure 3-19** limited to a minimum of the historical monthly average project efficiency, and (3) the

regression equations on **Figure 3-14** and **Figure 3-19** limited to a minimum of the 75th percentile historical monthly project efficiency. If the regression R-Squared is less than 0.5, the monthly average project efficiency was used for (2), and the 75th percentile historical monthly project efficiency was used for (3). **Table 3-1** and **Table 3-2** show the 2007 – 2021 computed demands (CWN/PE) and the November 1 RISD shortfalls using the three different project efficiency methods for TFCC and AFRD2.

In my opinion, the foregoing discussion clearly and convincingly establishes that the SWC members often operate at unreasonably low project efficiencies, particularly NSCC and TFCC. The proposed procedure will ensure to a clear and convincing standard, that (a) shortages to the SWC members will be computed only when they are operating at reasonable project efficiencies, (b) the SWC members are protected from material injury by junior groundwater pumping, (c) the groundwater users are protected from excessive or undue mitigation obligations and curtailment, and (d) the beneficial uses of the interconnected surface water and groundwater resources of the Snake River and the ESPA are maximized.

4.0 IRRIGATED AREA

The 2008 Order from Hearing Officer Schroeder in the SWC Delivery Call found that non-irrigated acres should not be included in determining the irrigation demands of the SWC members:

> *"Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members. IGWA has established that at least 6,600 acres claimed by TFCC in its district are not irrigated. Similar information was submitted concerning the Minidoka Irrigation District, indicating that the claimed acreage of 75,152 includes 5,008 acres not irrigated and Burley Irrigation District has some 2,907 acres of the 47,622 acres claimed not irrigated. These amounts may, of course, change as acreage is removed from irrigation or possibly added back."*
> (IDWR, 2008 at P. 53)

The April As-Applied Order determined that the following acreages for the SWC members will be used to compute the monthly CWN and RISD values using the equations listed above in Section 3.0.

6. Based on the information submitted by the SWC, the Department will use the following total irrigated acres:

	Total Irrigated Acres[1]	Data Source
A&B	15,924	SRBA Partial Decree
AFRD2	62,361	SRBA Partial Decree
BID	46,035	2013 shapefile submitted by BID, reduced by Department for overlapping acres and acres outside of service area.
Milner	13,264	2010 service area shapefile, reduced by Department for overlapping acres and acres outside of service area.
Minidoka	75,093	SRBA Partial Decree
NSCC	154,067	SRBA Partial Decree
TFCC	194,732	2013 shapefile submitted by TFCC, reduced by Department for overlapping acres and acres outside of service area.

As indicated in the above table, the total irrigated area figures for the SWC members are based either on figures from their partial decrees or from shapefiles submitted to IDWR many years ago. Neither of these sources have been shown to reflect the acres actually irrigated by the SWC members.

During the meetings of the SWC TWG held in late 2022, IDWR presented analyses of the SWC member irrigated area in 2011, 2017, and 2021 with non-irrigated acres removed.

The following is a summary of the irrigated area figures that IDWR presented for the three years.

SWC Irrigated Acres

SWC Member	2011 Acres*	2017 Acres*	2021 Acres*	Methodology Acres
A&B	21,585	21,634	21,625	15,924
AFRD2	68,368	66,606	68,384	62,361
Burley	44,113	44,168	44,139	46,035
Milner	13,239	13,202	13,233	13,264
Minidoka	71,295	72,016	71,073	75,093
NSCC	220,953	218,498	220,937	154,067
TFCC	179,486	180,956	179,456	194,732

* with non-irrigated acres removed

According to deposition testimony from Matt Anders, IDWR overlaid aerial imagery from 2011, 2017, and 2021 on the irrigated area shapefiles from the SWC members and determined whether each parcel was irrigated, not irrigated, or partially irrigated. The partially irrigated parcels included hardened acres (roads, buildings, etc.) and other areas that that were not irrigated. If the non-irrigated portions of the partially irrigated parcels were removed, the 2011, 2017, and 2021 irrigated area figures would be lower than the amounts shown in the above table.

The highlighted methodology acres in the above table for Burley, Minidoka, and TFCC represent irrigated acres used in the SWC Methodology that exceed that irrigated acres determined by IDWR. Clearly, based on IDWR's own data, the highlighted methodology acres do not represent the actual irrigated areas of the SWC members. In my opinion, it would be more appropriate to use the 2021 acres for purposes of the demand calculations. The acres in 2021 are shown to be generally consistent with acreages from 2011 and 2017, all of which are less than IDWR's proposed methodology acres.

The 2021 acres for the TFCC are 15,276 acres less than the methodology acres. Based on the weighted average annual crop irrigation requirement for the TFCC over the last 20 years of approximately 2.2 AF/acre and an average project efficiency of 35%, the acreage

difference will overstate the TFCC annual demand by approximately 96,000 AF. This is more than the projected 2023 TFCC shortage of 75,200 AF in the April As-Applied Order.

5.0 SUPPLEMENTAL GROUNDWATER

According to the Fifth Supplemental Order, the use of supplemental groundwater may be considered in determining the irrigated acreage of the SWC members.

> *"In determining the total irrigated acreage, the Department may account for supplemental ground water use. The Department currently does not have sufficient information to accurately determine the contribution of supplemental ground water to lands irrigated with surface water by the SWC. If and when reliable data is available to the Department, the methodology will be amended to account for the supplemental ground water use."*
> (Fifth Methodology Order at P. 40)

IDWR has been asserting a lack of information regarding the use of supplemental groundwater by the SWC members for over ten years. The subject of supplemental groundwater use by the SWC members was raised as a concern in the SWC TWG meetings in 2015 and 2022, and the response has always been that there is not enough information.

In my 2007 expert report for the SWC Delivery Call, I summarized the supplemental groundwater acres based on information the SWC members submitted to the IDWR Director in response to his request for information. The following is the tabulation of supplemental groundwater acres that was in my 2007 report.

Table 3

Supplemental Ground Water Acreage
Surface Water Coalition
(acres)

District/Company	Acres
A&B Irrigation District	-
American Falls Reservoir District #2	11,462
Burley Irrigation District	263
Milner Irrigation District	1,890
Minidoka Irrigation District	4,650
North Side Canal Company	16,358
Twin Falls Canal Company	13,775

Source: Supplemental Response to Director's Information Request, April 15, 2005

IDWR maintains a database and shapefiles for groundwater rights and surface water rights in the state. It would be a relatively simple matter to overlay the shapefiles of the groundwater water right acreages on the shapefiles of the surface water irrigated areas for the SWC members to determine the surface water acres with access to groundwater.

In addition, IDWR now requires all ESPA groundwater pumping to be measured or estimated, so there should be pumping records available for the groundwater rights having acres that overlap the irrigated area shapefiles for the SWC members.

A reasonable mechanism could be developed to estimate the supplemental groundwater use by the SWC members. Repeated assertions that insufficient information is available to assess the use of supplemental groundwater use by the SWC members is unreasonable and is starting to ring hollow.

6.0 TRANSIENT GROUNDWATER MODELING

Until the Fifth Methodology Order, all prior methodology orders determined the priority date for curtailment of junior groundwater users because of a determination of material injury to the SWC members caused by a shortage in RISD or a shortage to reasonable carryover based on steady-state runs of the ESPAM. Repeated ESPAM runs were made simulating the impacts of pumping junior to various assumed priority dates until the annual impact at steady-state to the near Backfoot to Minidoka reach of the Snake River matched the amount of the predicted combined shortage to the SWC members.

The Fifth Methodology Order proposes a sea-change in the procedure for determining the priority date for curtailment of junior groundwater users. Instead of steady-state runs, IDWR will perform transient runs of the ESPAM to determine the priority date of curtailment. IDWR will make repeated transient runs of the ESPAM simulating the impacts of curtailing pumping junior to various assumed priority dates until the impact on the near Blackfoot to Minidoka reach between May 1 and September 30 in the first year of curtailment totals the amount of the predicted combined shortage to the SWC members.

In the April As-Applied Order, IDWR determined curtailment of groundwater rights with priority dates junior to December 30, 1953, was necessary to produce a reach gain to the near Blackfoot to Minidoka reach between May 1, 2023, and September 30, 2023, totaling 75,200 AF (forecast combined shortage to the SWC members in 2023).

IDWR now asserts in the Fifth Methodology Order that it must move from steady-state to transient modeling because it has a better understanding of applying the two different types of modeling and that the calibration using monthly stress periods and halfmonth time steps is a refinement that now allows such a change.

> *"Furthermore, the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling to determine a curtailment priority date that would supply adequate water to the senior water right holders. The first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version was calibrated using monthly stress periods and halfmonth time steps, a refinement that facilitates in-season transient modeling for calculating the response to curtailment of groundwater use. The purpose of this Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("Fifth Methodology Order") is to update the Director's methodology for determining material injury to storage and natural flow water*

rights either held by or committed to members of the SWC consistent with the Director's ongoing obligation to use the best available science and information." (Fifth Methodology Order at P.2)".

IDWR asserts in the Fifth Methodology Order that curtailment of groundwater rights junior to a curtailment date determined based on steady-state modeling would not produce sufficient water during the first year of curtailment to offset the impact to the senior surface water rights.

> *"Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year. Fifty percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately four years. Ninety percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately 24 years."* (Fifth Methodology Order at P. 30).

The Fifth Methodology Order cites the mechanism used for surface water administration in support of the need for transient curtailment analysis.

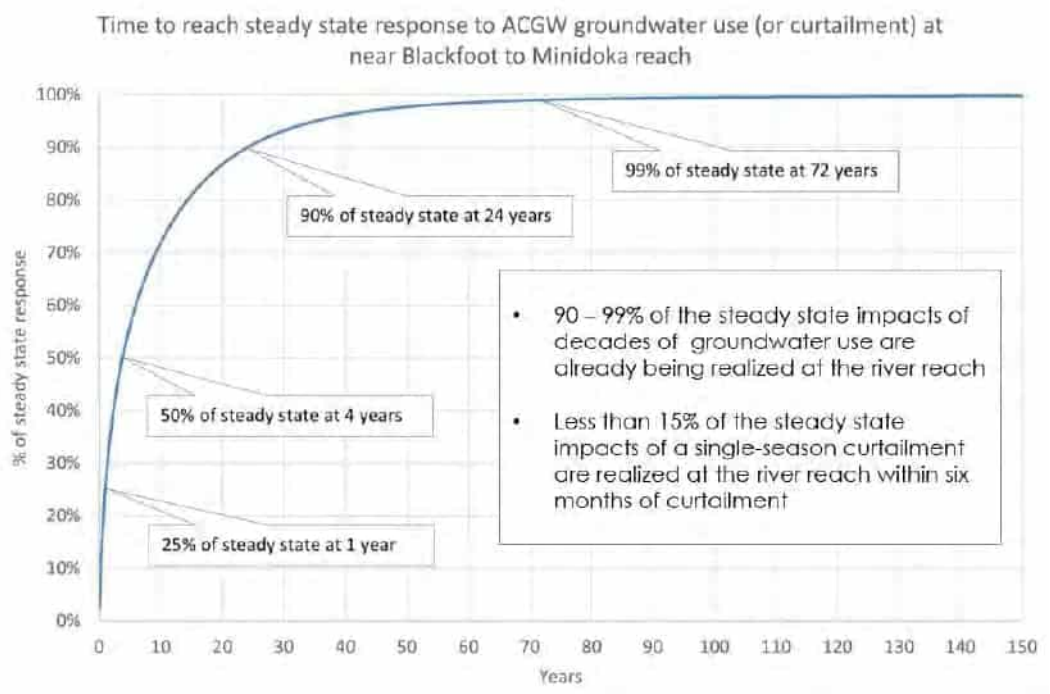
> *"In surface water administration, uses by holders of junior priority surface water rights are curtailed until the senior surface water rights are fully satisfied, absent a futile call and if the senior surface water users need the water to accomplish a beneficial use. In other words, under surface water administration, junior surface water rights are generally curtailed unless the senior gets water in the quantity and at the time and place required."* (Fifth Methodology Order at P. 35).

Monthly stress periods and halfmonth time steps have been part of the ESPAM model since 2013 and are not new refinements. Prior to ESPAM 2.1, the differences between steady-state modeling and transient modeling were well understood by IDWR and the ESHMC members and were frequently discussed during meetings.

In my opinion, given the circumstances of the conjunctive administration of groundwater and surface water in the Upper Snake River Basin, use of steady-state modeling to determine the priority date of curtailment is reasonable and appropriate. In addition, as described below, administration that treats ground water rights like surface water rights (i.e., by requiring curtailment to satisfy seniors) is grossly inefficient and results in disproportionate impacts on junior ground water users.

There has been a moratorium against new groundwater development in the ESPA without mitigation since 1993. Therefore, all pre-moratorium wells have been pumping for at least 30 years, and most wells for much longer. As a result, the effects of the pumping by pre-moratorium wells on Snake River flows have reached near steady state. This is

evident in the following results of a curtailment run that was presented by Jennifer Sukow (IDWR) during the November 28, 2022, TWG meeting (Slide 6) that show the effects of ESPA pumping are approximately 93% of steady-state after 30 years and 98% of steady-state after 50 years:



It follows that the steady-state curtailment runs that IDWR has used for eighteen years, since the Director issued his first SWC curtailment order in 2005, represent reasonable estimates of the last increment of depletions to the near Blackfoot to Minidoka reach being caused by wells that are junior to the simulated curtailment date. These impacts reflect the aggregated impacts of all current and prior pumping by the junior wells. In my opinion, steady-state modeling is the technically correct way to determine the curtailment date for the SWC Methodology.

In Colorado, it was recognized early on that it was impractical to conjunctively administer wells and surface water rights in the same manner as administration between surface water rights because of the delayed impacts on surface streams from curtailing groundwater pumping. Use of transient modeling effectively attempts to administer groundwater rights as if they were surface water rights, which is ill advised because of the delayed response of streamflows to groundwater curtailment. A more elegant and efficient solution is to require junior groundwater users to offset impacts to senior surface water rights caused by current and prior pumping. In that way, the seniors are protected

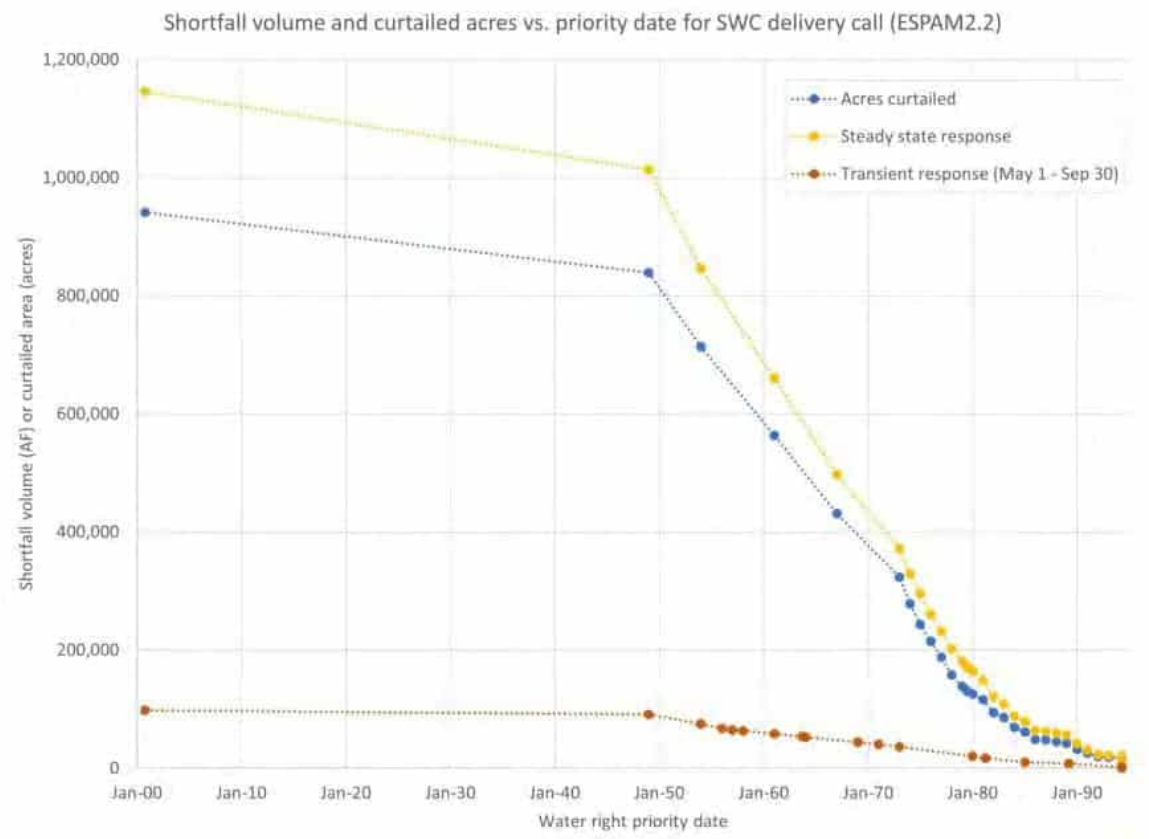
from injury and the junior groundwater users can continue to pump. This was the practice in Idaho until the imposition of the Fifth Methodology Order and has been the practice in Colorado for over 50 years.

In Colorado, junior groundwater users are required to have a judicially or administratively approved plan in place that is capable of replacing the injurious impacts on surface users in time, place, and amount in order for the juniors to pump any groundwater. Otherwise, the junior groundwater user is permanently curtailed unless or until they can obtain approval of a replacement plan.

In sum, the process of determining curtailment dates based on steady-state runs should *continue* to be applied in the Upper Snake River Basin because it will properly assign the obligation for mitigating any computed shortages to the SWC members to the junior groundwater users whose current and prior pumping is the cause of the shortage.

Further, in my opinion, implementation of transient groundwater modeling in the Fifth Methodology Order will cause injury to certain groundwater users by requiring them to mitigate for impacts to senior surface water rights that they did not cause.

Consider the present situation with a predicted shortage to the TFCC of 75,200 AF in 2023. It is the last 75,200 AF of depletions to the near Blackfoot to Minidoka reach that created the current shortage. Based on the following graph presented by Jennifer Sukow during the November 28, 2022, TWG meeting, curtailment of pumping from wells junior to sometime in the mid-1980s would produce 75,200 AF/y of water at steady state to the near Blackfoot to Minidoka reach.



In other words, the last 75,200 AF of depletions to this reach that created the shortage to the TFCC was caused by wells junior to the mid-1980s.

Under the prior appropriation doctrine, the wells senior to the mid-1980s are entitled to the conditions that existed at the time of their appropriation. Among those conditions would be that the last 75,200 AF of depletion to the near Blackfoot to Minidoka reach caused by more junior wells would not have occurred and would not have created the shortage to TFCC that exists in 2023. Curtailing or requiring mitigation from groundwater rights in 2023 with priority dates senior to the mid-1980s would injure those groundwater rights because pumping under these more senior groundwater rights did not create the shortage to the TFCC this year. The obligation to mitigate the 75,200 AF of shortage to the TFCC in 2023 should be shouldered by wells junior to the mid-1980s. These are the wells whose current and prior pumping created the shortage in 2023.

7.0 SUMMARY OF OPINIONS

Based on my review and analysis of the materials disclosed by IDWR, my involvement in SWC Delivery Call matters since 2005, and my 37 years of experience in conjunctive administration of groundwater and surface water rights, the following is summary of my professional opinions on the Fifth Methodology Order and the April As-Applied Order.

1. IDWR made substantive changes to the SWC Methodology in the Fifth Methodology Order including a change in the BLY used to forecast SWC member demands at the beginning of the year, changes in the monthly project efficiencies used to compute demands mid-season, and changes in how the priority date for curtailment of junior groundwater users is determined.
2. It has been over 15 years since the last comprehensive review of the SWC Methodology. During that time, there have been numerous changed conditions that dictate that all elements of the SWC Methodology be reassessed to determine if they remain appropriate for determining shortages to the SWC members caused by junior groundwater pumping and whether the proposed changes to the SWC Methodology are reasonable and appropriate.
3. The proposed change in the BLY from 06/08/12 to 2018 that increased the combined BLY demand by approximately 142,000 AF was arbitrary and unreasonable given that the 06/08/12 BLY is only 40 AF (0.001%) less than the 2000 – 2021 average diversions. Further, if the diversions from 2022 are considered in computing the average annual diversions, then the 06/08/12 diversions would still be above average and would still qualify as a BLY.
4. The combined diversions of the SWC members have increased by an average of 148,826 AF since 2005 while average project efficiencies of most SWC members have declined. IDWR has not analyzed the reasonableness of these changes in light of the substantive increases these changes will cause to the computed shortages of the SWC members.
5. Continued sprinkler conversions and advancements in irrigation technology and management suggest that project efficiencies should have increased over the last 15 years rather than decreased.
6. Lower project efficiencies for certain of the SWC members in some or all months will cause unreasonable increases in computed diversion demands and water shortages, especially for TFCC.

7. Unreasonably low efficiencies during the shoulder months of April, May, September, and October will cause unreasonable monthly water demands, especially in months when the CWN is greater than average.
8. Industry standard procedures should be employed to assess the reasonableness of the monthly project efficiencies of the SWC members, including the reductions in project efficiencies that have occurred over the last 15 years. IDWR employed such procedures in evaluating whether Unit B was short of water in assessing the A&B delivery call in 2008.
9. Scatter plots of monthly diversions vs CWN during the last 15 years show that CWN is often a poor predictor of the diversion demands of the SWC members. This indicates that the SWC Methodology should be examined and revised to improve how the diversion demands of the SWC members are determined.
10. Project efficiencies are unexpectedly well-correlated to CWN for many SWC members in some months and for NSCC and TFCC in most months. This is a symptom of more water being diverted than is needed to meet crop water demand.
11. Use of CWN and average monthly project efficiencies will overstate SWC diversion demands in months with above average CWN.
12. The SWC Methodology would be improved by changing the way that monthly project efficiencies are determined for computing RISD. Regression equations based on CWN should be used for months with a moderate to strong correlation (R-squared > 0.5) with a floor no lower than the average monthly efficiency during the past 15 years. In months without a good correlation to CWN (R-squared < 0.5), project efficiencies should be set at the 75th percentile of efficiencies during the past 15 years. The monthly efficiency values for September should be used for October.
13. The irrigated area determined from shapefiles submitted by several of the SWC members exceeds the irrigated area determined by IDWR from analysis of aerial imagery and remote sensing in recent years. It is unreasonable and unlawful for non-irrigated acreages to be included in computing the CWN of the SWC members.
14. The discrepancy between claimed and actual irrigated area is especially egregious for TFCC which claims an irrigated area that is 15,276 acres greater than the irrigated area determined by IDWR in 2021. Based on an average annual ET rate of 2.2 AF/ac and an average project efficiency of 35%, the acreage discrepancy for TFCC would amount to approximately 96,000 AF, which is greater than the forecast shortage for TFCC in 2023 of 75,200 AF in the 2023 April As-Applied Order.

15. The SWC Methodology has long specified that supplemental groundwater pumping be considered in determining whether shortages to the SWC members exist. However, IDWR has done nothing over the past fifteen years to quantify or estimate the supplemental pumping of the SWC members. This is despite the availability of groundwater right mapping and groundwater pumping records that could be analyzed to reasonably determine the supplemental pumping of the SWC members.

16. The change in use of the ESPAM to determine the priority date of curtailment based on transient groundwater modeling is unreasonable because it will result in groundwater users having to mitigate or be curtailed for shortages to the SWC members that they did not cause. This is counter to the prior appropriation system and will cause injury to groundwater users.

17. Steady-state groundwater modeling is more appropriate for use in determining the priority date of curtailment for purposes of the SWC Methodology because virtually all of the ESPA pumping has been occurring since at least the early 1990s when the moratorium against new wells was instituted, and by 2023, the effects of ESPA pumping on Snake River flows have reached near-steady state.

18. Use of transient groundwater modeling to determine the priority date of curtailment improperly attempts to conjunctively administer groundwater rights under surface water right administration procedures. Conjunctive administration through curtailment is extremely inefficient and counter to mechanisms developed in Colorado and other western states in which conjunctive administration is enacted through replacement of depletions rather than through curtailment.

8.0 INFORMATION RELIED ON

The following information was relied upon in preparing this expert report.

Anders, Matthew. 2023. Deposition of Matthew Anders, P.G. on May 12, 2023. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company ["SWC"]. Including documents produced at deposition.

Franzoy, 2007. Franzoy Consulting, Inc. Expert Rebuttal Report Prepared in Rebuttal to Analyses and Conclusions of Experts for the Surface Water Coalition Dated November 7, 2007. Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of the SWC.

Idaho. 1903. Contract Between Idaho State Board of Land Commissioners and Twin Falls Land and Water Company. January 2, 1903.

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IDWR 2010a. Final Order Regarding Methodology Order for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC. April 7, 2010. Including IDWR backup documents.

IDWR 2010b. Amended Final Order Regarding Methodology Order for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC. June 16, 2010. Including IDWR backup documents.

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IDWR 2016. Fourth Amended Final Order Regarding Methodology Order for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC. April 19, 2016. Including IDWR backup documents.

IDWR 2022a. Presentations and backup documents provided as part of the Surface Water Coalition Delivery Call Technical Working Group. Meetings held on November 16, 17, and 28 and December 1, 9, and 14 in 2022.

IDWR 2022b. Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition. By: Kara Ferguson, Staff Hydrologist & Matt Anders, Hydrology Section Supervisor. December 23, 2022.

IDWR. 2023a. 37.03.11 – Rule for Conjunctive Manage of Surface and Ground Water Resources. IDAPA 37 – Department of Water Resources. Water Compliance Bureau. Available from: https://adminrules.idaho.gov/rules/current/37/. Last Accessed: May 22, 2023.

IDWR. 2023b. Fifth Amended Final Order Regarding Methodology Order for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC. April 21, 2023.

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Sullivan, 2008b. Spronk Water Engineers, Inc. Expert Rebuttal Report Dated August 27, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein.

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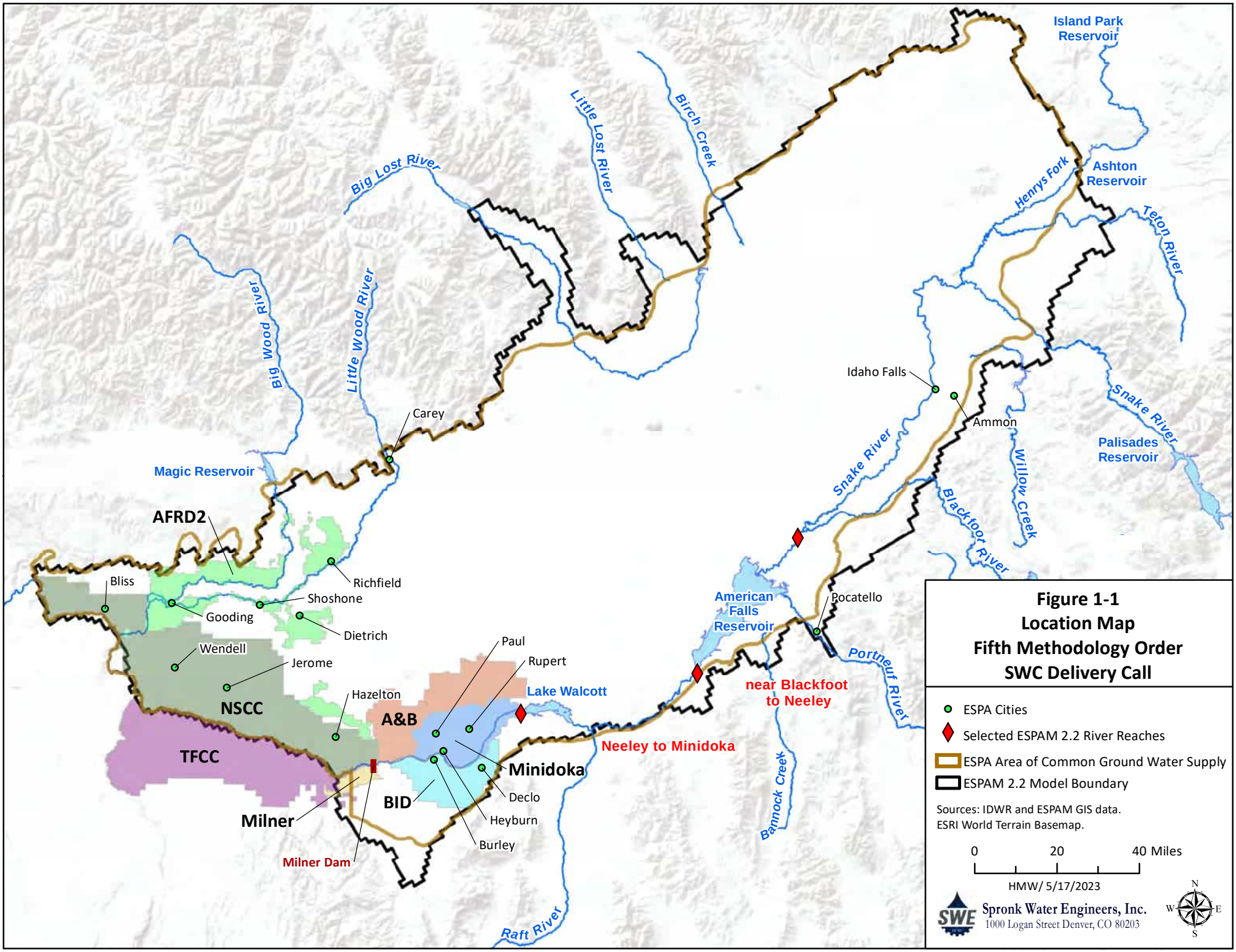
Sullivan, 2023b. Declaration of Gregory K, Sullivan, P.E. May 7, 2023. In Regard to Irrigated Acres in the SWC Methodology Order. In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the SWC.

FIGURES


Island Park Reservoir
Little Lost River
Birch Creek
Big Lost River
Henrys Fork
Ashton Reservoir
Teton River
Big Wood River
Little Wood River
Idaho Falls
Ammon
Snake River
Palisades Reservoir
Carey
Magic Reservoir
Snake River
Willow Creek
Blackfoot River
AFRD2
Bliss
Richfield
Shoshone
Gooding
Dietrich
Wendell
Jerome
Hazelton
NSCC
A&B
TFCC
Paul
Rupert
Lake Walcott
Minidoka
Declo
Heyburn
Burley
BID
Milner
Milner Dam
American Falls Reservoir
Pocatello
near Blackfoot to Neeley
Portneuf River
Neeley to Minidoka
Bannock Creek
Raft River
Figure 1-1
Location Map
Fifth Methodology Order
SWC Delivery Call
ESPA Cities
Selected ESPAM 2.2 River Reaches
ESPA Area of Common Ground Water Supply
ESPAM 2.2 Model Boundary
Sources: IDWR and ESPAM GIS data.
ESRI World Terrain Basemap.
0
20
40 Miles
HMW/ 5/17/2023
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
N
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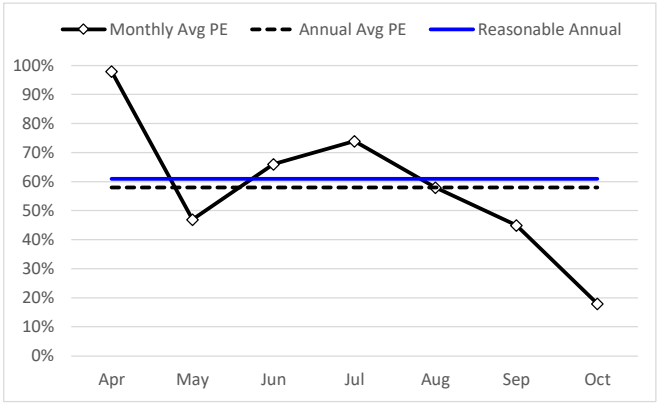
S

Figure 3-1
Annual and Monthly Average Project Efficiency
Surface Water Coalition Members
2007 - 2021
Exclude PE Outlier Months (> +/- 2 Std Dev)

A&B



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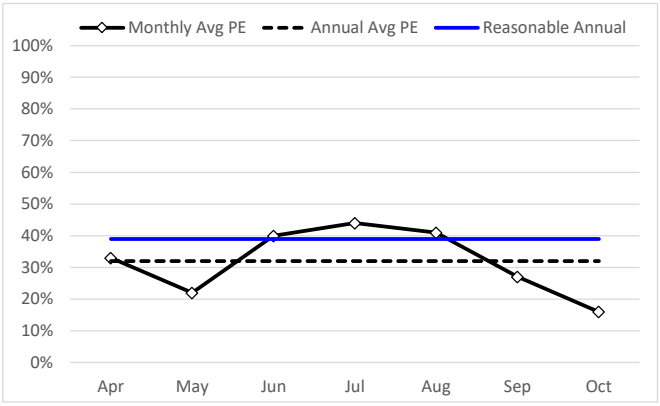

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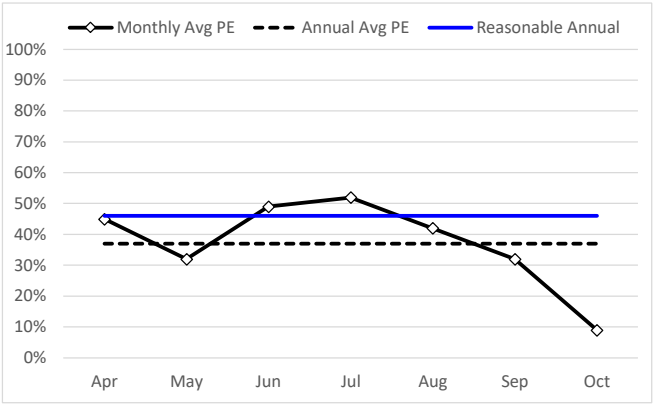
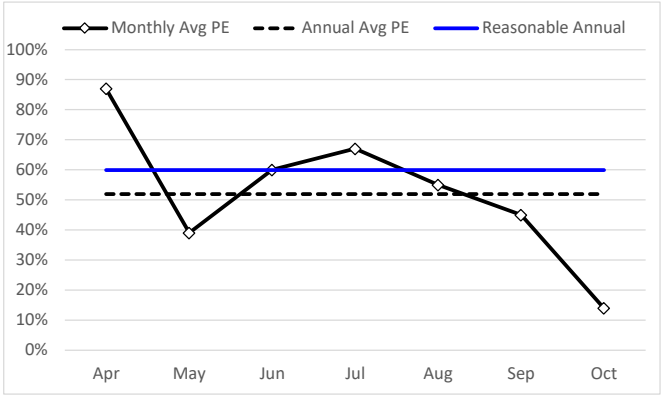
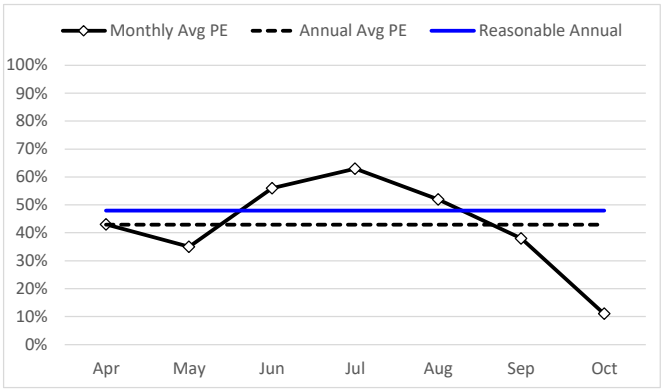


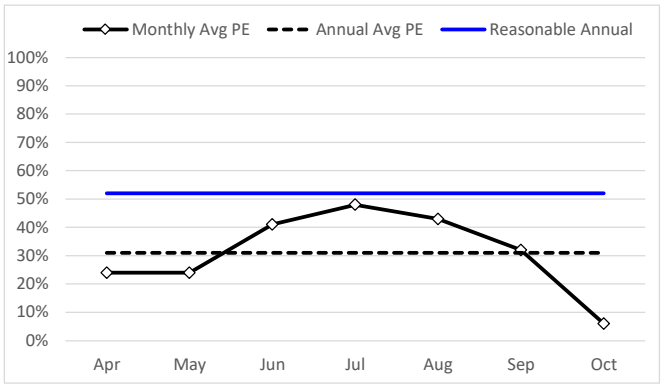
Milner



Minidoka



NSCC



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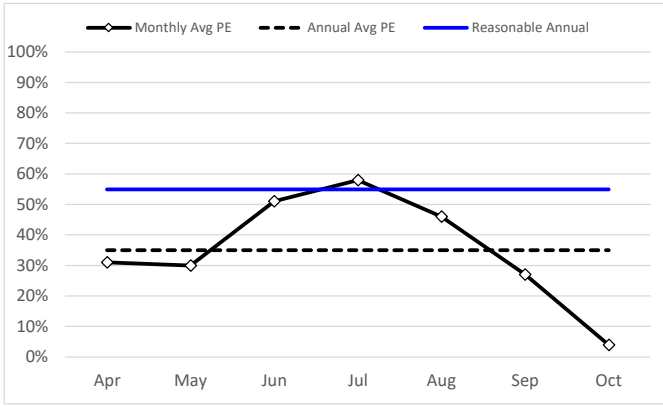
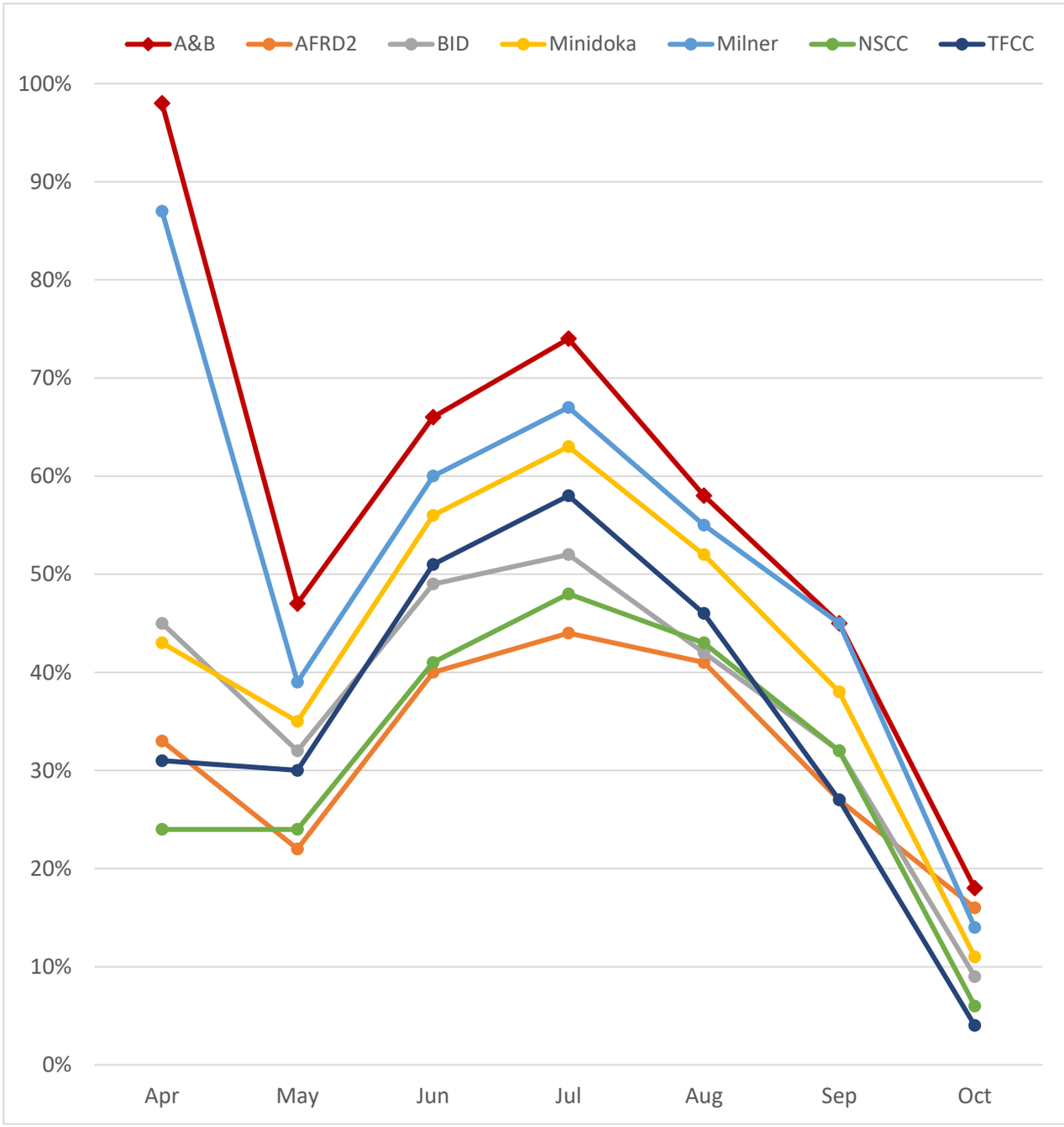


Notes:
(1) Monthly and Annual Average PE values from the Fifth Amended Methodology Order (P. 14; IDWR, April 2023).
(2) Reasonable Annual PE from Spronk 2007 report (Sullivan, 2007a).

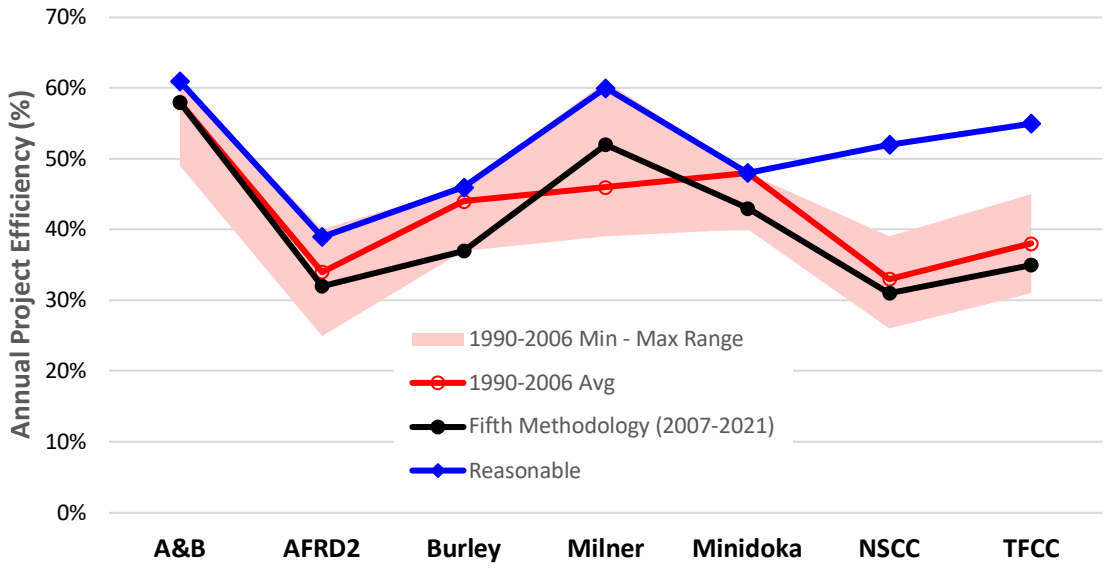
Figure 3-2
Monthly Average Project Efficiency
Surface Water Coalition Members
5th Amended Methodology Order



Notes:
Monthly average PE values from Fifth Amended Methodology Order (P. 14; IDWR, April 2023).

Figure 3-3

Reasonable and Actual Project Efficiencies
2008 Hearing vs. Fifth Methodology Order



	(1)	(2)			(3)
	Reasonable (Achievable) Project	Actual Project Efficiencies (1990-2006)			Fifth Methodology Order
SWC Member	Efficiencies	Min	Average	Max	(2007-2021)
A&B	61%	49%	58%	61%	58%
AFRD2	39%	25%	34%	40%	32%
Burley	46%	37%	44%	46%	37%
Milner	60%	39%	46%	61%	52%
Minidoka	48%	40%	48%	48%	43%
NSCC	52%	26%	33%	39%	31%
TFCC	55%	31%	38%	45%	35%

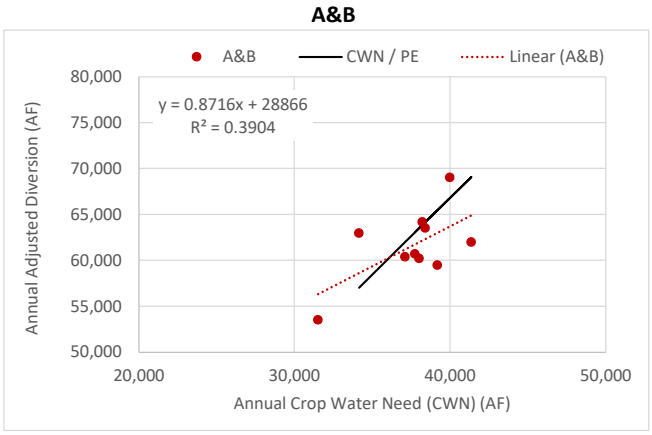
Notes:

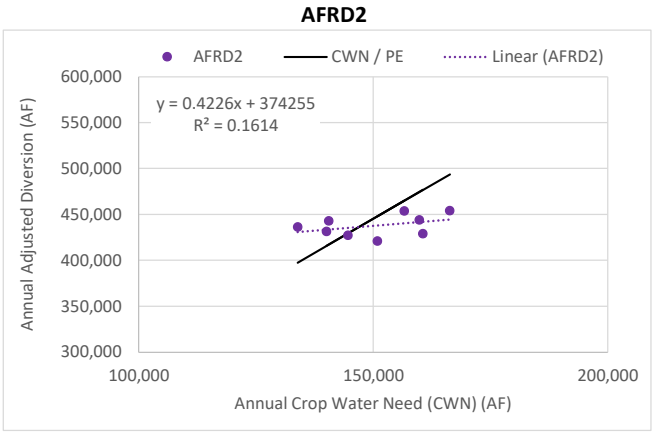
(1) From September 26, 2007 Sullivan Expert Report, SWC Delivery Call.
Based on reported conveyance efficiency x achievable on farm efficiencies.

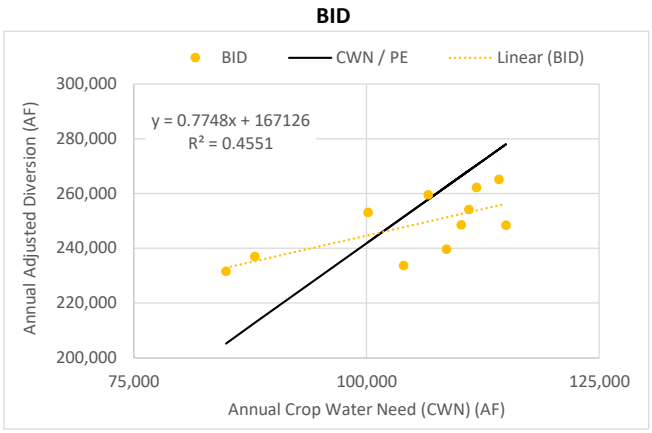
(2) From September 26, 2007 Sullivan Expert Report, SWC Delivery Call.
Based on analysis of SWC operations for 1990 - 2006.

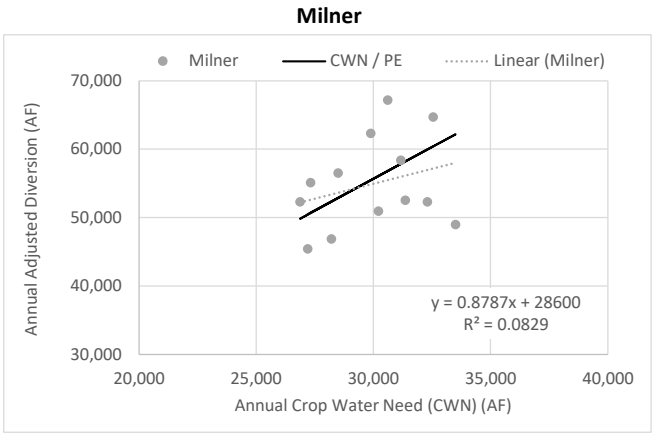
(3) From April 21, 2023 Fifth Methodology Order at 14.
Based on average of monthly efficiencies during 2007 - 2021.

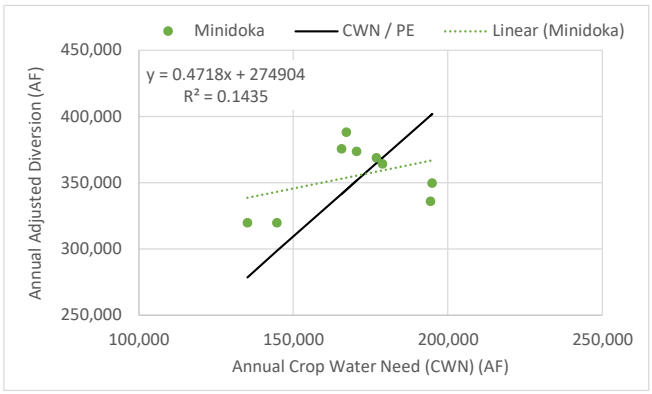
Figure 3-4
Annual Adjusted Diversion v. Annual Crop Water Needs (CWN)
Surface Water Coalition Members
2007 - 2021
Exclude PE Outlier Months (> +/- 2 Std Dev)

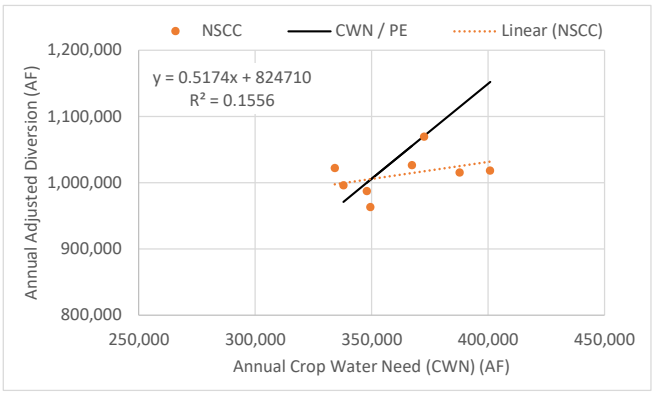


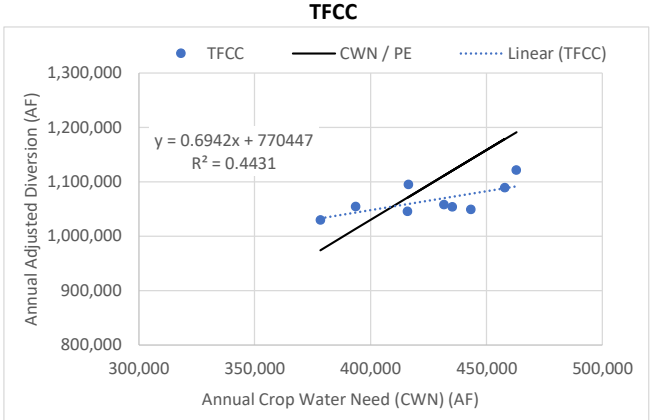








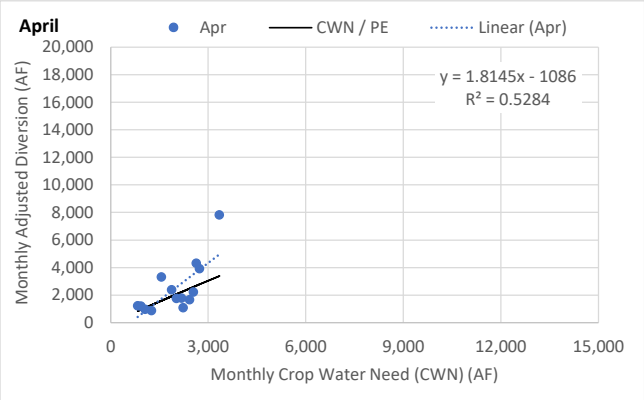


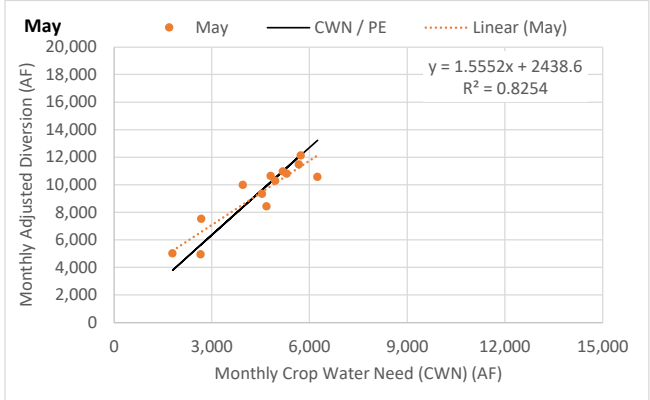


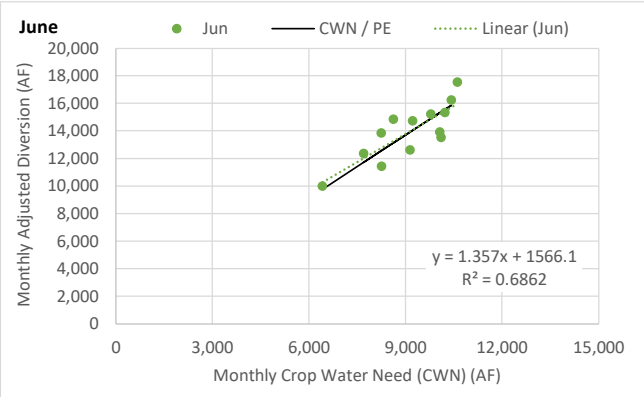
Notes:
Note different scales.

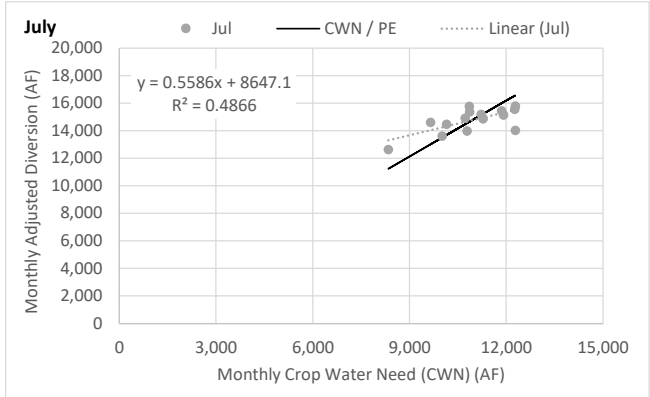
(1) Annual Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area (IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"
(2) Annual Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (see IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"
(3) Annual PE (colored dots) computed as the annual CWN (1) divided by the ann Adjusted Diversion (2).
(4) CWN/PE (black line) is the annual CWN (1) divided by the annual average Project Efficiency (PE).

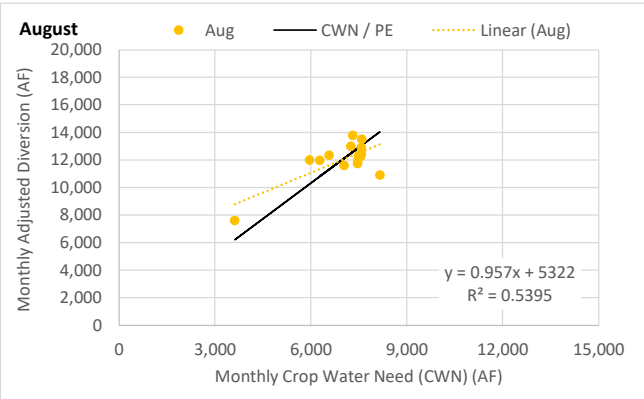
Figure 3-5
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
A&B
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

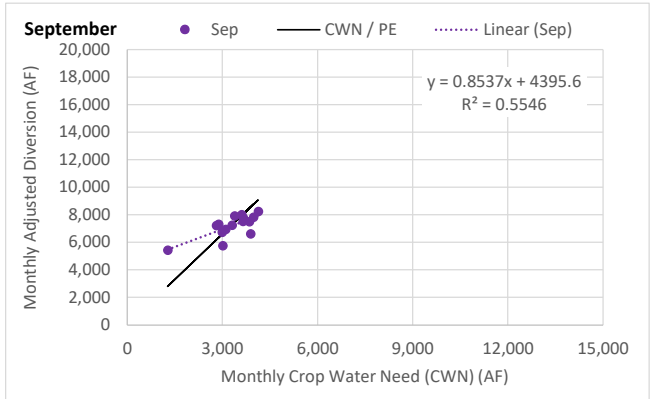


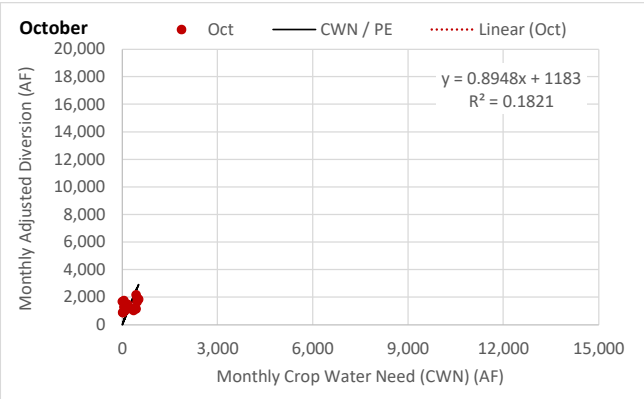












Notes:

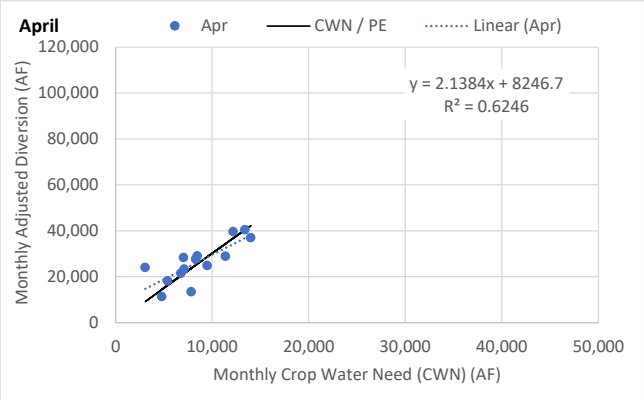
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

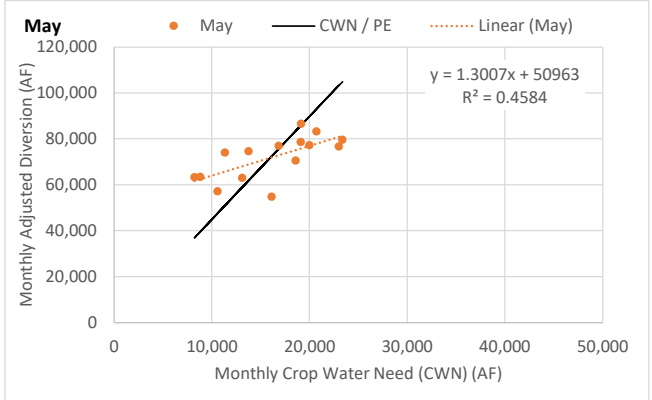
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

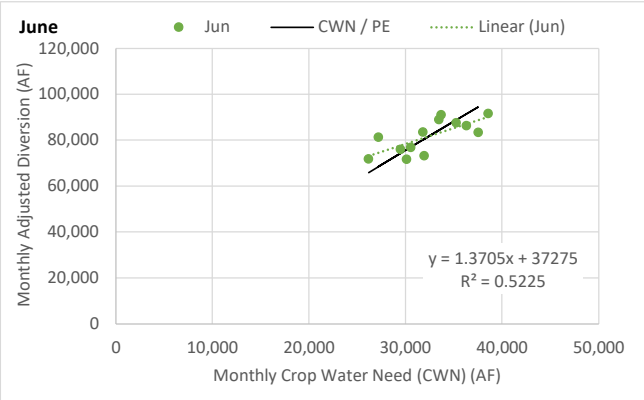
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

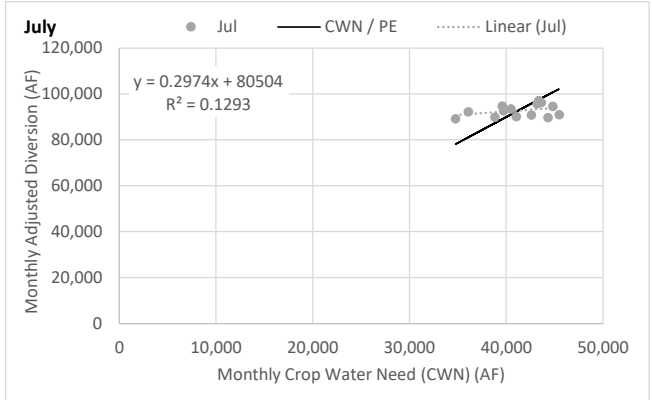
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

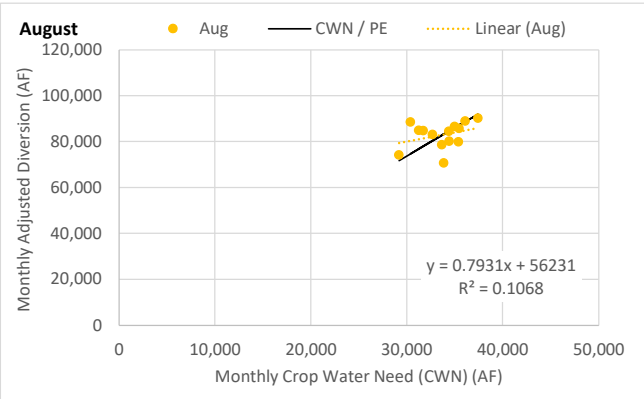
Figure 3-6
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
AFRD2
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

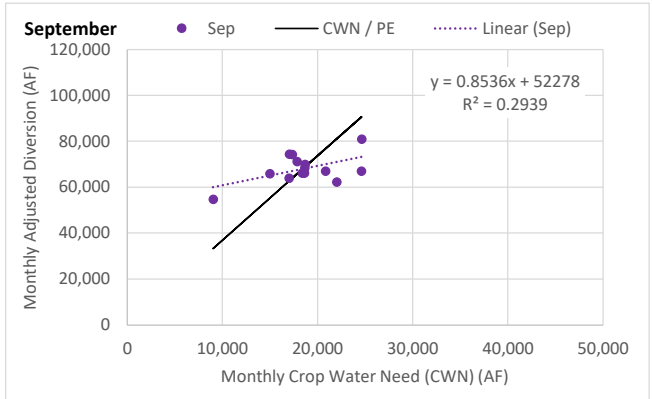


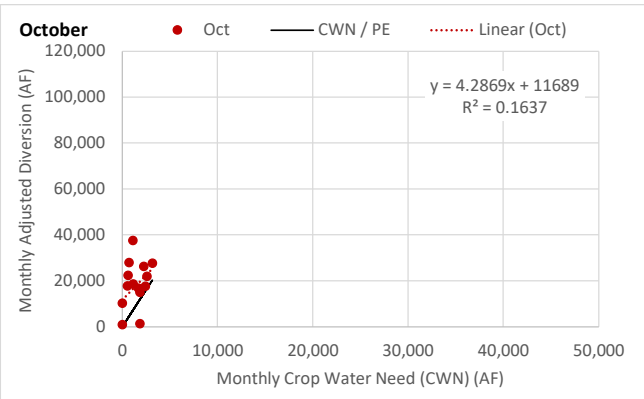












Notes:

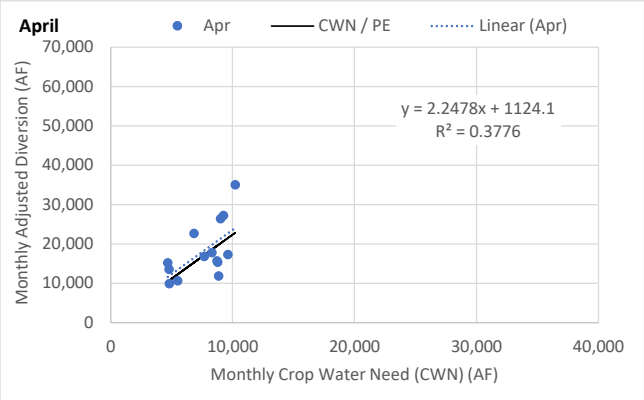
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

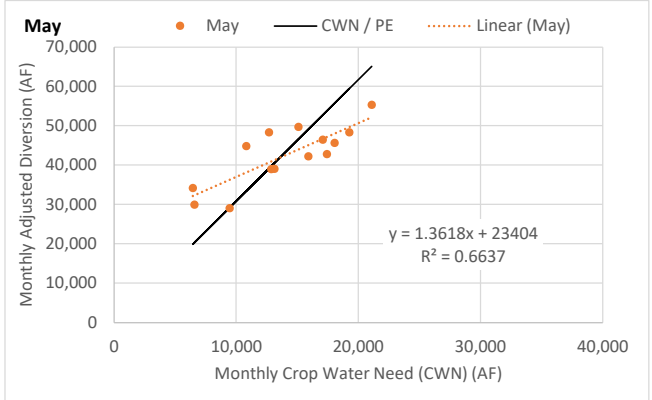
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

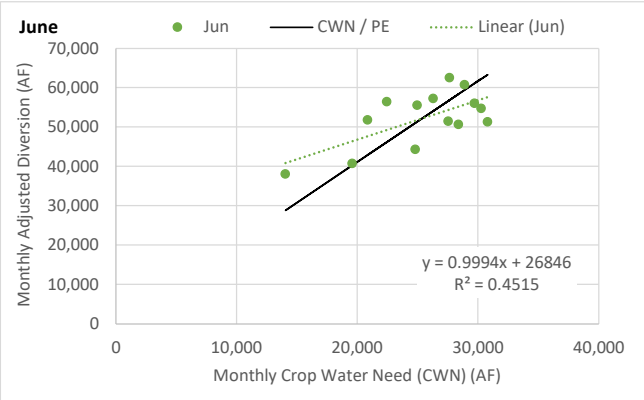
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

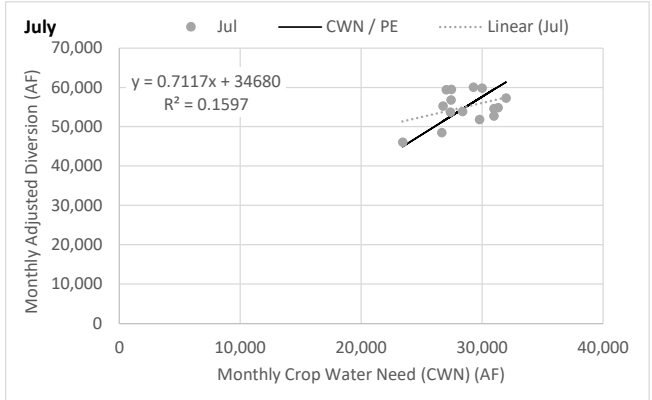
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

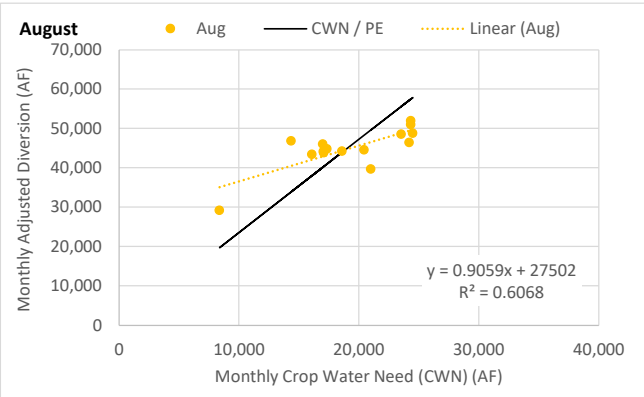
Figure 3-7
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
BID
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

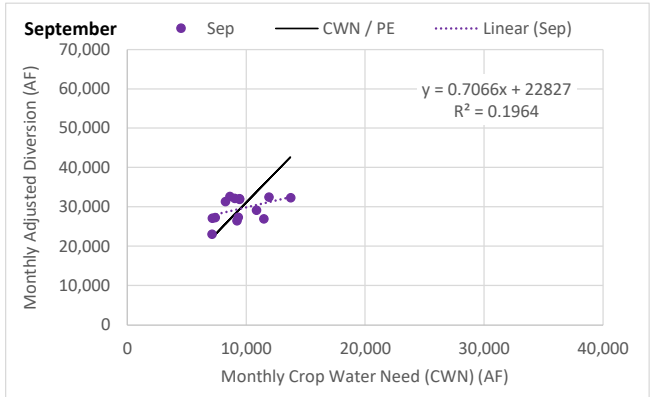


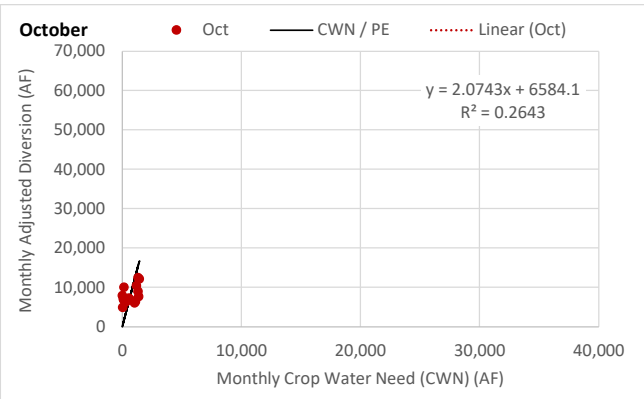












Notes:

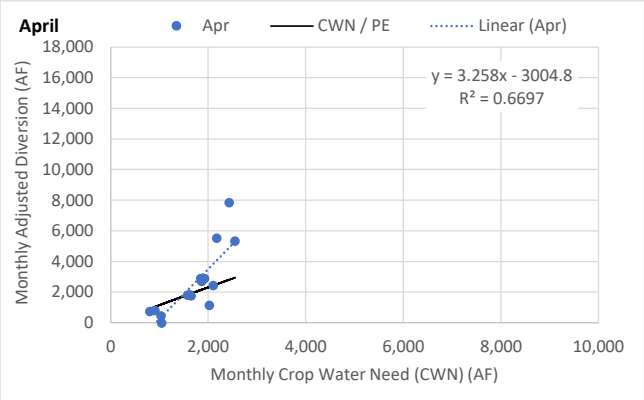
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

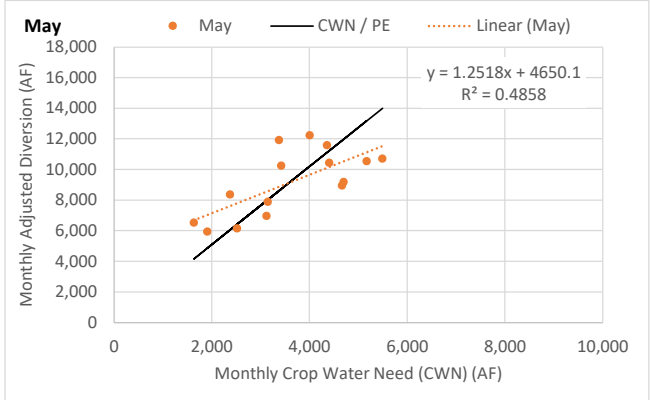
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

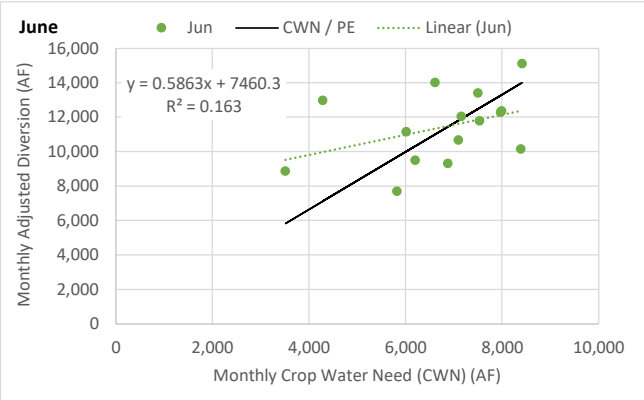
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

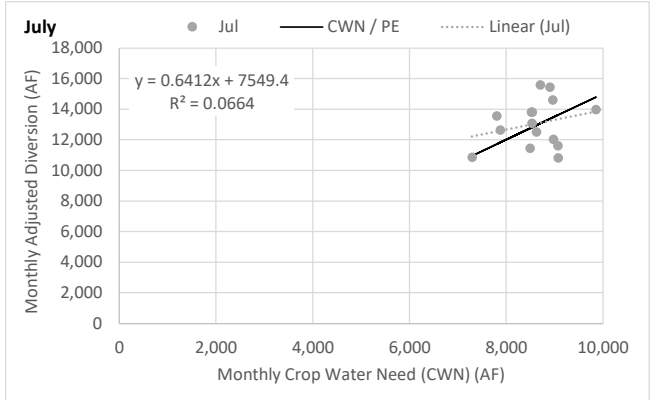
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

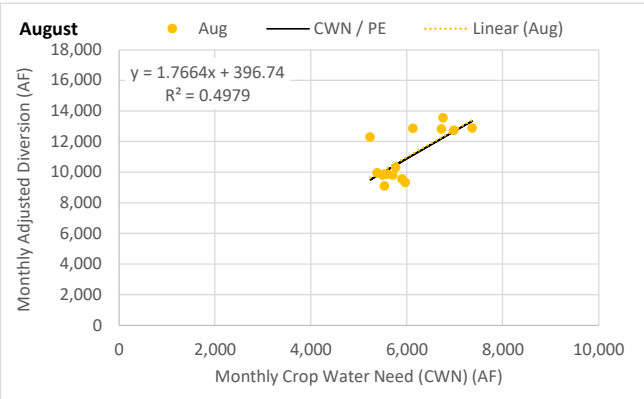
Figure 3-8
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
Milner
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

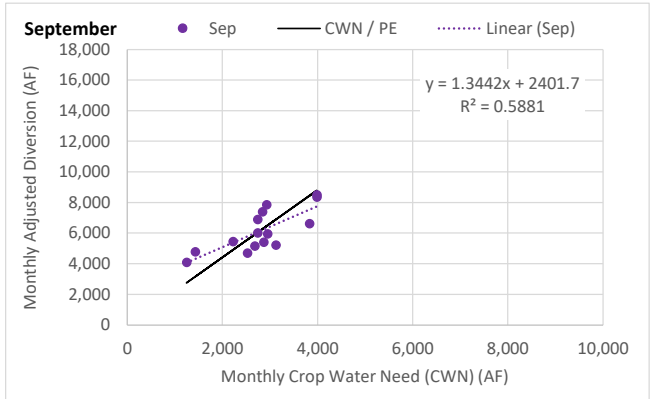


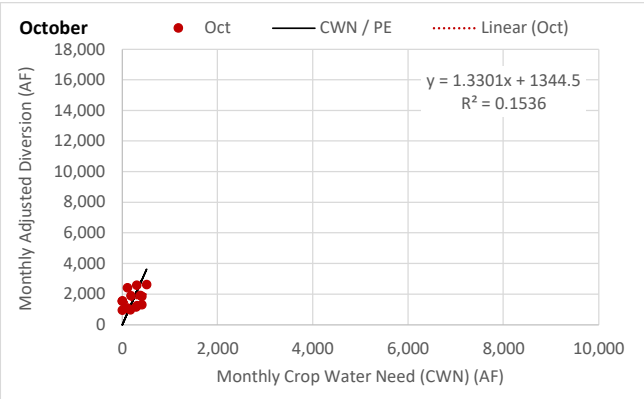












Notes:

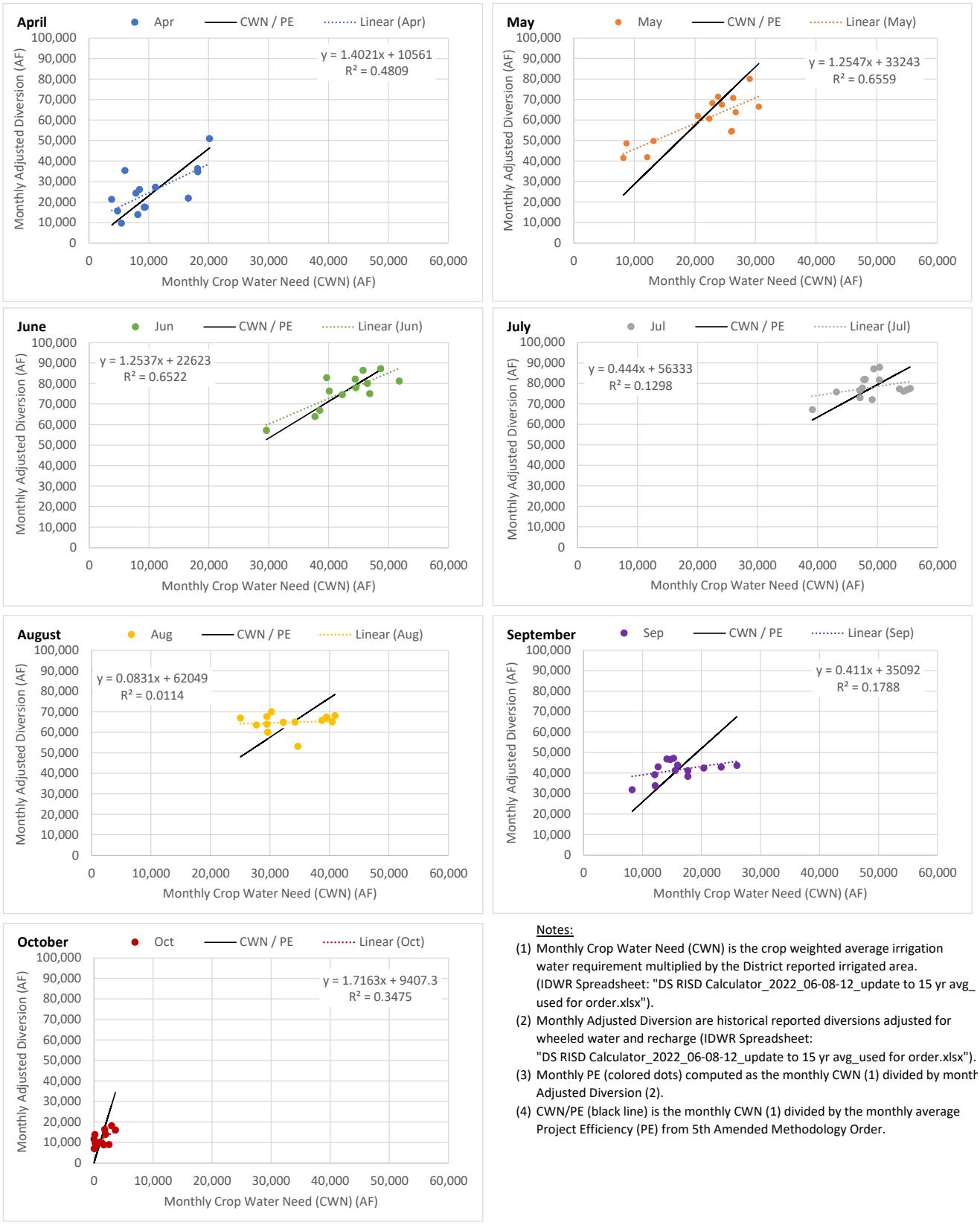
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-9
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
Minidoka
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

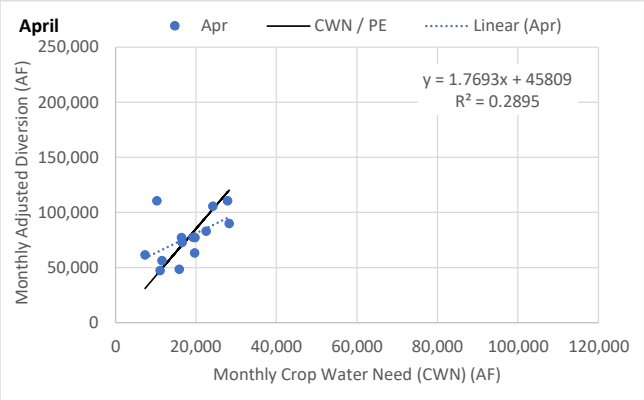
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

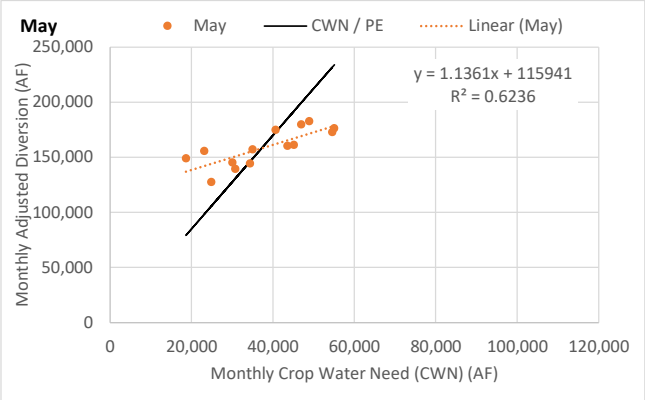
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

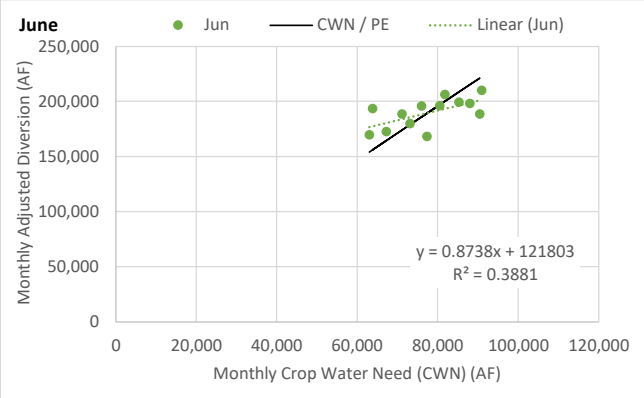
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

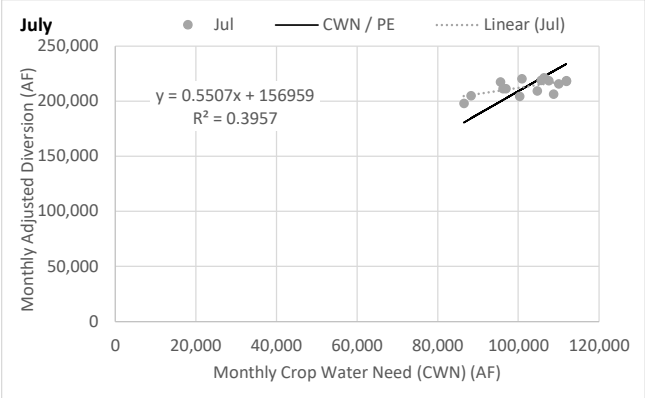
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

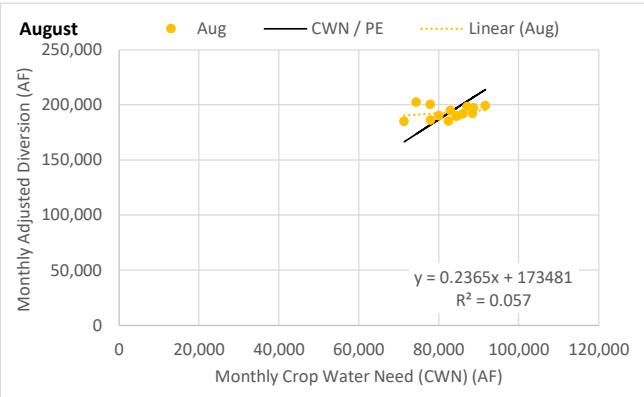
Figure 3-10
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
NSCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

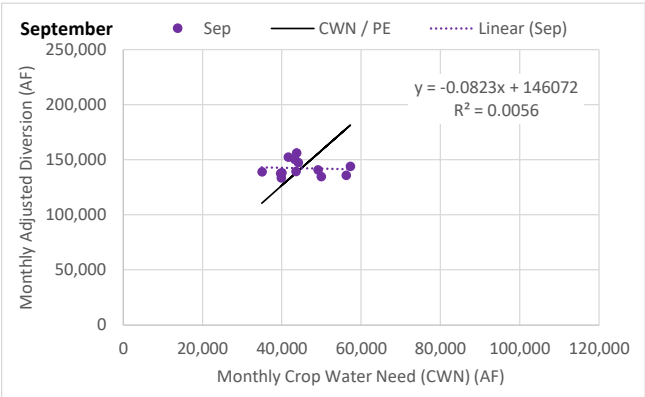


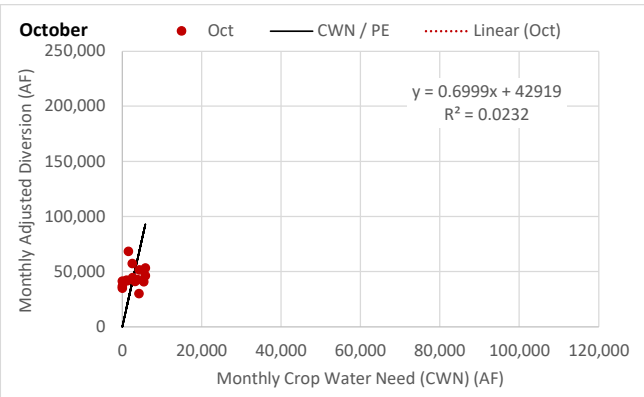












Notes:

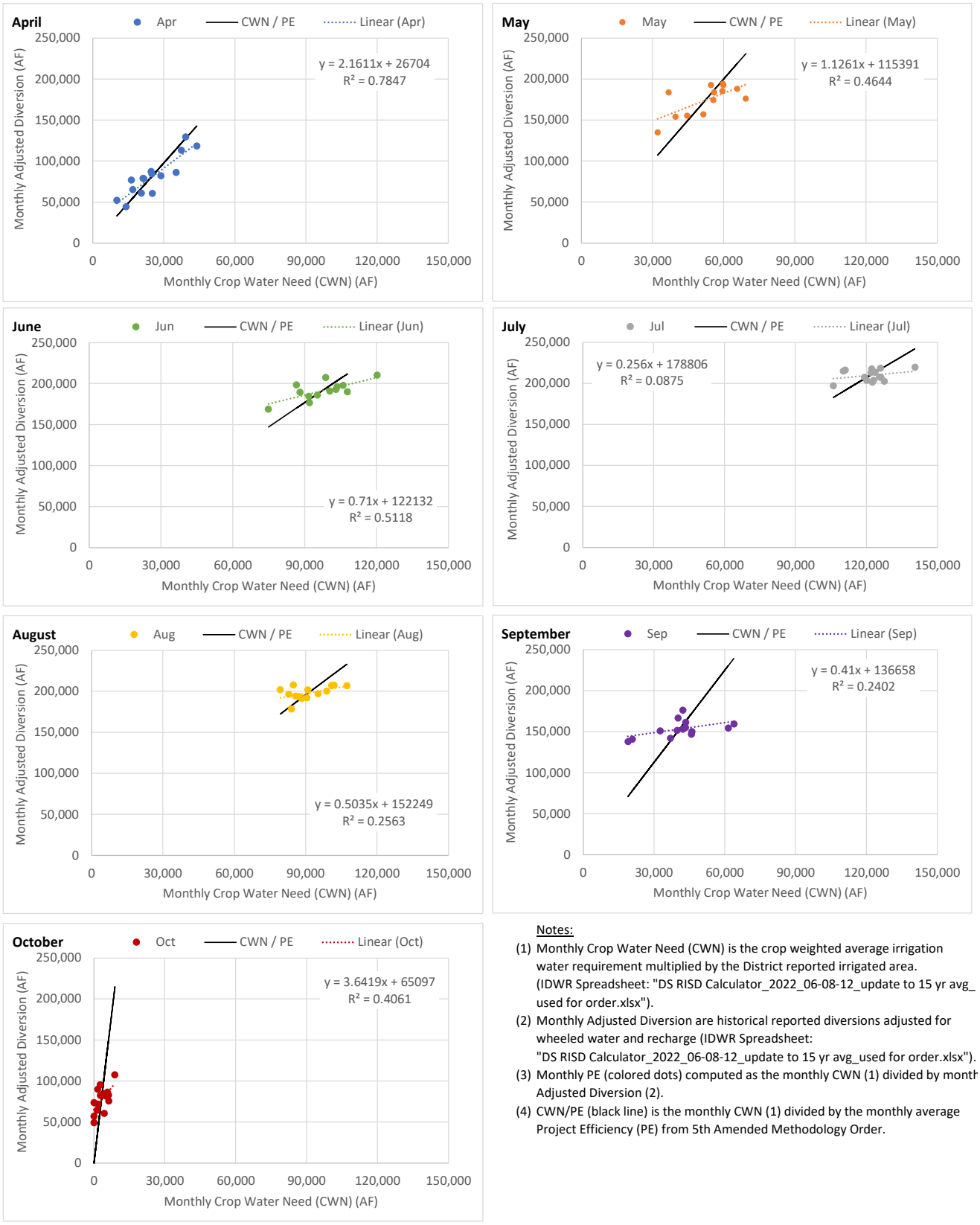
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-11
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
TFCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

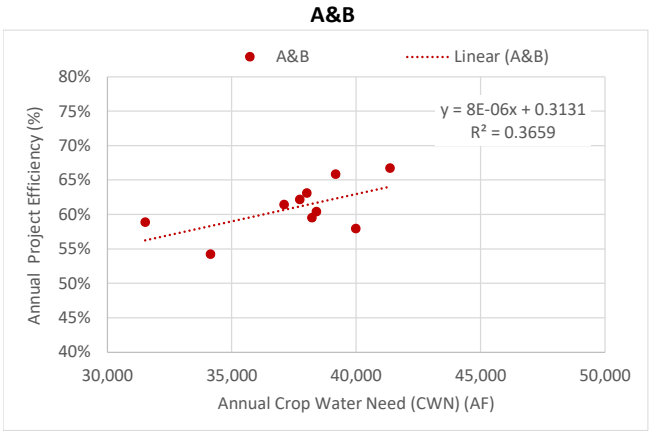
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

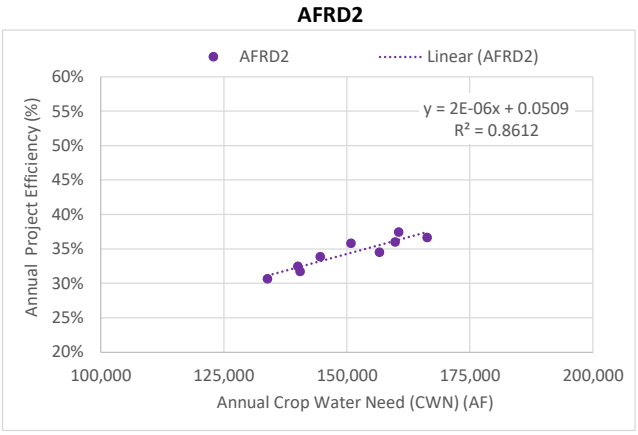
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

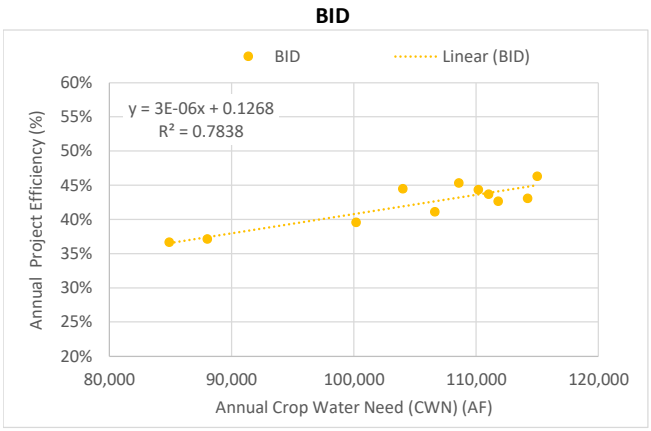
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

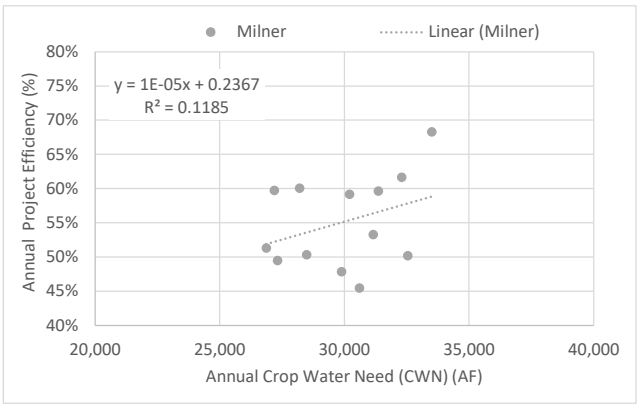
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

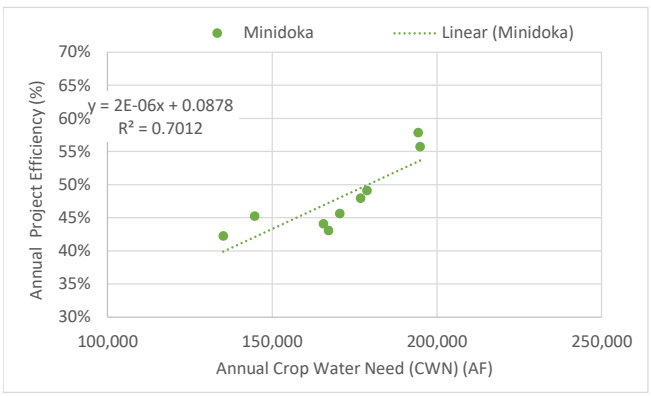
Figure 3-12
Annual Project Efficiency v. Annual Crop Water Need (CWN)
Surface Water Coalition Members
2007 - 2021
Exclude PE Outlier Months (> +/- 2 Std Dev)

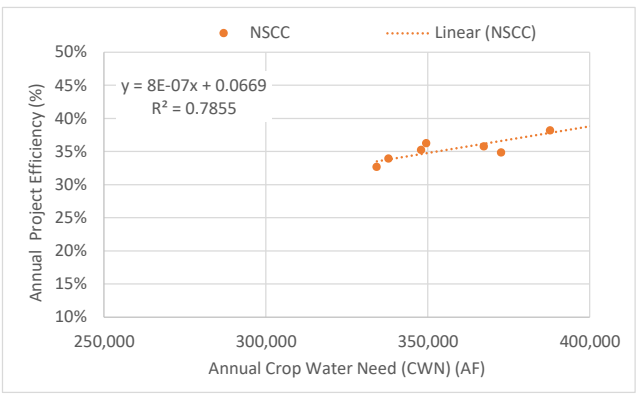


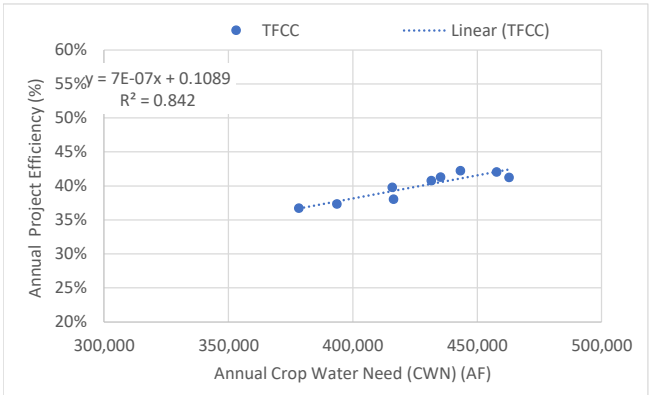






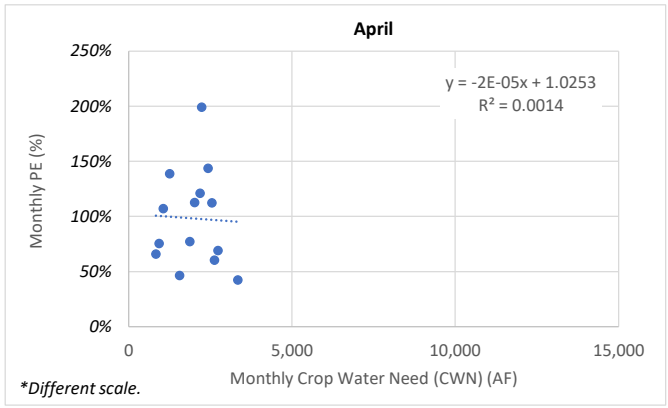




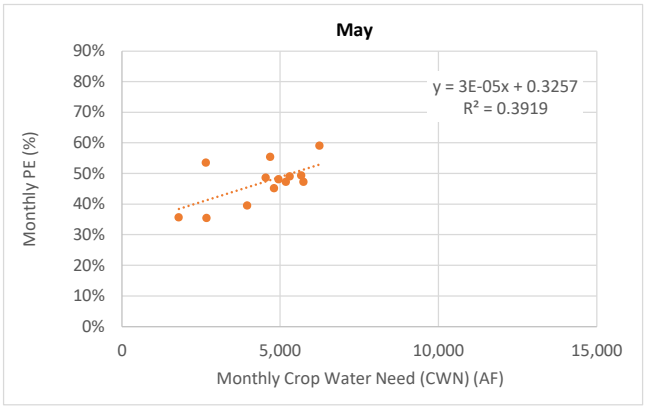


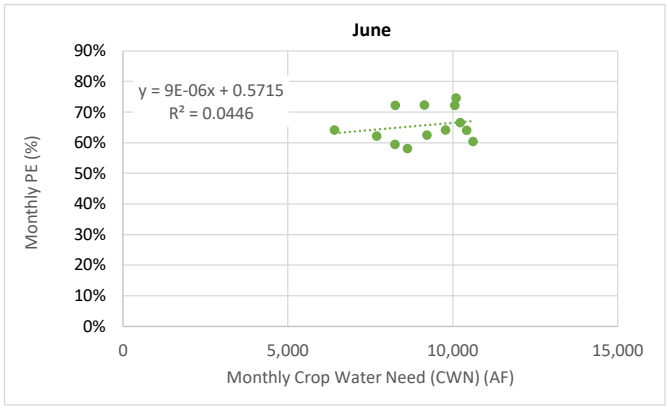
Notes:
Note different scales.
(1) Annual Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area (IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"]
(2) Annual Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (see IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"]
(3) Annual PE (colored dots) computed as the annual CWN (1) divided by the annu Adjusted Diversion (2).

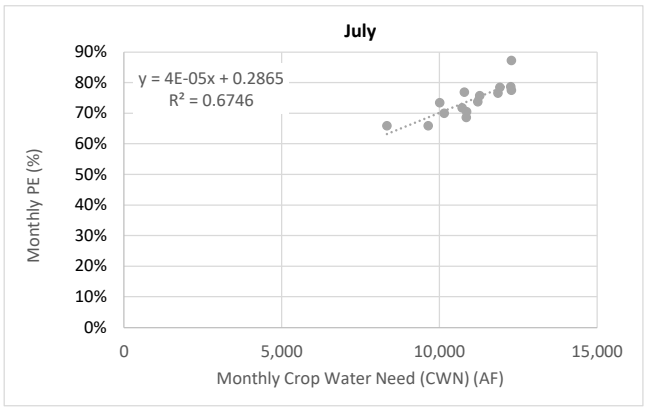
Figure 3-13
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
A&B
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

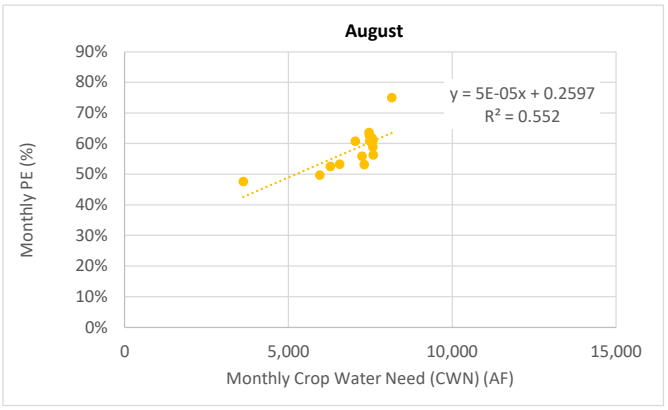


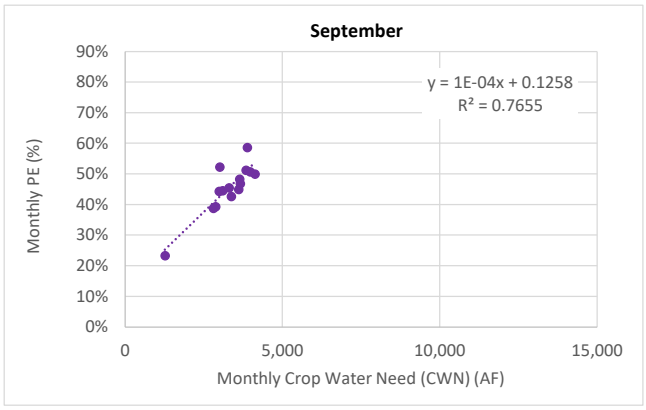
*Different scale.

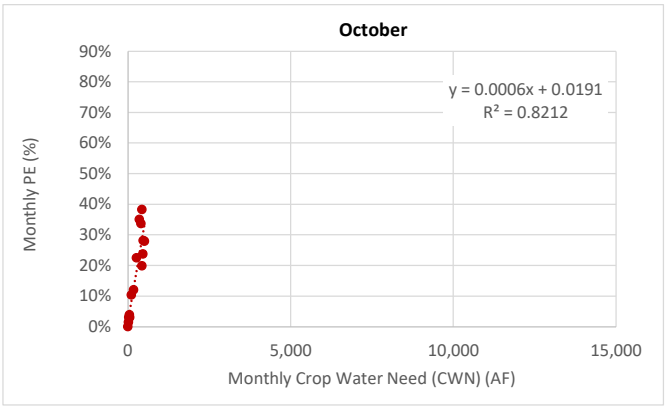












Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

Figure 3-14
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
AFRD2
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



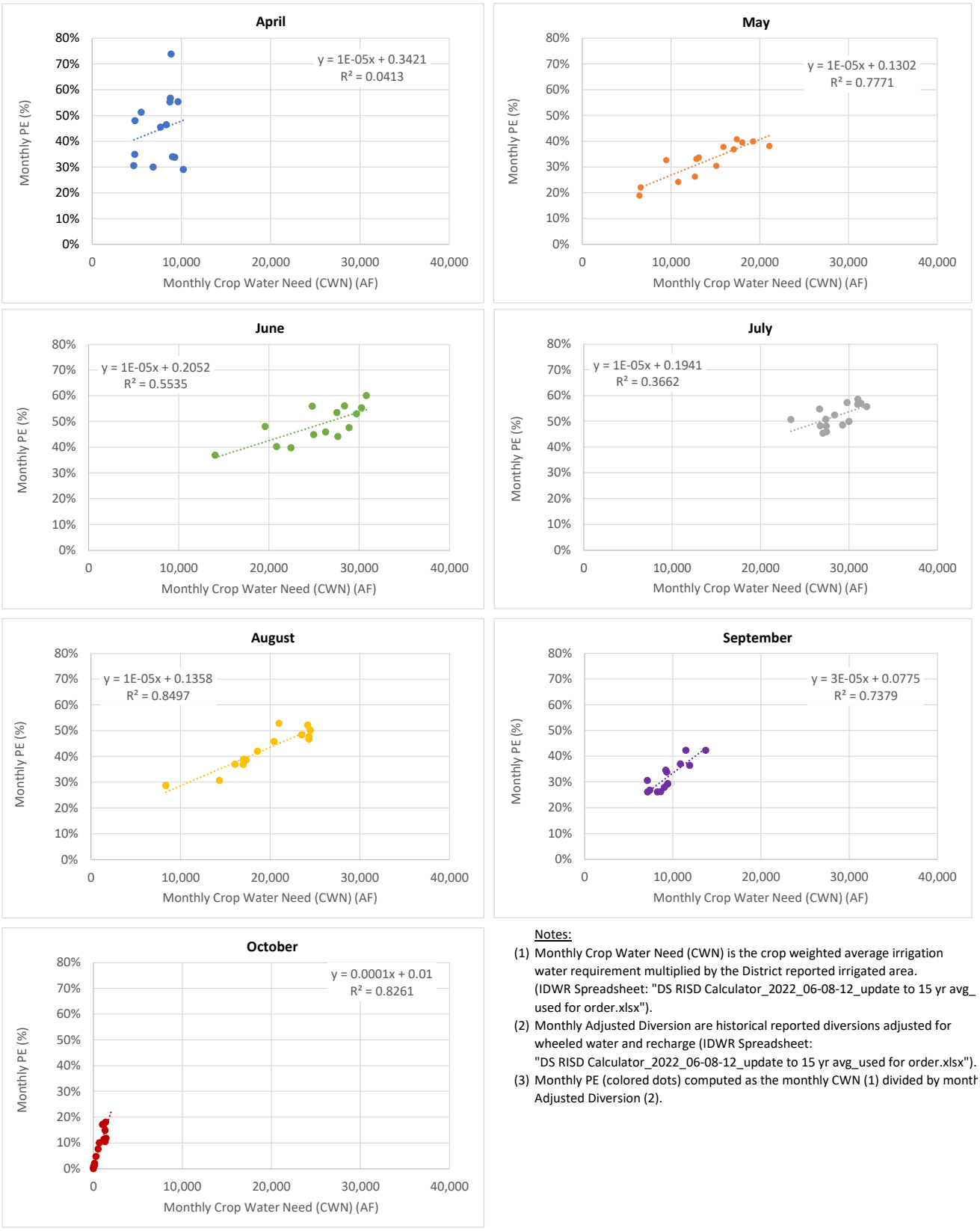
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

Figure 3-15
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
BID
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



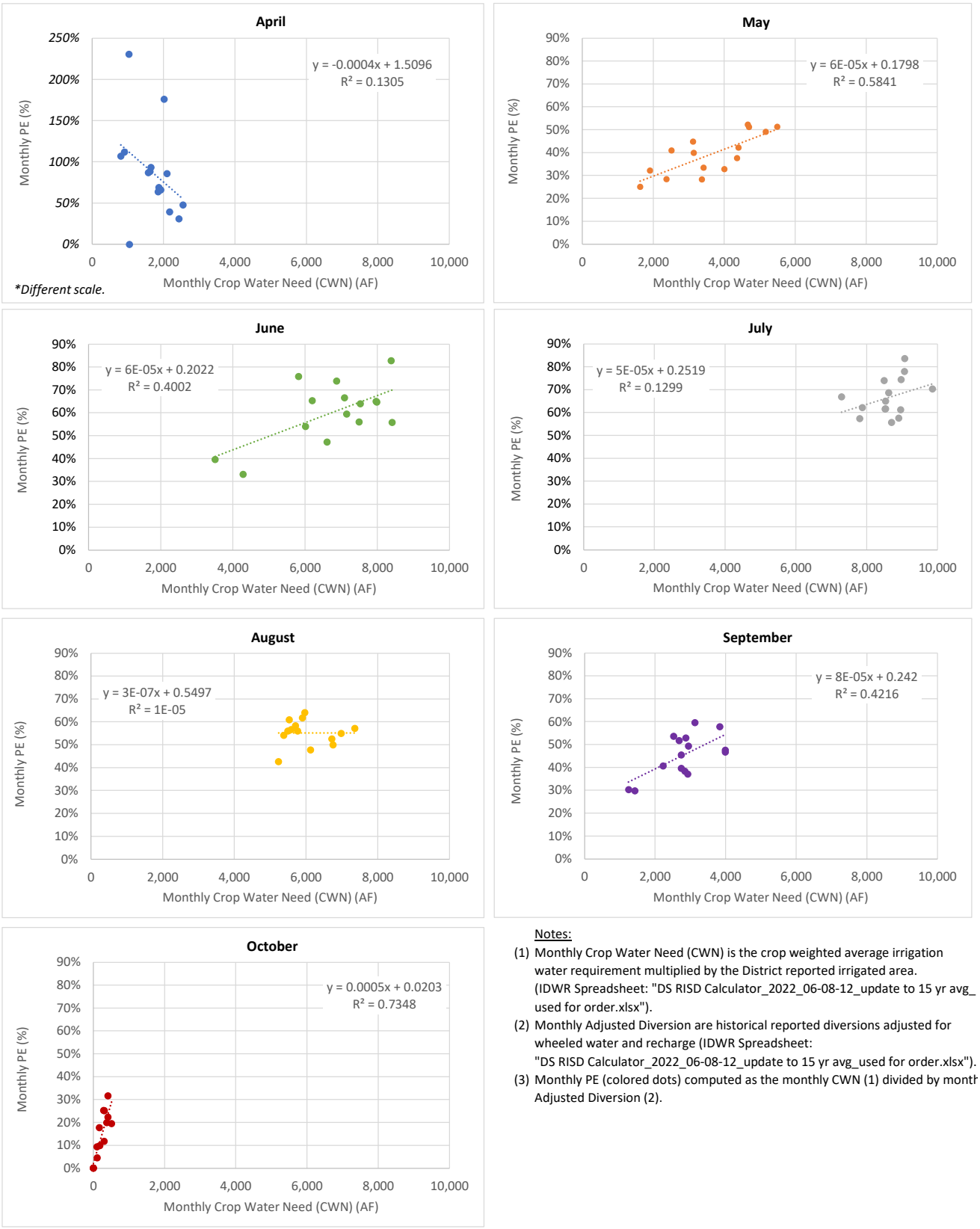
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montl Adjusted Diversion (2).

Figure 3-16
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
Milner
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



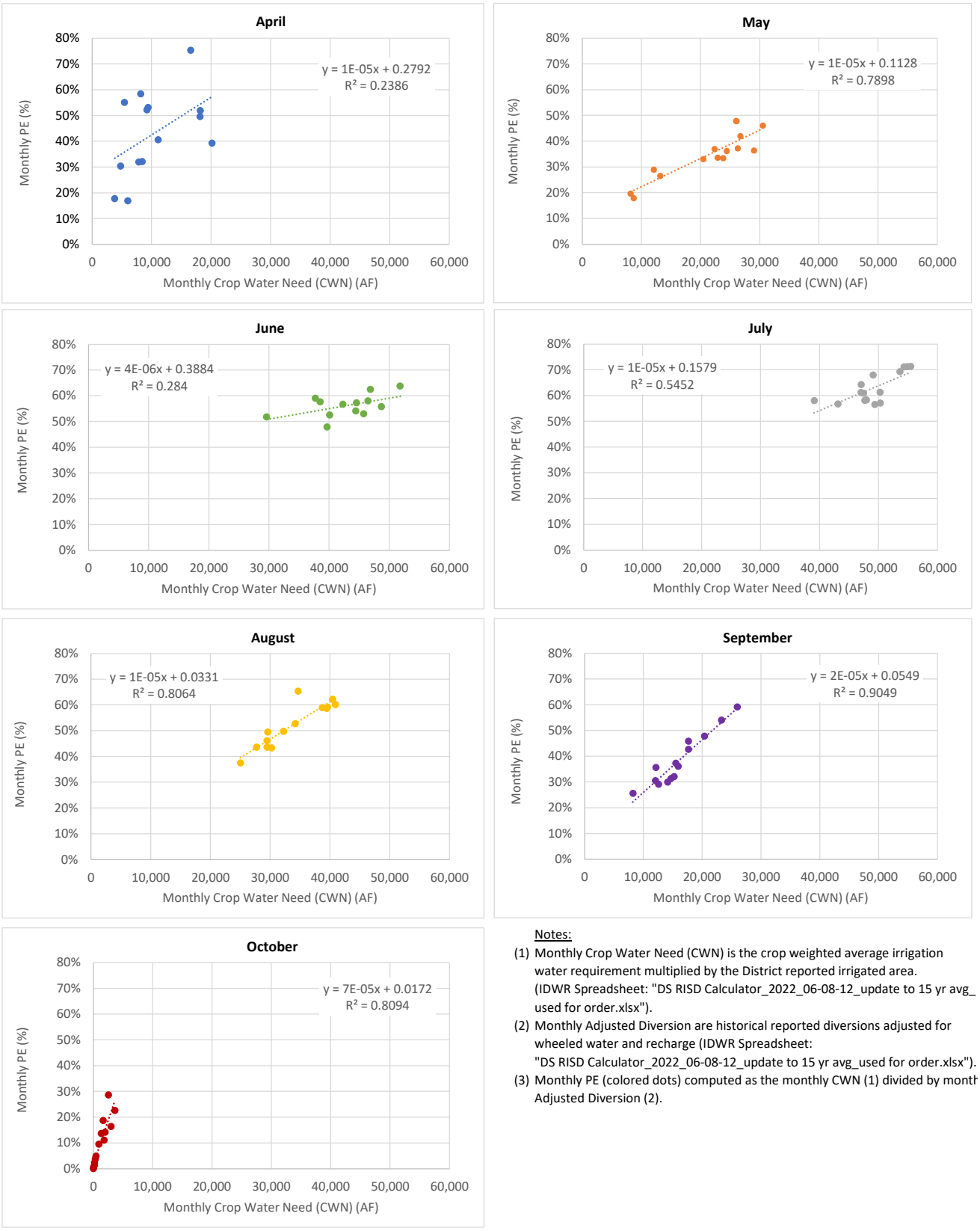
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

Figure 3-17
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
Minidoka
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montl Adjusted Diversion (2).

Figure 3-18
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
NSCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



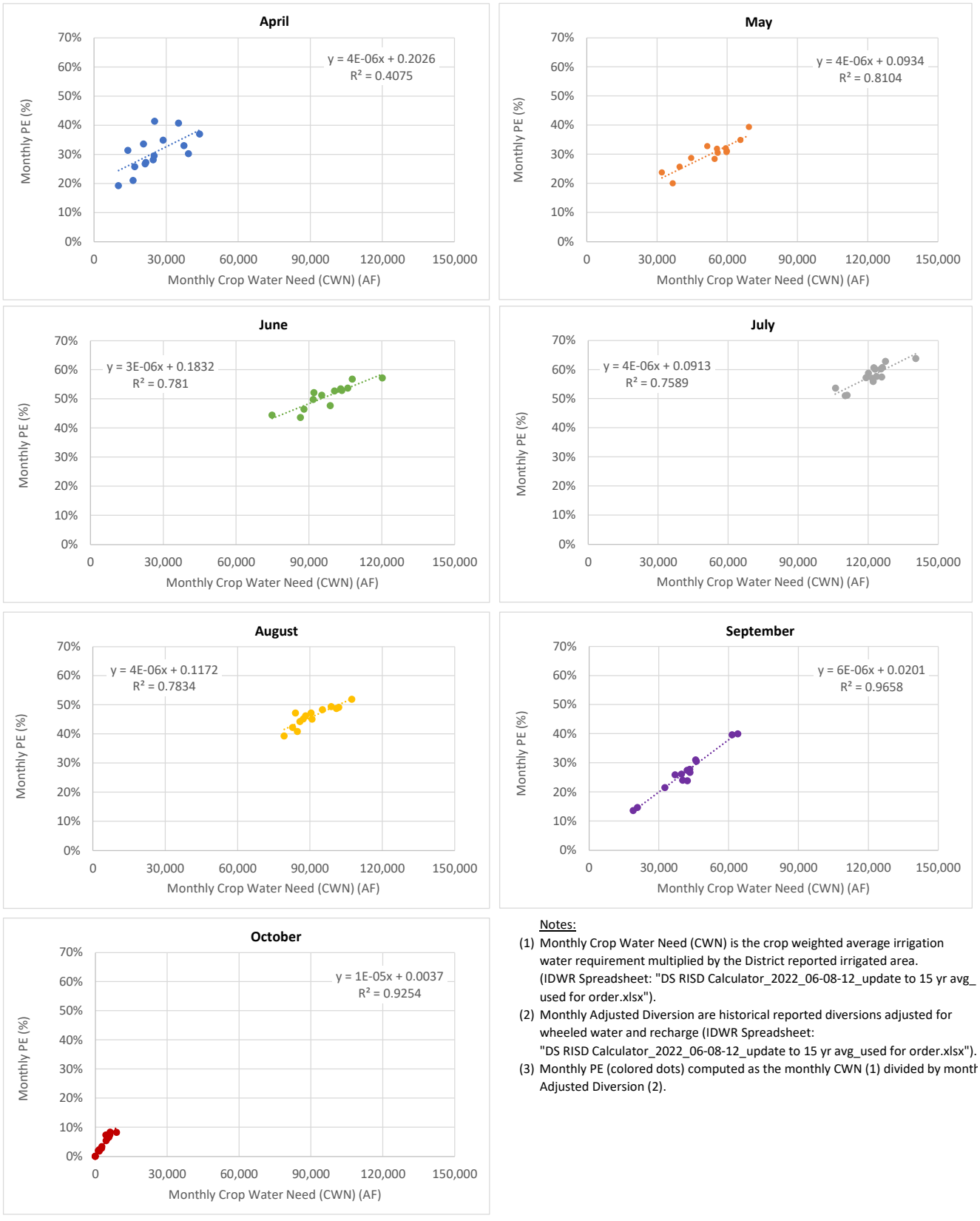
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montl Adjusted Diversion (2).

Figure 3-19
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
TFCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montl Adjusted Diversion (2).

TABLES

Table 2-1
Annual Diversions
Surface Water Coalition Members
(AF)

	Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Total
	2000	62,623	512,980	268,653	66,583	400,544	1,119,218	1,160,451	3,591,053
	2001	63,229	415,977	225,398	53,572	369,320	979,689	1,012,202	3,119,388
	2002	59,354	400,654	229,261	60,327	349,680	926,219	1,009,092	3,034,586
	2003	59,479	397,573	249,562	56,966	353,245	929,453	1,046,624	3,092,903
	2004	49,708	299,371	254,082	35,674	340,958	924,324	1,001,779	2,905,896
	2005	46,929	401,735	219,600	38,948	307,628	900,339	918,011	2,833,190
	2006	57,493	410,376	247,849	41,672	352,269	963,208	995,822	3,068,689
	2007	60,227	429,040	259,495	52,342	375,519	1,015,260	1,048,965	3,240,849
	2008	59,493	421,083	254,105	50,994	373,499	967,543	1,094,941	3,221,658
	2009	57,344	453,757	236,983	55,713	343,520	1,007,862	1,043,006	3,198,185
	2010	53,528	431,376	231,542	45,471	319,837	995,820	1,029,645	3,107,219
	2011	53,788	427,228	219,855	46,932	319,744	963,049	1,054,435	3,085,031
	2012	63,550	454,143	248,557	49,038	387,998	1,018,145	1,089,269	3,310,699
	2013	62,016	400,729	248,424	52,561	364,124	1,021,024	1,058,154	3,207,032
	2014	60,392	459,017	233,728	49,961	368,685	1,021,605	1,114,409	3,307,796
	2015	62,975	442,896	253,107	55,153	368,773	1,021,958	1,102,412	3,307,275
	2016	60,409	438,224	250,702	56,550	349,779	978,658	1,045,567	3,179,888
	2017	60,713	391,658	239,685	62,371	335,922	987,102	1,053,742	3,131,193
	2018	64,192	453,890	262,211	58,417	354,851	1,026,661	1,121,717	3,341,939
	2019	56,115	436,533	254,189	52,326	327,963	1,032,687	1,075,987	3,235,802
	2020	65,828	493,153	282,949	67,227	373,531	1,048,708	1,206,401	3,537,797
	2021	69,035	444,126	265,141	64,748	354,595	1,069,340	1,083,514	3,350,499
	2022	63,848	405,410	235,119	49,787	311,795	941,270	950,024	2,957,253
	Averages								
(1)	2000-2021	59,474	427,978	247,049	53,343	354,181	996,267	1,062,098	3,200,389
(2)	2000-2022	59,664	426,997	246,530	53,188	352,338	993,876	1,057,225	3,189,818
(1)	2000-2014	57,944	421,003	241,806	50,450	355,105	983,517	1,045,120	3,154,945
(1)	2015-2021	62,752	442,926	258,283	59,542	352,202	1,023,588	1,098,477	3,297,770
(3)	06/08/12	60,179	428,534	250,170	47,234	371,255	982,965	1,060,011	3,200,349
(4)	06/08/12 (Old)	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011	3,194,722
	Old 06/08/12 Average (Fourth Methodology Order) Minus 2000-2021 and 2000-2022 Averages								
	2000-2021	519	-306	4,482	-6,208	15,311	-17,379	-2,087	-5,668
	2000-2022	329	675	5,001	-6,053	17,154	-14,988	2,786	4,904
	Revised 06/08/12 Average Minus 2000-2021 and 2000-2022 Averages								
	2000-2021	705	556	3,121	-6,109	17,074	-13,302	-2,087	-41
	2000-2022	515	1,537	3,640	-5,954	18,917	-10,910	2,786	10,530

Notes:

(1) Annual diversions from 2000 - 2021 from spreadsheet provided by Mat Anders at his deposition on May 12, 2023: "BLYReview_2022_v1 used for TWG_used for order.xlsx".

(2) Annual diversions for 2022 from IDWR Spreasdheet: "DS RISD Calculator_2023_05_03.xlsx"

(3) Calculated average of 2006, 2008, and 2012 using data in table.

(4) 06/08/12 Average from Fourth Amended Methodology Order (April 2016).

Table 3-1

Summary of Annual Reasonable In-Season Demands and Shortages

TFCC

2007 - 2021 (AF)

	(1)	(1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Annual RISD			November 1 RISD Shortfall		
Year	CWN	Historical Adjusted Diversion	Nov. 1 Forecast Supply	CWN/ Methodology Order 5 PE	CWN/ Regression & Avg PE	CWN/ Regression & 75% PE	Methodology Order 5 PE	Regression & Avg PE	Regression & 75% PE
2007	443,275	1,048,965	1,030,224	1,127,782	1,073,397	1,035,277	97,558	43,173	5,053
2008	416,362	1,094,941	1,170,179	1,056,414	1,057,689	1,005,709	0	0	0
2009	352,119	1,043,006	1,141,701	947,397	940,865	896,483	0	0	0
2010	378,349	1,029,645	1,064,441	961,189	961,189	906,143	0	0	0
2011	393,611	1,054,435	1,215,802	972,593	981,358	938,090	0	0	0
2012	457,841	1,089,269	1,173,413	1,153,456	1,104,500	1,075,324	0	0	0
2013	431,633	1,058,154	1,128,023	1,084,050	1,014,099	984,820	0	0	0
2014	365,130	1,114,409	1,258,773	932,688	910,543	872,296	0	0	0
2015	409,472	1,102,412	969,761	1,035,362	1,014,356	967,927	65,601	44,595	0
2016	415,928	1,045,567	1,031,291	1,018,220	996,747	957,887	0	0	0
2017	435,307	1,053,742	1,212,718	1,096,031	1,071,959	1,035,776	0	0	0
2018	462,889	1,121,717	1,193,720	1,178,165	1,060,523	1,031,778	0	0	0
2019	396,648	1,075,987	1,176,197	991,190	965,223	931,602	0	0	0
2020	465,580	1,206,401	1,281,322	1,214,351	1,100,743	1,063,109	0	0	0
2021	478,907	1,084,609	1,063,647	1,242,713	1,195,067	1,138,478	179,066	131,420	74,831

Notes:

(1) Monthly Crop Water Need (CWN), monthly Historical Adjusted Diversion, and November 1 Forecast Supply volumes from IDWR spreadsheet: *DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx* .

(2) Monthly CWN divided by monthly average PE from 5th Amended Methodology Order (IDWR method).

(3) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = historical average; Oct PE = Sep PE).

(4) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE).
In (2)-(4), per the IDWR Methodology, the April and October minimum and maximum limits are applied and outliers +/- two standard deviations are removed for purposes of computing the PE.

(5) Maximum [(2) - Nov. 1 Forecast Supply, 0].

(6) Maximum [(3) - Nov. 1 Forecast Supply, 0].

(7) Maximum [(4) - Nov. 1 Forecast Supply, 0].

Table 3-2

Summary of Annual Reasonable In-Season Demands and Shortages

AFRD2

2007 - 2021 (AF)

	(1)	(1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Annual RISD			November 1 RISD Shortfall		
Year	CWN	Historical Adjusted Diversion	Nov. 1 Forecast Supply	CWN/ Methodology Order 5 PE	CWN/ Regression & Avg PE	CWN/ Regression & 75% PE	Methodology Order 5 PE	Regression & Avg PE	Regression & 75% PE
2007	160,584	429,040	437,004	463,777	431,895	417,823	26,773	0	0
2008	150,892	421,083	525,302	435,515	423,846	401,770	0	0	0
2009	129,641	453,757	623,736	390,936	375,244	361,230	0	0	0
2010	140,084	431,376	539,947	397,330	391,574	369,223	0	0	0
2011	144,619	427,228	701,749	410,255	399,657	378,691	0	0	0
2012	166,340	454,143	490,168	483,272	452,317	441,601	0	0	0
2013	156,747	400,729	412,067	450,789	421,329	404,622	38,723	9,262	0
2014	132,568	459,017	551,279	393,507	366,471	355,017	0	0	0
2015	140,505	442,896	392,208	395,557	390,220	361,712	3,349	0	0
2016	139,802	438,224	488,209	379,802	379,802	352,307	0	0	0
2017	147,288	391,658	608,214	425,202	420,602	391,734	0	0	0
2018	156,633	453,890	579,089	439,069	409,156	389,840	0	0	0
2019	133,905	436,533	539,070	379,019	372,850	349,675	0	0	0
2020	156,003	493,153	591,776	461,089	428,276	403,450	0	0	0
2021	159,868	444,126	454,968	459,813	438,704	419,380	4,845	0	0

Notes:

(1) Monthly Crop Water Need (CWN), monthly Historical Adjusted Diversion, and November 1 Forecast Supply volumes from IDWR spreadsheet: *DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx* .

(2) Monthly CWN divided by monthly average PE from 5th Amended Methodology Order (IDWR method).

(3) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = historical average; Oct PE = Sep PE).

(4) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE).

In (2)-(4), per the IDWR Methodology, the April and October minimum and maximum limits are applied and outliers +/- two standard deviations are removed for purposes of computing the PE.

(5) Maximum [(2) - Nov. 1 Forecast Supply, 0].

(6) Maximum [(3) - Nov. 1 Forecast Supply, 0].

(7) Maximum [(4) - Nov. 1 Forecast Supply, 0].

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **HEARING SUBPOENA: JENNIFER SUKOW**

To: **Jennifer Sukow**

Pursuant to IDAPA 37.01.01.523, you are commanded to appear before Gary Spackman, Director of the Idaho Department of Water Resources, at the Department of Idaho Water Resources' State Office, located at 322 E. Front Street, 6th Floor, Conference Rooms 602A–D, Boise, Idaho, at 9:00 A.M. on June 6, 7, 8, and 9, 2023, to serve as a witness in an administrative hearing in the above-entitled action.

SO ORDERED THIS 5th day of June 2023.

Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of June 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

Jennifer Sukow jennifer.sukow@idwr.idaho.gov	☒ Email

Sarah Tschohl
Paralegal

From: Baxter, Garrick
Sent: Tuesday, June 6, 2023 8:56 AM
To: Tschohl, Sarah; John K. Simpson; Travis L. Thompson; Jess Nielsen; wkf@pmt.org; tj@racineolson.com; Elisheva Patterson; 'David W. Gehlert (david.gehlert@usdoj.gov)'; Matt J Howard; Sarah A Klahn; Max C. Bricker; Diane Thompson; Diehl, Rich; Candice McHugh; Chris Bromley; Rob Williams (rewilliams@wmlattys.com); Robert L Harris; rfife@idahofallsidaho.gov; sjohns@olsentaggart.com; nolsen@olsentaggart.com; staggart@olsentaggart.com; Dylan Anderson; Olenichak, Tony; Skinner, Corey; 'William Parsons'
Cc: Spackman, Gary; Weaver, Mathew; Wood, Pete; Jenkins, Megan
Subject: Milner and Minidoka shapefiles
Attachments: swc_shapefiles_2023.zip

Dear Parties,
Paragraph 22 of the Fifth Methodology lists the number of irrigated acres in the shapefile for Milner as 13,264 acres, and the number of irrigated acres for Minidoka as 77,176 acres. These numbers are correct. On May 5, 2023, the Department provided the parties, and posted to our publicly available website, a variety information that Jennifer Sukow and Matt Anders may rely on at the June 6-10 hearing. Included in that information were the Milner and Minidoka shape files. It has come to the Department's attention that the Department inadvertently provided Milner and Minidoka's 2022 shapefiles—not the 2023 shapefiles. The Department apologies for the oversight. Attached to this email are the 2023 shapefiles for Milner and Minidoka. The Director anticipates taking official notice of these files at the hearing.

Garrick Baxter | Lead Deputy Attorney General
Idaho Department of Water Resources | Energy and Natural Resources Division
Office of the Attorney General | State of Idaho
208-287-4811 | ag.idaho.gov

NOTICE: This message, including any attachments, is intended only for the individual(s) or entity(ies) named above and may contain information that is confidential, privileged, attorney work product, or otherwise exempt from disclosure under applicable law. If you are not the intended recipient, please reply to the sender that you have received this transmission in error, and then please delete this email.

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Jun 06, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
(208) 232-6109 – fax
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Reply to SWC's Response to IGWA's Amended Notice of Mitigation**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, Henry's Fork Ground Water District, Bonneville-Jefferson Ground Water District, and Bingham Ground Water District, hereby replies to the *Surface Water Coalition's Response to IGWA's Amended Notice of Mitigation* ("*SWC Response*") filed June 5, 2023.

First, the SWC argues that the 2009 Storage Water Mitigation Plan requires IGWA to provide mitigation equal to the entire 75,200 acre-feet Demand Shortfall predicted by the *April 2023 As-Applied Order* as opposed to the 63,645 acre-feet attributable to groundwater diversions by IGWA's patrons. (*SWC Response*, p. 2.) In other words, the SWC contends that for IGWA's patrons to avoid curtailment they must mitigate not only for their own groundwater diversions but also for the groundwater diversions of A&B Irrigation District, Southwest Irrigation District, the Water Mitigation Coalition, the Coalition of Cities, Pocatello, Idaho Falls, and the approximately 900 water rights having no mitigation plan.

The SWC relies on a finding of fact in the *Order Determining Deficiency in IGWA's Notice of Secured Water* ("*Order*") which tells only half the story. Finding of Fact # 4 notes that when

IGWA filed its 2009 Storage Water Mitigation Plan, IGWA proposed to mitigate all material injury of senior users. At that time, IGWA did not have the modelling data needed to distinguish between reach gain impacts of groundwater use by IGWA's patrons versus reach gain impacts of groundwater use by other water users.

The Director's order approving the 2009 Storage Water Mitigation Plan states that "IGWA's obligation for mitigation shall be determined as set forth in the Methodology Order." (*Order Approving Mitigation Plan*, IDWR Docket No. CM-MP-2009-007, p. 10, Nov. 9, 2009.) This ruling is quoted in the *Order*, but ignored by the SWC. This ruling is significant because the Department now has the data needed to distinguish between reach gain impacts from groundwater use by IGWA's patrons versus other water users. Accordingly, the *April 2023 As-Applied Order* specifies IGWA's share of the total predicted Demand Shortfall as 63,645 acre-feet. This is the amount of mitigation for which IGWA is legally responsible, and this is the amount that IGWA will provide to the SWC.

Next, the SWC argues that IGWA has failed to comply with the Settlement Agreement dated September 7, 2022, between IGWA and the SWC. The SWC cites the term of that agreement that requires IGWA to "advise the Coalition of its ability to deliver 30,000 acre-feet of storage by April 1, 2023," and then asserts, disingenuously, that "IGWA has not done so." (*SWC Response*, p. 3.) The truth is, during the spring of 2023, counsel for IGWA spoke with counsel for the SWC on two different occasions about this term of the agreement, advising counsel for the SWC on both occasions that IGWA expects to be able to rent the full 30,000 acre-feet from other spaceholders, but that IGWA is prepared to rent storage from the SWC if needed. On both occasions, counsel for the SWC advised counsel for IGWA that the SWC would prefer that IGWA rent storage from other spaceholders. IGWA has proceeded accordingly.

Lastly, the SWC argues that IGWA has failed to comply with the September 7, 2022, Settlement Agreement by not submitting storage water contracts to the Director as proof of compliance. Yet, the terms of the agreement do not require IGWA to provide storage water contracts to the Director; it requires only that storage water be delivered to the SWC "within 10 days after the Date of Allocation." IGWA will abide by the terms of the agreement.

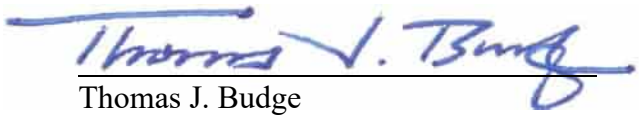
Dated this 6th day of June, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 6th day of June, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Max Bricker Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov

Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
Jun 06, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
Phone: (208) 232-6101
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Petition for Reconsideration of Order Determining Deficiency in IGWA's Notice of Secured Water**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, Henry's Fork Ground Water District, Bonneville-Jefferson Ground Water District, and Bingham Ground Water District, through counsel, submit this petition for reconsideration of the *Order Determining Deficiency in IGWA's Notice of Secured Water* issued May 23, 2023 ("*Order*") in this matter.

First, IGWA respectfully requests that the Director withdraw the new requirement that Water District 1 fees be paid before the Director will accept signed storage water lease or option contracts as proof of IGWA's ability to provide storage water as mitigation. The order approving the 2009 Storage Water Mitigation Plan does not require payment of fees prior to the delivery of storage water to the SWC; it simply requires "proof of rental or an option to rent storage water," evidenced by "fully executed and irrevocable contracts with holders of Snake River storage." (*Order Approving Mitigation Plan*, IDWR Docket No. CM-MP-2009-007, June 3, 2010.) IGWA has traditionally waited until July or August to pay Water District 1 fees on storage water that is provided to the Surface Water Coalition (SWC) as mitigation, without issue. IGWA has never

failed to pay such fees. Moreover, fees cannot be paid on water secured by option contract until the option is exercised, which may not occur until after Steps 6 and 7 of the Methodology Order.

Second, the *Order* questions IGWA's compliance with the 2009 Storage Water Mitigation Plan on the basis that "it is unclear whether IGWA has the authority to submit the ground water districts contracts to the Director for consideration." *Order* at 5). This conjecture is without merit as the districts in question (Bingham Ground Water District and Bonneville-Jefferson Ground Water District) are members of IGWA, regardless of their decision to appear separately in select matters. *IGWA's Notice of Ground Water District Mitigation* states explicitly that it is submitted on behalf of all of IGWA's member ground water districts. If Bingham Ground Water District or Bonneville-Jefferson Ground Water District contested IGWA's authority to provide notice of mitigation on their behalf, they would have said so. They have not.

DATED June 6, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 6th day of June, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr U.S. DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard U.S. BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Max Bricker SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov

Corey Skinner IDWR-SOUTHERN REGION 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-EASTERN REGION 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING MOTION FOR DIRECTOR TO ISSUE SUBPOENAS**

BACKGROUND

On June 1, 2023, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, and Wendell (collectively the "Cities"), the Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Groundwater District ("BJGWD"), and Bingham Groundwater District ("BGWD") (collectively "Groundwater Users"), filed a *Motion for Director to Issue Subpoenas* ("Motion for Subpoenas").

The Groundwater Users' motion requests that the Director issue subpoenas for Mathew Weaver, Deputy Director of the Idaho Department of Water Resources, and Tony Olenichak, Water District 01 Watermaster. *Motion for Subpoenas* at 2. The Groundwater Users further request that the witnesses be put on notice that they may be called at any time between June 6–10. *Motion for Subpoenas* at 3.

ANALYSIS

Rule 523 of the Department's Rules of Procedure grants the presiding officer the discretion to issue subpoenas. IDAPA 37.01.01.523 ("The presiding officer may issue subpoenas upon a party's motion or upon its own initiative."). Idaho Rule of Civil Procedure ("I.R.C.P.") 45(d)(1) advises that the court may quash or modify a subpoena if among things the subpoena is "unreasonable, oppressive, fails to allow time for compliance, requires disclosure of privileged or other protected matter and no exception or waiver applies, or subjects a person to undue burden …."

It does not appear Idaho Appellate Courts have answered what constitutes an unreasonable time for compliance with a subpoena to attend a hearing as contemplated under I.R.C.P. 45(d)(1). "In cases where no Idaho case law is directly on point, federal case law interpreting a similar federal rule can be persuasive." *State v. Fox*, 170 Idaho 846, 859, 517 P.3d 107, 120 (2022) (quoting *State v. Loera*, 167 Idaho 533, 538, 473 P.3d 802, 807 (2020)). Federal Rule of Civil Procedure ("F.R.C.P.") 45(3)(A)(i) advises that the court must quash a subpoena that "fails to allow a reasonable time to comply[.]" F.R.C.P. 45(3)(A)(i) is substantially similar

to I.R.C.P. 45(d)(1). Federal Courts appear to conclude that 14 days is presumptively reasonable, but notice of a week or less has generally been considered unreasonable. *See Angelo, Gordon & Co., L.P. v. MTE Holdings, LLC*, No. 20 MISC. 23, 2020 WL 4700910, at *2 (S.D.N.Y. Aug. 13, 2020) (citations omitted); *see also Jordan v. Comcast Cable Commc'ns Mgmt., LLC*, No. 1:14-CV-3622-WSD, 2016 WL 5899314, at *1 (N.D. Ga. Oct. 11, 2016) ("The Court finds Plaintiff's Counsel's subpoena, served a week before the hearing and before a three-day holiday weekend, fails to allow a reasonable time to comply and would subject Defendants to undue burden[.]"); *Brown v. Hendler*, No. 09 CIV. 4486 RLE, 2011 WL 321139, at *2 (S.D.N.Y. Jan. 31, 2011) ("[T]he Court finds that nine days was not a reasonable time to comply with the subpoena.").

As it pertains to Mr. Olenichak, he is not a party to this action. He lives in Idaho Falls, approximately 280 miles from Boise where the hearing will be held. The Groundwater Users have requested he be available to testify from June 6–10. *Motion for Subpoenas* at 3. It is unreasonable and overly burdensome to request a subpoena requiring Mr. Olenichak to travel—and stay overnight for 5 days—on less than a week's notice. This is especially true given that the hearing was set on April 21, 2023, or approximately 6 weeks ago. The Groundwater Users may request that Mr. Olenichak appear to testify of his own accord, whether remotely or in-person. But the Director will not subpoena Mr. Olenichak under these circumstances.

As it pertains to Mr. Weaver, he is likewise not a party to this action. Moreover, as the Groundwater Users advise, he is currently on a family vacation out of the country and will remain out of the country throughout the duration of the hearing. The Groundwater Users suggest Mr. Weaver could appear remotely as other individuals intend to. This is true, but Mr. Weaver was provided no advanced notice to prepare prior to leaving the country.

The Director has already identified two Department staff to testify at the hearing, Matthew Anders and Jennifer Sukow. During the prehearing conference the Director advised the parties he was limiting staff witnesses to Matthew Anders and Jennifer Sukow, but advised that he would consider enlarging the list if the parties could identify issues "outside of those that Matt Anders or Jennifer Sukow could discuss …." Prehr'g 41:25–41:41. The Groundwater Users request a subpoena so they can question Mr. Weaver concerning "the Department's preparation and issuance of the Fifth Methodology Order and the As-Applied Order ...." *Motion for Subpoenas* at 2. The Ground Water Users have failed to identify issues outside of those that Matthew Anders and Jennifer Sukow could discuss and which are appropriate for Mr. Weaver to testify to. Mr. Weaver cannot speak to what information the Director considered, the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* speaks for itself in that regard.

ORDER

Based on the forgoing discussion, IT IS HEREBY ORDERED that the Groundwater Users' *Motion for Director to Issue Subpoenas* is DENIED.

DATED this 7th day of June 2023.

Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 7th day of June 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

RECEIVED
Jun 08, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
Ph: (208) 232-6101
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Motion to Take Official Notice of Joint Forecast**

Idaho Ground Water Appropriators, Inc. ("IGWA"), on behalf of its members North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, Aberdeen-American Falls Area Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, hereby moves the Director of the Idaho Department of Water Resources pursuant to rule 602 of the rules of procedure of the Department (IDAPA 37.01.01.602) to take official notice of relevant portions of the April Water Supply Outlook Report issued by the United States Department of Agriculture for the 2023 water year issued April 7, 2023 ("April 2023 Joint Forecast").

Rule 602 states: "The presiding officer may take official notice of any facts that could be judicially noticed in the courts of Idaho, of generally recognized technical or scientific data or facts within the agency's specialized knowledge and records of the agency." A fact which could be judicially noticed in the courts of Idaho include "a fact that is not subject to reasonable dispute because it: (1) is generally known within the trial court's territorial jurisdiction; or (2) can be accurately and readily determined from sources whose accuracy cannot reasonably be questioned." Idaho Rule of Evidence 201.

The *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fifth Methodology Order*") issued April 21, 2023, relies upon the annual April Joint Forecast to predict the water supply that will be available to the SWC. Accordingly, the *Final Order Regarding April 2023 Forecast Supply (Steps 1-3)* ("*April 2023 As-Applied Order*") issued April 21, 2023, utilizes the April 2023 Joint Forecast to calculate the Demand Shortfall to the SWC under steps 1-3 of the *Fifth Methodology Order*.

Since the April Joint Forecast is a component of the *Fifth Methodology Order* and is utilized in the *April 2023 As-Applied Order*, IGWA respectfully requests that the Director take official notice of the portion of the April 2023 Joint Forecast attached hereto as ***Appendix A*** which consists of the entire April 2023 Joint Forecast except for the regional forecasts for areas that do not contribute to the SWC water supply (Panhandle Basins, Clearwater River Basin, Salmon River Basin, West Central Basins, Bear River Basin).

Dated this 8th day of June, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of June, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov

Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

APPENDIX A

United States Department of Agriculture

Natural Resources Conservation Service

Idaho Water Supply Outlook Report
April 1, 2023



New record SWE set at the Pebble Creek SNOTEL & Snow Course for April 1 (photo by Cameron Williams, 3/28/2023).

Pebble Creek SNOTEL site was installed in 2021 to expand snow monitoring in the Willow-Blackfoot-Portneuf basin. SNOTEL sites are often installed near existing snow courses so that the new data can be used right away in snow runoff forecasting. Measurements have been made at this snow course for 78 years and a new record was set this month with 87" depth and 29.5" SWE. Although we are excited that drought-stricken areas are finally getting relief, these large amounts of snow could lead to flooding in places if melting occurs too quickly this spring.

Water Supply Outlook Report
Federal - State – Private Cooperative Snow Surveys

For more water supply and resource management information:

Contact: Your local county *Natural Resources Conservation Service Office* Internet Web Address: http://www.id.nrcs.usda.gov/snow/
Natural Resources Conservation Service Snow Surveys
9173 West Barnes Drive, Suite C
Boise, ID 83709-1574, (208) 378-5700 ext. 5

To join a free email subscription list, please contact us by email at: idboise-nrcs-snow@usda.gov

How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when the snow melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to produce runoff forecasts. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertainty is in the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

Starting in 2020, streamflow forecasts with poor prediction skill (jackknife $r^2 < 0.34$) will no longer be issued. This will primarily affect the January and June forecasts, with little change anticipated for the February, March, April, and May forecasts. For more information, please contact Danny Tappa (daniel.tappa@usda.gov)

USDA is an equal opportunity provider and employer. To file a complaint of discrimination, write: USDA, Office of the Assistant Secretary for Civil Rights, Office of Adjudication, 1400 Independence Ave., SW, Washington, DC 20250-9410 or call (866) 632-9992 (Toll-free Customer Service), (800) 877-8339 (Local or Federal relay), (866) 377-8642 (Relay voice users).

April 2023: Idaho Water Supply Summary

Overview

Mother Nature did not get the memo that winter was supposed to come to an end. March was colder than normal across Idaho with well above normal precipitation south of the Clearwater Basin (Fig. 1). Precipitation amounts were so high last month that water supply conversations shifted from, "will we get out of drought?" to concerns about potential flooding. How quickly the snowpack melts this spring will determine the balance of having enough water or too much water. Cold temperatures across the state have delayed the runoff season; these delays are especially apparent in the Southern Snake basins, which typically begin their runoff season in mid-March. With April forecasted to be cool and wet, increases in streamflow may continue to be delayed.

Large gains in the snowpack during March turned the tables for water supply. Streamflow forecasts are well above normal in southern Idaho, and in the Boise, Wood, Lost, Willow-Blackfoot-Portneuf, and Bear River basins. Water supply looks more than adequate across the state given the robust snowpack. Due to low reservoir storage in the Upper Snake River system, water supply could still be limited for some water users despite the improvements in this month's streamflow forecasts.

Weather and drought outlooks

The first part of April is expected to be warmer and potentially drier than normal before returning to cool, wet conditions. In general, April is expected to be cooler and wetter than normal according to the one month outlook from NOAA's Climate Prediction Center (CPC). Looking farther ahead, cool temperatures are favored this spring south of the Clearwater Basin. Northern Idaho may experience drier than normal conditions this spring; future precipitation conditions remain unknown elsewhere in the state. The CPC stated that La Niña conditions ended in March, and predict El Nino-Southern Oscillation (ENSO) neutral conditions this spring and early summer.

Drought status improved across large swaths of Idaho. Drought category improvements occurred where this year's snowpack is well above normal and reflect that northern Idaho is drier than central and southern Idaho. Currently, 31% of Idaho lands are in moderate drought (D1) with a portion of Lemhi County remaining in severe drought (D2); the rest of the state is abnormally dry (DO). After multiple years of drought conditions, it will take time to fully recover. The seasonal drought outlook predicts drought will persist in the Panhandle but will improve across the rest of the state.

Snowpack

It was a very snowy March with records set at many SNOTEL stations and snow courses! The snowpack is near to well above normal across the entire state (Fig. 3). Basins south of the Clearwater have the highest snowpack (SWE) percentages compared to northern Idaho. Although March wasn't quite as wet in northern Idaho, all basins in that area finally reached normal snowpack conditions (94% to 101%). Snowpack ranges from 113% to 226% in the rest of the state as of April 1 (Fig. 3). Compared to median peak snowpack values in each basin, snowpack ranges from 84% to 168% (Fig. 4). Whatever metric you use, we can agree this has been a banner snow year for southern Idaho that will be talked about for years to come.

Cooler than normal temperatures across the state, especially south of the Snake River Plain, preserved the low and mid-elevation snowpack. Usually in March, the snowpack in the Southern Snake basins has begun melting but this year, it has just kept growing. With warmer temperatures on the horizon, we should begin to see some melting occur at lower elevations. One way to track when the snowpack is ready to melt is to watch snow density increase as temperatures warm. As snow density reaches ~45%, it's a good indication the snowmelt runoff season has begun. These 'Snow to Flow' graphs are helpful to see the past timing of snowmelt compared to that year's snowpack, the Northwest River Forecast Center (NWRFC) provide river and flood forecasts, and the USGS site shows real-time streamflow conditions.

Precipitation

In March, northern Idaho was much drier than the rest of the state. Monthly precipitation was 60 to 102% compared to the rest of the state, where precipitation was 134 to 203% of normal (Fig. 1). This pattern of drier conditions in northern Idaho has persisted from fall and through this winter. Total water year precipitation is 75 to 81% of normal in northern Idaho, near normal in the Salmon, West Central, and Upper Snake basins, and well above normal everywhere else (Fig. 2). The southeast portion of the state continued to be the wettest at ~142% of normal total water year precipitation.

Water supply and streamflow forecasts

Water supply conditions have turned around since last month with the very wet, cold March. All basins, apart from Upper Snake River water users, can expect sufficient water supply this irrigation season. This holds true especially if we have normal to above normal spring precipitation. Due to low reservoir carryover, water supply may still be limited for some water users in the Upper Snake River. However, the water supply picture for this important region has vastly improved over this winter.

April 1 streamflow forecast volumes increased significantly from last month (Fig. 5), reflecting the well above normal March precipitation and massive gains in the snowpack. The unusually large amounts of snow still lingering at the low and mid-elevations strongly influenced the rise in snowmelt runoff forecasts. Although soil conditions remain dry and may reduce snowmelt volume, there's enough water headed our way that dry soils likely won't play as big of a role this year as the previous two. The impacts of having large amounts of snow at these lower elevations in late winter will be determined by how quickly warm spring temperatures arrive and whether the nights are also warm. We would like to see a gradual snowmelt progression to avoid flooding.

For the primary forecast period, well above normal streamflow volumes are predicted in the Southern Snake, Boise, Wood, Lost, Willow-Blackfoot-Portneuf, and Bear River basins. Near normal streamflow is forecasted for the Upper Snake, Henrys Fork-Teton, Payette, Weiser, and Salmon basins. Streamflow is forecasted to be below normal in the Clearwater and Panhandle basins. To look at the range of possible streamflow volume outcomes, consult these forecast graphics for your basin of interest. Streamflow, snowpack, and precipitation data for each basin can be accessed here or on the NRCS interactive map here.

Reservoir storage is still below normal across many parts of the state. This makes sense because inflow into reservoirs has been very low this winter. Streamflow for the October 1 to April 1 time period is well below normal. This reflects the multi-year drought, reduced groundwater and dry soil conditions as well as the colder than normal temperatures throughout this winter. However, once the snowpack begins melting, we will quickly see reservoirs begin to fill. In anticipation of all the runoff, flood risk management operations began on the Boise River system on April 3. Reservoir storage in the Boise system is 64% of capacity and the Payette system is at 61% of capacity.

On April 6, reservoir storage in the Upper Snake River system (above Milner Dam) is ~2.22 million acre-feet and is 55% full. The system is unlikely to fill this year although a rainy spring in combination with the above normal snowpack would help bring reservoir levels closer to normal in the upper system (Jackon Lake and Palisades Reservoirs). The NRCS forecast for Snake River at Heise during the April through September period is 110% of normal (4,020 KAF). The forecast increased by 380,000 acre-feet from last month. Downstream, the NWRFC forecast for Snake River at Milner, is 103% of normal (6,371 KAF). Given current storage and streamflow forecasts, available water supply will likely be good but insufficient for all water users in this region. Continuation of wet conditions this spring would help alleviate water supply limitations for Upper Snake water users.

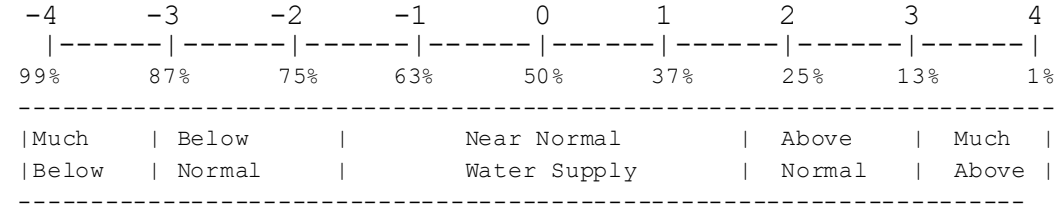
IDAHO SURFACE WATER SUPPLY INDEX (SWSI) April 1, 2023

The Surface Water Supply Index (SWSI) is a predictive indicator of surface water availability within a watershed for the spring and summer water use season. The index is calculated by combining pre-runoff reservoir storage (carryover) with forecasts of spring and summer streamflow. SWSI values are scaled from +4.0 (abundant supply) to -4.0 (extremely dry), with a value of zero indicating a median water supply as compared to historical occurrences. The SWSI analysis period is from 1991 to present.

SWSI values provide a more comprehensive outlook of water availability by combining streamflow forecasts and reservoir storage where appropriate. The SWSI index allows comparison of water availability between basins for drought or flood severity analysis. Threshold SWSI values have been determined for some basins to indicate the potential for agricultural irrigation water shortages.

BASIN or REGION	*SWSI Value*	*Most Recent Year With Similar SWSI Value*	*Agricultural Water Supply Shortage May Occur When SWSI is Less Than*
Spokane	**-0.8**	**2019**	**NA**
Clearwater	**-1.5**	**2016**	**NA**
Salmon	**1.5**	**2012**	**NA**
Weiser	**1.0**	**2012**	**NA**
Payette	**1.0**	**2009**	**NA**
Boise	**2.0**	**2012**	**- 2.4**
Big Wood above Hailey	**2.5**	**1993**	**- 2.7**
Big Wood	**2.8**	**1999**	**0.6**
Camas Creek nr Blaine	**4.0**	**2006**	**NA**
Little Wood	**2.8**	**2019**	**- 1.4**
Big Lost	**2.8**	**2018**	**0.9**
Little Lost	**2.0**	**2018**	**1.6**
Teton	**0.8**	**2014**	**- 3.9**
Henrys Fork	**1.8**	**2008**	**- 2.9**
Snake (Heise)	**-0.7**	**1993**	**- 1.6**
Oakley	**2.0**	**2007**	**-0.1**
Salmon Falls above Jackpot	**4.0**	**2011**	**NA**
Salmon Falls	**2.3**	**1999**	**- 0.6**
Bruneau	**3.3**	**2017**	**NA**
Owyhee	**1.5**	**2005**	**- 2.1**
Bear River	**1.5**	**2021**	**- 3.9**

SWSI SCALE PERCENT C ANCE OF E CEE ANCE AN INTERPRETATION



NA=Not Available / Not Applicable; Note: The Percent Chance of Exceedance is an indicator of how often a range of SWSI values might be expected to occur. Each SWSI unit represents about 12% of the historical occurrences. As an example of interpreting the above scale, the SWSI can be expected to be greater than -3.0, 87% of the time and less than -3.0, 13% of the time. Half the time, the SWSI will be below and half the time above a value of zero. The interval between -1.5 and +1.5 described as "Near Normal Water Supply," represents three SWSI units and would be expected to occur about one-third (36%) of the time.

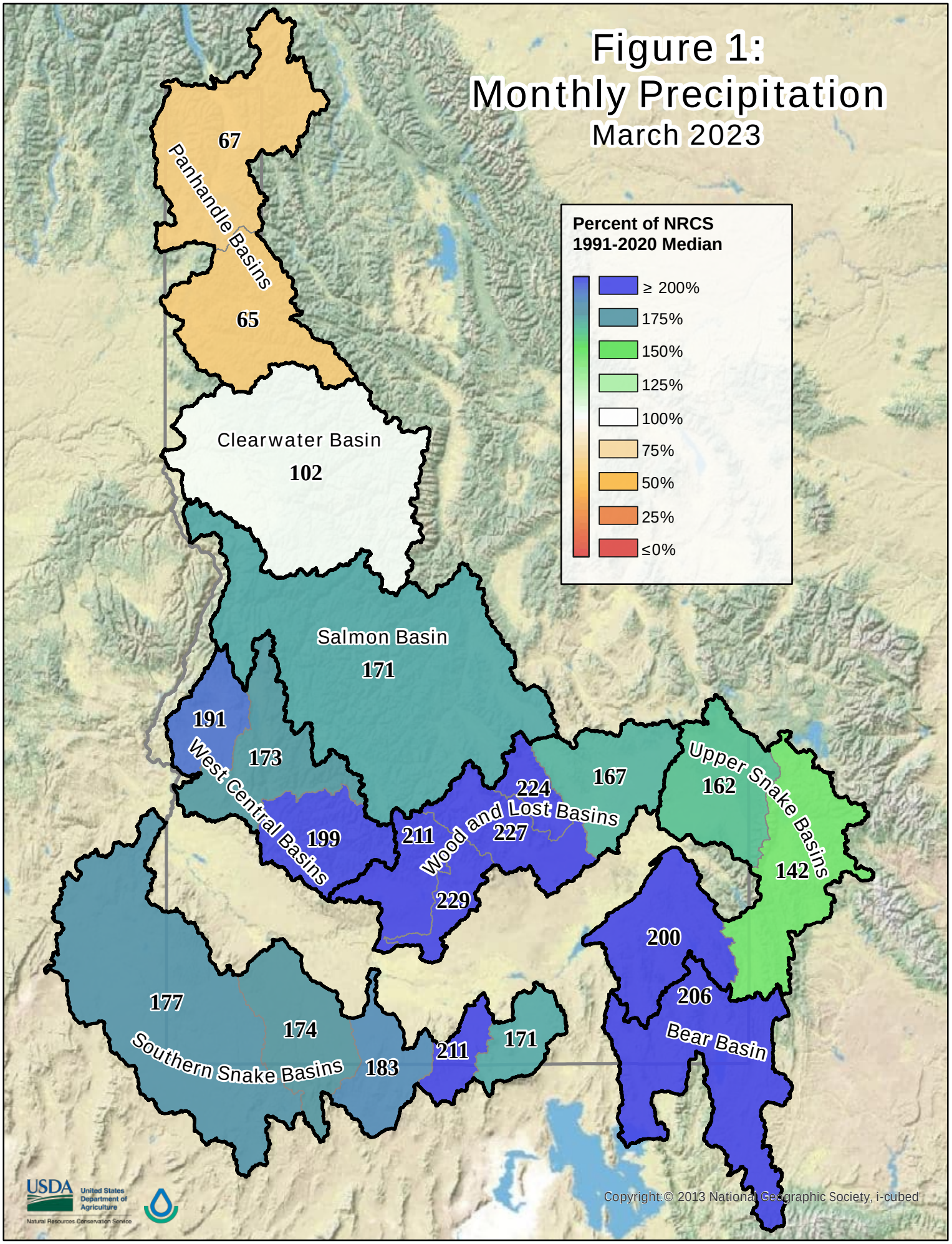


Figure 1:
Monthly Precipitation
March 2023
Percent of NRCS
1991-2020 Median
≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤0%
67
Panhandle Basins
65
Clearwater Basin
102
Salmon Basin
171
191
173
West Central Basins
199
211
Wood and Lost Basins
224
227
229
167
Upper Snake Basins
162
142
200
206
Bear Basin
177
174
Southern Snake Basins
183
211
171
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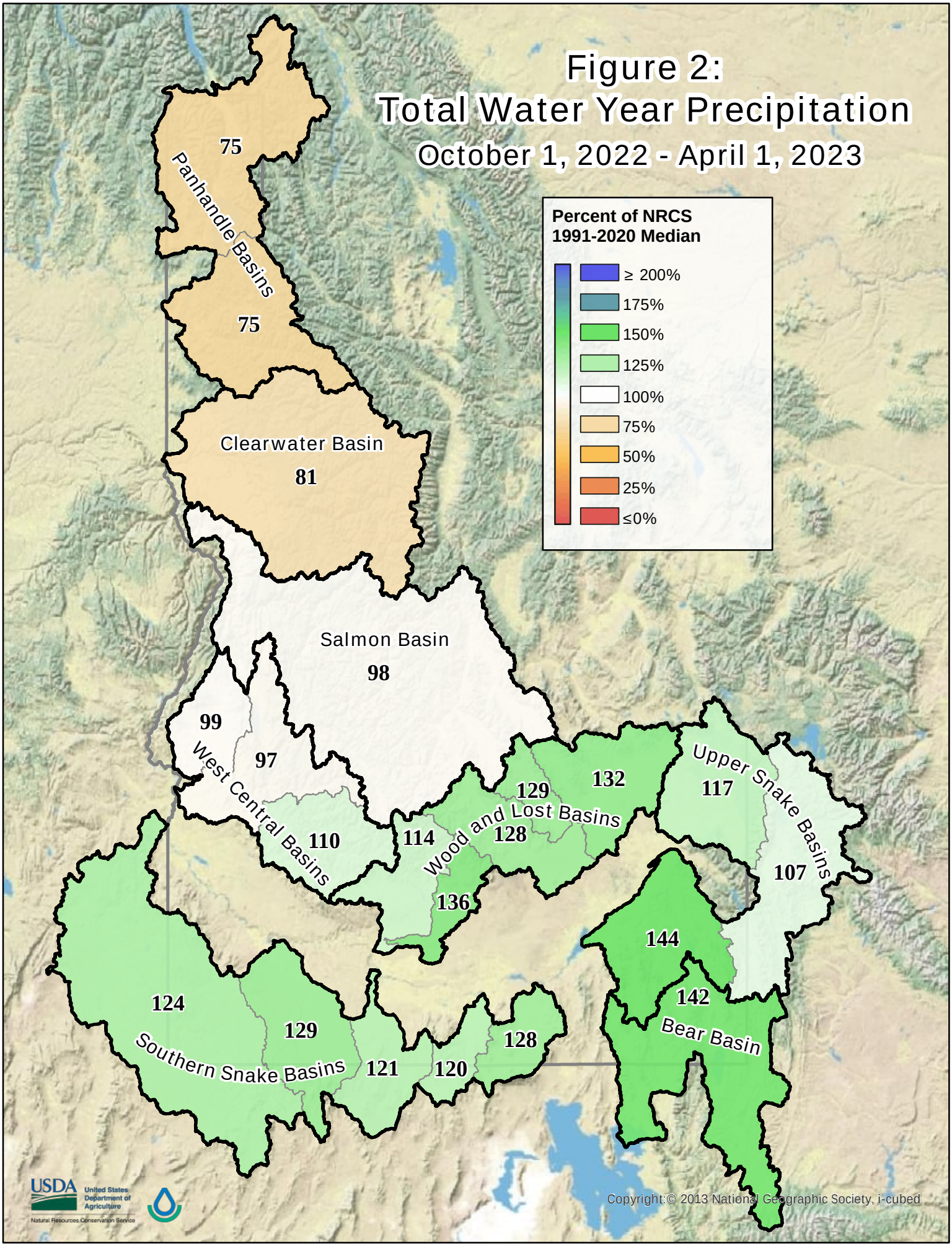
Figure 2:
Total Water Year Precipitation
October 1, 2022 - April 1, 2023
Percent of NRCS
1991-2020 Median
≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤0%
75
Panhandle Basins
75
Clearwater Basin
81
Salmon Basin
98
99
97
West Central Basins
110
114
129
128
132
Wood and Lost Basins
136
Upper Snake Basins
117
107
144
142
Bear Basin
124
129
Southern Snake Basins
121
120
128
USDA United States Department of Agriculture
Natural Resources Conservation Service
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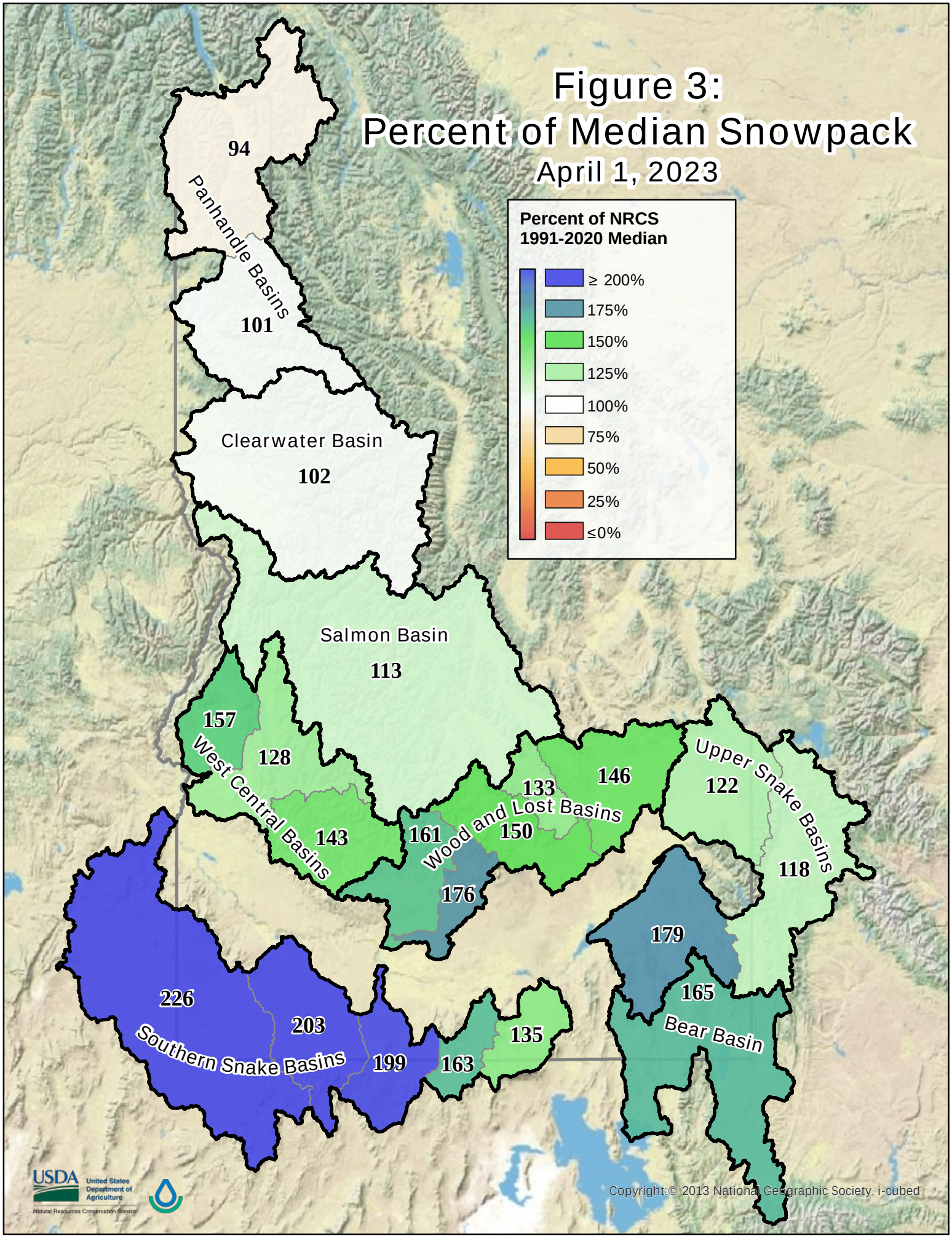
Figure 3:
Percent of Median Snowpack
April 1, 2023
Percent of NRCS
1991-2020 Median
≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤0%
94
Panhandle Basins
101
Clearwater Basin
102
Salmon Basin
113
157
West Central Basins
128
143
161
Wood and Lost Basins
150
133
146
Upper Snake Basins
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Bear Basin
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Southern Snake Basins
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199
163
135
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Natural Resources Conservation Service
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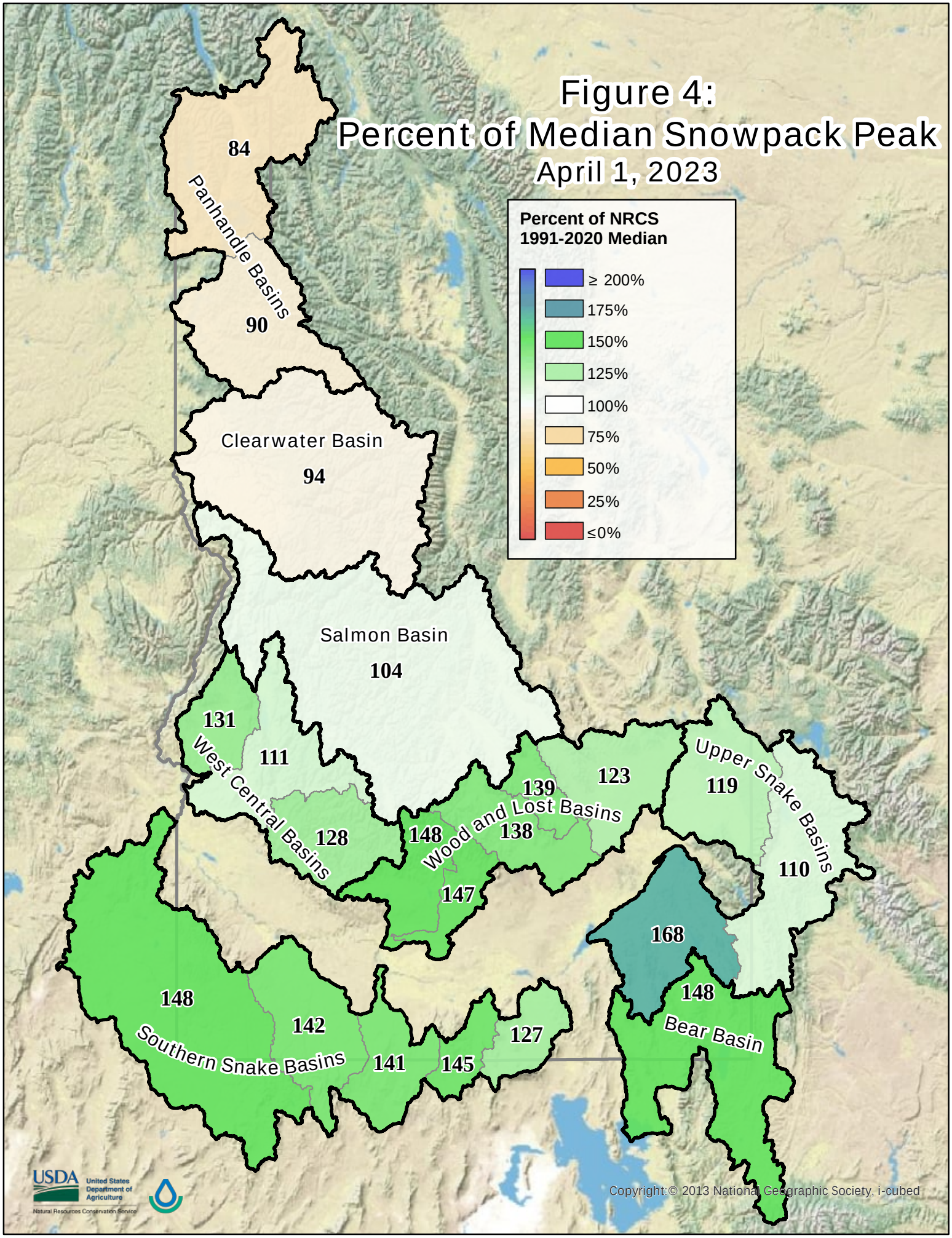
Figure 4:
Percent of Median Snowpack Peak
April 1, 2023
Percent of NRCS
1991-2020 Median
≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤0%
84
Panhandle Basins
90
Clearwater Basin
94
Salmon Basin
104
131
West Central Basins
111
128
148
Wood and Lost Basins
139
138
147
123
Upper Snake Basins
119
110
168
148
Bear Basin
148
Southern Snake Basins
142
141
145
127
USDA
United States Department of Agriculture
Natural Resources Conservation Service
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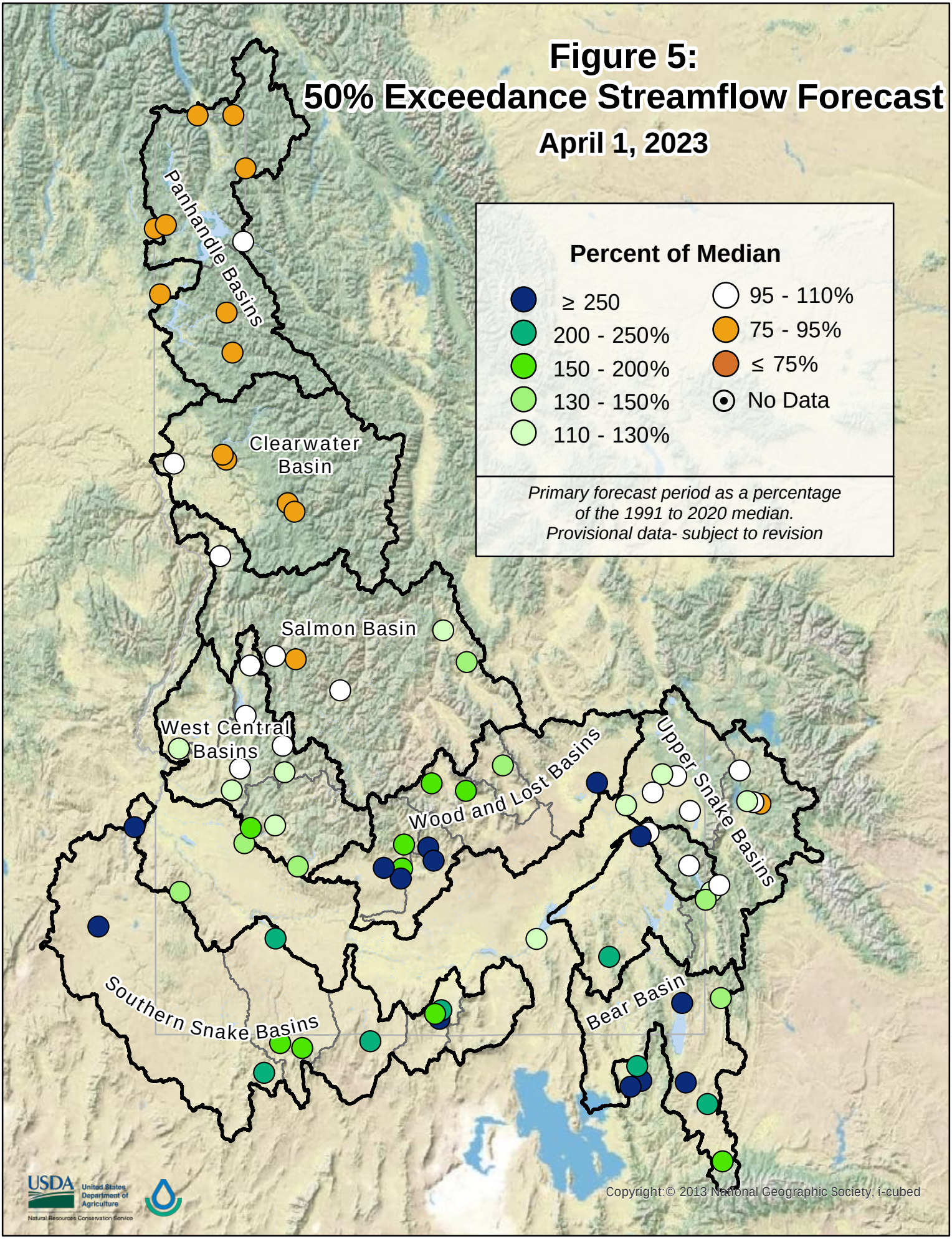
Figure 5:
50% Exceedance Streamflow Forecast
April 1, 2023
Percent of Median
≥ 250
200 - 250%
150 - 200%
130 - 150%
110 - 130%
95 - 110%
75 - 95%
≤ 75%
No Data
Primary forecast period as a percentage of the 1991 to 2020 median.
Provisional data- subject to revision
Panhandle Basins
Clearwater Basin
Salmon Basin
West Central Basins
Wood and Lost Basins
Upper Snake Basins
Southern Snake Basins
Bear Basin
USDA United States Department of Agriculture
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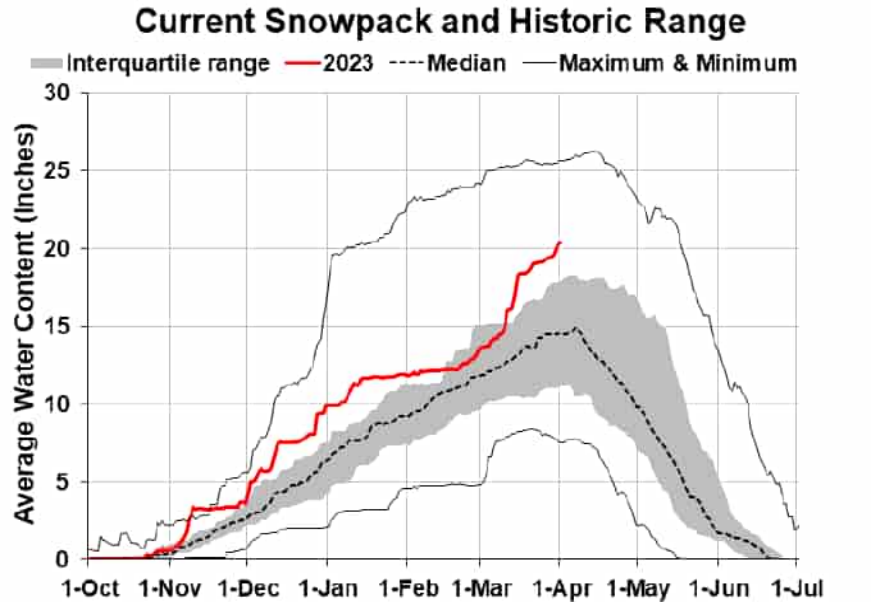
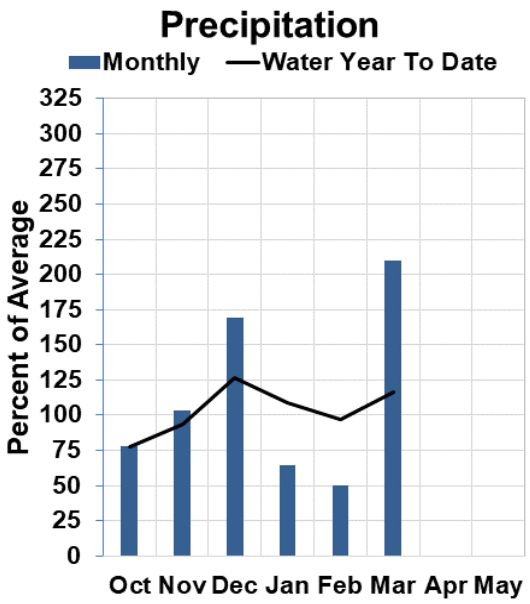
Wood & Lost River Basins

April 1, 2023





WATER SUPPLY OUTLOOK

Monthly precipitation totals for March were well above normal across the Wood & Lost River basins. The Big & Little Wood, as well as the Big & Little Lost basins received ~210 to 230% of normal monthly precipitation, while the Birch-Medicine Lodge basins received 167% of normal (Fig. 1). Water year total precipitation is impressive across the area, and now ranges from ~115 to 135% of normal (Fig. 2). Basin snowpack is spectacular, with all basins between ~135 to 175% of normal for April 1 (Fig. 3). Current snowpack levels greatly exceed the normal seasonal peak snowpack (Big Wood, Little Wood, Big Lost, Little Lost, Camas Creek), and are the highest totals observed since 2017. Snowpack density remains low for this time of year, which is a strong indicator widespread melt and runoff will be delayed this spring.

April 1 reservoir storage is below the 30-year normal for Magic Reservoir (37%) and Mackay Reservoir (86%), while releases are being made from Little Wood Reservoir (51% of normal, 38% full) to make room for significant inflow there. Streamflow forecasts for the Wood and Lost basins are now significantly above normal and range from ~145 to 280% of normal. The median forecast for Camas Creek near Blaine is now 220 KAF (489% of normal!), which is more than enough to fill Magic Reservoir by itself. While the above normal snowpack brings much needed drought relief, it simultaneously carries the potential for spring flooding. If needed, NOAA's Northwest River Forecast Center provides a variety of products related to flood forecasting and awareness.

Wood and Lost Basins Streamflow Forecasts - April 1, 2023

Forecast Point	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment <--Drier----------Projected Volume----------Wetter--> 90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Med (KAF)
Camas Ck at Camas	APR-JUL	42	54	64	370%	74	90	17.3
Little Lost R bl Wet Ck nr Howe	APR-JUL	28	32	36	144%	39	44	25
	APR-SEP	33	39	43	148%	47	54	29
Big Lost R at Howell Ranch	APR-JUL	183	210	225	155%	245	270	145
	APR-SEP	205	230	250	157%	270	300	159
Big Lost R bl Mackay Reservoir	APR-JUL	139	163	179	172%	195	220	104
	APR-SEP	165	191	210	165%	225	255	127
Little Wood R ab High Five Ck	APR-JUL	104	120	131	252%	143	161	52
	APR-SEP	111	128	140	250%	152	172	56
Little Wood R nr Carey 2	APR-JUL	114	131	143	265%	156	176	54
	APR-SEP	121	139	152	262%	166	188	58
Big Wood R at Hailey	APR-JUL	255	295	320	152%	345	385	210
	APR-SEP	285	325	355	154%	385	425	230
Big Wood R ab Magic Reservoir	APR-JUL	157	215	255	183%	305	380	139
	APR-SEP	169	225	270	185%	320	400	146
Camas Ck nr Blaine	APR-JUL	165	198	220	489%	245	285	45
	APR-SEP	165	198	220	478%	250	290	46
Big Wood R bl Magic Dam 2	APR-JUL	330	415	480	279%	550	655	172
	APR-SEP	350	435	500	275%	565	675	182

Normals based on 1991-2020 reference period: streamflow, snowpack, precipitation, & reservoir normals are medians.

1) 90% and 10% exceedance probabilities are actually 95% and 5%

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Reservoir Storage (KAF): End of March

Reservoir Name	Current (KAF)	Last YR	Median (KAF)	Capacity (KAF)
Mackay Reservoir	28.4	24.4	32.8	44.4
Little Wood Reservoir	11.4	19.5	22.1	30.0
Magic Reservoir	30.5	31.4	81.4	191.5

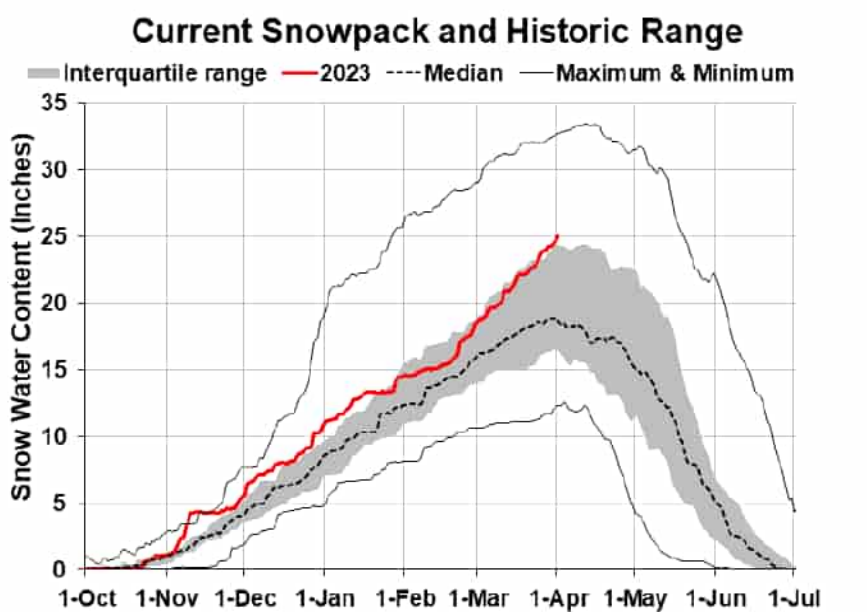
Watershed Snowpack Analysis: April 1, 2023

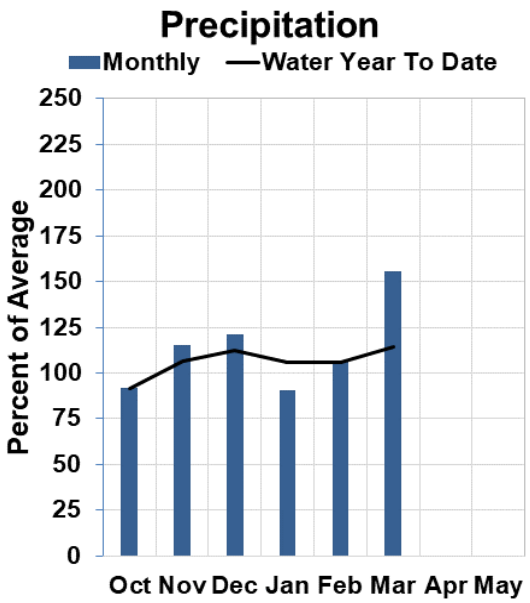
Basin Name	# of Sites	% of Median 2023	2022
Camas-Beaver Creeks	4	154%	44%
Birch-Medicine Lodge Creeks	6	141%	74%
Little Lost River	5	133%	76%
Big Lost River ab Mackay	5	142%	75%
Big Lost Basin Total	7	150%	75%
Fish Creek	3	208%	80%
Little Wood ab Resv	5	162%	68%
Big Wood River ab Hailey	8	147%	71%
Camas Creek	4	202%	35%
Birch-Medicine Lodge-Camas-Beaver Total	10	146%	61%
Little Wood Basin Total	8	176%	72%
Big Wood Basin Total	12	162%	61%



Upper Snake River Basins

April 1, 2023





WATER SUPPLY OUTLOOK

Precipitation fell consistently throughout March as storm after storm hit the region. Monthly precipitation was well above normal for all Upper Snake basins (Fig. 1). Only Buffalo Fork, one of the easternmost sub-basins, received below normal March precipitation. Water year total precipitation in the Upper Snake basins as of April 1 are well above normal; Henrys Fork-Teton is 117%, Snake River above Heise is 107%, and the Willow-Blackfoot-Portneuf is 144% of normal (Fig.2). Snowpack is well above normal in the Upper Snake River with basins ranging from 118 to 179% (Fig.3). NOAA's Official 30-Day Outlook predicts below normal temperatures to continue with no clear precipitation signal.

Storage is 87% of normal for the Upper Snake system. The Jackson Lake and Palisades reservoirs are 57% of normal (36% of capacity), and Henrys Fork-Teton reservoirs are 103% of normal (89% of capacity). With the roughly one million acre-feet deficit that began the winter, we will need well above normal streamflow to return to normal storage. Median streamflow forecasts for the region range from ~93 to 141% for the April to July runoff period. While the above normal snowpack brings much needed drought relief, it simultaneously carries the potential for spring flooding. If needed, NOAA's Northwest River Forecast Center provides a variety of products related to flood forecasting and awareness.

Upper Snake River Basin Streamflow Forecasts - April 1, 2023

Forecast Point	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment <--Drier----------Projected Volume----------Wetter--> 90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Med (KAF)
Henrys Fk nr Ashton 2	APR-JUL	440	490	525	111%	560	610	475
	APR-SEP	585	640	680	108%	720	780	630
Falls R nr Ashton 2	APR-JUL	355	390	415	105%	440	475	395
	APR-SEP	430	475	505	106%	530	575	475
Teton R nr Driggs	APR-JUL	116	141	158	108%	175	199	146
	APR-SEP	151	182	205	115%	225	255	178
Teton R nr St Anthony	APR-JUL	285	340	370	104%	405	455	355
	APR-SEP	355	415	460	108%	500	560	425
Henrys Fk nr Rexburg 2	APR-JUL	1120	1270	1370	113%	1470	1610	1210
	APR-SEP	1420	1610	1730	109%	1860	2040	1580
Snake R at Flagg Ranch	APR-JUL	415	465	505	109%	540	590	465
	APR-SEP	450	510	550	109%	590	645	505
Snake R nr Moran 2	APR-JUL	735	810	865	118%	915	995	730
	APR-SEP	805	890	950	117%	1010	1100	810
Pacific Ck at Moran	APR-JUL	100	129	149	97%	169	197	154
	APR-SEP	107	137	157	98%	178	210	160
Buffalo Fk ab Lava Ck nr Moran	APR-JUL	210	240	265	93%	285	320	285
	APR-SEP	235	270	300	97%	325	360	310
Snake R ab Reservoir nr Alpine 2	APR-JUL	1820	2020	2150	100%	2280	2480	2140
	APR-SEP	2080	2300	2460	101%	2610	2840	2430
Greys R ab Reservoir nr Alpine	APR-JUL	300	335	360	114%	385	420	315
	APR-SEP	350	390	420	115%	445	490	365
Salt R ab Reservoir nr Etna	APR-JUL	345	395	430	141%	465	515	305
	APR-SEP	430	490	530	139%	570	630	380
Snake R nr Irwin 2	APR-JUL	2690	3000	3210	110%	3410	3720	2930
	APR-SEP	3130	3490	3740	109%	3990	4360	3420
Snake R nr Heise 2	APR-JUL	2900	3210	3430	110%	3640	3960	3130
	APR-SEP	3390	3770	4020	110%	4280	4650	3660
Willow Ck nr Ririe 2	APR-JUL	86	109	127	318%	145	174	40
Portneuf R at Topaz	APR-JUL	98	111	120	240%	129	144	50
	APR-SEP	119	133	144	222%	154	171	65
Snake R at Neeley 2	APR-JUL	1610	2260	2760	115%	3320	4230	2390
	APR-SEP	1770	2440	2890	122%	3340	4010	2360

Normals based on 1991-2020 reference period: streamflow, snowpack, precipitation, & reservoir normals are medians.

1) 90% and 10% exceedance probabilities are actually 95% and 5%

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Reservoir Storage (KAF): End of March

Reservoir Name	Current (KAF)	Last YR	Median (KAF)	Capacity (KAF)
Jackson Lake	199.6	180.4	627.0	847.0
Palisades Reservoir	618.6	627.9	803.3	1400.0
Sub-Basin Total	**818.2**	**808.3**	**1430.3**	**2247.0**
Henrys Lake	83.9	82.5	85.0	90.4
Island Park Reservoir	117.4	122.0	109.3	135.2
Grassy Lake	12.0	10.8	13.2	15.2
Sub-Basin Total	**213.4**	**215.3**	**207.5**	**240.8**
Ririe Reservoir	49.1	49.7	48.7	80.5
Blackfoot Reservoir		203.5	198.6	337.0
American Falls Reservoir	1293.8	1346.3	1498.0	1672.6
Basin-Wide Total	**2374.5**	**2623.0**	**3383.1**	**4577.9**

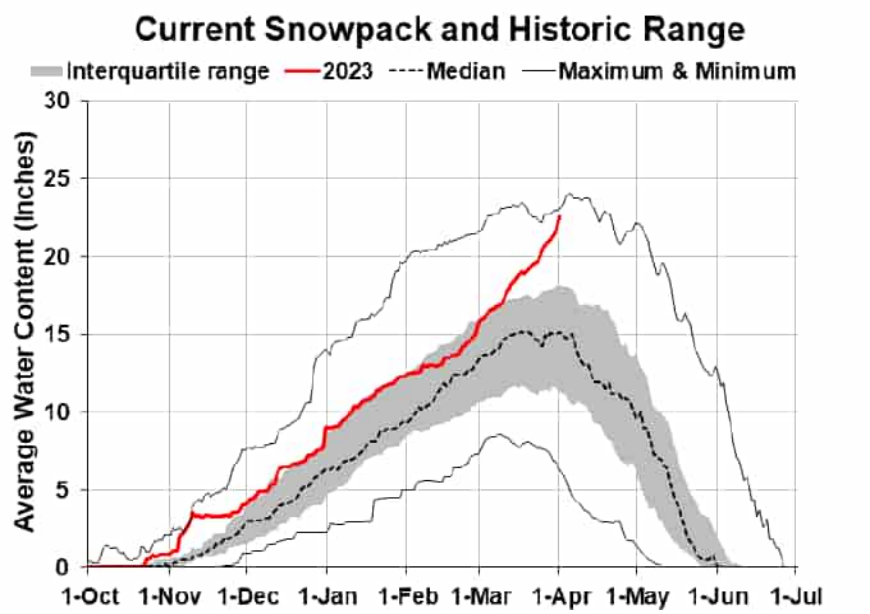
Watershed Snowpack Analysis: April 1, 2023

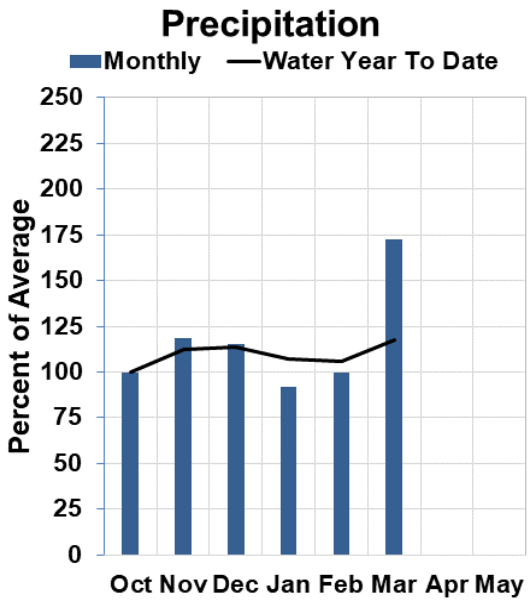
Basin Name	# of Sites	% of Median 2023	2022
Henrys Fork-Falls River	13	122%	66%
Teton River	9	119%	67%
Henrys Fork-Teton	20	122%	67%
Snake River ab Jackson Lake	12	116%	69%
Pacific Creek	3	111%	76%
Buffalo Fork	5	100%	75%
Gros Ventre River	5	101%	79%
Hoback River	5	116%	68%
Greys River	5	114%	71%
Salt River	6	136%	71%
Snake ab Palisades Resv	34	115%	70%
Willow Creek	5	114%	71%
Blackfoot River	6	170%	79%
Portneuf River	7	193%	54%
Willow-Blackfoot-Portneuf	17	179%	66%



Southern Snake River Basins

April 1, 2023





WATER SUPPLY OUTLOOK

March continued this winter's trend of above normal precipitation across the Southern Snake River basins. Monthly precipitation ranged between ~171 to 211%. Water year total precipitation continued to increase and is ~120 to 129% of normal across these basins. The snowpack is currently well above normal and ranges between ~135 to 226% of normal! Most SNOTEL sites in these basins surpassed the peak annual snowpack with little to no melting taking place yet. The deviation from normal is especially noticeable in the lower elevation areas that typically do not hold onto much snow this late into the season. The current snowpack is below normal density across the region. Less dense snow typically requires more energy input to produce snowmelt runoff, which suggests temperatures need to increase substantially before major runoff begins. However, with spring on our doorstep and the large amount of low-level snow we could see high runoff volumes soon. Comparable water years for each basin are: Owyhee 1982, Bruneau 1983, Salmon Falls 1983, Goose Creek 1983, and Raft 2011 & 2017.

Reservoir storage is below normal across the area, and current storage as a percent of normal is Oakley 71%, Wild Horse 91%, Lake Owyhee 50%, and Salmon Falls 53%. The current volumetric streamflow forecasts are well above normal for the 50% exceedance probability in each basin, they are: Owyhee 280%, Bruneau 195%, Salmon Falls 245%, and Goose Creek 237%. Water supply now looks sufficient in all of these basins.

Southside Snake River Basins Streamflow Forecasts - April 1, 2023

Forecast Point	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment <--Drier----------Projected Volume----------Wetter--> 90% (KAF)	70% (KAF)	50% (KAF)	% Median	30% (KAF)	10% (KAF)	30yr Med (KAF)
Goose Ck ab Trapper Ck nr Oakley	APR-JUL	25	31	36	269%	41	49	13.4
	APR-SEP	26	33	38	271%	43	51	14
Trapper Ck nr Oakley	APR-JUL	5.7	6.4	6.9	168%	7.4	8.2	4.1
	APR-SEP	6.8	7.5	8.1	159%	8.7	9.5	5.1
Oakley Reservoir Inflow	APR-JUL	28	35	40	229%	45	53	17.5
	APR-SEP	31	37	43	225%	48	56	19.1
Salmon Falls Ck nr San Jacinto	APR-JUL	100	121	137	245%	153	178	56
	APR-SEP	104	125	140	241%	157	182	58
Bruneau R nr Hot Spring	APR-JUL	235	285	320	204%	360	420	157
	APR-SEP	245	295	335	206%	375	435	163
Reynolds Ck at Tollgate	APR-JUL	6.3	8	9.3	145%	10.7	12.8	6.4
	APR-SEP	6.4	8.1	9.4	147%	10.8	13	6.4
Owyhee R nr Gold Ck 2	APR-JUL	22	31	37	215%	44	56	17.2
Owyhee R nr Rome	APR-JUL	385	510	605	295%	705	870	205
	APR-SEP	405	530	625	284%	730	895	220
Owyhee R bl Owyhee Dam 2	APR-JUL	425	545	640	272%	735	895	235
	APR-SEP	455	580	670	253%	770	925	265

Normals based on 1991-2020 reference period: streamflow, snowpack, precipitation, & reservoir normals are medians.

1) 90% and 10% exceedance probabilities are actually 95% and 5%

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Reservoir Storage (KAF): End of March

Reservoir Name	Current (KAF)	Last YR	Median (KAF)	Capacity (KAF)
Oakley Reservoir		19.4	26.6	75.6
Salmon Falls Reservoir	23.6	24.4	44.7	182.6
Wild Horse Reservoir	30.4	38.3	33.3	71.5
Lake Owyhee	229.5	286.4	460.0	715.0
Brownlee Reservoir	883.1	1079.0	1123.0	1420.0

Watershed Snowpack Analysis: April 1, 2023

Basin Name	# of Sites	% of Median 2023	2022
Raft River	2	135%	84%
Goose-Trapper Creeks	3	163%	77%
Salmon Falls Creek	7	199%	77%
Bruneau River	9	203%	62%
Reynolds Creek	7	132%	57%
Upper Owyhee	13	244%	41%
Owyhee Basin Total	20	226%	50%

Streamflow Adjustment List for All Forecasts Published in Idaho Water Supply Outlook Report: Streamflow forecasts are projections of runoff volumes that would occur without influences from upstream reservoirs or diversions. These values are referred to as natural, unregulated or adjusted flows. To make these adjustments, changes in reservoir storage, diversions, and inter-basin transfers are added or subtracted from the observed (actual) streamflow volumes. The following list documents the adjustments made for each forecast point. **(Revised Dec. 2018).**

Panhandle Region

Kootenai R at Leonia, MT (2)
+ Lake Koocanusa storage change
Moyie R at Eastport – no corrections
Boundary Ck nr Porthill – no corrections
Clark Fork R bl Cabinet Gorge (2)
+ Hungry Horse storage change
+ Flathead Lake storage change
+ Noxon Res storage change
Whitehorse Rapid gage used create longer term record
Pend Oreille Lake Inflow (2)
+ Pend Oreille R at Newport, WA
+ Hungry Horse Res storage change
+ Flathead Lake storage change
+ Noxon Res storage change
+ Lake Pend Oreille storage change
+ Priest Lake storage change
Priest R nr Priest R (2)
+ Priest Lake storage change
NF Coeur d' Alene R at Enaville - no corrections
St. Joe R at Calder- no corrections
Spokane R nr Post Falls (2)
+ Lake Coeur d' Alene storage change
Spokane R at Long Lake, WA (2)
+ Lake Coeur d' Alene storage change
+ Long Lake, WA storage change

Clearwater River Basin

Selway R nr Lowell - no corrections
Lochsa R nr Lowell - no corrections
Dworshak Res Inflow (2)
+ Clearwater R nr Peck
- Clearwater R at Orofino
+ Dworshak Res storage change
Clearwater R at Orofino - no corrections
Clearwater R at Spalding (2)
+ Dworshak Res storage change

Salmon River Basin

Salmon R at Salmon - no corrections
Lemhi R nr Lemhi – no corrections
MF Salmon R at MF Lodge – no corrections
SF Salmon gage used to create longer term record
SF Salmon R nr Krassel Ranger Station – no corrections
Johnson Creek at Yellow pine – no corrections
Salmon R at White Bird - no corrections

West Central Basins

Boise R nr Twin Springs - no corrections
SF Boise R at Anderson Ranch Dam (2)
+ Anderson Ranch Res storage change
Mores Ck nr Arrowrock Dam – no corrections
Boise R nr Boise (2)
+ Anderson Ranch Res storage change
+ Arrowrock Res storage change
+ Lucky Peak Res storage change
SF Payette R at Lowman - no corrections
Deadwood Res Inflow (2)
+ Deadwood R bl Deadwood Res nr Lowman
+ Deadwood Res storage change
Lake Fork Payette R nr McCall – no corrections
NF Payette R at Cascade (2)
+ Payette Lake storage change
+ Cascade Res storage change
NF Payette R nr Banks (2)
+ Payette Lake storage change
+ Cascade Res storage change
Payette R nr Horseshoe Bend (2)
+ Deadwood Res storage change
+ Payette Lake storage change
+ Cascade Res storage change
Weiser R nr Weiser - no corrections

Wood and Lost Basins

Little Lost R bl Wet Ck nr Howe - no corrections
Big Lost R at Howell Ranch - no corrections
Big Lost R bl Mackay Res nr Mackay (2)
+ Mackay Res storage change
Little Wood R ab High Five Ck – no corrections
Little Wood R nr Carey (2)
+ Little Wood Res storage change
Big Wood R at Hailey - no corrections
Big Wood R ab Magic Res (2)
+ Big Wood R nr Bellevue (1912-1996)
+ Big Wood R at Stanton Crossing nr Bellevue (1997 to present)
+ Willow Ck (1997 to present)
Camas Ck nr Blaine – no corrections
Magic Res Inflow (2)
+ Big Wood R bl Magic Dam
+ Magic Res storage change

Upper Snake River Basin

Falls R nr Ashton (2)
+ Grassy Lake storage change
+ Diversions from Falls R ab nr Ashton
Henrys Fork nr Ashton (2)
+ Henrys Lake storage change
+ Island Park Res storage change
Teton R nr Driggs - no corrections
Teton R nr St. Anthony (2)
- Cross Cut Canal into Teton R
+ Sum of Diversions for Teton R ab St. Anthony
+ Teton Dam for water year 1976 only

Henrys Fork nr Rexburg (2)
+ Henrys Lake storage change
+ Island Park Res storage change
+ Grassy Lake storage change
+ 3 Diversions from Falls R ab Ashton-Chester
+ 6 Diversions from Falls R abv Ashton
+ 7 Diversions from Henrys Fk btw Ashton to St. Anthony
+ 21 Diversions from Henrys Fk btw St. Anthony to Rexburg
Snake R nr Flagg Ranch, WY – no corrections
Snake R nr Moran, WY (2)
+ Jackson Lake storage change
Pacific Ck at Moran, WY - no corrections
Buffalo Fork ab Lava nr Moran, WY - no corrections
Snake R ab Res nr Alpine, WY (2)
+ Jackson Lake storage change
Greys R nr Alpine, WY - no corrections
Salt R nr Etna, WY - no corrections
Palisades Res Inflow (2)
+ Snake R nr Irwin
+ Jackson Lake storage change
+ Palisades Res storage change
Snake R nr Heise (2)
+ Jackson Lake storage change
+ Palisades Res storage change
Ririe Res Inflow (2)
+ Willow Ck nr Ririe
+ Ririe Res storage change
The forecasted natural volume for Willow Creek nr Ririe does not include Grays Lake water diverted from Willow Creek drainage through the Clarks Cut diversion and into Blackfoot Reservoir.
Blackfoot R ab Res nr Henry (2)
+ Blackfoot Res storage change
The forecasted Blackfoot Reservoir Inflow includes Grays Lake water diverted from the Willow Creek drainage through the Clarks Cut diversion and into Blackfoot Reservoir.
Portneuf R at Topaz - no corrections
American Falls Res Inflow (2)
+ Snake R at Neeley
+ Jackson Lake storage change
+ Palisades Res storage change
+ American Falls storage change
+ Teton Dam for water year 1976 only

Southside Snake River Basins

Goose Ck nr Oakley - no adjustments
Trapper Ck nr Oakley - no adjustments
Oakley Res Inflow - *flow does not include Birch Creek*
+ Goose Ck
+ Trapper Ck
Salmon Falls Ck nr San Jacinto, NV - no corrections
Bruneau R nr Hot Springs - no corrections
Reynolds Ck at Tollgate - no corrections
Owyhee R nr Gold Ck, NV (2)
+ Wildhorse Res storage change
Owyhee R nr Rome, OR – no Corrections
Owyhee Res Inflow (2)
+ Owyhee R bl Owyhee Dam, OR
+ Lake Owyhee storage change
+ Diversions to North and South Canals

Bear River Basin

Bear R nr UT-WY Stateline, UT- no corrections
Bear R abv Res nr Woodruff, UT- no corrections
Big Ck nr Randolph, UT - no corrections
Smiths Fork nr Border, WY - no corrections
Bear R bl Stewart Dam (2)
+ Bear R bl Stewart Dam
+ Rainbow Inlet Canal
Little Bear R at Paradise, UT - no corrections
Logan R nr Logan, UT - no corrections
Blacksmith Fk nr Hyrum, UT - no corrections

Reservoir Capacity Definitions (Units in 1,000 Acre-Feet, KAF)

Different agencies use various definitions when reporting reservoir capacity and contents. Reservoir storage terms include dead, inactive, active, and surcharge storage. This table lists the volumes for each reservoir, and defines the storage volumes NRCS uses when reporting capacity and current reservoir storage. In most cases, NRCS reports usable storage which includes active and/or inactive storage. **(Revised Feb. 2015)**

Basin- Lake or Reservoir	Dead Storage	Inactive Storage	Active Storage	Surcharge Storage	NRCS Capacity	NRCS Capacity Includes
Panhandle Region						
Hungry Horse	39.73	---	**3451.00**	---	**3451.0**	Active
Flathead Lake	Unknown	---	**1791.00**	---	**1791.0**	Active
Noxon	Unknown	---	**335.00**	---	**335.0**	Active
Lake Pend Oreille	**406.20**	**112.40**	**1042.70**	**---**	**1561.3**	Dead + Inactive + Active
Lake Coeur d'Alene	Unknown	13.50	**225.00**	**---**	**238.5**	Inactive + Active
Priest Lake	**20.00**	**28.00**	**71.30**	**---**	**119.3**	Dead + Inactive + Active
Clearwater Basin						
Dworshak	Unknown	**1452.00**	**2016.00**	**---**	**3468.0**	Inactive + Active
West Central Basins						
Anderson Ranch	24.90	**37.00**	**413.10**	---	450.1	Inactive + Active
Arrowrock	Unknown	---	**272.20**	**---**	**272.2**	Active
Lucky Peak	Unknown	**28.80**	**264.40**	13.80	**293.2**	Inactive + Active
Lake Lowell	7.90	**5.80**	**159.40**	---	165.2	Inactive + Active
Deadwood	Unknown	---	**161.90**	**---**	**161.9**	Active
Cascade	Unknown	**46.70**	**646.50**	**---**	**693.2**	Inactive + Active
Mann Creek	1.61	0.24	**11.10**	**---**	**11.1**	Active
Wood and Lost Basins						
Mackay	0.13	---	**44.37**	**---**	**44.4**	Active
Little Wood	Unknown	---	**30.00**	**---**	**30.0**	Active
Magic	Unknown	---	**191.50**	**---**	**191.5**	Active
Upper Snake Basin						
Jackson Lake	Unknown	---	**847.00**	**---**	**847.0**	Active
Palisades	44.10	**155.50**	**1200.00**	**---**	**1400.0**	Dead +Inactive +Active
Henrys Lake	Unknown	---	**90.40**	**---**	**90.4**	Active
Island Park	0.40	---	**127.30**	**7.90**	**135.2**	Active + Surcharge
Grassy Lake	Unknown	---	**15.18**	**---**	**15.2**	Active
Ririe	4.00	6.00	**80.54**	10.00	**80.5**	Active
Blackfoot	0.00	---	**333.50**	3.50	**333.50**	Active (rev. 2/1/2015)
American Falls	Unknown	---	**1672.60**	**---**	**1672.6**	Active
Southside Snake Basins						
Oakley	0.00	---	**75.60**	**---**	**75.6**	Active
Salmon Falls	48.00	**5.00**	**182.65**	**---**	**182.6**	Active
Wild Horse	Unknown	---	**71.50**	**---**	**71.5**	Active
Lake Owyhee	406.83	---	**715.00**	**---**	**715.0**	Active
Brownlee	0.45	**444.70**	**975.30**	**---**	**1420.0**	Inactive + Active
Bear River Basin						
Bear Lake	5000.00	119.00	**1302.00**	**---**	**1302.0**	Active:
Capacity does not include 119 KAF that can be used, historic values below this level are rounded to zero						
Montpelier	**0.21**	**---**	**3.84**	**---**	**4.0**	Dead + Active

Interpreting Water Supply Forecasts

Each month, five forecasts are issued for each forecast point and each forecast period. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences. Water users need to know what the different forecasts represent if they are to use the information correctly when making operational decisions. The following is an explanation of each of the forecasts.

90 Percent Chance of Exceedance Forecast. There is a 90 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 10 percent chance that the actual streamflow volume will be less than this forecast value.

70 Percent Chance of Exceedance Forecast. There is a 70 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 30 percent chance that the actual streamflow volume will be less than this forecast value.

50 Percent Chance of Exceedance Forecast. There is a 50 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 50 percent chance that the actual streamflow volume will be less than this forecast value. Generally, this forecast is the middle of the range of possible streamflow volumes that can be produced given current conditions.

30 Percent Chance of Exceedance Forecast. There is a 30 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 70 percent chance that the actual streamflow volume will be less than this forecast value.

10 Percent Chance of Exceedance Forecast. There is a 10 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 90 percent chance that the actual streamflow volume will be less than this forecast value.

*Note: There is still a 20 percent chance that actual streamflow volumes will fall either below the 90 percent exceedance forecast or above the 10 percent exceedance forecast.

These forecasts represent the uncertainty inherent in making streamflow predictions. This uncertainty may include sources such as: unknown future weather conditions, uncertainties associated with the various prediction methodologies, and the spatial coverage of the data network in a given basin.

30-Year Median. The 30-year median streamflow for each forecast period is provided for comparison. The median is based on data from 1991-2020. The % MED column compares the 50% chance of exceedance forecast to the 30-year median streamflow; values above 100% denote when the 50% chance of exceedance forecast would be greater than the 30-year median streamflow.

AF - Acre-feet, forecasted volume of water are typically in thousands of acre-feet (KAF).

These forecasts are given to users to help make risk-based decisions. Users can select the forecast corresponding to the level of risk they are willing to accept in order to minimize the negative impacts of having more or less water than planned for.

To Decrease the Chance of Having Less Water than Planned for
A user might determine that making decisions based on a 50 percent chance of exceedance forecast is too much risk to take (there is still a 50% chance that the user will receive less than this amount). To reduce the risk of having less water than planned for, users can base their operational decisions on one of the forecasts with a greater chance of being exceeded such as the 90 or 70 percent exceedance forecasts.

To Decrease the Chance of Having More Water than Planned for
A user might determine that making decisions based on a 50 percent chance of exceedance forecast is too much risk to take (there is still a 50% chance that the user will receive more than this amount). To reduce the risk of having more water than planned for, users can base their operational decisions on one of the forecasts with a lesser chance of being exceeded such as the 30 or 10 percent exceedance forecasts.

Forecast use example:

Using the 50 Percent Exceedance Forecast. Using the example forecasts shown on the next page, there is a 50% chance that actual streamflow volume at the Henry's Fork near Ashton will be less than 280 KAF between June 1 and Sept. 30. There is also a 50% chance that actual streamflow volume will be greater than 280 KAF.

Using the 90 and 70 Percent Exceedance Forecasts. If an unexpected shortage of water could cause problems (such as irrigated agriculture), users might want to plan on receiving 245 KAF during Jun 1 through September 30 (from the 70 percent exceedance forecast). There is a 30% chance of receiving *less* than 245 KAF.

Alternatively, if users determine the risk of using the 70 percent exceedance forecast is too great, then they might plan on receiving 198 KAF (from the **90** percent exceedance forecast). There is 10% chance of receiving less than 72 KAF.

Using the 30 or 10 Percent Exceedance Forecasts. If an unexpected excess of water could cause problems (such as operating a flood control reservoir), users might plan on receiving 315 KAF between June 1 and Sept. 30 (from the 30 percent exceedance forecast). There is a 30% chance of receiving *more* than 315 KAF.

Alternatively, if users determine the risk of using the 30 percent exceedance forecast is too great, then they might plan on receiving 360 KAF (from the 10 percent exceedance forecast). There is a 10% chance of receiving more than 360 KAF. Users could also choose a volume in between any of these values to reflect their desired risk level.

Upper Snake River Basin Streamflow Forecasts - June 1, 2015

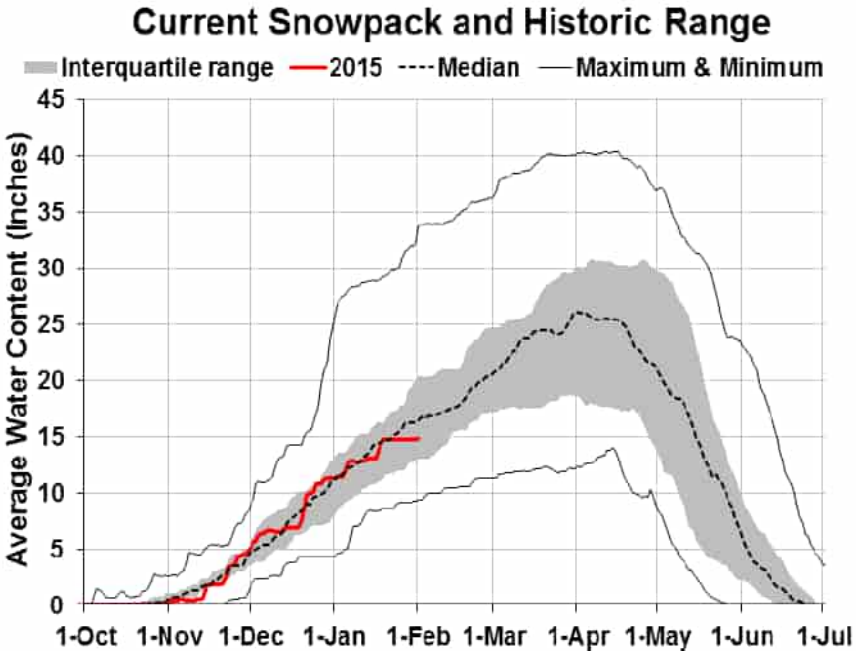
Forecast Point	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment ---Drier----------Projected Volume----------Wetter--- 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Henrys Fk nr Ashton	JUN-JUL	72	106	129	56	152	186	230
	JUN-SEP	198	245	280	68	315	360	410

Interpreting Snowpack Plots

Basin snowpack plots represent snow water equivalent indices using the average daily SNOTEL data[1] from several sites in or near individual basins. The solid red line (2015), which represents the current water year snowpack water content, can be compared to the normal dashed black line (Median) which is considered "normal", as well as the SNOTEL observed historical snowpack range for each basin. This allows users to gather important information about the current year's snowpack as well as the historical variability of snowpack in each basin.

The gray shaded area represents the interquartile range (also known as the "middle fifty"), which is the 25th to 75th percentiles of the historical daily snowpack data for each basin. Percentiles depict the value of the average snowpack below which the given percent of historical years fall. For example, the top part of the interquartile range (75th percentile) indicates that the snowpack index has been below this line for 75 percent of the period of record, whereas the reverse is true for the lower part of the interquartile range (25th percentile). This means 50 percent of the time the snowpack index is within the interquartile range (gray area) during the period of record.

[1] All data used for these plots come from daily SNOTEL data only and does not include snow course data (collected monthly), whereas the official basin snowpack percent of normal includes both SNOTEL and snow course data, potentially leading to slight discrepancies between plots and official basin percent of normal.



USDA Natural Resources Conservation Service
9173 West Barnes Drive, Suite C
Boise ID 83709-1574

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Issued by
Terry Cosby, Chief
Natural Resources Conservation Service
Washington, DC

Released by
Curtis Elke, State Conservationist
Natural Resources Conservation Service
Boise, Idaho

Report Created by
Idaho Snow Survey Staff
Natural Resources Conservation Service
Boise, Idaho
Email: idboise-nrcs-snow@usda.gov

Danny Tappa, Data Collection Officer (DCO)
Earl Adsley, Hydrologist
Pete Youngblood, Hydrologist, Coeur d'Alene, ID
Cody Brown, Hydrologist, Coeur d'Alene, ID
Justin Byington, Hydrologist
John Wilford, Electronics Technician

Erin Whorton, Water Supply Specialist (WSS)
Email: erin.whorton@usda.gov
(o) 208-685-6983 (c) 208-510-7294

Forecasts Provided by
Forecast Hydrologist Staff
NRCS, National Water and Climate Center
Portland, Oregon

Julie Koeberle, Forecast Hydrologist
Email: julie.koeberle@usda.gov

Numerous agencies and groups provide funding and/or support for the collection, operation and maintenance of the Cooperative Idaho Snow Survey program. Your cooperation is greatly appreciated!

This publication is dedicated to the people, agencies and organizations utilizing this data, information and forecasts for short and long term water management, planning, preparation, recreation and otherwise, for the enhancement of the economy and enrichment of livelihoods.

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John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S RESPONSE TO IGWA'S REPLY**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGAITON DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby responds to *IGWA's Reply to SWC's Response to IGWA's Amended Notice of Mitigation* dated June 6, 2023 ("IGWA Reply") as follows.

The IGWA Reply asserts two main points while ignoring whether IGWA has demonstrated that it can comply with existing mitigation plans and the Director's Orders. First, the IGWA Reply effectively states that the Director's Finding of Fact in the *Order Determining Deficiency in IGWA's Notice of Secured Water* ("Order") doesn't mean what it says. As pointed out earlier by the Coalition, the Director explicitly found that the Storage Water Mitigation Plan states "IGWA will mitigate for all ground water users, not just its members and non-member participants." That language would require IGWA to supply the entire injury amount of 75,200 acre-feet.

The IGWA Reply argues that since the Storage Water Mitigation Plan Order states "IGWA's obligation for mitigation shall be determined as set forth in the Methodology Order," IGWA's obligation is reduced to its proportionate share, even though IGWA has never attempted to amend the Storage Water Mitigation Plan Order and no order amending the Plan has been entered to reduce IGWA's obligation to less than what the Plan Order says. IGWA's interpretation is misguided - the amount of total injury is determined by the methodology orders, not IGWA's proportionate share of the Storage Water Plan. If IGWA is relying on the Storage Water Mitigation Plan to mitigate, it must mitigate for all ground water users, not just its members, in order to conform to the wording of the Plan.

Even if IGWA is correct in its interpretation, its mitigation submission is deficient. Under IGWA's interpretation, it would owe 62,635 acre-feet in 2023 mitigation water pursuant to the Storage Water Mitigation Plan. IGWA does not dispute that it also owes 30,000 acre-feet in 2023 to satisfy its obligation for its 2021 breach of the 2015 Settlement Agreement and Order entered by the Director approving that Agreement ("Settlement Agreement Plan"). To adequately

mitigate using IGWA's interpretation, IGWA must show the ability to provide a total of at least 92,635 acre-feet of mitigation water (*See 2022 breach below),* and it has not done so.

In the IGWA Reply, IGWA ignores the Settlement Agreement Plan. IGWA offers no argument as to why it can ignore that Plan, a plan approved by all of IGWA's member Ground Water Districts and approved by the Director. As stated in the *Surface Water Coalition's Response to IGWA's Amended Notice of Mitigation*, IGWA owes 50,000 acre-feet of mitigation storage water to the SWC every year, independent of injury determination. In consideration of this and the other required actions of the Settlement Agreement Plan, IGWA's member Ground Water Districts received safe harbor from all curtailment orders issued since the Settlement Agreement was approved by the Director until 2021, at which time the Director determined the Agreement was breached. To remedy the breach, IGWA agreed to furnish 30,000 acre-feet of storage water to the Coalition in 2023 to stop curtailment in 2022. Further, since 2016 IGWA's member Ground Water Districts have taken advantage of safe harbor, all the while SWC members were facing reduced supplies. Pursuant to the Settlement Agreement Plan and the breach Settlement Order, IGWA must demonstrate it can supply 80,000 acre-feet of mitigation water in 2023 and it has not done so.

Further, the SWC Response points out that IGWA has further breached the Settlement Agreement Plan by failing to submit to the Steering Committee its proposed actions to be taken for the upcoming irrigation season together with supporting information. In addition, a 2022 breach of the Settlement Agreement Plan is pending before the Director and in order to assure in-time, in-place mitigation, it is imperative that the 2022 breach be resolved. Again, SWC members endured short supplies in 2022 and uncertainty in 2023. Breaches of annual obligations impact SWC supplies for years into the future.

It is apparent that IGWA believes it can pick and choose which mitigation plan it can use to satisfy the Director's Orders. As shown in its original notice of mitigation, it attempted to mix and match plans, apparently because member Ground Water Districts could not agree on how to comply with mitigation, a proposal that was rejected by the Director. This was reinforced by the testimony of Lynn Carlquist last week – IGWA's members have not decided how to apportion mitigation obligations among themselves.

As further evidence that at least one Ground Water District's intention is to further breach the Settlement Agreement Plan, attached as Exhibit A is the *Declaration of Alan Jackson in Support of Motion to Stay Based on IDWR's Interference with Lawful Discovery* dated May 31, 2023, filed in the District Court of the Fourth Judicial District of the State of Idaho, Ada County, Case No. CV01-23-8306 ("Jackson Affidavit"). *See* Ex. A. In the Jackson Affidavit, Mr. Jackson states he is the manager of Bingham Ground Water District ("BGWD"). BGWD is a member of IGWA. In paragraph 14 of the Jackson Affidavit, Mr. Jackson states: "The feedback we had received from our patrons is that they would rather face curtailment from the State, than a voluntary curtailment under the newly interpreted settlement agreement" [referring to the Settlement Agreement Plan].

By ignoring the Settlement Agreement Plan and by failing to demonstrate that it can provide adequate mitigation storage water, IGWA is subjecting all of its member districts to a curtailment order pursuant to the provision of the Rules for Conjunctive Management of Surface and Ground Water Resources, IDAPA 37.03.11 ("Conjunctive Management Rules"). IDAPA 37.03.11.040.05 states:

> 05. Curtailment of Use Where Diversions Not in Accord With Mitigation Plan or Mitigation Plan Is Not Effective. Where a mitigation plan has been approved and the junior-priority ground water user fails to operate in accordance with such approved plan or the plan fails to mitigate the material injury resulting from

> diversion and use of water by holders of junior-priority water rights, the watermaster will notify the Director who will immediately issue cease and desist orders and direct the watermaster to terminate the out-of-priority use of ground water rights otherwise benefiting from such plan or take such other actions as provided in the mitigation plan to ensure protection of senior-priority water rights.

CM Rule 40.

The Coalition would certainly prefer that IGWA comply with the Settlement Agreement Plan and the resulting partnership seeking to restore the ESPA groundwater levels. The Coalition has engaged in unsuccessful discussions with IGWA in attempts to amend the Plan and address IGWA's concerns with the Plan. However, if IGWA elects to ignore or breach the Plan, it is the position of the Coalition that the Director must enforce the terms of the Conjunctive Management Rules.

As stated in the Coalition's earlier response, it is the position of the Coalition that IGWA cannot ignore the comprehensive terms of the Settlement Agreement Plan and mitigate only with the Storage Water Mitigation Plan to satisfy its 2023 obligations. Further, IGWA must demonstrate that it can comply not only with the Settlement Agreement Plan, but that it can comply with the 2021 Settlement Agreement, and that IGWA is required to furnish a minimum of 80,000 acre-feet in mitigation water in 2023 to satisfy the storage water portions of the Settlement Agreement Plan and the Settlement Agreement. By failing to do so, IGWA is electing to subject itself to the remedial provisions of the Conjunctive Management Rules.

DATED this 12th day of June, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District et al.

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 et al.

CERTIFICATE OF SERVICE

I hereby certify that on this 12th day of June, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Max C. Bricker Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

Exhibit A

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Trent Tripple, Clerk of the Court
By: Eric Rowell, Deputy Clerk

Dylan Anderson (ISB# 9676)
Dylan Anderson Law PLLC
P.O. Box 35
Rexburg, Idaho 83440

Phone - (208) 684-7701
Email - dylan@dylanandersonlaw.com

Attorney for Bingham Groundwater District. (BGWD)

IN THE DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

CITY OF POCATELLO, CITY OF IDAHO FALLS, CITY OF BLISS, CITY OF BURLEY, CITY OF CAREY, CITY OF DECLO, CITY OF DIETRICH, CITY OF GOODING, CITY OF HAZELTON, CITY OF HEYBURN, CITY OF JEROME, CITY OF PAUL, CITY OF RICHFIELD, CITY OF RUPERT, CITY OF SHOSHONE, CITY OF WENDELL, IDAHO GROUND WATER APPROPRIATORS, BINGHAM GROUND WATER DISTRICT, BONNEVILLE-JEFFERSON GROUND WATER DISTRICT, and MCCAIN FOODS USA, INC.,

Petitioners,

vs.

IDAHO DEPARTMENT OF WATER RESOURCES and GARY SPACKMAN, in his capacity as Director of the Idaho Department of Water Resources,

Respondents.

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT,

Case No. CV01-23-8306

DECLARATION OF ALAN JACKSON IN SUPPORT OF MOTION TO STAY BASED ON IDWR'S INTERFERENCE WITH LAWFUL DISCOVERY

NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY

I Alan Jackson, declare and state as follows:

1. I am over the age of 18 and competent to testify. I have personal knowledge of the facts set forth herein and, if called upon as a witness, I could and would competently testify thereto.
2. I am the manager of Bingham Ground Water District (BGWD), a position I have held since April 2017.
3. In the spring of 2022 the SWC asserted that BGWD had breached the mitigation plan agreement because the pumping in 2021 exceeded what they interpreted as an annual limit, which was a baseline established subsequent to the agreement, and in the context of averaging yearly pumping to determine compliance with the mitigation plan.
4. Up to that point it was understood by BGWD that the annual limit would be measured on an average basis because of the difficulty in determining a single year pumping need and reduction. This approach is similar to other components of the agreement, and other agreements with SWC. However, the SWC pursued their claim of breach and ultimately the Director agreed that the plain language of the agreement stipulated an annual limit without averaging or cumulative benefit.
5. The baseline average was not mentioned in the settlement agreement, but the Director adopted it as a yearly limit, despite the fact that it included years where pumping requirements were much higher, and much lower than this baseline.

6. Upon analysis of the impact of an annual limit, which was based on a reduction from the average usage between 2010-2014, BGWD determined that in order to comply with the pumping limit, it would have to cease irrigation on at least as many acres as would have been curtailed during the worst projected demand shortfall. Roughly 30,000 acres, similar to a 1976 curtailment date.
7. The total volume of ground water pumping in BGWD on an annual basis fluctuates significantly depending on the crop water demand. It is expensive to pump water from the aquifer so care is taken to ensure that no more water is pumped than is required. This means that when crop water demands are above average there is very little room to meet a hard pumping limit through pumping reductions without causing crop damage, especially when the limit is based on an average. The only way to stay within limits is to reduce irrigated acres and the loss of planted acres during the season would be devastating to a farm operation. It is impossible to accurately predict the total crop water demand for a growing season so the only way to ensure that a hard pumping limit is met is to assume the highest crop water demand every year and only plant as many acres as are certain to have enough water.
8. The crop water demand in 2021 was among the highest ever which meant that ground water pumping was much higher than the average. Irrigators in BGWD diverted on average about 2 acre-feet per acre which led to a districtwide usage totaling about 60,000 acre-feet greater than the hard pumping limit in the agreement, as interpreted by the Director. Based on the 2 acre-foot per acre average usage BGWD would have had to reduce irrigated acres for the entire season by about 30,000 acres in order to comply with the pumping limit. Comparatively, the in-season demand curtailment in

2021, based on the 4th Methodology Order, would have curtailed 26,650 acres in BGWD with a curtailment date of June 14, 1977. Given the similarity in idled acres every year under both scenarios BGWD determined that the settlement agreement did not in fact offer any safe harbor. In fact the settlement agreement was worse than the result of the 4th Methodology Order because along with the similar acreage reduction it required the acquisition of a significant amount of reservoir storage every year to comply with the terms of the agreement.

9. Throughout the settlement process, BGWD voiced its concerns about the settlement agreement, and that its patrons felt that facing the curtailment each year was actually a better outcome than meeting the demands of the settlement agreement as interpreted by the Director. This was based on the number of acres that would be dried up, the inability to get storage water for mitigation purposes on dry years, and crop insurance implications due to an agreed reduction.
10. Multiple sources reported back to BGWD that this position was interpreted as ignoring any responsibility to the SWC or to help stabilize the aquifer because the Department would not actually curtail. Although this is not the position BGWD took, or had any intention of taking, it became a theme among political and state officials.
11. A meeting was held with department staff, elected officials, SWC and representatives of all other ground water districts to create a straw man for settlement talks. BGWD was the only ground water district not invited. We believe that this is because of BGWD's position on curtailment.

12. During settlement conferences with the SWC, BGWD repeated this comparison often. It was also explained during the winter 2023 negotiations to amend the settlement agreement in the presence of IDWR staff and multiple elected state officials.
13. Prior to beginning one session of the settlement conference, Lt. Governor Bedke had invited Director Spackman to speak. He explained that if people did not believe he would curtail, they would be wrong, because if he ordered curtailment, the department would follow through with it.
14. Again, BGWD took the opportunity to explain that it did not doubt the Director's resolve in issuing a curtailment. On the contrary, we were advising patrons and developing plans to prepare for curtailment if we were not able to mitigate through other means. The feedback we had received from our patrons is that they would rather face curtailment from the State, than a voluntary curtailment under the newly interpreted settlement agreement.
15. The fact that the methodology of using the steady state condition in the ground water model to determine curtailment was no worse than the Director's interpretation of the terms in the settlement agreement was obviously a hindrance to the winter negotiations in which the SWC was calling for even greater pumping reduction and/or more storage mitigation.
16. As depositions have progressed in this case, there has been no new technical evidence presented that would require the Department to switch from the steady state condition in the methodology order, to transient state condition when determining curtailment dates. In fact, the questioning has shown that they knew as much about the impacts of transient vs steady state 7 years ago as they do today. It has also been made clear that

the decision to switch to transient coincides with settlement talks this spring. Why did the Department feel the need for such a drastic overhaul of the methodology order in such a short window without any notice or due process consideration? Furthermore, why is the department limiting Groundwater users from discovering any information related to the Directors decision, other than technical information that seems static and unchanged for years?

17. It is easy to conclude that the Director's decision to switch to the transient model is in direct retaliation to BGWD's position that curtailment is better than the Director's interpretation of the settlement mitigation plan. BGWD patrons feel that they have repeatedly been threatened and manipulated to comply with settlement agreement obligations which are substantially different from what they understood upon entering into the agreement, while the Department is simultaneously implementing a manifold increase in the consequences of curtailment under the 5th Methodology Order. BGWD desires to understand the Director's decision to go to the transient model and any influence from within or without the Department that may have pressured him to so undermine our position in settlement negotiations, but his limitation on Discovery is not allowing us to do so.

I declare under penalty of perjury under the laws of the State of Idaho that the foregoing is true and correct.

Dated May 31, 2023

_/s/ Alan Jackson_____
Alan Jackson,
Manager, Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 31th day of May, 2023, I caused to be filed a true and correct copy of the foregoing document via iCourt E-File and Serve, and upon such filing, the following parties were served via electronic mail:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, &
LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
CITY OF IDAHO FALLS
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak
IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

Rich Diehl
City of Pocatello
P.O. Box 4169
Pocatello, ID 83205
rdiehl@pocatello.us

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110
Boulder, CO 80302
sklahn@somachlaw.com
dthompson@somachlaw.com

____/s/ Dylan Anderson____.
Dylan Anderson
Attorney for Bingham Groundwater District

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Jun 16, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S POST-HEARING BRIEF**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGAITON DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby submits its post-hearing brief in response to the Director's instructions and request at the close of the administrative hearing held June 6-9, 2023.

The Director held an administrative hearing on the April 21, 2023 *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fifth Order*") (Ex. 300) and the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("*April As Applied Order*") (Ex. 301) on June 6-9, 2023. Various parties had filed requests for hearing and identified statements of issue to be addressed. At the hearing, the Director heard testimony from various lay and expert witnesses and admitted additional exhibits to assist in the review.

At the close of the hearing the Director identified certain questions for the parties to address in post-hearing briefing including:

1) Who bears the burden regarding uncertainty in the information presented (i.e. IDWR, seniors, juniors)?
2) What have the courts told us and what are those standards?
3) What is the appropriate due process for this type of hearing?

The Director recognized that this proceeding involves an on-going delivery call and that material injury has already been determined. The Director noted that there is a presumption that a senior water right holder is entitled to water pursuant to its decree and that groundwater pumping in the ESPA depletes flows to the Snake River that supplies the Surface Water Coalition's senior water rights. The Director further noted that the methodology order is the Department's implementation of the conjunctive management rules ("CM Rules") to evaluate water use by the senior and determine whether some adjustment is appropriate pursuant to the "clear and convincing evidence" standard. Finally, due process must take these factors into account. This post-hearing brief addresses those questions in context as well as the updates to the Fifth Order and additional evidence relevant to the April As Applied Order.

I. Burden of Proof in Conjunctive Administration

The Idaho Supreme Court affirmed the burden of proof and evidentiary standard to apply in conjunctive administration cases in *A&B Irr. Dist. v. Spackman*, 153 Idaho 500, 284 P.3d 225 (2012). In that decision the Court held:

> It is Idaho's longstanding rule that proof of "no injury" by a junior appropriator in a water delivery call must be by clear and convincing evidence. Once a decree is presented to an administering agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence.

155 Idaho at 524, 284 P.3d at 224.

The Court also recited the district court's reasoning behind this standard in water right administration which provides further insight into its basis:

> The application of the clear and convincing standard of proof only makes sense from a common sense perspective. If the Director determines that a senior can satisfy the decreed purpose of use on less than the decreed quantity reflected, he needs to be certain to a standard of clear and convincing evidence. In making a determination of whether or not to regulate juniors, the Director is required to evaluate whether the quantity available meets or exceeds the quantity the senior can put to beneficial use. If the Director regulates juniors to satisfy the senior's decreed quantity there is no risk of injury to the senior. However, if the Director regulates juniors to satisfy a quantity less than decreed, there is risk to the senior that the Director's determination is incorrect. There is no remedy for the senior if the Director's determination turns out to be in error and the senior comes up short of water during the irrigation season. **Any burden of this uncertainty should be borne by the junior** . . . [I]f the Director's determination is only based on a finding "more probable than not." The senior's right is put at risk and the junior is essentially accorded the benefit of uncertainty. The requisite high standard accords appropriate presumptive weight to the decree.

155 Idaho at 517, 284 P.3d at 242 (emphasis added).

The above conclusions have guided conjunctive administration in Idaho for well over a decade now. The Director has expressly acknowledged the same in the Fifth Order. *See* Ex. 300 at 33, ¶ 11. The baseline year, its criteria, and subsequent adjustments to in-season demand, take

this standard into account. Therefore, in response to the Director's question it is clear that Idaho courts have placed the burden of "uncertainty" squarely upon junior appropriators for purposes of water right administration. If the Director is unsure as to certain questions, and juniors are going to receive the benefit of out-of-priority diversions, then those juniors must prove defenses by the heightened standard to protect the seniors in times of shortage.

II. Director's Updates to Methodology in the Fifth Methodology Order

The Director first derived the framework for the methodology in the spring of 2010. The original methodology was challenged and litigated through judicial review. *See Memorandum Decision and Order on Petitions for Judicial Review*, Gooding County Dist. Ct., Fifth Jud. Dist., Consolidated Case No. CV-2010-382 (Sept. 26, 2014) ("2014 Order").[1] No party appealed that decision to the Idaho Supreme Court. Since that decision the Director has issued additional updates to the methodology through amended orders. The Fifth Order incorporated new data (2015-2021) not available when the Fourth Order was issued in 2016, and identified the following updates in response.

A. Baseline Year

The methodology's baseline year "is a year or average of years when irrigation demand represents conditions that predict need in the current year of irrigation at the start of the irrigation season." *Fifth Order* at 3, ¶ 7. A baseline year "should represent a year(s) of above average diversions . . . and should also represent a year(s) of above average temperatures and reference ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other factors . . .[and] actual supply should be analyzed to assure that the BLY is not a year of limited supply." *Id.* at 3-4, ¶ 9. The criteria for selecting a baseline year

[1] A full copy of the court's decision is in the record attached as Ex. A to the SWC's *Motion to Limit Scope of Hearing* (June 5, 2023).

has not changed since the Director issued the *Second*, *Third*, and *Fourth Orders*.[2] However, what has changed is the number of years the Director has available to analyze against that criteria. *See Fifth Order* at 11 ("the years 2000-2021 were considered for the BLY selection").

As a result of the updated data, the Director found that "BLY 06/08/12 no longer satisfies the presumption criteria that total diversions in the BLY should exceed the average annual diversions." *Id.* Consequently, the Director concluded that "total diversions for 2018 adequately protect senior water rights when predicting the demand shortfall at the start of the irrigation season and selects 2018 as the BLY." *Id.* at 12, ¶ 27. IDWR staff recommended changing the baseline year to 2018 in its December 23, 2022 staff memorandum. Ex. 914. The Ground Water Users dispute the use of 2018 and the Director's criteria for a baseline year in the methodology. Various positions were advanced advocating for an "average" year of diversions. *See generally*, Exs. 347A; 837A. The use of an "average" year was previously rejected by the District Court:

> The Director did not err in his intentional adoption of a baseline year based on above average temperatures and evapotranspiration and below average precipitation. The Court agrees that use of such data is necessary to protect senior rights if the Director is going to administer to an amount less than the full decreed quantity of the Coalition's rights. The arguments set forth by the City of Pocatello and IGWA that the Director must use data associate with an average year fail to take into account the legal limitations placed on the Director in responding to a delivery call. . . . As set forth above, using data associated with an average year in order to administer to less than the full decreed quantity of the Coalitions' water rights would not meet a clear and convincing evidenced standard. Therefore, the arguments set forth by IGWA and the City of Pocatello are unavailing.

2014 Order at 33-34.

[2] The Director has updated the baseline year before. In 2016, the Director updated the baseline year from the 06/08 average used in the *Second Order* to a new average of 06/08/12 because at that time "the 06/08 diversions are no longer above average." *See Fourth Order* at 11.

The use of 2018 as a baseline year is further supported by the data showing increased water demand in recent years. For example, since 2012 seven out of ten years have experienced below average growing season precipitation. *See Fifth Order* at 4. Over that same period nine out of ten years have experienced above average number of growing degree days. *See id.* at 7. Coupled with increases in higher consumptive use crops like corn and alfalfa, it is clear that the Coalition has witnessed increased water demands from their shareholders and landowners.[3] *See generally* Ex. 1 (pp. 4-9); Ex. 4 (pp. 7-11); *Barlogi Test.* Whereas junior groundwater users have the benefit of a firm water supply every year, it is appropriate to guard against dry and hot conditions for the senior by using the criteria selected by the Director. The 2018 baseline year is only one of two years that fit the methodology criteria and therefore it was appropriate for the Director to update the methodology. *See* Ex. 4 (p. 15).

B. Transient Use of ESPAM

The Eastern Snake Plain Aquifer Model (ESPAM) Version 2.2 has been adopted by the Eastern Snake Plain Hydrologic Modeling Committee (ESHMC) and has been used by IDWR in conjunctive administration, including in response to the Coalition's delivery call. *See* Ex. 3 (p. 3); *see also*, *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 814, 252 P.3d 71, 95 (2011). Although certain consultants raised questions concerning ESPAM 2.2, the juniors did not carry their burden to show that the model is unreliable or cannot be used for conjunctive administration. *See e.g. Final Order* at 24-25 (Docket No. AA-WRA-2021-001) (June 28, 2021) (Director noting that junior ground water users carried the burden to prove by clear and convincing evidence that groundwater model could not be used for administration).

[3] For purposes of the CWN crop mix calculator, IDWR should go back and adjust each year once that data becomes available to ensure the 3-year average is up to date. *See* Ex. 4 (pp. 8-9).

The Director identified how the ESPAM groundwater model has been and can be run to identify a curtailment date for junior groundwater rights causing material injury. *See Fifth Order* at 29-30. If a ground water right is not covered by an approved and effectively operating mitigation plan, then curtailment is the Director's only remedy to prevent material injury to the senior right. *See* CM Rule 40.05.

A steady-state analysis analyzes the impact of curtailment on the aquifer and connected river reaches long-term (i.e. 50 years), whereas a transient analysis predicts the timing of changes that would occur during the irrigation season. *See id.* at 30. The Director acknowledged that only "9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year." *See id.* In other words, if curtailment is based upon a steady-state analysis, it severely under-mitigates a predicted injury to the Coalition's senior water rights. Consequently, the Director adopted a transient analysis as being "necessary to simulate the short-term curtailments prescribed in the methodology."[4] *Id.* at 31.

The Director's transient use of ESPAM 2.2 is appropriate for calculating the in-season reach gains to the Near Blackfoot to Minidoka reach that would result from the curtailment of groundwater pumping. *See* Ex. 3 (p. 3). No expert testified that a steady-state run would fully mitigate the forecasted demand shortfall. The Director's transient use of the model to identify a curtailment date that would mitigate the in-season demand shortfall conforms to judicial precedent on this issue as well. *See Memorandum Decision and Order*, *Rangen, Inc. v. IDWR*, Twin Falls County Dist. Ct., Fifth Jud. Dist., Case No. CV-2014-4970 (June 1, 2015); *Memorandum Decision and Order*, *Rangen, Inc. v. IDWR*, Twin Falls County Dist. Ct., Fifth

[4] Such a finding is consistent with the Director's approval of mitigation plans where he allows the delivery of storage equal to the amount of an injury finding.

Jud. Dist., Case No. CV-2014-2446 (Dec. 3, 2014); *see also*, *Amended Final Order Regarding Compliance with Approved Mitigation Plan* at 17-19 (Docket No. CM-MP-2016-001, Apr. 24, 2023). Stated another way, if junior water users cannot mitigate the predicted in-season demand shortfall, Idaho law does not contemplate curtailment that would only supply between 9-15% of that shortfall during the irrigation season. In sum, the Dirctor's transient use of the model is required by Idaho's prior appropriation doctrine and is supported by the record. If juniors desire to pump out-of-priority and cannot replace the predicted in-season shortfall as required, curtailment must be sufficient to mitigate that shortfall during the irrigation season. A steady-state use of the model does not identify the proper curtailment date for that purpose.

III. Twin Falls Canal Company Water Use / Irrigated Acres

In his ruling following the 2008 hearing, the Hearing Officer (former Chief Justice Gerald Schroder) concluded:

> The evidence does not show substandard facilities for diversion or conveyance. The members of the Surface Water Coalition have improved their conveyance practices since the time the water rights were licensed or decreed. . . .
>
> There are various factors that might be considered that cause difference in the efficiency of diversion and conveyance within the irrigation districts. For example, the North Side Canal Company is very long, requiring more time for water to move from the initial diversion to the end of the system. There will be differences in the amount of evaporation and potentially of conveyance losses. Additionally, if the delivery of water at the beginning of the system is shut off, when the water is again turned on it takes considerable time for water to reach the far end of the system. Damage to the crops may occur during the delay. This simply says that there is no precise formula that can be applied from one SWC member to another. Differences exist. This does not mean that one district is using reasonable facilities and practices and another not. There is no evidence of decayed or damaged systems that are allowed to continue or practices that cause water to be wasted in transit. The evidence in this case indicates that each of the SWC members is operating with reasonable diversion and conveyance efficiency.

R. Vol. 37 at 7101-02.

This finding was echoed by the District Court on judicial review of the first methodology order:

> Furthermore, both the Hearing Officer and the Director found, in considering the Rule 42 factors, that the Coalition members operate reasonable and efficient irrigation projects. The Director found that "as found by the hearing officer in his recommended order, members of the SWC operate reasonably and without waste," and hat he will not "impose greater project efficiencies upon members of the SWC than have been historically realized."

2014 Order at 30-31.

The evidence at the June 6-9, 2023 hearing further showed that the Coalition members continue to operate reasonable and efficient irrigation projects. Specifically, TFCC's manager Jay Barlogi provided testimony about the company's water delivery operations as well as recent maintenance and conservation projects. *See generally*, Ex. 1 (pp. 3-23). Mr. Barlogi noted the increase in consumptive use crops across the project and how changes to sprinkler and residential use have created operational demands within the TFCC system. The company has implemented a number of projects to keep pace with operational demands and continues to look at ways to improve delivery and maintenance of the canal system. In other words, there was no evidence of "decayed or damaged" systems or water being wasted on the TFCC project.

That TFCC continues to put water to beneficial use and use water reasonably was confirmed by Mr. Barlogi as well. Mr. Barlogi described a general overview of operations for the irrigation season which is supported by the Director's previous finding that although crop water needs may vary, water is still put to beneficial use at these times. *See* Ex. 1 (pp. 4-8); *see also Order on Reconsideration of Final Order et al.* at 4, ¶ 16 (June 16, 2010) ("Computing a seasonal Ep that is weighted to monthly CWN is misleading because the computation ignores or dampens the effects of beneficial diversions of water necessary to rear crops that lie beyond simply meeting the consumptive requirement of the plant (i.e. canal charging, availability of a

steady supply of water, chemigation, soil tillage, etc.)"). These beneficial uses were supported by the testimony of the Coalition's experts in evaluating project efficiencies as well. *See* Ex. 4 (pp. 7-13).

Increased consumptive use crops (i.e. corn, alfalfa), as well as double-cropping, have an impact on water demands. *See* Ex. 1 (pp. 7-9); Ex. 4 (pp. 10-11). A review of Water District 01 delivery records confirms that TFCC operates within an accepted acre-feet per acre standard demonstrated by other large open canal systems within the district. *See* Ex. 8. Watermaster Tony Olenichak further testified that it was his opinion that TFCC operated and delivered water in a reasonable manner. *See generally, Olenichak Test.* This opinion was supported by other expert witnesses that testified at the hearing. *See Brockway Test.*, *Shaw Test.* On the other hand, the ground water users did not prove by clear and convincing evidence that TFCC was not putting water that it diverts to beneficial use. Even the exhibit offered by the Cities' consultant showed that measured returns in certain coulees across the TFCC project had remained stable (close to 50,000 acre-feet) and have even decreased over the last three years.[5] *See* Ex. 365.

There was considerable testimony concerning the number of irrigated acres within the TFCC project. The legal status of TFCC's decreed place of use (including the number of authorized acres) and the presumption IDWR must apply is outlined in the Step 1 letter from counsel to Director Spackman dated March 29, 2013. *See* Ex. 938. TFCC submitted an irrigated area shapefile to IDWR in 2013 and since then has sent letters confirming that the acreage has no changed by more than 5% from the prior year.

IDWR staff Matt Anders testified that IDWR previously used 183,589 acres in its irrigated acreage calculations before 2015. *See Anders Test.* This may have been based upon an

[5] The trend is similar for the "tributary gages" which include both natural streamflow and some irrigation return flows during the irrigation season. Certainly the type of water year will influence water availability and the amount of water identified in the flow measurements.

erroneous acceptance of a report presented at the 2008 hearing. *See* Ex. 938 (3/29/13 letter to Director Spackman noting the errors in the 2007 SPF report and fact that it was not adopted by the Hearing Officer). Further, IDWR did not have the benefit of the Court's 2014 Order and confirmation about how the Department must apply the "clear and convincing evidence" standard in conjunctive administration, particularly in application of the methodology.

The Coalition's expert report details issues with the 2017 irrigated lands dataset. *See* Ex. 4 (pp. 1-2). A review of that shapefile overlaid on 2021 aerial imagery shows lands that are irrigated have been removed and classified as "non-irrigated." *See* Ex. 6. Whereas the status of certain lands can change from year to year, and water can be transferred within the TFCC project, identifying exact irrigated acreage in the current year can be a challenge, particularly on a project TFCC's size. With the status of information that it had, IDWR properly relied upon its review of TFCC's 2013 shapefile and the juniors did not carry their burden to show by clear and convincing evidence a different number was justified.

Regardless of the irrigated acreage number and its application in the CWN calculator, a reduction in acreage does not automatically reduce demand or beneficial use of TFCC's water right. TFCC's manager explained that increased consumptive use crops, longer growing seasons, and even double-cropping, have all contributed to increased demands. Ex. 1 (pp. 8-9). Further, conversion to sprinklers have reduced historical returns back to the canal system, reducing water available for reuse. *See id.* (pp. 24-25). Although fewer acres may be irrigated, that would only slightly reduce overall project efficiency and not mean that less water is required for successful canal operations. Ex. 4 (pp. 13-14).

IV. AFRD#2 Baseline Year Diversion Volume

On rebuttal testimony the last day of the hearing (June 9), Matt Anders clarified an error regarding AFRD#2's total diversion volume in 2018. Evaluation of certain recharge water showed that the total volume diverted by AFRD#2 for its irrigation purposes was understated. IDWR should correct the 2018 baseline year data for AFRD#2 accordingly.

V. A&B Surface Water Delivery to Converted Lands / Proportionate Share in April As Applied Order

The April As Applied Order identified A&B's proportionate share of the projected in-season demand shortfall to be 458 acre-feet. *See* Ex. 301 (p. 5, n. 5). This calculation was made using a steady-state run of ESPAM to apportion respective responsibility for the shortfall and mitigation obligation. *See Sukow Test.*

A&B Irrigation District now delivers surface water to 3,576 acres that were formerly solely irrigated with groundwater. *See* Ex. 2. While successful operation of its pipeline requires certain groundwater use for pressurization, the lands are primarily supplied by surface water. It appears that IDWR created the "proportionate share" table using a simulated curtailment of A&B's water rights junior to December 30, 1953. *See April Background Information* (excel spreadsheet).[6] The simulation used a crop irrigation requirement of 2.59 acre-feet per acre and assigns a value of 10,629 acre-feet to the 4,107.9 acres authorized under the District's junior priority water rights (36-15127A et al.). Since A&B has replaced groundwater with surface water delivery on certain lands, that should be taken into account when analyzing the proportionate share of any in-season demand shortfall predicted for the Surface Water Coalition. *See* Ex. 2. In other words, the District is not pumping 10,629 acre-feet for those lands every year as identified in IDWR's background information.

[6] Available at: https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/

VI. Non-Participation in Water District 01 Rental Pool.

The Fifth Order notes that "water supplied to private leases or to the rental pool by a SWC member will be included as part of the SWC supply for that member because non-inclusion would unjustifiably increase the shortfall obligation." Ex. 300 at 13, ¶ 30. Questions arose in 2022 as to whether or not an injured Coalition member could receive an assignment of mitigation storage if that member was not a "participant" in the Water District 01 rental pool. *See SWC Request for Status Conference* at 3-5 (Apr. 27, 2022).

Tony Olenichak provided testimony at the hearing that a Coalition member could receive an assignment of storage water for mitigation purposes even if that member was not a participant in the rental pool. *See Olenichak Test.* The Director should clarify that fact going forward so that if a Coalition member decides to not participate in the rental pool in a given year, that would not preclude assignment of mitigation storage water if necessary, either as part of an approved mitigation plan or for delivery to mitigate injury.

VII. Due Process Concerns Addressed.

Finally, in response to the Director's note at the close of the hearing, while certain parties alleged concerns with the timing of the proceeding and schedules, all parties were subject to the same deadlines. Further, the unique issues related to timely water right administration in this case were explained as follows by the District Court:

> That segues us into issues pertaining to due process. Petitioners raised due process concerns pertaining to the hearing process utilized by the director for the administrative hearing to commence June 6th. In evaluating the due process concerns raised by the petitioners, the Court must be cognizant of the director's duty to timely administer water rights in priority. The Idaho Supreme Court instructed in Musser vs. Higginson that the director's duty to administer water is clear and executive. Time is of the essence in water administration. In any given year the reality is, there is a short timeframe between when water supply determinations can be made and when water users' demands for irrigation water begin. Any process employed by the director must account for the exigencies of

these time constraints. These exigencies were recognized by the drafters of our Constitution as set forth in the Idaho Supreme Court and American Falls Reservoir District Number 2. The Court found the drafters intended that there be no unnecessary delay in the delivery of water pursuant to a valid water right and that a timely response is clearly required when a delivery call is made and water is necessary to respond to that call. That's AFRD Number 2, 143 Idaho at 874. This analysis recognizes the failure of the director to timely administer in priority can result to senior rights in times of shortage. In conjunction, the Idaho Supreme Court further determined that neither the Constitution nor the statutes place any specific time frames on this process.

In this case the record reflects the Department began notifying individuals in September, 2022, that it would be reviewing data used in the Fourth Methodology Order. In November and December, 2022, the Department conducted six meetings regarding possible amendments to the Fourth Methodology Order where staff presented new data and analyses with respect to methodology. Later in December the Department released a document setting forth preliminary recommendations for amendments to the Fourth Methodology Order. The preliminary recommendations stated that the Department will continue to evaluate the integration of these recommendations and others into the methodology. The recommendations also invited outside consultants to submit written comments by January 16, 2023, which some outside experts did by submitting preliminary comments.

On April 21st, 2023, the director issued the Fifth Amended Methodology Order and Final Order regarding the April, 2023, forecast supply. In the final order regarding the April, 2023, forecast supply, the director predicted an in-season demand shortfall to the Twin Falls Canal Company in the amount of 75,200-acre feed. The order gave affected juniors until May 5, 2023, to establish they can mitigate for their proportionate share of the predicted demand shortfall. For those juniors who could not, the order stated that the director would issue a curtailment order.

The director did not hold a hearing prior to issuing the April 21st, 2023, orders. However, he has set a hearing --and he has set a hearing to commence June 6th, 2023, on the orders pursuant to Idaho Code Section 42-1701A(3). Idaho Code Section 42-1701A(3) governs hearings before the director. Subsection 3 applies where the director takes action without a hearing. Normally a party has 15 days to request a hearing under Subsection 3. However, because the director found time was of the essence and because he anticipated multiple parties would request a hearing, he took the proactive step of sua sponte noticing up a hearing to save time. He also set a prehearing conference for April 28th, 2023. The director subsequently denied a request from the petitioners to continue the June 6th hearing until December or January. He also denied a request from the petitioners to appoint an independent hearing officer. On May 2nd, 2023, the director issued a scheduling order, directing that discovery be completed by May 31st, 2023. Then on May 5th, 2023, the director issued an order limiting discovery to preclude questions regarding the director's deliberative process. Okay. Again, on May 2nd, 2023, the director issued a scheduling order, directing that discovery be

> completed by May 31st, 2023. Then on May 5th, 2023, the director issued an order limiting discovery to preclude questions regarding the director's deliberative process on legal and policy considerations. Okay. So in evaluating the process in this case against the director's duty to timely administer water rights in priority, the Court finds it provides due process consistent with the exigencies of the circumstances and the need to administer water in priority to avoid injury to senior rights.
>
> In making this finding, the Court is influenced by the fact that administration in this case arises in the larger context of an ongoing delivery call that has existed since 2005. The director issued its first methodology order in 2010. Since then, the methodology order has been modified and amended three times to account for new data, modeling revisions, and climate trends. So this is not a new issue. And the director gave heads-up that amendments may be required again in 2023, starting in September of 2022, when he notified individuals that the Department was investigating integrating new data techniques into the methodology order. Again, he then conducted a series of meetings, presenting new data and techniques, and issued a preliminary recommendation setting forth proposed amendments and inviting comment from outside experts. In effect, the parties were put on notice starting in September of 2022 that amendments to the methodology order were being considered. Based on prior actions within the context of this ongoing delivery call, parties were also well-aware of the exigent time constraints following demand shortfall predictions. In particular, in its memorandum decision issued on April 11, 2011, in Gooding County Case CV-2010-382, the Court addressed similar due process arguments concerning short timeframes for notice and discovery in the context of this very call. The process provided then was found to provide due process. In this instance the parties are being provided with a hearing on the 2023 orders to commence on June 6th. They were provided approximately six weeks actual notice for the hearing.
>
> In addition, the director began making parties aware that amendments to the methodology order were being considered back in September of 2022. At the hearing on June 6th the parties will be given the opportunity to present evidence and arguments pertaining to the 2023 orders. The Court finds this process provides due process consistent with the exigencies of the circumstances and the director's duty to timely administer water rights in priority. And frankly, setting a hearing after the irrigation season as requested is not a tangible alternative, given the director's duty and the demand shortfall prediction for the 2023 irrigation season.

Transcript, June 1st Hearing, *IGWA et al. v. IDWR*, Ada County Dist. Ct., Fourth Jud. Dist., Case No. CV01-23-8187.

Based upon the above, the parties were provided the necessary due process in this proceeding, and any allegations of the Director violating constitutional rights are unfounded given the unique circumstances regarding conjunctive administration.

CONCLUSION

The Coalition submits the above post-hearing brief on the issues identified.

DATED this 16th day of June, 2023.

MARTEN LAW LLP

/s/ Travis L. Thompson
Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

/s/ W. Kent Fletcher
W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 16th day of June, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Max C. Bricker Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

/s/ Jessica Nielsen
Jessica Nielsen
Assistant for Travis L. Thompson

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Jun 16, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB# 7928)
Maximilian C. Bricker (ISB# 12283)
SOMACH SIMMONS & DUNN, P.C.
sklahn@somachlaw.com
mbricker@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris (ISB# 7018)
HOLDEN KIDWELL HAHN & CRAPO
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB# 6530)
MCHUGH BROMLEY, PLLC
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities")

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **CITY OF POCATELLO, CITY OF IDAHO FALLS, AND COALITION OF CITIES' CLOSING BRIEF**

The City of Pocatello, City of Idaho Falls, and Coalition of Cities[1] ("Cities"), by and through their undersigned counsel, hereby submit their *Closing Brief* in the above captioned matter. The Cities' *Closing Brief* will focus on areas of the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Order"), issued by the Director of the Idaho Department of Water Resources ("IDWR" or "Department") on April 21, 2023, that merit revision based on evidence presented during the June 6-9 hearing.

[1] The Coalition of Cities is composed of the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell.

Introduction

At the close of the hearing, the Director made the following comment, in the context of providing some guidance on topics to be covered in the closing briefs:

> And then I think -- associated with that, I think there's also a question about burdens of proof. In other words, in the conjunctive -- and I don't know the answer to this, necessarily, but under the conjunctive management rules, who bears the burden of establishing, by clear and convincing evidence, what those adjustments should be? Is it the Department's burden? Is it the senior burden? Or is it the junior burden?

Vol. IV Tr. at 203:14-22. This *Closing Brief* focuses on modifications to the *Order* that the Cities believe the Department should make based on "clear and convincing" evidence; it also takes issue with the Department's imposition of transient modeling.[2] As for who bears the burden: the Department bears the initial burden of determining the basis for administration. If the Department proposes to administer water rights in a manner that is at variance with the senior's decree, it must on its own determine what is "clear and convincing." On issues such as irrigated acres and project efficiency, the Department has taken the easy road—it has used acreage values provided by the Surface Water Coalition ("SWC") members themselves and refrained from analyzing the reasonableness of SWC members' project efficiencies, which would require revisiting the 2008 determinations of Justice Schroeder.

In a hearing such as this, where the juniors are challenging the bases of the *Order*, the juniors bear the burden of showing by "clear and convincing" evidence that the Department/SWC values are incorrect. This is supported by a prior decision of Judge Wildman:

> [I]f the junior users believe for some reason that the seniors will receive water they cannot beneficially use, it is their burden under the established evidentiary

[2] The Director's remarks at the close of the fourth day of hearing also seemed to reflect the sentiment expressed by Judge Wildman at the June 1 arguments related to IWGA and the Cities' complaints for judicial review and requests for extraordinary writs: it is difficult to understand why the Department couldn't have taken a more measured approach on any shift in modeling for purposes of curtailment, for example, to hold a hearing on this topic during the winter months.

> standards . . . to prove that fact by clear and convincing evidence. For example, the juniors may assert that the Director in their opinion is considering some, but not *all* acres that are no longer irrigated by the seniors.

Memorandum Decision and Order on Petitions for Judicial Review (Case No. CV-2010-382, filed Sept. 26, 2014) at 31. In acknowledging this standard, however, it bears noting that "clear and convincing" evidence is not an impossible bar to breach—notwithstanding the attitude of the SWC and apparent viewpoint of the Department—but it is simply a higher standard than preponderance. For example, there was testimony at the hearing from Department staff and the SWC's expert that Twin Falls Canal Company's ("TFCC") 2013 irrigated acreage data contains "hardened" acres. It is hard to know how admissions against interest like these could be anything *but* clear and convincing evidence.

A further point is that if the juniors bear this burden—and the Cities acknowledge that they do to the extent they are challenging a determination in the Department's *Order*—they need time to prepare for a hearing. Flippant suggestions that the parties have been sitting around preparing for a hearing for the last period of months are no substitute for due process; nor is the dismissal of a request for extraordinary relief by the District Court (which should not be read as anything other than what it was).

Finally, the Cities urge the Department to stay true to its word that it has an "ongoing obligation to use the best available science and information." Ex. 300 at 2. Because the Department has chosen to, *inter alia*, accept irrigated acreage data from SWC members without any scrutiny, omit 2022 data in the *Order*, and refrain from analyzing the reasonableness of SWC member's project efficiencies, the Cities feel strongly that the Department has fallen short of meeting this obligation. Accordingly, the Cities request that the Department revise the *Order* as described below.

I. The Department Must Correct the SWC's Irrigated Acreage Amounts Because they are Erroneous and Overstate the SWC's CWN.

The Department must revise the *Order* to incorporate irrigated acreage data that accurately reflects SWC-member irrigation. During trial, Mr. Anders, the Department's lead on technical revisions from the *Fourth Methodology Order* to the *Fifth Methodology Order*, testified that the *Order's* quantification of TFCC's irrigated acres (194,732 acres) includes "hardened acres," which cannot be irrigated, as well as partially irrigated acres; he also admitted that the *Order's* quantification of A&B Irrigation District's irrigated acres includes A&B's 1994 enlargement/water spreading acres. Mr. Anders also testified that IDWR has not looked for enlargement/water spreading acres within other SWC boundaries.

Moreover, accurate acreage values are available in the form of IDWR irrigated land datasets, developed by the Department for, *inter alia,* calibration of the ESPAM. *See* Testimony of Mr. Anders. The Director accepted into evidence the SWC's Expert Report, Exhibit 4, which identifies three different Department-prepared data sets—IDWR 2011 Delineation, IDWR 2017 Delineation, and an acreage dataset associated with NRT METRIC.[3] The Department's irrigated acreage datasets demonstrate that TFCC has been irrigating between 179,000 and 181,000 acres in recent history. Ex. 4 at 3. Mr. Sullivan's testimony established that the Department's irrigated acreage datasets more accurately depict the amount of acres that the Twin Falls Canal Company ("TFCC"), Burley Irrigation District, and Minidoka Irrigation District irrigate than the acreage values used in the *Order* on p. 10 at paragraph 22. The Cities' Expert Report demonstrates that using more accurate irrigated acreage data could reduce TFCC's reasonable in-season demand ("RISD") by a magnitude of 96,000 acre-feet. Ex. 347A at 18-19. Thus, for those SWC

[3]NRT METRIC stands for "near real time" METRIC, and refers to a method of determining crop consumptive use under evaluation by the Department in "near real time."

members who irrigate less acres than the amounts in the 2013 shapefile or their decreed acreage amounts, paragraph 22 of the *Order* should be revised so that the irrigated acreage amounts match those used in the Department's 2017 data set.

The Idaho Supreme Court has stated that "the Director 'has the duty and authority' to consider circumstances when the water user is not irrigating the full number of acres decreed under the water right." *A&B Irrigation v. Spackman (In re A&B Irrigation Dist.),* 155 Idaho 640, 652 (2013) (quoting *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.* ("*AFRD#2*"), 143 Idaho 862, 876 (2007)). The Department's use of the acreage values in paragraph 22 of the *Order* (which erroneously includes non-irrigated acres and junior acres) in determining the SWC's crop water need ("CWN") results in CWN values that are significantly overstated.[4] Further, use of this inaccurate irrigated acreage data for Methodology administration results in the Department determining shortages associated with acres that the SWC members cannot beneficially irrigate, which is contrary to law. *See, e.g., A&B Irrigation,* 155 Idaho at 652; IDAPA 37.03.11.020.03.

II. The Department's Reliance on Historical Average Project Efficiencies is Flawed and Overstates the SWC's RISD.

The Department's use of historical average project efficiencies to calculate RISD under Steps 6-9 is flawed because it fails to consider whether SWC members' operations are reasonably efficient. While Justice Schroeder concluded at the end of the 2008 hearing in this matter that SWC members were operating reasonably efficiently, the Department has not made (and does not make) evaluations of SWC system efficiencies as part of the Methodology Order since.[5] Even

[4] Further, the use of accurate irrigated acreage data demonstrates that key Methodology assumptions (e.g., that TFCC's operations are reasonably efficient) based on the 2008 hearing in this matter are no longer true.
[5] The Cities were prepared to conduct the same type of operational evaluations that were performed prior to the 2008 hearing to develop evidence to test the Department's assumption that operations that were efficient in 2008 are still

the SWC's expert, Dr. Brockway, agreed that the reasonableness of an appropriator's irrigation operations is based on "current industry standards or current state of the art." Vol. IV Tr. at 130:2-16. As Mr. Sullivan testified, "current industry standards or current state of the art" have changed in the past 15 years because of continued sprinkler conversions and advances in irrigation technology and management. Thus, project efficiencies that may have been reasonable in the past may be unreasonable now or in the future as conditions change; and since the SWC delivery call is an ongoing proceeding, with the requirement to use the best available science, it is correct to periodically review efficiencies to ensure they are reasonable and result in reasonable computed diversion demands.

The *Order*, on pp. 13-14, enumerates the monthly "project efficiencies" for each SWC member in paragraph 32. The methods used to determine project efficiencies (or "E_p") in the *Order* assume a linear relationship between diversions and CWN, in other words, that diversions (or RISD) linearly rise and fall with changes in CWN. However, as Mr. Sullivan showed in his Expert Report (*see* section 3.2 and Figures 3-4 through 3-11), the reality is different—in fact, in many months there is a weak correlation between SWC diversions and changes in CWN. In other words, some SWC members seemingly divert water based more on availability rather than CWN, often resulting in diversions in excess of what is reasonably necessary to meet crop demand. This simplifies SWC irrigation operations because it minimizes the need for active water management, and in the absence of a delivery call (or a year in which the Director predicts an adequate water supply), the Cities have no objection to this type of operation.

efficient; this is one of several areas of inquiry that the Cities were not able to pursue due to the inadequate time for discovery in this matter. *See* Testimony of Greg Sullivan; *see also* Exhibit 347A at 3, 12.

However, in years in which the Director predicts a shortage and orders curtailment, the Department should not calculate SWC members' RISD by dividing CWN by average historical project efficiencies. This approach effectively locks in historical diversions as the measure of RISD and relies on what is, at best, circular logic: CWN/historical diversions are used to compute E_p and CWN/E_p is used to compute diversion demand (or RISD). As Dr. Brockway testified, "diversions are a given," without any consideration for whether the diversions are reasonable, efficient, and not wasteful. *See* Vol IV Tr. at 51:1-15. Dr. Brockway testified that if TFCC reduced its system losses (e.g., operational spills) it could also reduce its diversions by a magnitude of 200,000 acre-feet to raise its average project efficiency from 0.35 to 0.42. *Id.* at 131:2-25. The notion that SWC member diversions are locked in stone and can never again be re-evaluated is absurd and counter to case law and the Conjunctive Management Rules ("CMR").

The flaws in the Department's approach to project efficiency are further reinforced by Figures 3-12 through 3-19, Exhibit 347A, and Mr. Sullivan's testimony on the same. Figures 3-12 through 3-19 show that project efficiencies vary with CWN. As a result, the Department's reliance on historical average monthly project efficiencies to calculate RISD (in Steps 6-9) results in overstated RISD amounts that are not supported by actual diversions.

As reflected in Exhibit 347A, and the testimony of Mr. Sullivan at the hearing, the Cities suggest the Department jettison the efficiency values in paragraph 32 and rely on project efficiencies that reflect reasonably efficient operations consistent with industry standards. Short of that, the Cities suggest the following refinements to project efficiencies to reasonably reflect the historical relationships between CWN and E_p and ensure that the E_p generally reflect above average efficiencies that the SWC members have demonstrated they routinely achieve.

The Cities suggest that the Department derive project efficiency values depending on the R^2 relationship between E_p and CWN[6]:

- When the R^2 relationship between E_p and CWN is greater than 0.50, use the regression equations found in Figures 3-13 through 3-19 for the months from April-September (but no lower than the historical average monthly efficiencies);
- When the R^2 relationship between E_p and CWN is less than 0.50, use the 75th percentile of efficiency as shown in the graphs.

III. The Department Must Revert to Steady-State Modeling Because the Curtailment of Water Rights via Transient Modeling is not Justified and is Contrary to Law.

In the *Order*, the Department, for the first time, decided to switch from using steady-state modeling to using transient modeling to determine the priority date of water rights that must be curtailed to produce the demand shortfall. The timing of the change is curious, and is not due to ESPAM improvements: Jennifer Sukow and Dave Colvin both testified that the Department has had transient modeling at its disposal since the model's inception and that refinements made in 2013 allow for a finer time-step. Without any basis, the Department's mantra has been that curtailment based on transient modeling is required to ensure the seniors are provided with water "at the time and place required," apparently based on the standards for a *mitigation plan* under CMR 43. There is no appellate or statutory law that authorizes the Department to view curtailment in the same manner as a request by a junior for a mitigation plan.

Furthermore, curtailment based on transient modeling is inconsistent with Idaho law because of the vast disparity between acres curtailed to water that shows up in the stream. The Idaho Supreme Court has stated "the policy of securing the maximum use and benefit, and least

[6] For convenience, **Exhibit A** (attached) illustrates the monthly project efficiencies (or the equations to calculate project efficiencies) for each SWC member if the Department adopted the Cities' suggested method.

wasteful use of Idaho's water resources, has long been the policy in Idaho." *Rangen, Inc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 131 (2016) (citing *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 808 (2011)). The Court acknowledged that this policy "limits the prior appropriation doctrine by excluding from its purview water that is not being put to beneficial use." *Id*. (citing *AFRD#2*, 143 Idaho at 876). The Court further tied the policy of maximum use to an acceptable "limit on the prior appropriation doctrine," found in CMR 20.03, that "[a]n appropriator is not entitled to command the entirety of large volumes of water in a surface or ground water source to support his appropriation contrary to the public policy of reasonable use of water." *Id.* (quoting IDAPA 37.03.11.020.03 (CMR 20.03)). The Court has held that the Director has broad discretion in implementing the CMR, which honor the state policy of reasonable use of both surface and ground water. *See id.* at 130.

> The policy of reasonable use includes the concepts of priority in time and superiority in right being subject to conditions of reasonable use as the legislature may by law prescribe as provided in Article XV, Section 5, Idaho Constitution, optimum development of water resources in the public interest prescribed in Article XV, Section 7, Idaho Constitution, and full economic development as defined by Idaho law. . . .

Rangen, 160 Idaho at 131 (quoting CMR 20.03).

In the conjunctive administration of groundwater and surface water, the Court has recognized that "not all of the water collected due to the curtailment will accrue to the senior water right holder; some will remain in the aquifer and some will flow to other tributary springs." *Id.* at 132. Accordingly, the Court said:

> This complexity can make it very difficult to balance a senior right holder's interest in receiving additional water against the State's interest in securing the maximum use and benefit, and least wasteful use, of its water resources. In light of this challenging balancing requirement, *it is necessary that the Director have some discretion to determine in a delivery call proceeding whether there is a point where curtailment is unjustified because vast amounts of land would be curtailed to produce a very small amount of water to the caller*.

Id. at 132 (emphasis added). Idaho law therefore authorizes the Director to rely on CMR 20.03 and Article XV, section 7, of the Idaho Constitution as a basis to limit curtailment. In *Rangen*, this policy authorized the Director to impose a trim line. *Id.* at 134. Here, the policy authorizes, if not requires, the Department to determine the priority date of water rights that must be curtailed by using steady-state modeling because curtailment under transient modeling unjustifiably increases the amount of curtailed acres tenfold and moves the priority date more senior by roughly 30-35 years. *See* Ex. 318 at 13.

Setting aside whether facts or conditions warrant the Department's switch in its modeling approach *this year*, the use of transient modeling in this delivery call in general offends the principles set forth in Idaho Code § 42-101, and the rationale and principles set forth by the Idaho Supreme Court in *Rangen* and *Clear Springs Foods*, because:

1) The disparity between the number of acres curtailed using transient modeling in 2023 (roughly 700,000), *see* Ex. 322 at 13, the amount of water that junior groundwater users would be precluded from diverting (estimated to be between 1.75 million acre-feet ("maf") and 2.0 maf) due to the curtailment, and the amount of water that would accrue to TFCC this year (75,200 acre-feet ("af")), renders curtailment past the "point where [it] is unjustified," *Rangen*, 160 Idaho at 132;
2) As discussed in the testimony of Greg Sullivan, Jennifer Sukow, and Dave Colvin, it is the past and present pumping by groundwater rights junior to approximately 1987 that has caused Snake River flows to decline by 75,200 af this year, so, consistent with the prior appropriation doctrine, only those junior right holders who are causing the shortage should face curtailment, *see* Ex. 347A at 25-26;

3) The maximum amount of water that curtailment using transient modeling could *ever* accrue to the near Blackfoot to Minidoka reach of the Snake River in the first year of curtailment is 97,700 AF, *see* Ex. 322 at 15. To achieve 97,700 AF of water, *all* ground water rights would need to be curtailed. In a dry year such as 2022, where there was a predicted shortage of 162,000 AF, transient modeling would be ineffective at fully reducing shortages calculated to SWC members. This further illustrates the limitations of curtailment and transient modeling as effective elements in administration of the SWC delivery call.

The Department's use of transient modeling disregards its duty to balance the State's interests in securing the maximum use and benefit of its water resources against the interests of the senior users; instead, it shifts conjunctive administration to a shut-and-fasten strict priority system that defies the Department's statutory mandate to "equally guard all the various interests involved" to the use of water. Idaho Code § 42-101.

Further, curtailment under transient modeling could result in certain water users being curtailed, or being forced to supply mitigation water, when those users are not injuring the SWC's members whatsoever. In *Rangen*, the SWC "argue[d] that the prior appropriation doctrine requires administration of all rights contributing to the material injury . . . ." 160 Idaho at 130. Here, testimony from Jennifer Sukow, Dave Colvin, and Greg Sullivan demonstrates that using steady-state modeling better reflect reality in the ESPA, as the aquifer has reached a state of quasi-equilibrium and it is those groundwater users with priority dates junior to the mid-1980s that are causing the SWC's shortfall in 2023. *See, e.g.*, Ex. 347A at 25-26. It is inequitable, if not unconstitutional, to redress an injury by penalizing water users who did not cause the injury.

Accordingly, the Department must not curtail water users who are not actually contributing to the SWC's demand shortfall.

Finally, the Department should revert to using steady-state modeling because use of the transient model would not adequately redress the SWC's material injury—the maximum amount of water that could accrue to TFCC in 2023 through curtailment is 97,700 af. *See* Ex. 318 at 13, 15. Had 2023 been a dry year, the demand shortfall could have far exceeded this amount, meaning that curtailment of *all* pumping on the ESPA would still not be enough. Curtailing so much pumping would be unjustified and contrary to Idaho law. This validates the testimony of Greg Sullivan, who opined that curtailment of groundwater users (in lieu of requiring these users to supply mitigation water) is an inferior and inefficient way to conjunctively administer surface and groundwater rights.

In sum, the Department must revise the *Order* to reinstate the use of steady-state modeling to determine "a priority date for curtailment if mitigation obligations are not satisfied." If not, curtailment using transient modeling will be unjustified (based on the disparity between acres curtailed and water accrued), and will unduly prejudice users who did not cause the SWC's injury.

Respectfully submitted this 16th day of June, 2023.

SOMACH SIMMONS & DUNN

By 

Sarah A. Klahn (ISB # 7928)
Maximilian C. Bricker (ISB #12283)

Attorneys for City of Pocatello

HOLDEN KIDWELL HAHN & CRAPO

By___/s/ Robert L. Harris_____
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

MCHUGH BROMLEY, PLLC

By___/s/ Candice M. McHugh_____
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 16th day of June 2023, I caused to be filed and served a true and correct copy of the foregoing document via electronic mail to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139
Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP
P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Sarah Klahn (ISB #7928)

Exhibit A

Monthly Project Efficiencies for SWC Members

Month	A&B	AFRD2	BID	Milner
April	1.19	0.38	0.54	1.04
May	0.49	PE = 1.01E-05*CWN + 0.059 (min = 0.26)	PE = 1.39E-05*CWN + 0.130 (min = 0.38)	PE = 5.88E-05*CWN + 0.180 (min = 0.47)
June	0.72	0.42	PE = 1.11E-05*CWN + 0.205 (min = 0.55)	0.66
July	PE = 4.15E-05*CWN + 0.286 (min = 0.77)	PE = 9.51E-06*CWN + 0.052 (min = 0.47)	0.56	0.72
August	PE = 4.60E-05*CWN + 0.260 (min = 0.61)	0.42	PE = 1.50E-05*CWN + 0.136 (min = 0.48)	0.58
September	PE = 9.97E-05*CWN + 0.126 (min = 0.50)	PE = 1.22E-05*CWN + 0.045 (min = 0.30)	PE = 2.57E-05*CWN + 0.078 (min = 0.36)	0.52
October	Use Sept. PE	Use Sept. PE	Use Sept. PE	Use Sept. PE

Month	Minidoka	NSCC	TFCC
April	0.53	0.27	0.34
May	PE = 1.10E-05*CWN + 0.113 (min = 0.40)	PE = 4.58E-06*CWN + 0.062 (min = 0.27)	PE = 3.92E-06*CWN + 0.093 (min = 0.32)
June	0.58	PE = 3.39E-06*CWN + 0.146 (min = 0.43)	PE = 3.34E-06*CWN + 0.183 (min = 0.53)
July	PE = 9.61E-06*CWN + 0.158 (min = 0.69)	PE = 3.52E-06*CWN + 0.120 (min = 0.50)	PE = 4.01E-06*CWN + 0.091 (min = 0.60)
August	PE = 1.45E-05*CWN + 0.033 (min = 0.59)	PE = 4.61E-06*CWN + 0.047 (min = 0.45)	PE = 3.76E-06*CWN + 0.117 (min = 0.49)
September	PE = 2.05E-05*CWN + 0.055 (min = 0.45)	PE = 7.33E-06*CWN - 0.013 (min = 0.35)	PE = 5.99E-06*CWN + 0.020 (min = 0.30)
October	Use Sept. PE	Use Sept. PE	Use Sept. PE

Notes:

(1) PE values based on analysis of historical data from the last 15 years (2007-2021).

(2) For months in which the R-squared value for the historical PE vs CWN relationship is greater than 0.5, compute the monthly PE using the historical regression equation based on the monthly CWN, but no lower than the historical average PE shown.

(3) For months in which the R-squared value for the historical PE vs CWN relationship is less than 0.5, the monthly PE is set at the 75th percentile value from the historical data.

RECEIVED
Jun 16, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB# 11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
tj@racineolson.com
elisheva@racineolson.com
Attorneys for Idaho Ground Water Appropriators, Inc.

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Post-Hearing Brief**

Idaho Ground Water Appropriators, Inc., ("IGWA"), acting for and on behalf of North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, American Falls-Aberdeen Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, submits this post-hearing brief pursuant to verbal instructions given by the Director at the conclusion of the hearing held June 6-9, 2022.

INTRODUCTION

Anytime the Department undertakes a review of the Methodology Order, the objective must be to improve its accuracy as a tool to administer surface and ground water resources in accordance with the Conjunctive Management Rules ("CM Rules"). In applying the CM Rules, the Idaho Supreme Court has instructed the Department to use the "best science available." *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 813 (2011). Consequently, the Department has a duty to periodically review the Methodology Order, evaluate its performance, and make changes as appropriate to more accurately manage surface water and groundwater resources under the SWC delivery call in accordance with the CM Rules using the best science available.

The CM Rules were developed to bridge Idaho's different statutory schemes for managing surface water and groundwater. The prior appropriation doctrine applies in both contexts, but it applies differently due to their different hydrologic environments. River flows fluctuate considerably throughout each irrigation season and reset each winter from snowfall. By contrast, changes in aquifer levels occur slowly over multi-year periods. Surface water can be shepherded among water users through rivers, canals, and ditches in a matter of hours or days, whereas groundwater cannot. When a groundwater well is shut off, the effect emanates in all directions, it may take months or years for a senior-priority water user to realize additional water, and the senior may not need additional water when it finally arrives.

Given their different hydrologic properties, the Idaho Legislature adopted different schemes for applying the prior appropriation doctrine to surface water and groundwater. Surface water is distributed under Idaho Code § 42-607 by opening and closing headgates to shepherd the available supply to those entitled to receive it on any given day of the year. By contrast, aquifers are managed under the Ground Water Act based on "reasonable ground water pumping levels" designed to maximize beneficial use of the resources by allowing groundwater users to fully develop the resource so long as they do not overdraft the aquifer. Idaho Code § 42-226. If holders of groundwater rights overdraft the aquifer, priority determines which water rights must be curtailed to maintain a reasonable groundwater pumping level. *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 802, 252 P.3d 71, 83 (2011) ("…with respect to ground water pumping, the prior appropriation doctrine was modified so that it only protects senior ground water appropriators in the maintenance of reasonable pumping levels in order to obtain full economic development of ground water resources.")

The CM Rules aim to bridge these different schemes. Under conjunctive management, delivery calls by senior surface water users are not controlled by the "reasonable pumping level" construct of the Ground Water Act, but nor are they entitled to curtail beneficial use of far more water than the senior needs, as stated in CM Rule 20.03: "An appropriator is not entitled to command the entirety of large volumes of water in a surface or ground water source to support his appropriation contrary to the public policy of reasonable use of water as described in this rule." The Idaho Supreme Court has affirmed the balancing act required by the CM Rules: "Somewhere between the absolute right to use a decreed water right and an obligation not to waste it and to protect the public's interest in this valuable commodity, lies an area for the exercise of discretion by the Director." *American Falls Reservoir Dist. No. 2 v. Idaho Dept. of Water Resources*, 143 Idaho 862, 880 (2007) ("*AFRD2*").

What makes conjunctive management so problematic is the large amount of beneficial use of groundwater that must be curtailed to supply a relatively small amount of additional surface water to senior users. The prior appropriation doctrine was adopted not only because it protects the interests of prior appropriators, but also because it facilitates full development of the state's water resources. Misapplied conjunctive management can have the opposite effect by minimizing beneficial use of Idaho's water resources.

Courts have historically curbed the exercise of priority in circumstances where it would significantly impede full development of the state's water resources. In *Schodde v. Twin Falls Land & Water Co.*, 224 U.S. 107 (1917), a senior-priority water user was deprived of his ability to divert water from the Snake River because it would have prevented development of the Twin Falls Canal and the North Side Canal systems under junior-priority water rights. The court denied the senior's claim, holding that his appropriation "lacks one of the essential attributes of an appropriation—it is not reasonable." *Id*. at 118. The court explained:

> In this arid country, where the largest duty and the greatest use must be had from every inch of water, in the interest of agriculture and home building, it will not do to say that a stream may be dammed so as to cause subirrigation of a few acres, at a loss of enough water to surface irrigate ten times as much by proper application.

Id. at 124-25. The doctrine of reasonable use is grounded in a long series of Idaho Supreme Court decisions. For instance, in *Poole v. Olaveson*, 82 Idaho 496, 502 (1960), the court held: "The policy of the law of this State is to secure the maximum use and benefit, and least wasteful use, of its water resources." Similarly, in *Farmer's Cooperative Ditch Co. v. Riverside Irrigation Distr.*, 16 Idaho 525, 525-36 (1909), the court held:

> Economy must be required and demanded in the use and application of water. Water users should not be allowed an excessive quantity of water to compensate for and counterbalance their neglect or indolence in the preparation of their lands for the successful and economical application of the water. One farmer although he has a superior water right, should not be allowed to waste enough water in the irrigation of his land to supply both him and his neighbor simply because his land is not adequately prepared for the economical application of the water.

In keeping with the doctrine of reasonable use, the CM Rules do not allow seniors to simply call for their full decreed water right and then sit back while the Department curtails juniors. Rather, a conjunctive management call triggers analyses of how much water the senior reasonably needs to accomplish their beneficial use, whether the senior is using water efficiently, and reasonable use of the resource, among other things. In reviewing the Methodology Order, the Director must evaluate its performance against the objectives of the CM Rules and make changes using the best science available that will cause it to more accurately and effectively implement the CM Rules.

The last evidentiary hearing involving the Methodology Order occurred in 2008. The recent hearing reflects 15 years of experience along with new and better science and data. Some of the information presented at the hearing warrants immediate changes to the *Fifth Methodology Order*. Other information deserves further analysis by a technical working group charged with recommending improvements to be incorporated into the methodology at a future date. It is imperative that identified weaknesses in the methodology not go unaddressed simply because an improved process and better science is not ripe for immediate implementation.

LEGAL STANDARD

Implicit in the directive to use the best science available is an obligation to use the best data available. Yet, in some instances the *Fifth Methodology Order* does not use the best science or the best data due to a misperception by Department staff that it does not satisfy a clear and convincing standard of proof. In light of this, a review of applicable legal standards and burdens of proof is appropriate.

First, the Department has a statutory duty to equally guard the interests of both senior and junior water users when administering the State's water resources, as stated in the introductory sentence of Idaho's water code:

> Water being essential to the industrial prosperity of the state, and all agricultural development throughout the greater portion of the state depending upon its just

> apportionment to, and economical use by, those making a beneficial application of the same, its control shall be in the state, which, in providing for its use, shall equally guard all the various interests involved. (Idaho Code § 42-101)

Second, the two bedrock components of the prior appropriation doctrine—priority and beneficial use—are co-equal. *In Matter of Distribution of Water to Various Water Rights Held By or For Ben. of A & B Irrigation Dist., at al.*, 155 Idaho 640, 650 (2013) ("The prior appropriation doctrine is comprised of two bedrock principles—that the first appropriator in time is the first in right and that water must be placed to a beneficial use"). Neither is superior to the other. There is no "clear and convincing" standard of proof favoring one over the other. The Department must give equal weight to both when administering the State's water resources.

Third, senior water users generally have a right to exercise priority and curtail junior water users, but "this is not an absolute rule without exception." *AFRD2*, 143 Idaho at 880. Seniors can only call for as much water as they need to accomplish their beneficial use when using water efficiently and without waste. *A&B Irr. Dist. v. IDWR*, 153 Idaho 500, 524 (2012). A determination that the senior needs less than their full decreed rate of diversion requires clear and convincing evidence. 155 Idaho at 655.

Fourth, priority cannot be exercised in a manner that is unreasonable. The waters of Idaho are a state-owned resource, and the people of Idaho have an interest in seeing the state's water put to maximum beneficial use, as discussed above. The prior appropriation doctrine was adopted not only because it protects the interests of prior appropriators, but also because it facilitates the public's interest in achieving maximum utilization of the state's water resources. The doctrine of reasonable use guards this interest.

SUMMARY

Based on the evidence presented at the hearing, IGWA contends that the following changes to the *Fifth Methodology Order* should be implemented immediately:

- Use the best science available to determine actual irrigated acreage of SWC entities.
- Use the best science available to determine and account for supplemental groundwater use of SWC entities.
- Require SWC entities to annually submit an accurate GIS shapefile or other trustworthy analysis of actual irrigated acreage and supplemental groundwater use.
- Adjust the Baseline Year (BLY) to more accurately represent water demands of SWC entities without excessive material injury calculations.
- Apply the futile call doctrine to exclude from curtailment those groundwater rights for whom curtailment will provide no additional water to the SWC by the Time of Need.
- Implement a trim line to prevent an unreasonable exercise of priority.

In addition, the Director should reconvene a technical working group comprised of both Department staff and consultants for the parties, charged with further analyzing data and making recommendations to improve the methodology, including the following:

- Improve the end-of-season injury calculation to more accurately reflect actual injury.
- Develop a mechanism and process for Department staff and third party consultants to annually review the irrigated acreage and supplemental groundwater use information submitted by SWC entities.
- Develop a mechanism to account for project efficiencies based on real efficiency factors.
- Develop a mechanism to adjust the Forecast Supply (FS) formula to account for water accruing to the SWC from major tributaries to the Snake River below Heise, including the Henry's Fork, Willow Creek, Blackfoot River, Portneuf River, and Raft River basins.
- Develop an improved method of predicting FS for Twin Falls Canal Company.

ANALYSIS

Since the fundamental purpose of the Methodology Order is to calculate material injury, the principal goal of reviewing the Methodology Order must be to improve its accuracy in that regard. Any changes to the methodology should cause it to do a better job of calculating injury.

Evaluating the accuracy of the Methodology Order naturally requires a comparison of calculated injury with actual injury. Just because the Methodology Order calculates injury does not mean injury actually occurs, and vice versa.

Since Twin Falls Canal Company (TFCC) is usually the only SWC entity for which the Methodology Order predicts injury, TFCC must be the focal point of a comparison of calculated versus actual injury. As explained below, the *Fifth Methodology Order* significantly over-calculates injury for TFCC, in part due to errors and inaccuracies in the data used in the Methodology Order that can easily be remedied.

The *Fifth Methodology Order* should be revised to more accurately calculate injury. In addition, the change from a steady-state to a transient-state application of the ESPA Model (ESPAM) necessitates application of the futile call doctrine and the doctrine of reasonable use to protect the public interest in beneficial use of the ESPA in accordance with the CM Rules.

1. The *Fifth Methodology Order* should be revised to more accurately calculate injury.

As long as TFCC shareholders have enough water to grow the crops they desire to grow, they do not experience material injury. Undisputed evidence shows that TFCC has a very reliable supply of water, and that TFCC almost always delivers to its shareholders at least 5/8 inch per acre, which is enough to grow all crops customarily raised on the TFCC tract. Only in the most severe drought years is TFCC unable to deliver 5/8 inch.

By contrast, the *Fifth Methodology Order* calculates injury to TFCC almost every year. The injury calculations are so extreme that they bear little resemblance to reality. Therefore, revisions should be made to the *Fifth Methodology Order* to so that calculated injury more accurately reflects actual injury.

1.1 TFCC's annual water diversions have remained remarkably steady over the last half-century.

While the diversion of groundwater from the ESPA has contributed to declining reach gains to the Near Blackfoot to Neeley reach, diversions by TFCC have remained remarkably steady over the last half-century, as evident by TFCC's own diversion records. (Ex. 4, p. 7, Fig. 4.) Since 2010, TFCC diversions have actually trended upward. This demonstrates that declining reach gains have not generally diminished the water supply available to TFCC. This is because TFCC holds the most senior natural flow water right among all SWC entities. Declining reach gains have impacted the natural flow supplies of junior-priority SWC entities like Burley Irrigation District (BID) and Milner Irrigation District (MID) much more than TFCC; however, BID and MID hold large amounts of storage which has allowed them to absorb declining reach gains without experiencing material injury.

1.2 TFCC's longtime consultant and expert witness confirmed that TFCC has a reliable water supply.

TFCC's longtime consultant Dr. Charles Brockway, Jr. testified that TFCC is well known as having a reliable supply of water, owing to its most senior natural flow rights supplemented by storage water. As evidence of this, Dr. Brockway explained that there are relatively few supplemental groundwater wells within TFCC. If TFCC's water supply were unreliable, Dr. Brockway testified there would be many more supplemental groundwater wells.

1.3 TFCC shareholders can raise crops with 5/8 inch per acre without suffering material injury.

TFCC delivers water to shareholders on a per share basis, measured in miner's inches. The TFCC system was designed for one share per acre, but there are currently 10,000-20,000 more shares than irrigated acres, resulting in an average of around 1.1 shares per acre. The peak rate TFCC can deliver is 3/4 inch per share, but TFCC's base delivery is 5/8 inch per share. During severe drought TFCC has on occasion delivered 1/2 inch per share. (Ex. 332).

To be sure, it is easier to manage a canal with peak diversions. Peak diversions require little operational efficiency, whereas managing water more efficiently requires more care and attention. Consequently, TFCC, like all other canal companies, diverts its maximum authorized diversion rate when water is plentiful, even if its shareholders could grow their crops with less water when used efficiently. (Barlogi.)

When making a conjunctive management delivery call, however, senior users are not entitled to curtail juniors simply to enjoy the convenience of peak flows and easy operational management. Given the large amount of beneficial use of groundwater that must be curtailed to provide a comparatively small amount of additional to a senior surface user, the CM Rules require seniors use water efficiently before looking to curtail juniors. CM Rule 40.03 provides:

> In determining whether diversion and use of water under rights will be regulated under Rule Subsection 040.01.a. or 040.01.b., the Director shall consider whether the petitioner making the delivery call is suffering material injury to a senior-priority water right and is diverting and using water efficiently and without waste, and in a manner consistent with the goal of reasonable use of surface and ground waters as described in Rule 42.

As explained below, the amount of water TFCC needs to raise crops without suffering material injury has not heretofore been determined. However, the record is clear and unequivocal that TFCC shareholders can raise crops on 5/8 inch per acre without suffering material injury.

(a) The amount of water TFCC needs to raise crops without suffering material injury has not been determined.

The Department's original material injury analysis considered, among other things, "average monthly headgate deliveries to the entity's members or shareholders (e.g., 5/8 inch)." *Order*, p. 31 (Feb. 14, 2005). Consequently, the original evidentiary hearing held in 2008 included evidence of the amount of water TFCC stockholders need to raise crops without suffering material injury. After considering the evidence, the hearing officer, former Idaho Supreme Court Justice Gerald Schroeder, made the following finding of fact:

> The former Director accepted Twin Falls Canal Company's response that 3/4 inch constituted full headgate delivery, and TFCC continued to assert that position at hearing. This is contradicted by the internal memoranda and information given to the shareholders in the irrigation district. It is contrary to a prior judicial determination. It is inconsistent with some of the structural facilities and exceeds similar SWC members with no defined reason. Any conclusions based on full headgate delivery should utilize 5/8 inch.

Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation, p. 53, 55. (April 29, 2008). On September 5, 2008, the Director issued the *Final Order Regarding the Surface Water Coalition Delivery Call* accepting the hearing officer's recommendation.

On appeal, the district court ruled that "senior right holders are authorized to divert and store up to the full decreed or licensed quantities of their storage rights, but in times of shortage juniors will only be regulated or required to provide mitigation subject to the material injury factors set forth in CMR 042." *Order on Pet. For Jud. Rev.*, Gooding Cty. Case No. CV-2008-551, p. 26 (July 24, 2009). However, the court determined that the Director's finding that a "full headgate delivery" is 5/8 inch per acre exceeded his authority because TFCC's authorized diversion rate was to be decided in the SRBA. *Id*. at 31-32. On rehearing, the court clarified that while the SRBA court determines that maximum authorized rate of diversion under TFCC's water rights, the Department may determine under the CM Rules that TFCC needs less than its maximum rate to accomplish its beneficial use, but that such a determination must be supported by clear and convincing evidence. *Order on Pet. For Rehearing*, Gooding Cty. Case No. CV-2008-551, p. 7-8 (Aug. 23, 2010). Since the hearing officer did not indicate the evidentiary standard he applied to arrive at his 5/8 inch full headgate delivery finding, the district court remanded the matter to the Department to make that determination. *Id*.

The court's decision concerning the clear and convincing standard relied on a separate district court decision issued earlier that year in the A&B Irrigation District delivery call case. There, the court ruled that the decreed rate of diversion reflects a determination of beneficial use at the time of adjudication, but "there may be post-adjudication factors relevant to the determination of how much water is actually needed." *Memorandum Decision and Order on Pet. For Jud. Rev.*, Minidoka Case No. 2009-647, p. 30 (May 4, 2010). The court explained:

> The most obvious example would be if the senior is not irrigating the full number of acres for which the right was decreed. Efficiencies, new technologies and

> improvements in delivery systems that reduce conveyance losses can result in a circumstance where the full decreed quantity may not be required to irrigate the total number of decreed acres. The subsequent lining or piping of a ditch or the conversion from gravity fed furrow irrigation to sprinkler irrigation can reduce the quantity of water needed to accomplish the purpose of use for which the right was decreed. Year to year variations in water requirements also result from the types of crops that may be planted. The Idaho Legislature specifically acknowledged water users could reduce water requirements through the implementation of efficiencies and authorized the ability to expand irrigated acreage so long as the rate of diversion was not increased. See I.C. § 42-1426.

Id. at 30-31. The court noted also that "the rate of diversion for an irrigation water right sets a maximum rate of diversion to satisfy the peak water demand for the most water intensive crop grown in the region. In the event the senior is irrigating a less water intensive crop, the maximum rate of diversion may not be required." *Id*. at 30, fn. 11. The court then quoted a decision issued by the SRBA court stating:

> the quantity element of a water right necessarily sets the 'peak' limit on the rate of diversion that a water right holder may use at any given point in time … whereas the beneficial use limit is a fluctuating limit, which contemplates both rate of diversion and total volume, and takes into account a variety of factors, such as climatic conditions, the crop which is being grown at the time, the stage of the crop at any given point in time, and the present moisture content of the soil, etc.

Id. at 32.

Returning to the SWC case, after the district court issued its rehearing decision in August of 2010 remanding the 5/8 versus 3/4 inch issue, IDWR filed a motion for reconsideration stating: "As established in the Methodology Order, the Director is using 3/4 of an inch for TFCC diversions, instead of the stated 5/8 of an inch in his September 5, 2008 Final Order;" therefore, "the basis for the remand is moot." *Motion to Clarify / Motion for Reconsideration of Orders on Petitions for Rehearing*, Gooding County Case No. CV-2008-551, p. 3 (Aug. 26, 2010). Around that time, the Department had changed how it calculated material injury, switching from the "Minimum Full Supply" methodology to the "Reasonable In-Season Demand" methodology. The district court accepted the Department's representation. *Amended Order on Petitions for Rehearing; Order Denying Surface Water Coalition's Motion for Clarification*, Gooding County Case No. CV-2008-551, p. 10 (Sep. 10, 2010). Accordingly, the Idaho Supreme Court did not address the issue on appeal, though it noted it in the procedural history. *In Matter of Distr. of Water to Various Water Rts. Held By or For Ben. of A & B Irr. Dist.*, 155 Idaho at 647 (2013).

The Methodology Order does not actually utilize a 3/4 inch headgate delivery, 5/8 inch delivery, or any other headgate delivery as part of its material injury determination for TFCC. Rather, it predicts material injury using a "Baseline Year" mechanism which is based on each SWC entity's gross diversion volume in a year or average of years with below-average precipitation, above-average ET, and unlimited water supply.

Since material injury under the Baseline Year mechanism is not tied to headgate deliveries, the parties ceased litigating whether TFCC shareholders can raise their crops with 5/8 inch per acre without suffering material injury. However, the parties foresaw that the issue would be

relevant in the future. Therefore, when TFCC's water rights were adjudicated in the SRBA, TFCC, IGWA, and Pocatello signed a stipulation in April of 2012 stating:

> a. Evidence relating to water use after November 19, 1987 was not at issue in the Adjudication. These water rights are decreed in the Snake River Basin Adjudication based on the extent of beneficial use that existed prior to or at the time of commencement of the Adjudication on November 19, 1987. The parties agree that issues related to conjunctive administration (including factors identified in IDAPA 37.03.11.42), as they exist after November 19, 1987, were not at issue in these subcases.
>
> b. The "diversion rate" element under each water right reflects the maximum authorized rate of diversion under each water right. However, the parties agree that crop water demand can vary over the course of an irrigation season, or from season to season, meaning the maximum authorized diversion rate may or may not be required over the entire course of a particular irrigation season.

Ex. 184, p. 2.[1]

IGWA is not presently raising the 5/8 inch headgate delivery as a means of changing or replacing the Baseline Year mechanism currently used in the Methodology Order to predict material injury. Rather, IGWA is raising it for the purpose of comparing how well the Methodology Order's material injury calculations correlates with actual injury. The Idaho Supreme Court has made clear that "evaluating whether a diversion is reasonable in the administrative context should not be deemed a re-adjudication." *AFRD2*, 143 Idaho at 878 (citing *Schodde*, 244 U.S. 107 (1912)).

(b) Clear and convincing evidence demonstrates that TFCC shareholders can raise crops on 5/8 inch per acre without suffering material injury.

The evidence is unequivocal that TFCC shareholders can fully irrigate their crops with 5/8 inch per acre without suffering material injury.

First, TFCC's shares of stock were issued on the basis that they provide a delivery rate of 5/8 inch per acre. When TFCC undertook to construct its canal system, it entered into a contract with the State Board of Land Commissioners stating that each share of stock provides a right to the delivery of 5/8 inch per acre when supplies permit: "The certificates of sale of water rights and the certificates of shares of stock of the Twin Falls Canal Company, Limited, shall each upon being issued to the purchaser or holder of land under the canal system, be made to indicate and define in the contract or certificate as the case may be, the amount of water, to-wit: One eightieth of a second foot allotted to each acre represented thereby." (Ex. 363, p. 7; Ex. 364)

Second, TFCC's internal policy documents clearly establish that 3/4 inch is the maximum capacity of the system and that 5/8 inch is the normal headgate delivery. TFCC's 1999 Management Plan states that "TFCC has always operated on the premise that the Company must deliver 5/8 m-in per acre constant flow so long as that supply is available." (Ex. 4166, p. 2.)[2]

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1 An SRBA Standard Form 5 (Stipulated Elements of a Water Right) incorporating this stipulation was filed with the SRBA Court on May 23, 2012, in Subcase Nos. 1-4, 1-10 and 1-209.

2 Ex. 4166 citation is found as a part of the final agency record on appeal in Gooding County Case No. CV-2008-551.

Likewise, TFCC's Operations Policy states: "The TFCC water right is 5/8ths of an inch per share. This includes an obligation to deliver 1/80th of a cubic foot per second for each share of stock when water is available." (Ex. 339, p. 2.); *State v. Twin Falls Canal Co*., 21 Idaho 410 (1911); *Twin Falls Land & Water C. v. Twin Falls Canal Co*., 79 F.2d 431 (9th Cir. 1935).

Third, TFCC leases storage to the Bureau of Reclamation for flow augmentation purposes on years when it delivers 5/8 inch per share. If TFCC shareholders suffer genuine injury with a 5/8 inch delivery, TFCC would not voluntarily lease storage to a third party.

Fourth, 5/8 inch per acre is ample to raise all crops grown by TFCC shareholders. TFCC's manager testified that shareholders typically take water continuously throughout the irrigation season beginning in April and ending in late September or October. Conservatively assuming a 5-month irrigation season and a delivery rate of 5/8 inch per acre, TFCC delivers 4.7 acre-feet per acre to the headgate of each shareholder. By comparison, the following table shows the volume of water needed to grow each crop customarily grown by TFCC shareholders, based on precipitation deficit data developed by the University of Idaho for the Twin Falls area.

Twin Falls 3SE (NWS – USC00109299)		
Precipitation Deficit Data		
Crop	Annual ET (a-f)	Growing Season ET (a-f)
Alfalfa - peak (no cutting effects)	3.8	3.84
Alfalfa - frequent cuttings	3.01	3.05
Sugar Beets	2.53	2.59
Field Corn - moderate season length	2.02	2.07
Silage Corn - truncated season	1.94	2
Sweet Corn - early plant	1.62	1.66
Sweet Corn - late plant	1.62	1.65
Potatoes - early harvest	1.55	1.6
Potatoes - late harvest	1.85	1.9
Grass Hay	2.97	3.07
Spring Grain - irrigated	1.8	1.93
Winter Grain - irrigated	1.99	1.92
Grass Pasture - high management	2.91	3.01
Grass Pasture - low management	2.32	2.41

All of this clearly demonstrates that TFCC shareholders can raise their crops on 5/8 inch without suffering material injury. The SWC offered no contradictory evidence.

1.4 The Methodology Order frequently calculates injury in years when TFCC delivers 5/8 inch or more per acre.

TFCC produced a chart showing the amount of water it has delivered to the headgates of its shareholders since 1990, showing at least 5/8 inch delivery throughout the entire irrigation season in all but five of the last 32 years. (Ex. 332.) By contrast, the Methodology Order frequently calculates material injury at the end of the irrigation during yeas when TFCC delivers

5/8 inch and even 3/4 inch per share for the duration of the irrigation season, as shown in the "November Actual Demand Shortfall" column of the following table which is a combination of the tables contained in Exhibit 837A at Attachment C and page 6 (Table 2-8):

Year	April BLY 06-08-12 (AF)	April BLY 2018 (AF)	July BLY 06-08-12 (AF)	July BLY 2018 (AF)	November Actual Demand Shortfall (AF)	TFFC inches per acre	Year
2000	30,183	126,125	0	0	0	3/4	2000
2001	179,947	334,970	160,472	200,546	243,565	*3/4, 5/8, 1/2*	*2001*
2002	42,800	131,308	17,381	45,136	31,217	5/8	2002
2003	10,124	93,902	43,808	80,241	0	5/8	2003
2004	199,101	364,958	223,032	264,426	264,340	*5/8, 1/2*	*2004*
2005	114,916	228,241	0	0	0	5/8	2005
2006	0	0	365,880	388,939	23,792	3/4	2006
2007	56,914	152,855	201,036	253,185	289,065	5/8	2007
2008	0	15,138	46,525	55,334	0	3/4	2008
2009	0	34,109	0	0	0	3/4	2009
2010	94,957	190,898	0	0	0	3/4	2010
2011	0	0	0	0	0	3/4	2011
2012	0	53,778	69,066	92,125	139,524	3/4, 5/8	2012
2013	28,802	110,912	114,058	154,132	22,588	3/4, 5/8	2013
2014	0	0	0	0	0	3/4, 5/8	2014
2015	88,959	184,901	107,418	138,684	92,246	3/4	2015
2016	44,163	111,457	21,271	44,330	7,853	3/4	2016
2017	0	65,382	0	0	0	3/4	2017
2018	0	44,805	0	0	10,996	3/4	2018
2019	20,943	88,237	0	0	0	3/4	2019
2020	0	59,101	0	0	0	3/4	2020
2021	40,491	126,102	162,873	194,139	190,816	*3/4, 5/8, 1/2*	*2021*
2022	162,613	313,446	52,771	84,036	276,551	*5/8, 1/2*	*2022*

No adjustments are made in the *Fifth Methodology Order* to improve the accuracy of the end-of-season material injury calculation. Evidence presented at the hearing shows the overcalculation is due in part to errors or inaccuracies in the data in the data used in the Methodology Order, as discussed below. Some of these errors can be corrected immediately to improve the accuracy the Methodology Order; others should be assigned to the technical working group for further analysis.

1.5 The *Fifth Methodology Order* generates extreme pre-season and mid-season injury predictions that bear little resemblance to reality.

Whereas the end-of-season calculation is intended to reflect actual injury, the Methodology Order intentionally overpredicts Demand Shortfall (DS) in April (Step 3) and July (Step 6) by using above-average water demand for the Baseline Year (BLY) and below-average water supply as the Forecast Supply (FS). These biases compound to aggressively over-predict DS. The *Fifth Methodology Order* takes the overprediction to new heights by adopting a new BLY that is much more aggressive than the BLY used in prior iterations of the Methodology Order.

In addition, errors and inaccuracies in the data used in the methodology cause it to overpredict DS even further. The result is a *Fifth Methodology Order* that generates extreme overpredictions of DS that bear little resemblance to reality. As shown in the above table, a hindcast of the *Fifth Methodology Order* applying it to the time period 2000-2022 shows it generating DS predictions in April (Step 3) and July (Step 6) in 20 out of 22 years, even though

TFCC rarely suffers injury in reality. In most of those years, the curtailment would shut off water to every groundwater right from the ESPA—farmers, cities, food processors, and others.

The above table demonstrates that the *Fifth Methodology Order* is far out of balance with the objectives of the CM Rules. This is reinforced by the fact that it generated a massive curtailment in 2023 despite snowpack being far above average and a reservoir system expected to fill or nearly fill. Nobody familiar with water supplies in the Upper Snake River Basin believes there is any legitimate risk of injury to TFCC this year.

1.6 Evidence presented at the hearing identified several solutions that will improve the accuracy of the *Fifth Methodology Order*.

Fortunately, there are solutions. The Methodology Order can become more accurate at predicting material injury by (i) adjusting the BLY to correlate with hydrologic conditions represented previously by the BLY, (ii) adjusting the FS to account for inflows from other tributary basins, (iii) developing an improved regression model to forecast water supply for TFCC, (iv) using actual irrigated acreage to calculate material injury, (v) accounting for supplemental groundwater use, and (vi) developing a method of calculating project efficiency based on real efficiency factors.

(a) Baseline Year (BLY).

The *First Methodology Order* utilized 2006 and an average of 2006 and 2008 ("06/08") as a BLY. 2006 BLY represented 97% of the 2000-2008 total SWC diversions, and the 06/08 BLY represented 100% of the average 2000-2008 total SWC diversions. Both 2006 and the 06/08 average were determined by the Department to be an appropriate BLY. (Ex. 837A, p. 13.)

The *Third Methodology Order* updated the BLY based on data from 2009-2014 data, with the Department selecting average diversions in 2006, 2008 and 2012 as the BLY, resulting in a BLY equivalent to 101% of average diversions from 2000-2014. *Id*. The *Fifth Methodology Order* adopts a single year of diversions in 2018 as the BLY, pushing the BLY to 104% of average diversions from 2000-2021. For TFCC, diversions for 2018 are 106% of the average 2000-2021 diversions.

The difference between 101% and 104% or 106% BLY is far more consequential than one might expect, adding 96,000 acre-feet of predicted DS in April. (Ex. 837A, p. 18.) This is a significant reason why the *Fifth Methodology Order* has become far less accurate at predicting injury than the *Fourth Methodology Order*.

2018 is a poor representation of above-average water demand of the SWC because it falls on the extreme end of the spectrum for precipitation. For years from 1992-2021, 2018 was the only irrigation season where there was zero precipitation from July to September.

It is also significant that the Methodology Order creates a "positive feedback loop" that incentivizes SWC entities to divert as much water as possible in order to elevate their average diversion volumes, which in turn generates a higher BLY, which in turn requires junior water users to provide more mitigation to the SWC to avoid curtailment. (Sullivan.) Not surprisingly, TFCC diversions have trended upward in recent years, forcing the BLY upward. *Id.*

The 2018 BLY is not the only option. As shown in Table 2-4 of Exhibit 837A, a BLY of 06/18 is more consistent with the average 2000-2021 BLY selection criteria values than a BLY of 2018 or 2020. (Ex. 837A, p. 19.) This change to the Methodology Order can be implemented immediately and will improve its accuracy in predicting material injury.

(b) Forecast Supply (FS).

The Methodology Order predicts water supply to the SWC based on flows at Heise Gauge on the South Fork of the Snake River near Ririe, without accounting for inflows from other major tributary basins such as the Henry's Fork, Willow Creek, Blackfoot River, Portneuf River, and Raft River. As of April 3, 2023, snow water equivalent in the Willow Creek basin was 178% of normal, the Blackfoot basin was 186% of normal, Henry's Fork Bains at 124% of normal, and the Portneuf basin 216% of normal, whereas the Upper Snake Basin above Palisades was at 120%. (Ex. 366.) In years like 2023 when the unaccounted-for tributaries have much higher snowpack than the headwaters of the South Fork, the Methodology Order significantly underpredicts actual water flows available to the SWC, which results in an overprediction of DS.

The Director should instruct the technical working group to evaluate incorporation of other major tributaries in the FS formula in order to improve the accuracy of the Methodology Order's DS calculations.

The Director should also instruct the technical working group to take action to improve the regression model used to forecast water supply to TFCC. The current model has a degrading R^2 value, decreasing from 0.86 in 2014 to 0.72 in 2022. R^2 values are a standard statistical tool used to quantify the predictive power of a model. (Sigstedt; Anders.) R^2 values range between one (1) and negative one (-1), with numbers approaching either representing better model predictions. *Id.* The decreasing R^2 value in the TFCC model means that the predictive power of the TFCC FS model is getting worse over time. *Id.* Given the continued, persistent decrease in R^2 values on the TFCC model, it is unlikely to improve in future years. (Sigstedt.)

The TFCC model has been a concern since at least 2015 when Sophia Sigstedt provided recommendations to the Department for improving the methodology's natural flow models. (Ex. 837A, p. 77). At that time, Ms. Sigstedt presented an alternative forecast model approach that should be investigated. *Id.* Department staff have been concerned with the TFCC forecast for several years, but no action has been taken to explore Ms. Sigstedt's proposal or otherwise improve the regression model for TFCC.

The *Fifth Methodology Order* states: "The forecasting techniques will be revised based on updated data and the forecasting techniques may be revised when improvements to the forecasting tools occurs." (Ex. 300, p. 18). Accordingly, the Director should task the technical working group with developing a more accurate and reliable forecast supply model for TFCC.

(c) Irrigated Acreage.

TFCC's water rights authorize the irrigation of 196,162 acres. However, this reflects irrigation as of the commencement of the SRBA on November 19, 1987. TFCC admits that fewer acres are irrigated today. Thus, the clear and convincing standard has been met that TFCC is not irrigated its full decreed acreage.

At the first evidentiary hearing held in 2008, a manual review of the TFCC project revealed a total of 183,589 irrigated acres. (Ex. 3007A[3]; Ex. 837A, p. 8.) From 2010-2014, the Department calculated material injury for TFCC based on this figure. (Sigstedt; Ex. 837A, p. 8.) Since 2015, the Department has assumed 194,732 irrigated acres based on a GIS shapefile that TFCC generated in-house with no collaboration with IDWR or the groundwater users directly

[3] Ex. 3007A was admitted to the agency record in this matter during the original 2008 delivery call and is contained in the final agency record on appeal in Gooding County Case No. CV-2008-551.

affected by the issue. (Sigstedt). The TFCC shapefile has never been subject to scrutiny in an evidentiary hearing. At the recent hearing, it was made clear that the 2013 shapefile was created with a broad brush that captured all land that could theoretically be irrigated, including many homes, farmsteads, subdivisions and other lands that are not in fact irrigated. Thus, the 2013 TFCC shapefile captures a gross acreage figure that is far greater than actual irrigated acreage within TFCC.

IDWR maintains Irrigated Lands data sets used in the ESPA Model to calculate irrigated acreage which were developed using a much more precise process. The 2011 Irrigated Lands data set calculated 179,486 irrigated acres for TFCC. (Ex. 928, at p. 19.) The 2017 Irrigated Lands data set calculated 180,956 acres. *Id*. The 2021 METRIC data used in ESPAM is also more precise than TFCC's shapefile and shows 179,486 irrigated acres. *Id.* at p. 16. The 2017 and 2021 data sets are more recent than the 2013 shapefile. Jennifer Sukow testified that these data sets represent the best science available to determine actual irrigated acreage, and this is the data used in ESPAM for purposes of calculating curtailment under the Methodology Order.

While the Irrigated Lands and METRIC datasets consistently calculate around 15,000 fewer irrigated acres than TFCC's 2013 shapefile, the acreage figures cited above (179,486 and 180,956) still overstate actual irrigated acreage because they encompass both irrigated land and semi-irrigated land (subdivisions, etc.).

Matt Anders testified that he declined to use the best science available and the best data available because he did not believe it satisfies the "clear and convincing" standard of proof. This is mistaken. Once a junior proves that a senior is not irrigating the full number of acres, the Department must use the best science available to determine actual irrigated acreage.

The SWC could not defend their 2013 shapefile as accurately representing actual irrigated acreage. Instead, TFCC's manager and its expert Dr. Brockway, Jr. argued that TFCC has a legal obligation to deliver water to all shares of stock in the company, and the Department should therefore assume that every acre with appurtenant shares is fully irrigated regardless of whether the land is actually irrigated. TFCC's position is untenable and contradictory to the fundamental premise of the CM Rules and the prior appropriation doctrine that a senior can only call for water that will in fact be applied to beneficial use.

Remarkably, TFCC has done nothing to accurately track irrigated acreage in its surface area. It does not maintain a map or record book of any type. TFCC annually reports irrigated acreage to IDWR under Step 1 of the Methodology Order, but there is no data or analysis to support it. Not because TFCC lacks the ability to maintain an accurate GIS shapefile or other database of actual irrigated acres. Other canal companies do this. Water users having water rights with a permissible place of use do this. But because it benefits TFCC to not maintain an accurate inventory of irrigated acreage.

Neither IGWA nor other groundwater users have access to TFCC's water delivery data, making it very difficult if not practically impossible for them to analyze actual irrigated acres. Instead, they must trust TFCC to provide an honest accounting of irrigated acreage.

To improve the accuracy and reliability of the Methodology Order, the Director should remove the 5% irrigated acreage threshold from the Methodology Order and require SWC entities to annually submit an accurate GIS shapefile or other reliably documentation of actual irrigated acreage. The Director should also direct the technical working group to develop a mechanism to review the annual submissions of SWC entities, as contemplated by the Department in 2015. (Ex. 837A, p. 56.)

Until that is done, the Director should use the most recent Irrigated Lands data set or

METRIC data set to determine actual irrigated acreage of SWC entities. This course of action is warranted under the clear and convincing standard of proof because the evidence is undisputed that (i) TFCC is not irrigating all of its decreed acres, (ii) TFCC's 2013 shapefile was relatively imprecise and captures many acres that are not actually irrigated, and (iii) the Irrigated Lands data set and the METRIC data set represent the best science available.

(d) Supplemental Groundwater Use.

In 2015, Department staff recommended that a procedure be developed for reviewing irrigated land data self-reported by SWC entities and accounting for supplemental groundwater use. (Ex. 837A, p. 9.) The recommendation notes that "There was insufficient time for the committee to evaluate [supplemental ground water use]" but that the Department committee recommended reviewing this issue. *Id*. at 56. Eight years later, the *Fifth Methodology Order* states: "At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities." (Ex. 300, p. 10). Matt Anders testified that they performed no additional analysis or review to address supplemental ground water use since 2015.

TFCC's manager and expert consultant Dr. Brockway, Jr. both testified that there is some supplemental groundwater use within TFCC. IGWA does not have the ability to accurately evaluate supplemental groundwater use for the same reason that it cannot accurately evaluate surface water irrigated acres—because TFCC holds the surface water delivery data. Unless the Department requires TFCC to disclose this data or provide a report of supplemental groundwater use, the Methodology Order will continue to assume there is no supplemental groundwater use and, as a result, overpredict DS.

The Department has a database used in the ESPA Model that assigns a groundwater fraction to mixed-source lands. (Sukow.) As of today, this is the best science and data available to document supplemental groundwater use. The Department should utilize this data when calculating material injury, and task the technical working group with developing a method to reliability track supplemental groundwater use.

(e) Project Efficiency.

CM Rule 42.01.d requires the Director, when determining material injury under the CM Rules, to consider "the rate of diversion compared to the acreage of land served, the annual volume of water diverted, the system diversion and conveyance efficiency, and the method of irrigation water application."

Conveyance efficiency is based primarily on canal seepage and evaporation. The Methodology Order, however, does not evaluate such factors. Instead, it calculates efficiency simply as the product of crop water need divided by gross diversions. If CWN stays constant and diversions go up, the Methodology Order calculates lower efficiency, and vice version.

This approach is problematic because it makes no adjustment for real efficiency improvements. TFCC's manager testified that the company has made major efficiency improvements, including large lining projects. The Methodology Order makes no adjustment as a result of such improvements. Further of issue is the Department's use of total SWC diversions to calculate project efficiency. The *Fifth Methodology Order* states that Project Efficiency is CWN divided by Q_D. Q_D is defined as "irrigation entity diversion of water *specifically put to beneficial use for the growing of crops* within the irrigation entity." (Ex. 300, p. 13) (emphasis added). The

Department currently does not determine what portion of total SWC diversions are specifically put to beneficial use for the growing of crops. (Brockway).

The Director should direct the TWG to develop a mechanism to track real canal efficiency based on real efficiency factors.

2. The *Fifth Methodology Order* should be amended to apply the futile call doctrine.

One reason curtailment is so excessive under the *Fifth Methodology Order* is because it fails to apply the futile call doctrine, despite CM Rule 20.04 stating: "The principle of the futile call applies to the distribution of water under these rules." The CM Rules defined a "futile call" as "A delivery call made by the holder of a senior-priority surface or ground water right that, for physical and hydrologic reasons, cannot be satisfied within a reasonable time of the call by immediately curtailing diversions under junior-priority ground water rights or that would result in waste of the water resource."

The futile call doctrine has a long history in Idaho. Since at least 1904 it has been applied to surface water administration. *Cartier v. Buck*, 9 Idaho 571, 75 P. 612, 613 (1904); *Moe v. Harger*, 10 Idaho 302, 77 P. 645 (1904). In applying the futile call doctrine, courts have noted that futile call "is a well established part of the prior appropriation doctrine." Order on Pet. for Jud. Rev., at 21, *Clear Springs Foods, Inc. v. Spackman*, No. 2008-0000444 (Gooding Cnty. Dist. Ct. Idaho June 19, 2009) (citing *Gilbert v. Smith*, 97 Idaho 735, 552 P.2d 1220 (1976); *Martiny v. Wells*, 91 Idaho 215, 419 Idaho 470 (1966); *Jackson v. Cowan*, 33 Idaho 525, 196 P. 216 (1921); *Moe v. Harger*, 10 Idaho 302, 77 P. 645 (1904)).

At the hearing, testimony confirmed that IDWR continues to apply the doctrine as between surface water users. For example, Tony Olenichak testified that the doctrine is applied every year in the Teton Basin when the tributaries to the main stem of the Teton River lose their surface water connection. He explained that if shutting off diversions on a tributary stream does not cause surface water to reach the main stem within 5-7 days, the futile call doctrine takes effect and junior users are allowed to divert water out of priority.

Mr. Olenichak explained that the reason tributaries in the Teton Basin lose a surface water connection is because the surface flow in the tributary streams sinks into the ground through gravelly soils. Much if not all of this water flows underground in the shallow aquifer until it daylights via springs along the main stem of the Teton River. Nonetheless, the subsurface connection does not preclude application of the futile call doctrine.

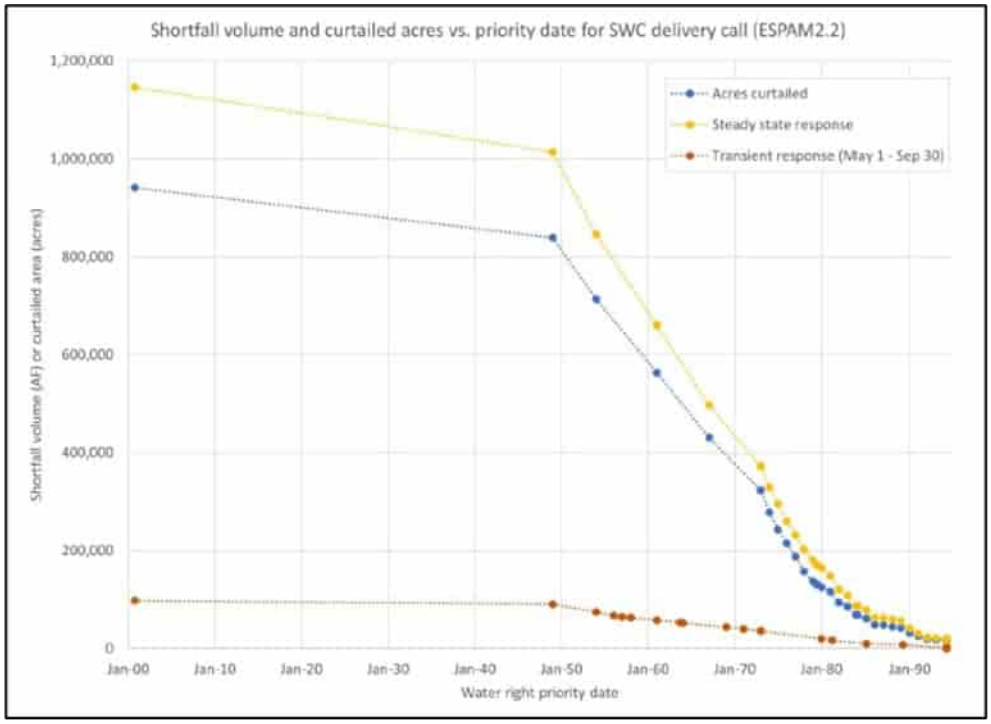
As a minimum, the futile call doctrine must be applied to the SWC delivery call to preclude curtailment of groundwater rights for whom curtailment would provide no additional water to the SWC by the Time of Need. However, the doctrine has historically not been so strict. By definition, it also includes circumstances where curtailment would be wasteful. Indeed, in surface water systems the doctrine takes effect even when the senior would receive a small amount of water via underground connectivity.

Undisputed evidence at the hearing shows that curtailment of groundwater pumping within Carey Valley Ground Water District , Madison Ground Water District, and Henry's Fork Ground Water District will provide zero additional water to the SWC at the Time of Need, and curtailment of groundwater pumping within North Snake Ground Water District, Magic Valley Ground Water District, Jefferson-Clark Ground Water District, and Bonneville-Jefferson Ground Water District will provide essentially no additional water to the SWC when compared to the magnitude of curtailment within those districts. (Ex. 837A, p. 43.)

Based on undisputed evidence, the Director should immediately implement the futile call doctrine in an amended *Fifth Methodology Order*.

3. The *Fifth Methodology Order* should be amended to apply CM Rule 20.03 and prevent the unreasonable exercise of priority by SWC entities.

The change from a steady-state to transient-state model means that exponentially more acres of farmland will be curtailed for each acre-foot of Demand Shortfall calculated under the *Fifth Methodology Order*, as shown in Exhibit 905 cited below. This massive shift requires the Department to revisit the doctrine of reasonable use as set forth in CM Rule 20.03: "An appropriator is not entitled to command the entirety of large volumes of water in a surface or ground water source to support his appropriation contrary to the public policy of reasonable use of water as described in this rule."



Comparison of priority dates calculated for April DS Forecasts (May 1 Curtailment), Ex. 90, p. 13.

Courts have historically curbed the exercise of priority in circumstances where it would significantly impede full development of the state's water resources. Ironically, the seminal case involved development of the Twin Falls and North Side canal systems. *Schodde v. Twin Falls Land & Water Co.*, 224 U.S. 107 (1917). In *Schodde*, a senior-priority water user's ability to divert water from the Snake River was nullified by development of the Twin Falls Canal Company (TFCC) and North Side Canal Company (NSCC) diversions. The senior sued, but the court denied their claim, holding that the senior's appropriation "lacks one of the essential attributes of an appropriation—it is not reasonable." *Id*. at 118. The court explained:

> In this arid country, where the largest duty and the greatest use must be had from every inch of water, in the interest of agriculture and home building, it will not do to

> say that a stream may be dammed so as to cause subirrigation of a few acres, at a loss of enough water to surface irrigate ten times as much by proper application.

Id. at 124-25. Were it not for the sideboard of reasonableness imposed upon the exercise of priority, TFCC and NSCC would not exist. Now, however, the shoe is on the other foot. It is TFCC that desires to exercise priority in a manner that would eliminate ten times as much water as would accrue to TFCC from curtailment.

Moreover, this is not a situation where TFCC will go without water in the absence of curtailment. TFCC's water supply consists primarily of "base flow" from the Snake River. While reach gains from the ESPA have declined since 1980, the decline has had little if any impact on TFCC's water supply. TFCC's expert, Dr. Brockway, testified that diversions have remained steady over the last 46 years. Thus, the decline in reach gains does not appear to have affected TFCC's water supply. The decline presumably affected other SWC entities who have junior-priority natural flow rights but much higher storage reserves than TFCC which have enabled them to absorb declining reach gains without experiencing material injury.

In all but four of the last 46 years, TFCC's annual diversion volume has stayed within 75,000 acre-feet, or seven (7) percent, of average. Even in the most extreme drought year TFCC's diversion volume was within 151,000 acre-feet, or 14 percent, of average. (Ex. 4, p. 6-7). Thus, even on the occasion when the methodology order accurately predicts a DS, curtailment of hundreds of thousands of acres of groundwater irrigated farmland will do no more than increase TFCC's water supply by a few percentage points.

It strains credulity to think it reasonable to exercise priority in a manner that curtails ten or fifty times more water than TFCC would receive from curtailment, especially when TFCC will receive nearly full supply of water without curtailment, and when a shortfall can be remedied through more efficient water conveyance and usage practices.

4. Due Process and the Idaho Administrative Procedures Act.

IGWA maintains that Director violated due process and the Idaho Administrative Procedures Act by (i) failing to hold a hearing before issuing the *Fifth Methodology Order*, (ii) rushing into an after-the-fact hearing without providing adequate time for groundwater users to fully analyze and be prepared to fairly address all components of the *Fifth Methodology Order*, (iii) denying discovery of information relevant to the *Fifth Methodology Order*, (iv) denying the groundwater users subpoena of Mathew Weaver, and (v) refusing to allow an offer of proof of evidence that would have been submitted through Mr. Weaver. In support of this position, IGWA incorporates by reference *Ground Water Districts' Brief in Support of Motion for Stay, Motion for Injunctive Relief, Motion to Compel, Motion for Expedited Decision, and Application for Order to Show Cause* filed May 19, 2023, in Ada County Case No. CV01-23-08187.

The methodology order defines a nine-step process of water rights administration under the SWC delivery call. While implementation of the process is inherently time-sensitive to account for contemporary water supply conditions, any review and amendment of the process is not time-sensitive. Development of the first methodology order was urgent because there was no prior method in place for administering water rights under the SWC call, but this is not true for subsequent changes to the methodology. The record is undisputed that the Department could have held a hearing *before* issuing the *Fifth Methodology Order*.

Failing to hold a hearing first skews the process because any significant changes made to the *Fifth Methodology Order* after-the-fact is evidence that the initial order was mistaken. This

naturally creates pressure on the Department not to make any significant changes after-the-fact, particularly where the decision has enormous consequences. It would be extremely difficult for any human to admit an error that wrongly exposed hundreds of thousands of acres of farmland to curtailment and forced junior-priority groundwater users to needlessly spend millions of dollars renting storage for mitigation.

When the decision is made before a hearing is held, the evidence presented after-the-fact can no longer be viewed by the decisionmaker in a neutral manner, at least subconsciously, but with a slant aimed to justify the original order. It is human nature.

The decision to not hold a hearing before issuing the *Fifth Methodology Order*, combined with the decision to keep certain types of information out of the record, has fostered distrust by those affected by the order and undermined the credibility of the Department. Whether or not the Department has something to hide, "the coverup is worse than the crime."

The best way to restore trust would be for the Department to vacate the *Fifth Methodology Order* and initiate a transparent, collaborative process for reviewing and analyzing the methodology, followed by a hearing before issuances of an amended methodology order. The evidence presented at the recent hearing provides a solid foundation for this type of process. In the meantime, the Department can proceed with water rights administration under the *Fourth Methodology Order*.

The second best way to restore trust would be to immediately change those components of the *Fifth Methodology Order* for which the evidence clearly warrants a change, as indicated above, and initiate a transparent, collaborative process for further analyzing those components which require further analysis.

CONCLUSION

For the foregoing reasons, IGWA respectfully requests that the Director amend the Fifth Methodology Order and issue instructions to the Department's technical working group as outlined above in the Summary section of this brief.

DATED this 16th day of June, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 16th day of June, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Elisheva M. Patterson

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
Jun 16, 2023
DEPARTMENT OF
WATER RESOURCES

Skyler C. Johns, ISB No. 11033
Steven L. Taggart, ISB No. 8551
Nathan M. Olsen, ISB. No. 7373
OLSEN TAGGART PLLC
P. O. Box 3005
Idaho Falls, ID 83403
Telephone: (208) 552-6442
Facsimile: (208) 524-6095
Email: sjohns@olsentaggart.com
staggart@olsentaggart.com
nolsen@olsentaggart.com

Attorneys for Bonneville-Jefferson Ground Water District

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BONNEVILLE-JEFFERSON'S POST-HEARING BRIEF AND JOINDER IN SUPPORT OF IGWA'S POST-HEARING BRIEF**

The Bonneville-Jefferson Ground Water District (hereafter "Bonneville-Jefferson"), acting for and on behalf of its respective members, through counsel, submits its *Post-Hearing Brief*, pursuant to the Director's instructions and request at the close of the administrative hearing on June 6-9, 2023. Bonneville-Jefferson also joins in support of *IGWA's Post-Hearing Brief*.

OVERVIEW

This brief addresses a portion of the evidence presented during the June 6-9, 2023, hearing before the Idaho Department of Water Resources (hereafter "Department") on the April 21, 2023,

Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover (hereafter "Fifth Order") (Ex. 300) and the Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3) (hereafter "April As Applied Order") (Ex. 301).

During the hearing, the parties presented testimony from various lay and expert witnesses and various exhibits were presented and admitted into the record. At the close of the hearing the Director allowed the parties one week to submit post-trial briefing. He requested that the parties not provide detailed commentary on the nuanced testimony from the hearing. Rather, he identified legal questions for the parties to address.

Given the time frame set by the Director, Bonneville-Jefferson has prepared its brief having not received nor reviewed all the hearing transcripts. This brief is based upon the exhibits admitted at the hearing and counsel's notes on testimony from the hearing.

APPLICABLE LEGAL STANDARDS

The hearing in question is to address the findings of fact and conclusions of law of an agency order. In *Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 137, 369 P.3d 897, 915 (2016), the Idaho Supreme Court explained:

> Idaho Code section 67–5248 provides that an agency order shall include "a reasoned statement in support of the decision" and "shall be accompanied by a concise and explicit statement of the underlying facts of record supporting the findings." I.C. § 67–5248(a). The order should "identify facts, as well as inferences drawn from the facts upon the application of its expertise and judgment, which underlie its decision. Such an explanation is essential to meaningful judicial review." *Woodfield v. Bd. of Prof'l Discipline of Idaho State Bd. of Med.*, 127 Idaho 738, 747, 905 P.2d 1047, 1056 (Ct.App.1995).

In short, the Director bears the burden of supporting his order, but the answer to the Director's questions about respective burdens of proof is probably best set forth in *Jasso v. Camas Cnty.*, 151 Idaho 790, 796, 264 P.3d 897, 903 (2011):

> If there is to be any meaningful judicial scrutiny of the activities of an administrative agency—not for the purpose of substituting judicial judgment for administrative judgment but for the purpose of requiring the administrative agency to demonstrate that it has applied the criteria prescribed by statute and by its own regulations and has not acted arbitrarily or on an ad hoc basis—we must require that its order clearly and precisely stated what it found to be the facts and fully explain why those facts lead it to the decision it makes. Brevity is not always a virtue.
>
> ...
>
> We wish to make it clear that by insisting on adequate findings of fact we are not simply imposing legalistic notions of proper form, or setting an empty exercise for local governments to follow. No particular form is required, and no magic words need be employed. *What is needed for adequate judicial review is a clear statement of what, specifically, the decisionmaking body believes, after hearing and considering all the evidence, to be the relevant and important facts upon which its decision is based. Conclusions are not sufficient*.
>
> *Workman Family P'ship.*, 104 Idaho at 37, 655 P.2d at 931 (emphasis original) (citations and quotations removed).

This case illustrates that the Director's decision must show that he considered the applicable rules and statutes and identify precisely what he found to be facts. In this regard, the conclusions in the Fifth Methodology Order must consider the criteria set forth in the Rules for Conjunctive Management and it must precisely identify the facts upon which each conclusion is based. However, in making these determinations, the Director must also use the "best science available." *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 813 (2011).

The Proposed Finding of Fact set forth below, as well as the arguments presented in IGWA's Post-Hearing Brief, show that the Fifth Methodology Order did not meet this standard. For Example, no factual basis was identified justifying the sudden move from steady state to

transient modeling, as this was, as Jennifer Sukow stated, a policy decision. The Order did not consider, nor did the Director allow evidence, regarding futile call. Where the parties were barred from obtaining or presenting evidence regarding the Director's factual basis for policy decisions, the move to transient modeling falls short of the standard above.

Furthermore, the Fifth Methodology Order is not supported in fact with regard to certain adjustments not being included in the model. For example, technically defensible data sets exist to make adjustments for supplemental ground water and to calculate and exclude fallowed acres in the Twin Falls Canal Company.

PROPOSED FINDINGS OF FACT

A. Testimony of Bryce Contor

Following are the proposed findings of fact based upon the testimony, expert report, and exhibits provided by Bonneville-Jefferson's retained expert, Bryce Contor, of Rocky Mountain Environmental Associates, Inc:

1. The Fifth Amended Methodology Order does not present a technical rationale supporting implementation of transient modeling because:

   a. IDWR has had access to the current understanding of the general implications of transient vs. steady-state modeling since at least 1999, and access to the specific implications of a curtailment context since 2006;

   b. The 1999 SRPAM model had stress periods even shorter than the current model;

   c. Though its stress periods were longer than the current model, the 2006 ESPAM1.1 model was designed and deployed to represent effects on an irrigation-season time scale;

d. The 2013 ESPAM2.1 model had identical stress periods to the current ESPAM2.2 model.

e. The transient version of the model can be used to represent temporary curtailment of water rights.

f. No new methods or information has been developed since 2006 that would substantially effect the impacts of transient modeling.

2. A technically correct Finding of Fact #83 is:

> Merriam-Webster's Dictionary defines stead-state as "a state or condition of a system or process… that does not change in time. "A steady state ESPAM simulation based on input values of acre feet of curtailment can only indicate total acre feet of accrual to modeled reaches of the Snake River and tributary springs resulting after the effects of curtailment have fully been realized. For example, a steady-state analysis of curtailment of 1,000-acre feet would indicate where the 1,000 acre feet of accrual eventually would be expressed, but would not describe the timing of arrival of accruals.

3. A technically correct Finding of Fact #84 is:

> Steady-state analysis does not calculate the time to reach steady-state conditions nor describe the seasonal timing of the impacts, but only estimates the spatial distribution of accruals. To estimate the timing of accruals, transient modeling must be employed.

4. The Department has not set criterion for accuracy and precision of the ESPAM2.2 results.

a. Unless the criteria for accuracy and precision are very low, ESPAM2.2 is not sufficiently precise for monthly estimation of effects to the Near Blackfoot to Minidoka reach, for decisions that have the gravity of substantial volumes of supply for the SWC.

5. The use of ESPAM modeling in the Fifth Methodology Order is not technically defensible because ratios of relief to cost are not considered in light of modeling precision, and when the underlying policy is not adjusted for spatial and temporal differences in response.

6. The arguments presented against considering supplemental groundwater use within the SWC are not factually correct because it is technically possible and reasonably achievable to assess and address supplemental groundwater use within the SWC:

a. Since the initial development of ESPAM1.0 in the early 2000s, the extent and effect of supplemental groundwater irrigation has been calculated for the parts of the SWC Service Areas that are within the ESPAM model boundary.

b. The data and methods that have been used in the ESPAM model are readily available and applicable to the parts of the SWC Service Areas that are outside the ESPAM model boundary.

c. As a result of measurement orders, the measurement and report of well discharge data, and the availability of these data in IDWR's Water Measurement Information System (WMIS) are much more robust than in the early 2000s when these calculations first were undertaken, and the methods developed.

d. IDWR has known, or could have known, since at least 2015 that these data would be important to a correct calculation of Reasonable In Season Demand. The intervening eight years would have been sufficient time to apply the existing data and methods, or to improve them, for purposes of the methodology.

e. Because of the existence of these methods and data, a defensible adjustment for supplemental groundwater use within the SWC Service Areas is reasonably within reach, on a technical basis.

f. Also, substantially more acre feet of diversion are required to support a surface-water irrigated acre than a groundwater-irrigated acre because the curtailment requirement is multiplied by the following:

   i. An acre of groundwater irrigation requires fewer acre feet of gross diversion than does an acre of surface-water irrigation supplied by a long canal.

   ii. For most groundwater-irrigated lands, more accrual from curtailment arrives at nontarget reaches than arrives at the Near Blackfoot to Minidoka Reach.

   iii. The curtailment requirement again is multiplied by the fact that more accruals from curtailment occur in future years than in the year of need.

   iv. Thus, neglecting a single acre of supplemental irrigation within the SWC Service Area results in needless curtailment of many groundwater-irrigated acres.

   v. Therefore, strictly on a technical basis, the refinement of quantifying the effect of supplemental irrigation within the Surface Water Coalition service area could provide substantial relief to a broad constituency of Idaho water users.

g. Deficiencies that might exist in the groundwater-diversion data from IDWR's Water Measurement Information System will tend to under-estimate rather than

over-estimate pumping, resulting in a conservative over-attribution of calculated surface-water shortfall. This is conservative on behalf of the senior users.

h. The following factors multiply the effect of ignoring supplemental groundwater use within the SWC:

i. Because of inherent characteristics of surface-water delivery systems, supplying one acre with surface water requires substantially more water than supplying an acre with groundwater.

ii. Not all effects of curtailment of groundwater propagate to the Near Blackfoot to Minidoka reach, so more than one acre foot of curtailment is required to produce one acre foot of accrual.

iii. When obligations are calculated on a transient basis, the temporal delay in propagation creates an additional multiplier of effort.

7. The Department's use of transient modeling in the Fifth Amended Methodology Order is not technically defensible where it fails to model and account for future accruals to target, and non-target reaches.

8. Technical methods exist to inform a coherent plan under either a transient or a steady state paradigm. This could be accomplished by aligning the calculation and expectations of relief to the physical time frame of aquifer response by considering future accruals to target and non-target reaches.

9. Transient modeling is more technically defensible if, when accounting for non-target accruals, the accounting decay of accruals, and the spatial assignment, match reality. The transient aquifer response functions with double-entry accounting technologies should be linked

and the hydrologic realities of groundwater/surface water, the legal requirements of prior appropriation water law, and the economic requirements for equitable and efficient allocation of resources must be honored.

10. A reasonable and technically defensible way exists to identify fallowed acres in the methodology order. If the purpose is to establish a Permissible Place of Use or a Service Area, fallowed acres should be included. If the purpose were to describe the total amount of irrigation in a single year, the acres should not be included.

11. Failing to exclude fallowed acres in and adjust for such acres, distorts the results in favor of SWC.

12. IDWR irrigated data land sets contain the information necessary to generate a more technically defensible calculation of the SWC irrigated acres than the shapefiles provided by SWC.

13. Omitting supplemental ground water adjustments in the model creates a "multiplier" effect. The same thing applies to the 5% "no change" standard for accepting the SWC's representation of its acreage. If a surface-water-irrigated acre required nearly six acre feet of diversion and a groundwater irrigated acre required two acre feet, approximately three acres of groundwater reduction would be needlessly indicated for a one-acre over-estimate of surface-water irrigation. Because only about half the accruals from curtailment, on average, arrive at the Near Blackfoot to Minidoka reach, six acres would have to be curtailed to achieve the effect of three acres of reduction. If the IDWR estimate is correct that only 9% to 15% of accruals arrive in the first five months of the irrigation season, then an additional multiplier of ten must be applied, so that an over-estimate of one acre of surface-water irrigation could curtail 60 acres of groundwater beneficial use.

14. The 2023 As-Applied Order employs Steady State analysis to calculate IGWA's proportionate responsibility for mitigation, but these calculations are not defined by the Fifth Amended Methodology Order.

15. The mechanisms that drive fallowed acres or foregone irrigation are persistent year to year. Omitting them from an irrigated-lands map is the best way to ensure that the map represents the typical number of acres irrigated in any one year. This is true even though the particular locations of fallow or foregone irrigation will change from year to year.

16. A single-year curtailment calculated using steady-state modeling cannot produce full relief for the SWC. However, for many of the hindcast years, neither would a single-year curtailment based on transient modeling have been able to produce full relief.

17. IDWR processing of irrigated-lands data includes remote-sensing data from multiple dates in the given year, as well as hand work to refine results. These are the best available science for determination of irrigated area.

18. Use of WMIS pumping data allows direct calculation of the contribution of supplemental groundwater pumping, regardless of the complexity of the distribution system. Failures in WMIS data that might occur would cause an underestimate of pumping volume, which would result in a bias in results that would tend to increase the calculated shortfall.

19. The "best available science" for considering irrigation returns is to use the data that are available, because omission of unmeasured returns is conservative in that it would tend to increase the calculated shortfall. Applying an imperfect data set still is conservative in behalf of producing an over-calculation of shortfall.

20. Omission of known factors, for which data and methodology exist, makes the Fifth Amended Methodology Order technically incomplete and therefore does not represent the best available science.

21. Either transient or steady-state modeling can be part of a technically valid approach that is coherent in administration relative to the temporal implications of the method chosen and the characteristic response time through the aquifer.

22. Although Matt Anders testified that, in considering anticipated reservoir carryover, IDWR consults with Water District 01, such practice is not specified in the Fifth Amended Methodology Order. This practice should be specified in the Order to ensure consistency in the data used by the Department.

23. TFCC's estimation of its irrigated acres is not reliable because a reliable calculation of a 5% or more variation in 196,000 irrigated acres cannot be determined accurately without conducting measurements on the ground, in the field, or with robust remote-sensing analysis with field verification on a statistically valid sample.

24. IDWR did not implement any of the ground water users' suggestions to the technical working group but implemented some of SWC's suggestions.

25. The Department's omission of an adjustment to the model accounting for SWC return flows from field runoff drain systems cuts to the benefit of SWC.

26. The consequences of the degrading R square value in prediction equation(s) are that it indicates reduced ability to be sure that SWC receives adequate supply. Conversely, it could needlessly cause an excessive burden to ground water users.

27. The consequence of neglecting Portneuf, Blackfoot, and Henry's Fork in 2023, where the snowpack above Heise was anomalously low relative to all the other headwaters basins, was an inflated estimate of shortfall. The consequence will be to depress the estimation of shortfall on a year when above-Heise snowpack is anomalously high relative to the others.

28. Technical issues arise from the Department having not established any criterion for minimum conservatism of the RSID calculations, and from not having identified a mechanism to calculate the combined degree of conservatism. Too-little conservatism would harm the SWC and too-large would harm groundwater appropriators. Lack of calculation methods means that the combined effect remains unknown, and lack of a criterion means that even if it were known, it could not be evaluated. Contributors to conservatism include at least the following:

a. Conservatism in selection of baseline diversion volume;

b. Conservatism in selection of temperatures for calculation purposes;

c. Conservatism in selection of precipitation estimates.

29. The River Package does not allow proper representation of the communication between the River and the Aquifer, given that it is a single layered model. While the River Package can represent communication between the river and the top of the aquifer within the river cell, it cannot properly represent the complex transit of water to upper part of the river cell from deep in the aquifer, or from deep in adjacent cells.

B. Additional Facts

Following are other relevant facts supported by the evidence presented at the hearing:

1. Bonneville-Jefferson's retained expert, Rocky Mountain Environmental Associates, Inc., was not invited and did not participate in the technical working group for the Fifth Methodology Order.

2. The Department did not represent to members of the Technical Working Ground for the Fifth Methodology Order that the Department would implement transient modeling in its calculations for the 2023 irrigation season.

3. The parties were only permitted six weeks to conduct review and analysis of the Fifth Methodology Order, acquire evidence, depose witnesses, retain experts, and prepare legal arguments before the Department conducted the June 6, -9, 2023, hearing.

4. Bonneville-Jefferson and its experts did not have sufficient time to conduct full analysis that that would have provided the Department with information which could have improved the accuracy of the Fifth Methodology Order.

CONCLUSION

Based on the foregoing, the Director can and should modify his Order to consider all the factors in the Rules for Conjunctive Management and include the recommended adjustments that will improve the model.

DATED: June 16, 2023

OLSEN TAGGART PLLC

/s/ *Skyler C. Johns*
SKYLER C. JOHNS

CERTIFICATE OF SERVICE

I hereby certify that on this 16th day of June 2023, I served the foregoing document on the persons below via email as indicated:

/s/ Michelle J. Castro
Paralegal

Gary Spackman, Director Garrick Baxter, Deputy Attorney General IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	file@idwr.idaho.gov gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
John K. Simpson Marten Law LLP P.O. Box 2139 Boise, Idaho 83701-2139 Travis L. Thompson Marten Law LLP 163 Second Ave. W. P.O. Box 63 Twin Falls, Idaho 83303-0063	jsimpson@martenlaw.com tthompson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPARTMENT OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov

Matt Howard US BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

Thomas J. Budge Elisheva M. Patterson RACINE OLSON, PLLP 201 E. Center St. / P.O. Box 1391 Pocatello, Idaho 83204	tj@racineolson.com elisheva@racineolson.com
Dylan Anderson Dylan Anderson Law	dylan@dylanandersonlaw.com

RECEIVED
Jun 16, 2023
DEPARTMENT OF
WATER RESOURCES

Dylan Anderson (ISB# 9676)
Dylan Anderson Law PLLC
P.O. Box 35
Rexburg, Idaho 83440

Phone - (208) 684-7701
Email - dylan@dylanandersonlaw.com
Attorney for Bingham Groundwater District. (BGWD)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BINGHAM GROUNDWATER DISTRICT JOINDER IN IGWA'S AND BONNEVILLE-JEFFERSON'S POST-HEARING BRIEF, AND SUPPLEMENTAL BRIEF**

On June 6-9, the Department held a hearing to receive evidence and testimony regarding the fifth amended methodology order-and the as-applied order, issued on April 19, 2022. Bingham Ground water joins with IGWA in its post hearing brief, and offers a short supplemental brief regarding an issue that is intertwined with many of the arguments contained in IGWA's briefing, and with the methodology order that should be addressed by the department. The methodology order encourages and rewards higher diversions by the SWC.

The Methodology

Calculating Reasonable In-Season Demand involves complex averages of Crop Water Need (CWN), which involves Consumptive Use of a Specific Crop (ET_i) Precipitation (W_e), and irrigated area (A_i). However, when CWN is placed back into the formula to determine (RISD), all those calculations are essentially neutralized by a fluid and undefined project efficiency. When it is boiled down, Reasonable In-Season Demand (RISD) is just Diversion (Q_D); or average (Q_D) ran through a 14-year averaging process that's benefits are unexplained.

The simple equation in the methodology order outlined in paragraph 62 is as follows:

IDS=FS-RISD

Where:

IDS = demand shortfall for specified evaluation points throughout the season,

FS = forecasted supply adjusted for specified evaluation point during the season, and

RISD = reasonable in-season demand from above.

The methodology order goes on to show how each part of this equation is determined. Paragraph 33 of the Fifth methodology order shows the calculation for crop water need CWN, which is used to find the Reasonable in-season demand (RISD).

$$CWN = \sum_{i-1}^{n} (ET_i - W_e) A_i$$

Where,

CWN = crop water need

ET_i = consumptive use of specific crop type,

W_e = effective precipitation,

A_i = total irrigated area of specific crop type,

i = index variable representing the different specific crop types grown within the irrigation entity, and

n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

The crop water need equation involves complex calculations that unfortunately are rendered moot because of the project efficiency algorithm and how it is used the methodology

calculations. The project efficiency algorithm is outlined in paragraphs 28-29 in the fifth methodology as follows:

$$\mathbf{E_p} = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,

CWN = crop water need, and

Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

According to this, if CWN is high, then efficiency is proportionately high. If CWN is low, then efficiency is proportionately low. Because there is no standard efficiency, any efficiency is acceptable in the Reasonable In-Season Demand calculation. The testimony of the Surface Water Coalition's Expert Dr. Brockway highlighted this flaw as to acres and explained how acres do not matter in the methodology calculations. For the same reason that acres do not matter, CWN is nullified by an ever-expanding efficiency that assures any amount of diversion is reasonable and demanded. The only thing that calculating for CWN shows is how much of the overall diversion (Q_D)[1] is going to the crop water need, and how much is project efficiency; but these are arbitrary classifications because it is impossible, under this equation, to over-divert. Everything diverted is either crop water need, or project efficiency, and both are used to make up Reasonable In-Season Demand, ergo, everything diverted is Reasonable In-Season Demand.

The crop water need (CWN) and project efficiency (E_p) are used in determining the Reasonable In-Season Demand. The calculation for this is set out in paragraph 41 of the fifth methodology order as follows.

[1] Although technically there are some adjustments to the overall diversion that can be made as outlined in paragraph 30 of the methodology order, the testimony of Matt Anders is that Q_d is the diversion, and for the sake of this analysis, diversion is meant to be as adjusted in paragraph 30, for example if there was in-season recharge, or diversion shared with another entity.

$$RISD_{milestone\_x} = \sum_{j-1}^{n} \left(\frac{CWN_j}{E_{p-j}}\right) + \sum_{j-m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,

CWN = crop water need for month j,

E_p = baseline project efficiency for month j,

BD = baseline demand for month j,

j = index variable, and

m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

This equation represents crop water need (CWN) over baseline project efficiency for each month ($E_{p,j}$) to ultimately get the reasonable in-season demand (RISD). In April, this equation relies completely on the baseline year demand (BD), and slowly incorporate the in-season demand for the current year as that data becomes available. However, this equation is overly complex and misleading in what is actually being calculated.

Looking closer at CWN over E_p for month j $\left(\frac{CWN_j}{E_{p-j}}\right)$, The equation can be expanded out using the formula for baseline project efficiency ($E_p = \frac{CWN}{Q_D}$) and can be written as $\frac{CWN}{\frac{CWN}{Q_D}}$.To solve $\frac{CWN}{\frac{CWN}{Q_D}}$, simply flip and multiply as follows: $\frac{\cancel{CWN}}{1} \; x \; \frac{Q_D}{\cancel{CWN}}$ or $\frac{Q_D}{1}$ The crop water need is canceled out and we find that $\left(\frac{CWN_j}{E_{p-j}}\right) = Q_D$. When placed back into the original equation, we get: $RISD_{milestone\_x} = \sum_{j-1}^{n} (Q_D) + \sum_{j-m+1}^{7} BD_j$. In other words, Reasonable in-season demand is just an overly complex calculation that justifies whatever the diversion (Q_D) happens to be, just calculated on monthly intervals. Simplified even further, RISD=Q_D. Ultimately, the calculations for crop water need will only tell you how much of the diversion was used for crop water need, and whatever is left is project efficiency. If the crop water need goes up, project efficiency goes up (meaning if more of the diversion is going to crop need then less of the diversion is lost in

efficiency). If the crop water need goes down, the project efficiency goes down (meaning if less of the diversion is going to the crop demand, then more of the diversion is lost in efficiency calculations). This is illustrated in the fifth methodology order in the table in paragraph 32. Here we see that as the crop water needs are up in the middle of summer, the efficiency goes up.

Although this example illustrates that crop water need isn't actually accounting for anything, and is the equivalent of pretext calculations to justify whatever is diverted as "reasonable in-season demand" there are a few more complex layers to this equation. Unfortunately, when one dives into the details, the reasonable in-season demand only becomes more unreasonable.

The equations do a poor job of showing that the CWN_j used in the RISD calculation is slightly different from the CWN used in the E_p calculation because E_p is actually a fourteen-year rolling average of efficiency as outlined in paragraph 32 of the fifth methodology order.[2] The department does not explain why doing a fourteen-year rolling average of E_p is useful, or what the technical significance is, but that is what is done. In this case, there is an incentive for the SWC to increase diversions as much as possible because doing so would decrease efficiency. If efficiency is decreased for any year, the overall average efficiency is decreased, and RISD is increased making a shortfall more likely. In other words, increased diversions are rewarded with increased probability for injury.

If the department truly wants to account for actual acres and crop water need in a meaningful way, it must adopt a minimum efficiency standard. Without a minimum efficiency standard, all the calculations regarding crop water need are meaningless. Also, the number of acres irrigated become meaningless.

At the crux of many of the issues raised in IGWA's post hearing brief, is the lack of standard for any use, diversion, or efficiency. This is not to place blame on SWC because the inverse is also true. If they reduce diversions, the methodology order would actually punish them for doing so. Reduced diversion would produce a rise the average efficiency, thus lowering the calculated RISD. For example, SWC will divert at ¾ inch even if 5/8 is sufficient, because reducing to 5/8, although sufficient[3], would make calculated injury less likely.

[2] The exception to this is the April and October adjustment outlined in Paragraphs 42-46 of the Fifth Methodology Order.
[3] As argued in IGWA's brief.

The conclusions of law contained in paragraphs 5 and 6 regarding beneficial use, least wasteful use, and optimal development of water resources in the public interest are not only unsupported by the findings of fact, but are actually frustrated by the methodology order and findings of fact. The department should look at reasonable efficiency standards that would allow the Reasonable In-Season Demand to actually account for irrigated acres, and crop water need. The methodology order would have objective standards that actual reflect a Reasonable In-Season Demand, not just default to whatever is diverted. Not only that, the methodology order should incentivize reasonable diversion reductions, not punish SWC if they ever reduced.

Due Process

Bingham Ground Water District joins with IGWA and Bonneville-Jefferson Ground Water District in their briefing regarding Due Process, and adds as follows. Groundwater users are frustrated by the process of this methodology order change. The changes bring wide sweeping implications, and the explanation only refers to data and court decisions that are decades old. Why was this such an emergency? Why was this rushed into an order without a hearing when IGWA asked for a hearing on potential changes to the methodology order last fall? Groundwater pumpers are even more frustrated that when they asked for more answers, there were shut down through limitations on the scope of Discovery, and limitations on the scope of the hearing. In preparing its final decision, groundwater users request that the Department explain why the change was made so hastily and without a hearing. Please explain the policy reasons, outside the technical information which department employees were not allowed to testify about, but did testify exist. Groundwater users want to understand the policy decisions and reasons that let do increasing acres curtailed for a given injury by roughly 10 times.

DATED this 16 day of June, 2023.

Dylan Anderson Law, PLLC

___/s/_____
Dylan Anderson,
Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 16 day of May, 2023, a true and correct copy of the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
file@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370 Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

Dylan Anderson Law, PLLC

By: /s/
Dylan Anderson

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SIXTH FINAL ORDER REGARDING METHODOLOGY FOR DETERMINING MATERIAL INJURY TO REASONABLE IN-SEASON DEMAND AND REASONABLE CARRYOVER**

BACKGROUND

On April 19, 2016, the Director ("Director") of the Idaho Department of Water Resources ("Department") issued his *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order"). The Fourth Methodology Order: (1) explained how the Director would determine material injury to storage and natural flow water rights of members of the Surface Water Coalition ("SWC")[1]; (2) established methods for quantifying material injury to SWC storage and natural flow water rights as predictive and actual demand shortfalls; (3) established methods for quantifying mitigation obligations by holders of junior priority ground water rights for shortfalls in predictive and actual SWC water demands; and (4) established a method for determining a priority date for curtailment if mitigation obligations are not satisfied.

The processes established in the Fourth Methodology Order for determining material injury are not immutable. Updates to the methodology order based on additional data and analyses were always anticipated:

> Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will review and refine the process of predicting and evaluating material injury. The methodology will be adjusted if the data supports a change.

[1] The SWC is comprised of A&B District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company. Each entity holds separate senior surface natural flow water rights and has separate storage contracts for storage water space in the reservoirs.

Fourth Methodology Order, Conclusion of Law 17; *see also In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irrigation Dist.*, 155 Idaho 640, 645, 315 P.3d 828, 833 (2013) ("[t]he concept of a baseline is that it is adjustable . . . ."). The prediction and determination of rights and obligations of the holders of senior priority and junior priority water rights respectively must: (1) apply the best available science and underlying water data; (2) consider changing climatic and cropping patterns; and (3) adhere to the most recent decisions of the courts related to water administration.

Many of the data sets the Department relied upon in the Fourth Methodology Order have been expanded and now include additional years. Furthermore, the Director has had time to review and consider the implications of court decisions that require the Director to address a mitigation deficiency in the year it occurs. As a result, the director issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") on April 21, 2023. The purpose of the Fifth Methodology Order was to update the Director's methodology for determining material injury to storage and natural flow water rights either held by or committed to members of the SWC consistent with the Director's ongoing obligation to use the best available science and information.

On April 21, 2023, the Director also issued his (1) *Final Order Regarding April 2023 Forecast Supply* ("April 2023 As-Applied Order"), as well as a (2) *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Notice of Hearing"), which set a hearing on the Fifth Methodology and As-Applied Orders for June 6–10, 2023 ("June 6 Hearing"). During the June 6 Hearing, the parties proffered testimony and evidence regarding the Fifth Methodology Order and the April 2023 As-Applied order.

The purpose of issuing this *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Sixth Methodology Order") is to correct data in the Fifth Methodology Order found to be in error during the June 6 Hearing. This Sixth Methodology Order also edits a few other non-substantive matters in the Fifth Methodology Order.

FINDINGS OF FACT

I. Overview of the Methodology for Determining Material Injury to Water Rights by Determining Reasonable In-Season Demand and Reasonable Carryover

This methodology is based on the selection of a recent analogous, baseline year to predict reasonable in-season demand ("RISD") for the senior priority surface water rights during the upcoming irrigation season.

1. The method for determining material injury to water rights by determining RISD and reasonable carryover should be based on updated data, the best available science, analytical methods, and the Director's professional judgment as manager of the state's water resources. In the future, climate may vary and conditions may change; therefore, the methodology may need to

be adjusted to consider a different baseline year or years ("BLY") or changes to other components.

2. In-season demand shortfall ("IDS") will be computed by subtracting RISD from the forecast supply ("FS"). In-season demand shortfall is computed using the following equation:

$$IDS = FS - RISD$$

3. If the FS is greater than the RISD, there is no demand shortfall. If the FS is less that the RISD, the negative difference is the demand shortfall. Initially, RISD is equal to the historic demands associated with a BLY as selected by the Director, but will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

4. Reasonable carryover shortfall will be computed by subtracting reasonable carryover from actual carryover, where reasonable carryover is defined as the difference between a baseline year demand ("BD") and projected typical dry year supply. Reasonable carryover shortfall will be computed using the following equation:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

5. If actual carryover exceeds the reasonable carryover, there is no reasonable carryover shortfall. In contrast, if reasonable carryover exceeds the actual carryover, the negative difference is the reasonable carryover shortfall.

6. The concepts underlying the selection of the BLY, determination of in-season demand shortfall, and reasonable carryover shortfall will be discussed in detail below.

II. In-Season Demand Shortfall

A. Considerations for the Selection of a Baseline Year

7. A BLY is a year or average of years when irrigation demand represents conditions that can predict need in the current year of irrigation at the start of the irrigation season. The purpose of predicting need is to estimate material injury.

8. A BLY is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) irrigation practices. R. vol. 37, at 7098.[2] To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. *Id*. at 7096.

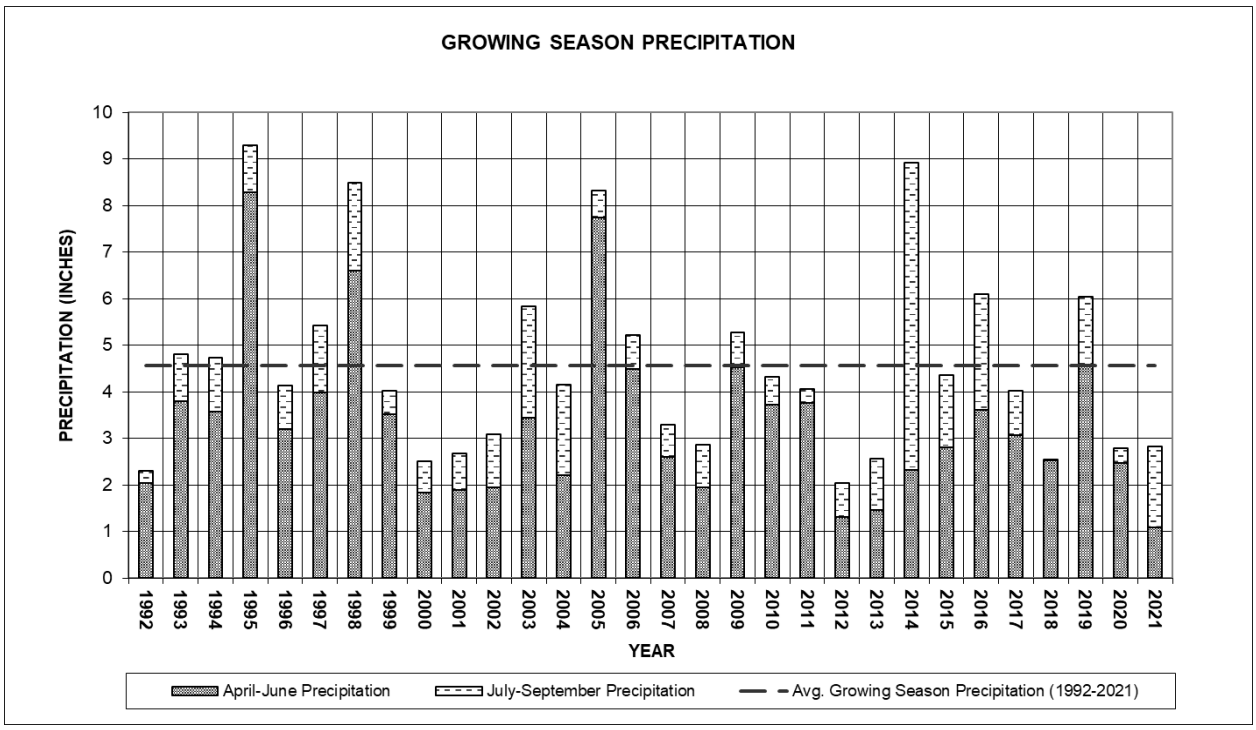
9. The historic diversion volumes from the BLY and the predicted supply forecast at the start of the irrigation season are inputs to predict the initial IDS, where a demand shortfall is the difference after subtracting BD from the FS. When the difference is a positive number, the IDS is zero. When the difference is negative, the negative value equals the in-season demand shortfall. IDS increases with increases in BD, decreases in FS, or both. Assuming constant irrigation practices, crop distributions, and total irrigated acres, demand for irrigation water typically increases in years of higher temperature, higher reference evapotranspiration ("ET"), and lower precipitation. If water demand data is averaged for several years and these averages are the basis to predict demand shortfall at the start of the season, in a high-water demand year, these averages may often under-predict the demand shortfall. In a high-water demand year, under-prediction of IDS might be acceptable if the junior priority ground water right holders and the senior priority surface water right holders shared equally in the risk of water shortages. Equality in sharing the risk will not adequately protect the senior priority surface water right holder from injury. Actual demand shortfalls to a senior surface water right holder resulting from predictions at the start of the irrigation season based on average data unreasonably shifts the risk of shortage to the senior surface water right holder. Therefore, a BLY should represent a year(s) of above average diversions and should not represent a year(s) of average or below average diversions. An above average diversion year(s) selected as the BLY should also represent a year(s) of above average temperatures and reference ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other factors. In addition, actual supply should be analyzed to assure that the BLY is not a year of limited supply.

i. Climate

10. For the methods outlined herein, climate is represented by precipitation, reference ET, and growing degree days.

[2] All citations to "Ex", "Tr.", or "R. vol." in this Order are to material that was admitted during the original January 18–February 5, 2008 Hearing in the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of [the SWC] ("2008 Hearing") and is part of the final agency record on appeal in Gooding County Case No. CV-2008-551, which was lodged with the Fifth Judicial District Court on February 6, 2009.

11. Precipitation. Water, in all phases, introduced to Idaho from the atmosphere is termed precipitation. During the growing season, precipitation reduces the irrigation water needed for growing crops. Ex. 3024, at 19. The figure below shows the precipitation recorded during the growing season at the National Weather Service's Twin Falls weather station.



Growing Season Precipitation at National Weather Service's Twin Falls Weather Station 1992–2021.[3]

[3] The Fourth Methodology Order included data for the period 1990 through 2014. This Fifth Methodology Order updated this chart with data for the period 1992 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order. The chart is created from NOAA National Weather Service total precipitation data obtained from the NCDC's Climatological Data Annual Summary Idaho report series for the Twin Falls 6 E and Twin Falls Sun Valley Regional Airport weather stations.

12. Evapotranspiration. ET is a variable representing both the amount of water that transpires from vegetation and the amount of water that evaporates from the underlying soil. ET is an important factor for properly estimating RISD. In its water budget calculations, the SWC proposed the use of ET values from the USBR as part of their Pacific Northwest Cooperative Agricultural Network, i.e., AgriMet. Ex. 8000, vol. II, ch. 9; Ex. 8000, vol. IV, app. AU. The ground water users proposed the use of ET values from Richard G. Allen and Clarence W. Robison 2007, Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, i.e., ETIdaho. Ex. 3007A, at 21; Ex. 3024, at 1–58.

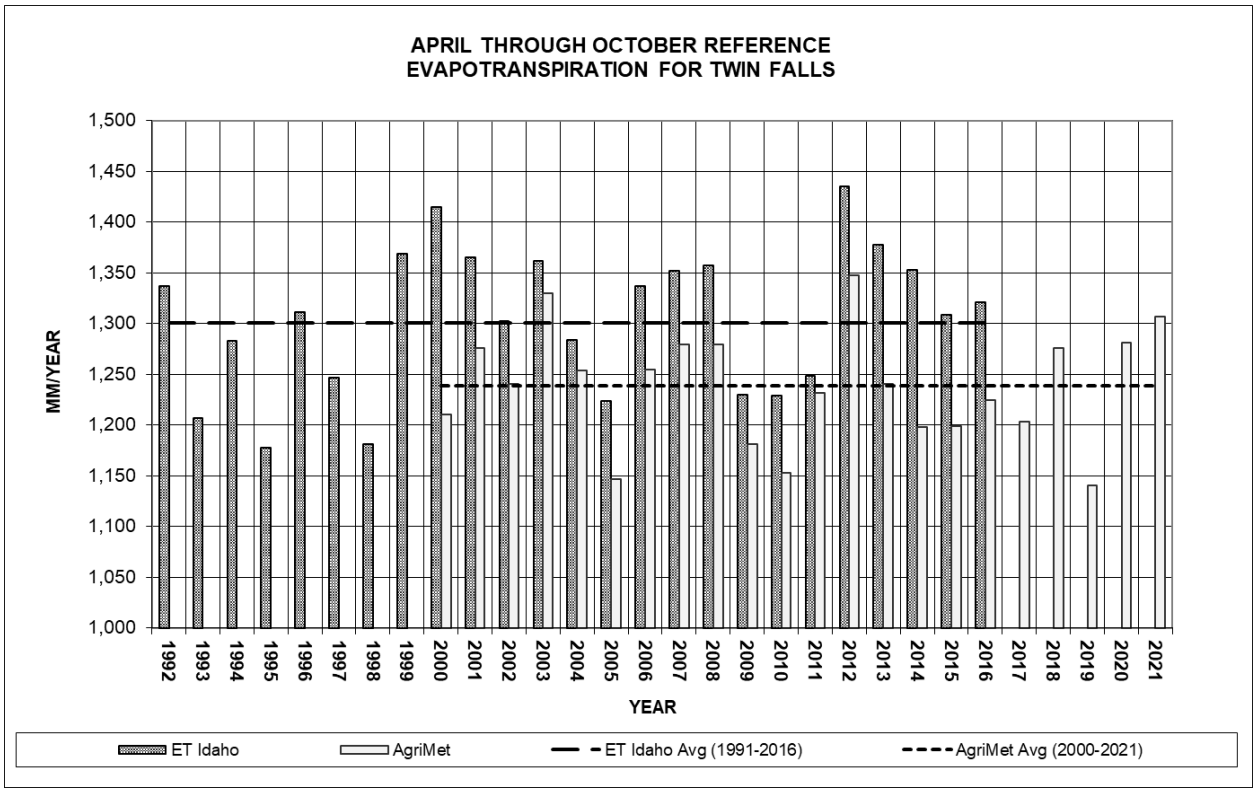
13. Reference ET is a standardized index that approximates the climatic demand for water vapor (i.e., ET). Both ETIdaho and AgriMet calculate and publish reference ET data. The Department will identify potential BLYs by consulting both ETIdaho reference ET and AgriMet reference ET.

14. Neither ETIdaho reference ET data nor AgriMet reference ET data span the entire period of analysis (1992–2021). ETIdaho reference ET data are currently available from 1990 through 2016.[4] AgriMet reference ET data are available from 2000 to 2021.[5] Ideal BLY candidates are years in which reference ET exceeds average reference ET values. Candidate baseline years are compared using both AgriMet and ETIdaho reference ET data for those years in which both data are available and only AgriMet data in those years where there is no ETIdaho data.

[4] The Fourth Methodology Order included ETIdaho reference ET data for the period 1991 to 2011. ETIdaho reference ET data is now available through 2016. The Fifth Methodology Order updated this chart with data for the period 1992 to 2016. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

[5] The Fourth Methodology Order included AgriMet reference ET data for the period 2000 to 2014. AgriMet reference ET data is now available through 2021. The Fifth Methodology Order updated this chart with data for the period 2000 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

15. Years of above average values of reference ET are appropriate BLY candidates.[6] Total April through October reference ET for the period of record from the Twin Falls (Kimberly) AgriMet site is shown below.

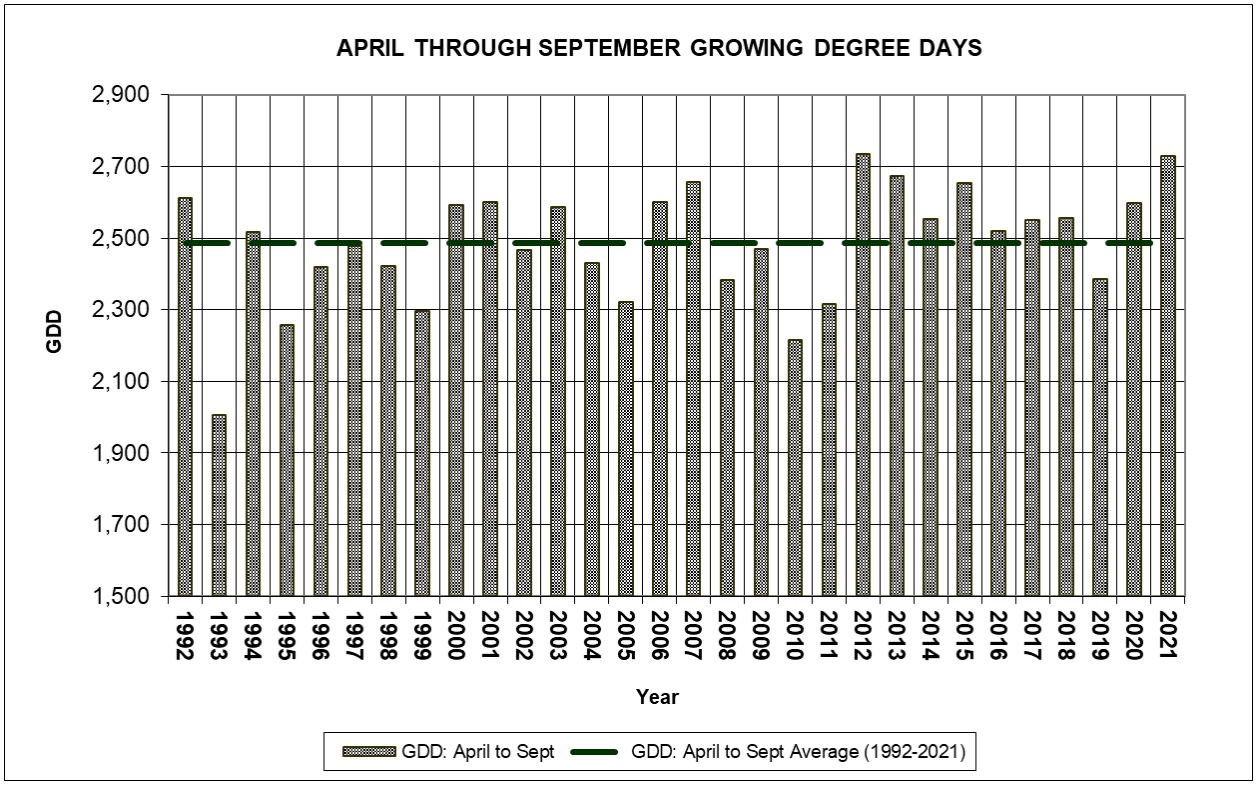


Reference ET for Twin Falls (Kimberly) with both AgriMet and ETIdaho data 1992–2021.[7]

[6] Values for reference ET between ETIdaho and AgriMet do not match because they are derived differently. The relevant information for identifying a potential BLY is the relationship between the year under consideration and the average for the data sets.

[7] The Fourth Methodology Order included data only through 2014. The Fifth Methodology Order updated this chart with combined data for the period 1992 to 2021, establishing a 30-year record which is the professional standard of practice for calculating climatic and hydrologic normals. This Sixth Methodology Order relies on the same data used in the Fifth Methodology Order.

16. Growing Degree Days. Growing degree days define the length and type of growing season. Growing degree days are an arithmetic accumulation of daily mean temperature above a certain base temperature. Ex. 3024, at 10, 117–21. These growth units are a simple method of relating plant growth and development to air temperatures. Different plant species have different base temperatures below which they do not grow. At temperatures above this base, the amount of plant growth is approximately proportional to the amount of heat or temperature accumulated. A higher annual growing degree day value correlates to a higher potential rate of plant growth. The table below shows growing degree days accumulated for April through September for the Twin Falls (Kimberly) AgriMet site.

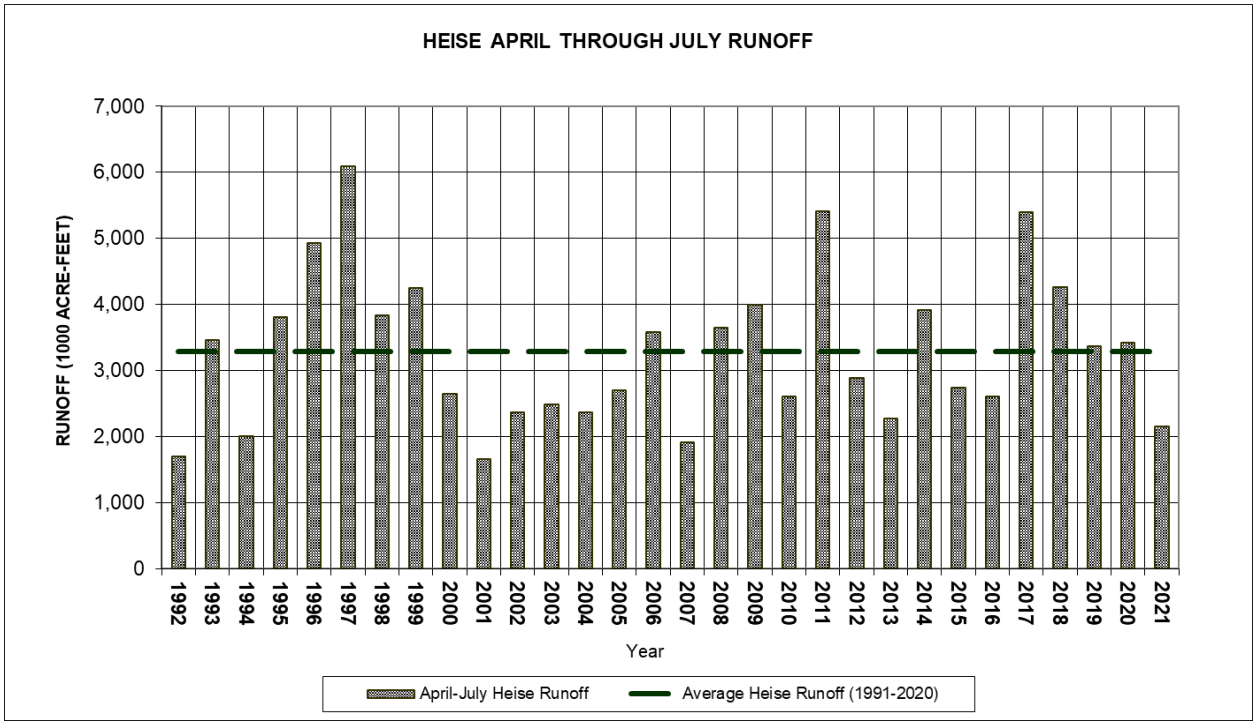


Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1992–2021.[8]

[8] The Fourth Methodology Order included data only through 2014. The Fifth Methodology Order updated this chart with data for the period 1992 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

ii. Available Water Supply

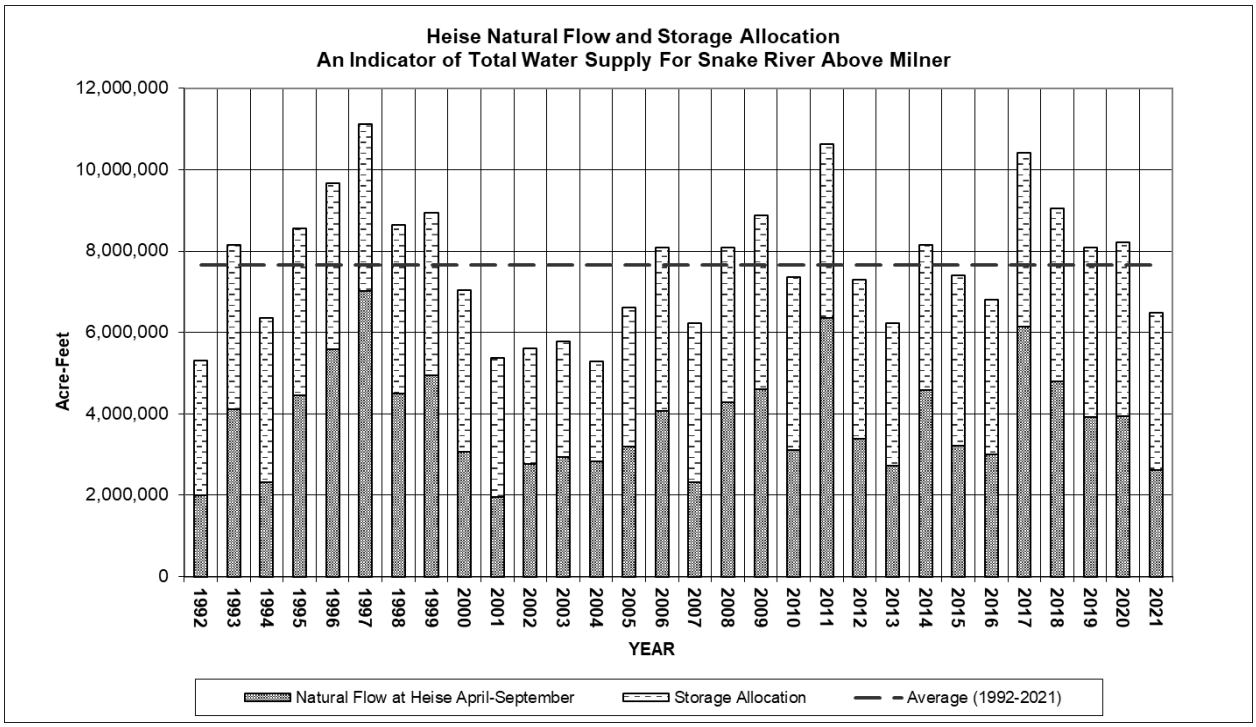
17. The April through July Heise runoff volume represents the volume of water available for diversion into storage reservoirs and is an indicator of natural flow supplies. The graph below shows actual unregulated flow volumes at Heise for 1992 through 2021. The 1992 to 2021 average (3,284,000 acre-feet) is displayed by the dashed line.



April through July Unregulated Flow Volume at Heise, 1992–2021.[9]

[9] The Fourth Methodology Order included data only through 2014. The Fifth Methodology Order updated this chart with data for the period 1992 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

18. The sum of the Heise natural flow and the reservoir storage allocations is an indicator of the total supply of the Snake River. The sum of the Heise natural flow and reservoir storage allocations for each year from 1992–2021 is represented in the graph below.



The sum of the Heise natural flow and the storage allocation for the Snake River above Milner 1992–2021.[10]

iii. Irrigation Practices

19. A baseline year ("BLY") must be recent enough to represent current irrigation practices. R. vol. 37, at 7099–7100. Current conditions should be represented by: (a) the net area of the irrigated crops, (b) farm application methods (flood/furrow or sprinkler irrigation), and (c) the conveyance system from the river to the farm. The type of sprinkler systems should be similar between the BLY and the current year.

20. Sprinkler systems are currently the predominant application system. *Id*. at 7101–02. To ensure that current irrigation practices are captured, selection of a BLY for the SWC should be limited to years subsequent to 1999. *Id*. at 7096; 7099–7100.

[10] The Fourth Methodology Order included data for the period 1990 to 2014. The Fifth Methodology Order updated this chart with data for the period 1992 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

21. According to the Hearing Officer at the 2008 Hearing, Gerald Schroeder ("Hearing Officer"), beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated. R. vol. 37, at 7100.

22. The following table summarizes: a) SWC entities; b) shapefile source of reported irrigated acres; c) year shapefile created; d) decreed irrigated acres; (e) number of reported acres in shapefile; and f) irrigated acres used in this methodology order for the 2023 irrigation season. The number of irrigated acres used in this methodology order is the number of reported acres unless that number is larger than the decreed irrigated acres, and if so, then the decreed acres were used. This table will be updated annually based on the reported number of irrigated acres by each SWC entity in Step 1 of the Methodology Order.

Entity	Shapefile Source	Shapefile Year	Partial Decree Acres	Shapefile Acres	Acres Used in Methodology
A&B	PPU[1]	2010	15,924	21,972	15,924
AFRD2	PPU	2010	62,361	69,077	62,361
BID	SWC	2013	47,643	46,035	46,035
Milner	PPU	2010	13,335	13,264	13,264
Minidoka	SWC	2023	75,093	77,176	75,093
NSCC	PPU	2010	154,067	224,463	154,067
TFCC	SWC	2013	196,162	194,732	194,732

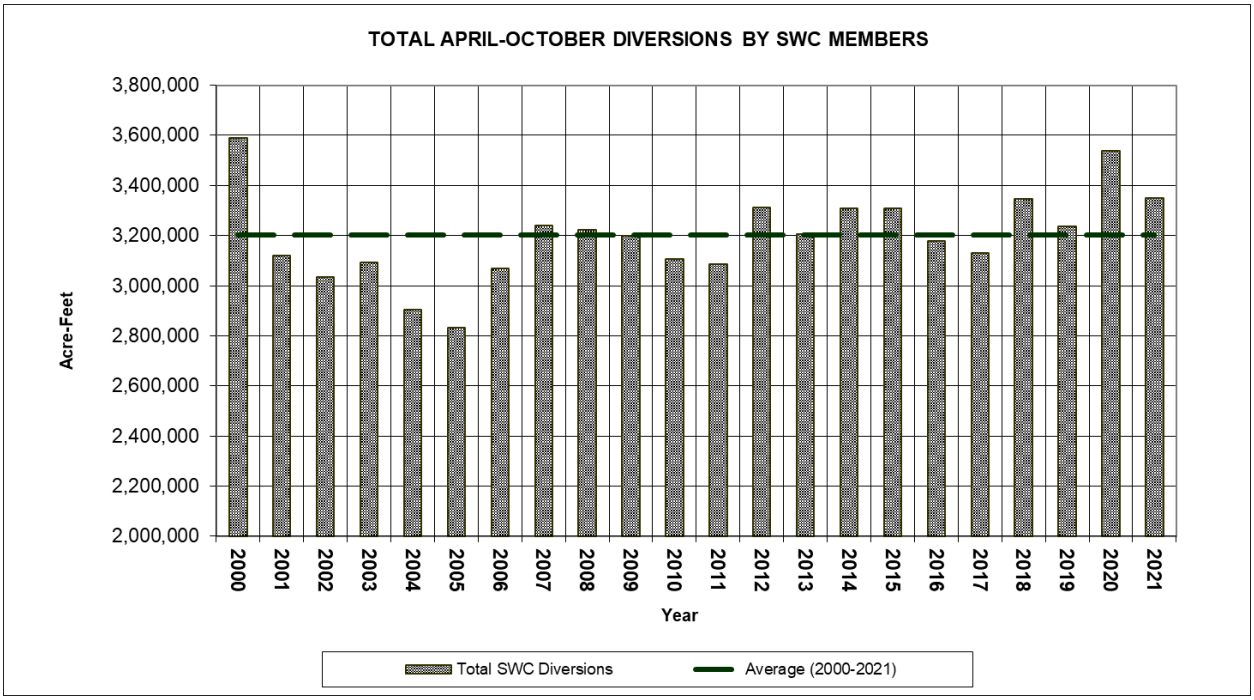
[1] IDWR permissible place of use.

Acres used in the methodology.

23. There are lands within the service areas of SWC entities that are irrigated with supplemental groundwater. Ex. 3007. Supplemental groundwater is a factor the Director can consider in the context of a delivery call. *Memorandum Decision and Order on Petitions for Judicial Review* ("Methodology Remand Order") in Gooding County Consolidated Case No. CV-2010-382, at 18–19. At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities.

iv. Diversions

24. The following figure summarizes the annual measured diversions by the combined SWC members from 2000–2021. Diversions for a baseline year should exceed the average diversions.



Total April–October Diversions by SWC Members.[11]

B. Selection of the Initial Baseline Year

25. When selecting the BLY, the Director must evaluate recent data to determine whether the BLY section criteria are satisfied.

26. In the Fourth Methodology Order, the Department considered the years 2000-2014 when deciding the BLY. Ultimately, the Department chose an average of the years 2006, 2008, and 2012 for the BLY ("BLY 06/08/12"). For this Sixth Methodology Order, the years 2000–2021 were considered for the BLY selection. With the addition of new data from 2014 to 2021, the total diversions by the SWC for the previous BLY 06/08/12 are 100% of the average SWC diversions for the years 2000–2021. As a result of adding the new data, BLY 06/08/12 no longer satisfies the presumption criteria that total diversions in the BLY should exceed the average annual diversions. Mem. Decision & Order on Pets. for Jud. Rev., at 34, *IGWA v. Idaho Dep't of Water Res.*, No. CV-2010-382 (Gooding Cnty. Dist. Ct. Idaho Sept. 26, 2014).

[11] The Fourth Methodology Order did not include this chart. It was added to the Fifth Methodology Order to demonstrate that the baseline year is a year of above average total diversions. As discussed in footnote 12, during the June 2023 Hearing the Department identified an error in AFRD#2's 2018 diversion data. Hr'g Tr. vol. IV, at 173–74. This correction was resolved in this Sixth Methodology Order, which relies on the updated data. The updated data did not result in an appreciable increase in 2018's diversion value.

27. Years 2018 and 2020 satisfy all the BLY selection criteria discussed above. Each of these years had (1) total diversions above the average diversions for the years 2000–2021, (2) total growing degree days above the average for the years 1992–2021, and (3) reference ET values above the average for the years 1992–2021. The years 2018 and 2020 also had total precipitation values below the average precipitation for the years 1992–2021 and were not water supply limited years. The Department has reviewed the SWC's diversion data for the 2020 irrigation season. The Department finds that 2020 ranks as the second-highest year of total diversions for the SWC and is more than one standard deviation above the average for the years 2000–2021. In comparison, 2018 ranks as the fourth-highest year of total diversions for the SWC and is less than one standard deviation above the average for the years 2000–2021. Choosing a BLY with above average diversions but within one standard deviation, ensures that a conservative year is selected that protects the senior while excluding extreme years from consideration. The Director concludes that total diversions for 2018 adequately protect senior water rights when predicting the demand shortfall at the start of the irrigation season and selects 2018 as the BLY.

Entity	2000–2021 Avg. Total Diversions (Acre-Feet)	06/08/12 Avg. Total Diversions (Acre-Feet)	06/08/12 % of Avg.	2018 Total Diversions (Acre-Feet)	2018 % of Avg.
A&B	59,474	59,993	101%	64,192	108%
AFRD2	427,978	427,672	100%	458,890	106%
BID	247,049	251,531	102%	262,211	106%
Milner	53,343	47,135	88%	58,417	110%
Minidoka	354,181	369,492	104%	354,851	100%
NSCC	996,267	978,888	98%	1,026,661	103%
TFCC	1,062,098	1,060,011	100%	1,121,717	106%
Total	3,200,617	3,194,722	100%	3,346,939	105%

Average SWC Diversions (acre-feet) for 2000–2021, 2006/2008/2012 BLY, and 2018 BLY.[12]

C. Calculation of Reasonable In-Season Demand

28. Prior to the irrigation season, reasonable in-season demand ("RISD") is the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the projected beneficial use of growing crops within the service area of the entity. Given that climate and system operations for the year being evaluated will likely be different from the BLY, the RISD must be adjusted for those differences. As stated by the Hearing Officer, "The concept of a baseline is that it is adjustable as weather conditions or practices

[12] In this Sixth Methodology Order, AFRD2's 2018 diversion value has been increased by 5,000 acre-feet. This increase was necessary to remedy the error committed by Department staff in calculating AFRD2's 2018 adjusted diversion value for the Fifth Methodology Order, which was identified during the June 6 Hearing. Hr'g Tr. vol. IV, at 173–74. The error is minor, accounting for approximately 1% of AFRD2's 2018 diversions. The Director concludes that the error had no appreciable impact on any calculations in the Fifth Methodology Order that relied on AFRD2's 2018 diversion volume.

change, and that those adjustments will occur in an orderly, understood protocol." R. vol. 37, at 7098.

i. Project Efficiency

29. Project efficiency ("E_p") is the ratio of total volumetric crop water needs within a SWC entity's boundary and the total volume of water diverted by that entity to satisfy its crop needs. It is the same concept as system efficiency, which was presented at the 2008 Hearing. Ex. 3007, at 28–29. Implicit in this relationship are the components of seepage loss (conveyance loss), on-farm application losses (deep percolation, field runoff), and system operational losses (return flows) for which data is not obtainable by the Department. By utilizing project efficiency and its input parameters of crop water need and total diversions, the influence of the unknown components for which data is not obtainable can be captured and described without quantifying each of the components. Project efficiency is derived by dividing crop water need by total diversions as depicted in the algorithm below:

$$E_p = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,
CWN = crop water need, and
Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

30. Monthly SWC entity diversions ("Q_D") will be obtained from Water District 01's diversion records. Ex. 8000, vol. II, at 8-4, 8-5. Raw monthly diversion values will then be adjusted to remove any water diversions that can be identified to not directly support the beneficial use of crop development within the irrigation entity. Examples of adjustments include the removal of diversions associated with in-season recharge and diversion of irrigation water on the behalf of another irrigation entity. Adjustments are unique to each SWC member and each irrigation season and will be evaluated each year. Any natural flow or storage water deliveries to entities other than the SWC for purposes unrelated to the original right will not be included as a part of the SWC water supply or carryover volume. Water that is purchased or leased by a SWC member may become part of the shortfall obligation to the extent that member has been found to have been materially injured. *See e.g.,* R. vol. 38, at 7201 n.11 (Eighth Supplemental Order). Conversely, water supplied to private leases or to the rental pool by a SWC member will be included as a part of the SWC supply for that member because non-inclusion would unjustifiably increase the shortfall obligation.

31. Monthly project efficiencies will be computed for the entire irrigation season. Project efficiency varies from month-to-month during the season and will typically be lower during the beginning and ending of the season. Monthly project efficiencies will be divided into actual monthly crop water need ("CWN") values to determine RISD during the year of evaluation.

32. In the Fourth Methodology Order, project efficiencies for each SWC member were initially averaged over an eight-year period (2007–2014) and project efficiency greater or less than two standard deviations were excluded from the calculation. By including only those values within two standard deviations, extreme values from the data set are removed. Under the Fourth Methodology Order, an updated 8-year rolling average of project efficiencies was calculated each year the methodology was implemented. The Director now finds that averaging over a rolling period of 15 years results in project efficiency values that are more consistent from year-to-year, reducing the impact of short-term trends. The Director finds that it is still appropriate to remove project efficiencies greater or less than two standard deviations from the average.

The following is a table of efficiency values averaged over the most recent fifteen-year period of record.

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.98	0.33	0.45	0.87	0.43	0.24	0.31	0.51
5	0.47	0.22	0.32	0.39	0.35	0.24	0.30	0.33
6	0.66	0.40	0.49	0.60	0.56	0.41	0.51	0.52
7	0.74	0.44	0.52	0.67	0.63	0.48	0.58	0.58
8	0.58	0.41	0.42	0.55	0.52	0.43	0.46	0.48
9	0.45	0.27	0.32	0.45	0.38	0.32	0.27	0.35
10	0.18	0.16	0.09	0.14	0.11	0.06	0.04	0.11
Season Avg.	0.58	0.32	0.37	0.52	0.43	0.31	0.35	

SWC Member Average Monthly Project Efficiencies from 2007–2021.[13]

ii. Crop Water Need

33. CWN is the volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability. CWN only applies to crops irrigated with surface water. CWN is the difference between the fully realizable consumptive use associated with crop growth, or ET, and effective precipitation (W_e) and is synonymous with the terms irrigation water requirement and precipitation deficit. Ex. 3024. For the purposes of the methodology, CWN is calculated as set forth below:

$$CWN = \sum_{i=1}^{n} (ET_i - W_e) A_i$$

[13] In the Fourth Methodology Order, this table summarized average E_p data for the period 2007 to 2014. The Fifth Methodology Order updated this table with average E_p data for the period 2007 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

Where:

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = effective precipitation,
A_i = total irrigated area of specific crop type,
i = index variable representing the different specific crop types grown within the irrigation entity, and
n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

iii. Evapotranspiration

34. ET can be estimated with theoretically based equations that calculate ET for an individual crop, necessitating crop distribution maps for each year. Ex. 3007A, at 21, fig. 3, tbls. 6–12; Ex. 3024, at 1–58; Ex. 8000, vol. II, ch. 9; Ex. 8000, vol. IV, app. AU.

35. At the 2008 Hearing, values of ET were estimated by the SWC from AgriMet, Ex. 8000, vol. IV, at AU-1, and by the ground water users from ETIdaho, Ex. 3007A, at 21; Ex. 3024, at 1–58. At this time, the Director finds that the use of AgriMet is more appropriate for determining ET than ETIdaho because AgriMet is available to all parties in real-time without the need for advanced programming. Accordingly, the methodology will rely on AgriMet derived ET values in the calculations of project efficiency, CWN, and RISD. In the future, with the development of additional enhancements, ETIdaho may become a more appropriate analytical tool for determining ET.[14]

36. CWN is derived by multiplying crop specific ET values, adjusted for estimated effective precipitation, by the total irrigated area of individual crop types, and summing the CWN for each crop type. The areas for individual crop types will be derived from published crop distributions from the United States Department of Agriculture's National Agricultural Statistics Service ("NASS"). Ex. 1005, at 1. NASS annually creates a crop-specific land cover digital dataset from satellite imagery and field checks. The dataset is called the Cropland Data Layer ("CDL"). Each year, the Department will calculate acreage by crop type for each SWC entity using NASS CDL data. In the future, the NASS data may not be the most accurate source of data. The Department prefers to rely on data from the current season if and when it becomes usable.

37. AgriMet ET and precipitation data are gathered at the Rupert and Twin Falls (Kimberly) stations. Both stations are in the vicinity of the SWC entities. A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), and Minidoka Irrigation District ("Minidoka") are nearest to the Rupert AgriMet station. ET data gathered at the Rupert station reasonably represents the climate conditions for A&B, BID, and Minidoka. American Falls Reservoir District No. 2 ("AFRD2"), Milner Irrigation District ("Milner"), North Side Canal

[14] IDWR held a series of meetings in the winter of 2022–23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meetings, IDWR discussed alternative methods of determining ET values, such as METRIC. However, the Director finds that the methods considered are not yet ready for incorporation into the administration of the SWC Delivery Call and will continue to rely on AgriMet ET data.

Company ("NSCC"), and Twin Falls Canal Company ("TFCC") are nearest to the Twin Falls (Kimberly) AgriMet station. ET data gathered at the Twin Falls (Kimberly) station reasonably represents the climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, vol. IV, at AU-2, AU-8.

iv. Effective Precipitation

38. Effective precipitation ("W_e") is the amount of total precipitation held in the soil horizon available for crop root uptake. Effective precipitation will be estimated from total precipitation (W) employing the methodology presented in the USDA Technical Bulletin 1275. Ex. 8000, vol. IV, at AU-3, AU-8. Total precipitation (W) data is published by the USBR as part of its Pacific Northwest Cooperative Agricultural Network, i.e., AgriMet.[15] Ex. 8000, vol. IV, at AU-3. W_e values derived from AgriMet based precipitation values are independent of crop type.

39. AgriMet precipitation (W) values are easy to understand and regularly used by the farming, water supply, and water management communities. Accordingly, the methodology will rely on AgriMet derived W values in the calculations of CWN and RISD.

40. As with ET data, AgriMet precipitation data are available from the Rupert and Twin Falls (Kimberly) stations. AgriMet data from the Rupert station reasonably represents climate conditions for A&B, BID, and Minidoka. AgriMet data from Twin Falls (Kimberly) reasonably represents climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, vol. IV, at AU-2, AU-8.

v. Summary of Reasonable In-Season Demand Calculation

41. At the start of the irrigation season, RISD is equal to the BD, or total season adjusted diversions for the BLY. When calculated in-season, RISD is calculated below.

$$RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p,j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month j,
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j = index variable, and
m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

[15] IDWR held a series of meetings in the winter of 2022–23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meeting, IDWR discussed alternative methods to determine W values, such as PRISM. However, the Director finds that the methods considered are not yet ready for incorporation into the administration of the SWC Delivery Call and will continue to rely on AgriMet precipitation data.

42. April RISD Adjustment: In April, the calculated RISD, which is the quotient of CWN and Ep, can underestimate actual canal operation diversions. Under-estimation occurs when the actual CWN value for April is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. Often, CWN in April is small due to precipitation, cool temperatures, and/or the immaturity of the crop. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events in April, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. To account for the conditions affecting the usability of the calculated RISD value for April, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

43. When the calculation of CWN/Ep results in a value for the month of April less than the average April diversion volume over a record of representative years in the recent past, the April RISD is set equal to the average April diversion volume. When the calculation of CWN/Ep results in a value greater than the average April diversion volume, the April RISD is equal to the calculated CWN/Ep volume.

44. October RISD Adjustment: In October, the calculated RISD, which is equal to the CWN divided by Ep, can both under-estimate and over-estimate actual canal operation diversions. The RISD may be underestimated when the actual CWN value for October is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events in October, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. Furthermore, RISD may be underestimated in October when a farmer diverts water at the field head gate for farming practices other than strictly satisfying CWN. Examples of water diversion practices at the field head gate that sometimes occur in October include diverting water for soil salt leaching, diverting water to build up the soil moisture profile for the following irrigation season, and/or diverting water to wet-up bare soil to prevent wind-driven topsoil erosion.

45. Unlike the month of April, RISD can be over-estimated in October. RISD may be over-estimated in years when actual CWN in October is much greater than typical CWN over a record of representative years in the recent past due to low precipitation and/or warm temperatures. To account for the conditions affecting the usability of the RISD value calculated for October, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

46. When the calculation of CWN/Ep results in a value for the month of October greater than the maximum October diversion volume from a record of recent representative years, or less than the minimum October diversion volume from the same record of recent representative years, the October RISD is set equal to the average October diversion volume over

the same period of recent representative years. When the calculation of CWN/Ep results in a value between the maximum and minimum October diversion volumes from a record of recent representative years, the October RISD is equal to the calculated CWN/Ep volume.

D. Adjustment of Forecast Supply

47. As stated by the Hearing Officer, "There must be adjustments as conditions develop if any baseline supply concept is to be used." R. vol. 37, at 7093. A prediction of the upcoming season's supply and demand is calculated at the beginning of the irrigation season and adjusted at specified milestones during the irrigation season to address changes in water supply and demand conditions in response to actual climatic and water supply conditions.

i. April Forecast Supply

48. The FS is comprised of natural flow and stored water.

49. Typically, within the first week of April, the USBR and the USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage from April 1 to July 31 for the forthcoming year. The joint forecast ("Joint Forecast") issued by the United States Bureau of Reclamation ("USBR") and the United States Army Corp of Engineers ("USACE") for the period April 1 through July 31 "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." R. vol. 8, ¶ 98, at 1379. Given current forecasting techniques, the earliest the Director can predict material injury "with reasonable certainty" is soon after the Joint Forecast is issued. R. vol. 2, at 226. With data from 1990 through the irrigation year previous to the current year, a regression equation will be developed for each SWC member.[16] The regression equations for A&B and Milner will be developed by comparing the actual Heise natural flow to the natural flow diverted. *See e.g.,* R. vol. 8, at 1416–22. For AFRD2, BID, Minidoka, NSCC, and TFCC, multi-linear regression equations will be developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted. The regression equations will be used to predict the natural flow diverted for the upcoming irrigation season. *Id*. at 1380. The actual natural flow volume predicted in the Director's April FS for each SWC entity will be one standard error below the regression line, which underestimates the available supply. *Id*.; Tr., at. 65:6–25, 66:1–2. The purpose of the shift to one standard error below the regression line is to ensure senior water right holders do not bear the risk of under-prediction of supply. The forecasting techniques will be revised based on updated data and the forecasting techniques may be revised when improvements to the forecasting tools occur.

50. The storage allocation for each member of the SWC will be estimated by the Department following issuance of the Joint Forecast. The Department will forecast reservoir fill and storage allocation consistent with the methods established in the *Fifth Supplemental Order Amending Replacement Water Requirements Final 2006 & Estimated 2007.* R. vol. 23, at 4294–

[16] IDWR held a series of meetings in the winter of 2022–23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meetings, IDWR discussed updating the regression models used to forecast the SWC's water supplies in April. However, the Director finds that the current models still adequately forecast water supplies in April and will continue to rely on the existing regression models.

97 as explained below. The Department will evaluate the current reservoir conditions and the current water supply outlook to determine a historical analogous year or years to predict reservoir fill. The Department may identify and use a combination of different analogous years to predict individual reservoir fill. Input variables for determining the individual storage water allocation for each SWC member are: (a) the analogous year's or years' total reservoir fill volume; (b) an estimated evaporation volume; and (c) the previous year's carryover volume. The FS (the combination of the forecast of natural flow supply and the storage allocation) for each SWC member will be determined by the Director shortly after the date of the Joint Forecast.

51. Any time prior to the Director's final determination of the April FS, if the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected shortfall determination.

ii. July Forecast Supply

52. Approximately halfway through the irrigation season, the FS will be adjusted. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the year-to-date natural flow diverted by each member of the SWC. The natural flow diversion for the remainder of the irrigation season will be estimated based on the regression analyses.

53. The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains that occur in the Snake River between the Blackfoot to Milner reach. Many different predictor variables were considered when developing the models used to predict the natural flow supplies for the remainder of the season, including those variables used in the April FS.[17] A step-wise statistical analysis was employed to help select the variables for each model. The following variables were selected to forecast water supplies halfway through the irrigation season: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Ocean Plateau SNOTEL site; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The model predictors were optimized for each SWC member and are summarized in the sections below.

54. Linear regression equations for AFRD2, A&B, and Milner, will be developed by comparing the July 1 snow water equivalent (inches) at the Two Ocean Plateau SNOTEL site to the natural flow diversions. The regression equations for AFRD2, A&B, and Milner will be applied only in those years when the snow water equivalent at the Two Ocean Plateau SNOTEL site is greater than zero (0). Years when the snow water equivalent equals zero, the total natural flow prediction for the period July 1 to October 31 will be zero (0) AF.

[17] IDWR held a series of meetings in the winter of 2022–23 with the parties' technical consultants to discuss potential updates to the methodology order. IDWR discussed updating the regression models used to forecast the SWC's water supplies in July. However, the Director finds that the current models still adequately forecast water supplies in July and will continue to rely on the existing regression models.

55. Multiple linear regression equations for BID, Minidoka, and NSCC will be developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) March depth to water at well 05S 31E 27ABA1 and (3) the snow water equivalent at the Two Ocean Plateau SNOTEL site on June 15.

56. The multiple linear regression model for TFCC will be based on the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) Spring Creek total discharge (January – May) and (3) the snow water equivalent at the Two Ocean Plateau SNOTEL site on June 15.

57. When adjusting the storage component of the FS, the Department must consider whether stored water has been allocated. In normal to dry years, the reservoirs will typically have filled to their peak capacity for the season and the storage water will have been allocated. If the BOR and Water District 01 have allocated stored water to spaceholders, the Department will use the actual preliminary storage allocations to the SWC. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on the storage allocations from an analogous year or years.

iii. Time of Need

58. The FS will again be adjusted shortly before the Time of Need. The Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

59. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the natural flow diverted by each member of the SWC as of the new forecast date. The natural flow diversion for the remainder of the irrigation season will be estimated based on a historical year with similar reach gains in the Blackfoot to Milner reach. The following is an example of estimating reach gains from an analysis of historical years. Reach gains for the years 2000 – 2003 and a portion of year 2004 are graphed below. Considering 2004 as an example of a current year and comparing 2004 to the hydrographs for 2000 – 2003, year 2003 has similar reach gains and is appropriately conservative. Therefore, the natural flow diverted in 2003 would be used to predict the natural flow diversions for the remainder of the 2004 season.



Example Reach Gain Analysis for 2004.

60. When adjusting the storage component of the FS, the Department will use the actual preliminary storage allocations to the SWC.

61. The adjusted FS is the sum of the year-to-date natural flow diversions, the predicted natural flow diversions for the remainder of the season, and the storage allocation.

E. Calculation of In-Season Demand Shortfall

62. The equation below determines the amount of predicted demand shortfall during the irrigation season.

$$IDS = FS - RISD$$

Where:

IDS = demand shortfall for specified evaluation points throughout the season,
FS = forecasted supply adjusted for specified evaluation point during the season, and
RISD = reasonable in-season demand from above.

63. The amount calculated represents the volume that junior ground water users with approved mitigation plans for delivery of water will be required to have available for delivery to members of the SWC found to be materially injured by the Director to avoid curtailment. The amounts will be calculated in April, at the middle of the season, and at the Time of Need.

III. Methodology for Determining Material Injury to Reasonable Carryover

64. Conjunctive Management ("CM") Rule 42.01.g states the following guidance for determining reasonable carryover: "In determining a reasonable amount of carry-over storage water, the Director shall consider average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system." Carryover shortfall will be determined following the completion of the irrigation season.

A. Projected Water Supply

65. CM Rule 42.01.g states that the Director "shall consider . . . the projected water supply for the system." Because it is not possible to adequately forecast the irrigation supply or demand for the following irrigation season at the end of the current irrigation season, the Director must estimate the carryover water needed in future dry years when demand exceeds supply, creating a need for carryover storage. The Director projected the water supply using typical dry years and subtracted it from a projected future demand to determine a projected carryover need.

66. The Heise natural flow is a predictive indicator of total water supply. For the years 2002 and 2004, the Heise natural flows were well below the long term average (1992–2021), but were not the lowest years on record.[18] The average of the 2002 and 2004 supply will be the projected supply, representing a typical dry year. The 2002 and 2004 supply is computed as follows:

- 2002 supply = natural flow diverted + new storage fill
- 2004 supply = natural flow diverted + new storage fill
- Projected supply = average of 2002 supply and 2004 supply

Carryover from previous years is not included in the 2002 and 2004 new storage fill because it was not new water supplied during the 2002 or 2004 irrigation year.

	2002 Natural Flow Diverted	2002 New Storage Fill	2002 Total Supply	2004 Natural Flow Diverted	2004 New Storage Fill	2004 Total Supply	Projected Supply (Average 02/04)
	----------Acre-Feet----------						
A&B	853	45,603	46,456	1	36,535	36,536	41,496
AFRD2	25,749	381,451	407,200	4,562	309,698	314,260	360,730
BID	89,886	174,454	264,340	102,706	152,387	255,093	259,716
Milner	5,058	43,430	48,488	1,027	35,175	36,202	42,345
Minidoka	143,937	256,602	400,539	141,460	229,574	371,034	385,787
NSCC	363,960	667,799	1,031,759	315,942	479,068	795,010	913,385
TFCC	851,970	186,233	1,038,203	881,345	150,218	1,031,563	1,034,883

SWC water supplies 2002, 2004, and 2002/2004 average (acre-feet).

67. Similar to projecting supply, the Director must also project demand. Because it is not possible to adequately forecast the irrigation demand for the following irrigation season at the end of the current irrigation season, the Director must project demand. R. vol. 37, at 7109. The 2018 BLY will be the projected demand.

[18] The Fourth Methodology Order included data for the period 1991 to 2014. The Fifth Methodology Order updated this chart with data for the period 1992 to 2021. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

68. The maximum projected carryover need is defined as the difference between a BLY demand and projected typical dry year supply. The following equation computes the maximum projected carryover need:

Maximum Projected Carryover Need = Projected Demand (2018 BLY) – Projected Supply (Average 02/04)

	Projected Demand (2018 BLY)	Projected Supply (average 02/04)	Maximum Projected Carryover Need
	----------Acre-Feet----------		
A&B	64,192	41,496	22,696
AFRD2	458,890	360,730	98,160
BID	262,211	259,716	2,495
Milner	58,417	42,345	16,072
Minidoka	354,851	385,787	0
NSCC	1,026,661	913,385	113,277
TFCC	1,121,717	1,034,883	86,834

SWC Projected Demand, Projected Supply and Maximum Projected Carryover Need (acre-feet).[19]

B. Average Annual Rate of Fill

69. CM Rule 42.01.g states that the Director "shall consider the average annual rate of fill of storage reservoirs . . . ." The average annual rate of fill of the storage reservoirs is the average of annual percentages of fill of each entity's reservoir space. The average annual reservoir storage fill is a benchmark that can be compared to projected carryover need. For purposes of the table below, any water contributed to the rental pool from the previous year was added to the next year's fill volume so that it does not artificially lower the percent fill. R. vol. 37, at 7108. Water that is supplied to the rental pool lowers carryover and could impact the following year's fill. The percent fill does not include water deducted for reservoir evaporation.

[19] The Fifth Methodology Order updated this chart with the new baseline year and calculated new maximum projected carryover need values. This Sixth Methodology Order relies on the same data included and calculated in the Fifth Methodology Order with one exception. As described in footnote 12, AFRD2's 2018 diversion value has been increased by 5,000 acre-feet to remedy an error committed by Department staff in calculating AFRD2's 2018 adjusted diversion value for the Fifth Methodology Order. Hr'g Tr. vol. IV, at 173–74.

The annual percent fill of storage volume by SWC entity is shown below:

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
1992	96%	100%	98%	93%	75%	76%	86%
1993	100%	100%	100%	100%	100%	93%	92%
1994	100%	100%	100%	100%	99%	99%	99%
1995	100%	100%	100%	100%	100%	100%	100%
1996	100%	100%	100%	100%	100%	100%	100%
1997	100%	100%	100%	100%	100%	100%	100%
1998	100%	100%	100%	100%	100%	100%	100%
1999	100%	100%	100%	96%	98%	98%	99%
2000	100%	99%	99%	98%	100%	97%	97%
2001	100%	100%	100%	100%	100%	91%	87%
2002	41%	100%	100%	79%	92%	84%	88%
2003	43%	100%	99%	66%	92%	94%	99%
2004	34%	82%	97%	48%	94%	78%	63%
2005	58%	100%	100%	76%	98%	100%	100%
2006	98%	100%	99%	98%	100%	99%	99%
2007	89%	100%	97%	92%	94%	95%	97%
2008	100%	100%	100%	100%	100%	99%	100%
2009	100%	100%	100%	100%	100%	100%	100%
2010	100%	100%	100%	100%	100%	100%	100%
2011	100%	100%	100%	100%	100%	100%	100%
2012	88%	100%	97%	91%	94%	94%	96%
2013	80%	100%	97%	90%	90%	97%	100%
2014	93%	100%	100%	100%	95%	100%	100%
2015	100%	100%	100%	100%	100%	100%	100%
2016	100%	100%	100%	100%	95%	100%	100%
2017	100%	100%	100%	100%	100%	100%	100%
2018	100%	100%	100%	100%	100%	100%	100%
2019	96%	100%	99%	97%	98%	98%	99%
2020	100%	100%	100%	100%	100%	100%	100%
2021	100%	100%	100%	100%	98%	100%	100%
Average	91%	99%	99%	94%	97%	96%	97%
Std Dev	19%	3%	1%	12%	5%	6%	8%

Annual Percent Fill of Storage Volume by Entity (1992–2021).[20]

[20] The Fourth Methodology Order included data from 1995 through 2014. The Fifth Methodology Order updated this chart with data from 1992 through 2021. The Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

C. Average Annual Carryover

70. CM Rule 42.01.g states that the Director "shall consider the . . . average annual carry-over for prior comparable water conditions . . . ." Actual carryover volumes are from annual storage reports published by Water District 1. Actual carryover from 1992 through 2021 are sorted into two categories – below average (dry) and above average (wet). The categories are based on Heise natural flow volumes from April through September.

The 1992 to 2021 average natural flow volume is 3,827 thousand acre-feet ("KAF").

Cat.	Year	Heise Apr–Sept (KAF)	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
			----------	----------	----------	Acre-Feet	----------	----------	----------
	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1992	2,001	11,966	11,548	31,977	28,896	16,928	19,439	3,590
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	38,686
	2007	2,320	62,739	7,962	32,138	37,761	61,744	66,807	39,999
	2021	2,622	73,688	988	61,327	27,448	65,393	121,946	13,581
	2013	2,721	55,563	21,477	54,350	34,740	55,374	135,658	23,419
Below	2002	2,775	30,192	8,932	74,573	14,662	102,139	133,702	46,825
Avg	2004	2,833	0	18,617	48,809	8,735	99,199	54,141	58,813
(Dry)	2003	2,931	9,401	3,904	52,550	6,944	82,895	169,674	0
	2016	3,012	89,845	58,689	84,302	46,050	108,482	283,728	21,497
	2000	3,059	69,436	20,787	107,425	45,762	161,423	205,510	56,536
	2010	3,108	96,172	113,895	101,620	59,628	184,940	324,712	46,243
	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	68,352
	2015	3,208	88,616	57,344	73,449	47,322	130,942	208,274	44,957
	2012	3,385	68,109	41,395	88,526	42,214	119,361	198,853	72,267
	Avg.	**2,764**	**52,345**	**33,050**	**66,187**	**34,034**	**99,827**	**163,881**	**37,446**
	2019	3,930	88,506	106,833	113,278	48,393	203,434	406,865	94,193
	2020	3,962	95,105	99,782	110,640	52,750	168,213	360,234	66,609
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	78,562
	1993	4,116	102,493	123,508	154,461	60,332	264,713	300,942	104,424
	2008	4,288	91,835	104,219	124,128	62,359	182,722	414,171	70,192
	1995	4,447	103,295	167,451	159,214	75,451	258,028	476,312	68,576
Above	1998	4,498	100,817	144,057	157,265	69,384	227,726	494,385	156,433
Avg	2014	4,594	78,917	96,756	154,382	57,305	207,834	448,682	130,086
(Wet)	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
	2018	4,796	93,754	115,442	92,727	50,776	163,465	351,483	54,285
	1999	4,949	93,354	121,793	168,545	67,147	243,322	453,706	191,501
	1996	5,583	105,209	145,019	150,358	70,250	253,786	522,790	111,459
	2017	6,139	110,348	219,940	168,293	67,754	258,106	528,880	169,862
	2011	6,347	102,139	107,618	104,915	64,487	246,699	504,578	129,757
	1997	7,007	102,539	114,684	134,906	65,307	242,758	464,411	136,926
	Avg.	**4,890**	**97,453**	**128,021**	**134,778**	**62,492**	**220,533**	**434,659**	**110,560**

Actual Carryover Volumes by Entity, Sorted by Heise Natural Flow (1992–2021).[21]

[21] In the Fourth Methodology Order, this table summarized data for the period 1994 to 2014 and adjusted WD 01 carryover values to remove water received for mitigation or water rented by the SWC entity to augment their supplies. The Fifth Methodology Order updated this chart with data for the period 1992 to 2021 and used raw carryover values reported by WD 01. Raw numbers were used because adjusted numbers reduced the SWC's

71. In considering the principles articulated in CM Rule 42.01.g, the Director will project reasonable carryover shortfalls for members of the SWC. The following table represents the 2018 BLY diversion volumes and total reservoir storage space by entity. By dividing the total reservoir space by the 2018 diversion volume, a metric is established that describes the total number of seasons the entity's reservoir space can supply water.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
	----------Acre-Feet----------						
Projected Demand (2018 BLY)	64,192	458,890	262,211	58,417	354,851	1,026,661	1,121,717
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930
Number of Seasons of Reservoir Space	2.1	0.9	0.9	1.6	1.0	0.8	0.2

Total Reservoir Space[22] in Comparison to Demand.[23]

D. Reasonable Carryover

i. A&B

72. A&B's reservoir space has the lowest average annual rate of fill with the highest variability in fill. *See* Finding of Fact 69. In dry years, the potential exists that A&B's actual carryover will be less than the maximum projected carryover need. *See* Finding of Fact 68, 70. A&B has an approximate two-year water supply provided by its total available storage space. *See* Finding of Fact 71. Because of its lower rate of fill, it is likely A&B will experience carryover shortfalls in consecutive dry years. Based on the evaluation criteria in CM Rule 42.01.g, A&B's reasonable carryover should be the maximum projected carryover need of 22,700 AF. *See* Finding of Fact 78.

ii. AFRD2

73. AFRD2 has the highest and most consistent reservoir rate of fill of any member of the SWC. AFRD2's storage space fills 99% of the time and has a fill variability of 3%. As

potential entitlement to reasonable carryover. This Sixth Methodology Order relies on the same data included in the Fifth Methodology Order.

[22] *See* R. vol. 8, at 1373–74.

[23] This Fifth Methodology Order updated this chart with a new baseline year and calculated a new number of seasons of reservoir space values. This Sixth Methodology Order relies on the same data included and calculated in the Fifth Methodology Order with the single exception discussed in footnote 12.

shown in the Annual Percent Fill table in Finding of Fact 69 above, its space only failed to fill in 2004 (82%) and 2000 (99%). AFRD2 has a high likelihood of filling during multi-year droughts and after a dry year. *See* Finding of Fact 69. Therefore, any unfilled space in the fall will most likely fill. AFRD2 has an approximate one-year supply available in storage. *See* Finding of Fact 71. AFRD2's storage space only failed to fill in years when the natural flow volume at Heise was less than 3,100 KAF. In a dry year, AFRD2's historical carryover volume is often less than the maximum projected carryover need using the equation set forth in Finding of Fact 68 and 70. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the reasonable carryover can be adjusted from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The historical average carryover of 16,700 AF in years when the natural flow volume at Heise was less than 3,100 KAF is the reasonable carryover for AFRD2. *See* Finding of Fact 78.

iii. BID & Minidoka

74. Historically, in dry years, BID's and Minidoka's carryover volumes have been well above the maximum projected carryover need and it is unlikely that they will have reasonable carryover shortfalls in the future. *See* Finding of Fact 68, 70; *see also* R. vol. 37, at 7105. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the reasonable carryover can be adjusted downward from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The reasonable carryover for BID and Minidoka is 0 AF. *See* Finding of Fact 78; *see also* R. vol. 37, at 7105.

iv. Milner

75. Similar to A&B, Milner's reservoir space has the second lowest average annual rate of fill of all entities and has a high degree of variability in fill. *See* Finding of Fact 69. In dry years, the potential exists that Milner's actual carryover will be less than the maximum projected carryover need. *See* Finding of Fact 68, 70. Milner has an approximate one and one half water supply available in storage. *See* Finding of Fact 71. Because of its rate of fill, it is likely Milner will experience carryover shortfalls in consecutive dry years. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the maximum projected carryover need of 16,100 AF is the reasonable carryover for Milner. *See* Finding of Fact 78.

v. NSCC

76. NSCC has a near-average annual rate of fill in comparison to all entities and an approximate one-year water supply available in storage. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its maximum projected carryover need will be less than its actual carryover. *See* Finding of Fact 68, 70. Based on the evaluation criteria in CM Rule 42.01.g, the reasonable carryover for NSCC is 113,300 AF. *See* Finding of Fact 78.

vi. TFCC

77. TFCC has a near average annual rate of fill in comparison to all entities, but only 20% of a single year's water supply is available in storage. TFCC's storage space fills 97% of

the time and has a fill variability of 8%. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its maximum projected carryover need will be less than its actual carryover. *See* Finding of Fact 68, 70. Based on the evaluation of the criteria in CM Rule 42.01.g, the reasonable carryover can be adjusted from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The historical average carryover in dry years of 37,400 AF is the reasonable carryover for TFCC. *See* Finding of Fact 78.

78. Reasonable carryover values for the SWC members are as follows:

	Reasonable Carryover (Acre-Feet)
A&B	22,700
AFRD2	16,700
BID	0
Milner	16,100
Minidoka	0
NSCC	113,300
TFCC	37,400

E. Reasonable Carryover Shortfall

79. Reasonable carryover shortfall is the numerical difference between reasonable carryover and actual carryover, calculated at the conclusion of the irrigation season. Actual carryover is defined as the storage allocation minus the total storage use plus or minus any adjustments. Examples of adjustments include SWC water placed in the rental pool and SWC private leases. Adjustments are unique to each irrigation season and will be evaluated each year. Any storage water deliveries to entities other than the SWC for purposes unrelated to the original right will be adjusted so that the water is not included as a part of the SWC carryover volume. Water that is purchased or leased by an SWC member may become part of the carryover shortfall obligation. *See e.g.,* R. vol. 38, at 7201 n.11 (Eighth Supplemental Order). Conversely, actual carryover must be adjusted to assure that water supplied by a SWC member to private leases or to the rental pool will not increase the reasonable carryover shortfall obligation to the same SWC member.

80. Reasonable carryover shortfall is calculated as follows:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

F. Determination of Curtailment Date

81. The Eastern Snake Plain Aquifer Model ("ESPAM") is the best scientific tool available to simulate aquifer and Snake River responses to stresses applied to the aquifer, such as ground water pumping from a well. Curtailment of junior ground water pumpers in response to the SWC Delivery Call would result in a reduction in the withdrawal of groundwater and a corresponding reduction in aquifer stress. ESPAM simulates the effects of the reduction in

aquifer stress and calculates predicted increases in aquifer discharge to the Snake River resulting from the curtailment of ground water pumping from the ESPA.

82. ESPAM simulations can be either steady-state or transient.

83. Merriam-Webster's Dictionary defines steady-state as "a state or condition of a system or process . . . that does not change in time." *Steady state*, Merriam-Webster.com, https://www.merriam-webster.com/dictionary/steady-state (April 19, 2023). A steady-state ESPAM simulation can only model increases in aquifer discharge to the Snake River resulting from continuous curtailments of an identical magnitude and location until the impacts of curtailment are fully realized. For example, a steady-state analysis of the curtailment of 1,000 acres, assumes that irrigation of the same 1,000 acres is curtailed every year at the same rate of consumptive use, until the impacts of that curtailment reach a steady state, or no longer change from year to year.

84. Steady-state analysis does not calculate the time to reach steady-state conditions nor describe the seasonal timing of the impacts. For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved. The assumption of continuous curtailment does not reflect reality in the SWC Delivery Call. Curtailments ordered as prescribed in the methodology are neither continuous nor long-term. Irrigation with ground water does not occur at a constant rate throughout the year nor from year to year. It is important to predict what benefits to the river are realized during the irrigation season in which injury has been determined. A steady-state ESPAM simulation cannot predict what benefits are realized during the irrigation season. In contrast, a transient ESPAM simulation will predict the timing of changes in river reach gains.

85. ESPAM was calibrated using one-month stress periods and can simulate a single (or partial) irrigation season of curtailment and predict the resulting increase in aquifer discharge to the Snake River during the same irrigation season using a transient simulation. In the context of this proceeding, the transient approach identifies the junior ground water rights that must be curtailed to produce increases in Snake River flows sufficient to offset material injury in the current irrigation season.

86. Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year.[24] Fifty percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately four years. Ninety percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately 24 years.

87. A curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the full predicted IDS unless the shortfall exceeds the accruals to the near

[24] The near Blackfoot to Minidoka reach is the reach of the Snake River from which the SWC diverts its water supplies.

Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights.

88. Steady-state simulations are appropriate for evaluating the average annual impact of aquifer stresses that have been, or will be, applied for decades (i.e., ground water pumping year after year, or continuous curtailment to the same date every year). The steady-state simulation of continuous curtailment applied in the Fourth Amended Methodology Order does not simulate the short-term curtailments prescribed in the methodology. The methodology prescribes curtailment only in years with a predicted IDS or carryover shortfall and prescribes the determination of a curtailment priority date that varies with the magnitude of the predicted shortfall.

89. Transient simulations are necessary to evaluate the impacts of aquifer stresses applied for short periods of time (i.e., short-term curtailments with varying priority dates). Transient simulations are necessary to simulate the short-term curtailments prescribed in the methodology.

CONCLUSIONS OF LAW

1. This order contains the methodology by which the Director will determine material injury to RISD and reasonable carryover to members of the SWC.

2. "The agency's experience, technical competence, and specialized knowledge may be utilized in the evaluation of the evidence." Idaho Code § 67-5251(5); IDAPA 37.01.01.600.

3. Idaho Code § 42-602 states that, "The director of the department of water resources shall have discretion and control of the distribution of water from all natural sources . . . . The director of the department of water resources shall distribute water . . . in accordance with the prior appropriation doctrine." According to the Hearing Officer, "It is clear that the Legislature did not intend to grant the Director broad powers to do whatever the Director might think right. However, it is clear also that the Legislature [in Idaho Code § 42-602] did not intend to sum up water law in a single sentence of the Director's authority." R. vol. 37, at 7085. "Given the nature of the decisions which must be made in determining how to respond to a delivery call, there must be some exercise of discretion by the Director." *American Falls Res. Dist. No. 2 v. Idaho Dept. Water Resources*, 143 Idaho 862, 875, 154 P.3d 433, 446 (2007).

4. "The prior appropriation doctrine is comprised of two bedrock principles—that the first appropriator in time is the first in right and that water must be placed to a beneficial use." *In Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A & B Irrigation Dist.*, 155 Idaho 640, 650, 315 P.3d 828, 838 (2012). "The concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*; *American Falls*, 143 Idaho at 879, 154 P.3d at 450 (stating that while an appropriation for a beneficial use is "a valuable right entitled to protection . . . . Nevertheless, that property right is still subject to other requirements of the prior appropriation doctrine."); *Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 131, 369 P.3d 897, 909

(2016) (explaining the "policy of beneficial use" serves as a "limit on the prior appropriation doctrine.").

5. "Concurrent with the right to use water in Idaho 'first in time,' is the obligation to put that water to beneficial use." *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447) (referring to "'the constitutional requirement that priority over water be extended only to those using the water'"). "'It is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation, and the amount of water necessary for the purpose of irrigation of the lands in question and the condition of the land to be irrigated should be taken into account.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar v. Goodrich*, 27 Idaho 26, 44, 147 P. 1073, 1079 (1915)).

6. "[T]he policy of securing the maximum use and benefit, and least wasteful use of Idaho's water resources, has long been the policy in Idaho." *Idaho Ground Water Assoc.*, 160 Idaho at 131, 369 P.3d at 909 (citing *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 808, 252 P.3d 71, 89 (2011)). The Idaho Constitution enunciates a policy of promoting "optimum development of water resources in the public interest." Idaho Const. Art. XV, § 7; *Baker v. Ore-Ida Foods, Inc.,* 95 Idaho 575, 584, 513 P.2d 627, 636 (1973). "There is no difference between securing the maximum use and benefit and least wasteful use of this State's water resources and the optimum development of water resources in the public interest. Likewise, there is no material difference between 'full economic development' and the 'optimum development of water resources in the public interest.' They are two sides of the same coin. Full economic development is the result of the optimum development of water resources in the public interest." *Clear Springs*, 150 Idaho at 809, 252 P.3d at 90. "The policy of securing the maximum use and benefit, and least wasteful use, of the State's water resources applies to both surface and ground waters, and it requires that they be managed conjunctively." *Id.*

7. "Conjunctive administration 'requires knowledge by the [Department] of the relative priorities of the ground and surface water rights, how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts the water flows in that source and other sources.' . . . . That is precisely the reason for the CM Rules and the need for analysis and administration by the Director." *American Falls,* 143 Idaho at 877, 154 P.3d at 448.

8. The CM Rules incorporate all principles of the prior appropriation doctrine as established by Idaho law. *American Falls*, 143 Idaho at 873, 154 P.3d at 444; CM Rule 20.02, 10.12.

9. While the presumption under Idaho law is that an appropriator is entitled to his decreed water right and the CM Rules may not be applied to require a senior appropriator to demonstrate an entitlement to the water in the first place, there may be post-adjudication factors relevant to the determination of how much water is actually needed in responding to a delivery call. *American Falls*, 143 Idaho at 877–78, 154 P.3d at 448–49. Under the CM Rules and Idaho law, the Director has the "authority and responsibility to investigate claims when delivery calls

are made," and the "authority to evaluate the issue of beneficial use in the administration context." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840. As the Idaho Supreme Court stated, "'[w]hile the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception . . . the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost.'" *Idaho Ground Water Assoc.*, 160 Idaho at 131, 369 P.3d at 909 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 433). "[T]he Director must have some discretion to balance these countervailing considerations in a delivery call." *Id*. "'If this Court were to rule the Director lacks the power in a delivery call to evaluate whether the senior is putting the water to beneficial use, we would be ignoring the constitutional requirement that priority over water be extended only to those using the water.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447).

10. In responding to a delivery call under the CM Rules, the Director "may employ a baseline methodology as a starting point for considering material injury," provided the baseline methodology otherwise comports with the prior appropriation doctrine as established by Idaho law. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841; *see Methodology Remand Order* at 17.

11. Once the Director determines "that material injury is occurring or will occur," junior appropriators subject to the delivery call bear "the burden of proving that the call would be futile or to challenge, in some other constitutionally permissible way, the senior's call." *American Falls*, 143 Idaho at 878, 154 P.3d at 449; *Methodology Remand Order* at 31. Junior appropriators have the burden of proving by clear and convincing evidence that the delivery call is futile or otherwise unfounded. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841.

12. "This case illustrates the tension between the first in time and beneficial use aspects of the prior appropriation doctrine." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838. The Idaho Supreme Court has in this case "recognized the critical role of the Director in managing the water resources to accommodate both first in time and beneficial use aspects: 'Somewhere between the absolute right to use a decreed water right and an obligation not to waste it and to protect the public's interest in this valuable commodity, lies an area for the exercise of discretion by the Director.'" *Id.* at 651, 315 P.3d at 839 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 451). Thus, in this case the Director may use "a baseline methodology, both as a starting point for consideration of the Coalition's call and in determining the issue of material injury." *Id.* at 650–51, 315 P.3d at 838–39. However, "[i]f changing conditions establish that material injury is greater than originally determined pursuant to the baseline analysis, then adjustments to the mitigation obligation of the juniors must be made when the Director undertakes his mid-season calculations." *Methodology Remand Order* at 18.

13. In the context of conjunctive administration, the Director's methodology for projecting material injury does not impose an obligation upon members of the SWC to reprove

their water rights. To the extent water is available, members of the SWC are authorized to divert and store water in accordance with the terms of their licenses or decrees. Nothing established herein reduces that authorization. The question that the CM Rules require the Director to answer in this proceeding is, when water is not available to fill the water rights of the SWC, how much water is reasonably necessary for the SWC to accomplish the beneficial purpose of raising crops; because what is needed to irrigate crops may be less than the decreed or licensed quantities. *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar*, 27 Idaho at 44, 147 P. at 1079) ("'[i]t is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation"). Again, "[t]he concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*

14. Holders of senior-priority water rights may receive less than their licensed or decreed quantities and not suffer material injury within the meaning of the CM Rules. As a result, in-season demand should be viewed in light of reasonableness and optimum development of water resources in the public interest. CM Rules 20 and 42; *American Falls*, 143 Idaho at 876–80, 154 P.3d at 447–51; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650–52, 315 P.3d at 838–40.

15. Here, the Director has established a methodology for determining material injury to members of the SWC. The methodology predicts material injury to RISD by taking the difference between RISD and the FS. The years 2000 through 2021 were analyzed to select the BLY because the period of years captured current irrigation practices in a dry climate. Based upon evaluation of the record, members of the SWC were exercising more reasonable efficiencies during this time period than during the 1990s when supplies were more plentiful. During periods of drought when junior ground water users are subject to curtailment, members of the SWC should exercise reasonable efficiencies to promote the optimum utilization of the State's water resources. CM Rules 20 and 42; *American Falls,* 143 Idaho at 876–80, 154 P.3d at 447-51; *Clear Springs*, 150 Idaho at 807–10; 252 P.3d at 88–91; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650–52, 315 P.3d at 838–40.

16. At this time, with the recognition that the methodology is subject to adjustment and refinement, RISD will be equal to the historic demands associated with the BLY (2018) and will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

17. Recognizing that climate and surface water supplies (natural flow and storage) are inherently variable, the Director's predictions of material injury to RISD and reasonable carryover are based upon the best available information and the best available science, in conjunction with the Director's professional judgment as the manager of the State's water resources. Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will continue to

review and refine the process of predicting and evaluating material injury. The methodology will continue to be adjusted if the data supports a change.

18. If the Director predicts that the SWC will be materially injured because of a demand shortfall prediction, either in the preseason or in the midseason, the demand shortfall represents a mitigation obligation that must be borne by junior ground water users. If mitigation water in the amount of the projected RISD shortfall cannot be secured or optioned by junior ground water users to the satisfaction of the Director, the Director will curtail junior ground water users to make up any deficit. *See* Order on Pet. for Jud. Rev., at 19, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009),

19. In previous years, the Director used steady-state modeling when determining the curtailment priority date. As part of the Director's ongoing obligation to evaluate the methodology, the Director must evaluate whether the use of steady-state continues to be supportable.

20. In surface water administration, uses by holders of junior priority surface water rights are curtailed until the senior surface water rights are fully satisfied, absent a futile call and if the senior surface water users need the water to accomplish a beneficial use. In other words, under surface water administration, junior surface water rights are generally curtailed unless the senior gets water in the quantity and at the time and place required.

21. Rule 43 of the CM Rules mandates that when the Director evaluates a mitigation plan, the mitigation plan must ensure that water is delivered to holders of senior priority surface water rights in both the quantity and at the time and place required by the senior. In considering a proposed mitigation plan pursuant to Rule 43, the Director must evaluate:

> **b.** Whether the mitigation plan will provide replacement water, *at the time and place required by the senior-priority water right*, sufficient to offset the depletive effect of ground water withdrawal on the water available in the surface or ground water source *at such time and place as necessary* to satisfy the rights of diversion from the surface or ground water source. Consideration will be given to the history and seasonal availability of water for diversion so as not to require replacement water at times when the surface right historically has not received a full supply, such as during annual low-flow periods and extended drought periods.
>
> **c.** Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right *when needed during a time of shortage* even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for multi-season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior-priority right in the event the mitigation water source becomes unavailable.

IDAPA 37.01.03.11.043.b–c (emphasis added). In other words, there is an assumption that senior water right holders calling for delivery of water under the CM Rules will receive, by curtailment or by mitigation, "replacement water at the time and place required by the senior-priority water right, sufficient to offset the depletive effect of ground water withdrawal . . . ." Only in a mitigation plan can "multi-season accounting of ground water withdrawals" be employed, and even then, the plan must "assure protection of the senior-priority right in the event the mitigation water source becomes unavailable."

22. The Director has an obligation to address a mitigation deficiency in the year it occurs. Mem. Decision & Order on Pet. for Jud. Rev., at 10, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-2446 (Twin Falls Cnty. Dist. Ct. Idaho Dec. 3, 2014); Mem. Decision & Order, at 8–9, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-4970 (Twin Falls Cnty. Dist. Ct. Idaho June 1, 2015).

23. The Director is also obligated to administer consistent with the guidance from the Courts. The Director concludes that any IDS determined by this methodology must be replaced by curtailment in time, place, and quantity unless mitigation allows for out-of-priority diversion of ground water.

24. As described in Finding of Fact 87, curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the *full* predicted IDS unless the shortfall exceeds the accruals to the near Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights. This methodology order depends on an annual evaluation of material injury and should also employ curtailment and or mitigation that supplies replacement water at the time and place required by the senior-priority water right in a quantity sufficient to offset the depletive effect of ground water withdrawal and to assure protection of the senior-priority right. Curtailment dates, periodically determined at time of recalculating in-season demand shortfall (IDS), should be calculated by a transient model simulation that will return the full quantity of water to the senior priority rights at the time and place required.

25. As described in Conclusion of Law 18, junior ground water users with approved mitigation plans to deliver storage water as mitigation must, to the satisfaction of the Director, secure or option mitigation water to avoid curtailment. By requiring that junior ground water users secure mitigation water or have options to acquire water in place during the season of need, the Director ensures that the SWC does not carry the risk of shortage to their supply. By not requiring junior ground water users to deliver or assign mitigation water until the Time of Need, the Director ensures that junior ground water users supply only the amount of mitigation water necessary to satisfy the RISD. All approved methods of mitigation shall be considered in the Director's review of projected RISD shortfall.

26. Unless there is reasonable certainty that junior ground water users can secure the predicted volume of water and provide that water at the Time of Need, the protection afforded to the senior water right holders is compromised. The risk of shortage is then impermissibly shouldered by the SWC. Members of the SWC should have certainty entering the irrigation

season and at midseason that mitigation water will be delivered or assigned at the Time of Need, or curtailment of junior ground water rights will be ordered.

27. Because climate and the supply that the SWC appropriated (natural flow and storage) are inherently variable, the Director cannot and should not insulate the SWC against all shortages. The Director can, however, protect the SWC against reasonably predicted shortages to RISD.

28. Currently, the USBR and USACE's Joint Forecast is an indispensable predictive tool at the Director's disposal for predicting material injury to RISD. Given current forecasting techniques, the earliest the Director can predict material injury to RISD with reasonable certainty is soon after the Joint Forecast is issued in early April. The pre-irrigation season supply forecast for A&B and Milner can be predicted solely from the Joint Forecast. To improve the accuracy of prediction, the pre-irrigation season supply forecast for AFRD2, BID, Minidoka, NSCC, and TFCC will currently be predicted from both the Joint Forecast and from flow data at Box Canyon.[25]

29. By shifting the April Forecast Supply prediction curve down one standard error of estimate, the Director purposely underestimates the water supply that is predicted. The Director further guards against RISD shortage by using the 2018 BLY, which has above average diversions, above average ET, below average in-season precipitation, and above average growing degree days. The 2018 BLY represents a year in which water supply did not limit diversions. The Director's prediction of material injury to RISD is purposely conservative. While it may ultimately be determined after final accounting that less mitigation water was owed than was provided, this is an appropriate burden for junior appropriators to carry. Idaho Cost. Art. XV, § 3; Idaho Code § 42-106. Shifting the prediction curve down one standard error of estimate and adoption of a BLY that uses above average diversions, above average temperatures and ET and below average precipitation is necessary to protect senior rights if the Director administers to an amount less than the full decreed quantity of the SWC's rights. *Methodology Remand Order* at 33, 35.

30. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water provided by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

31. "Storage water is water held in a reservoir and is intended to assist the holder of the water right in meeting their decreed needs." *American Falls*, 143 Idaho at 878, 154 P.3d at 449. "Carryover is the unused water in a reservoir at the end of the irrigation year which is retained or stored for future use in years of drought or low-water." *Id.* Under Idaho Code, "[o]ne may acquire storage water rights and receive a vested priority date and quantity, just as with any other water right," but "[t]here is no statutory provision for obtaining a decreed right to 'carryover' water." *Id.* Rather, carryover is a "component of the storage right." Order on Pet. for Jud. Rev., at 20, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-

[25] The method for predicting the natural flow supply may be subject change based upon improved predictive models.

0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009). Storage carryover is "permissible . . . absent abuse." *American Falls*, 143 Idaho at 880, 154 P.3d at 451.

32. The storage reservoirs implicated in this proceeding were intended to provide supplemental supplies of water "to create a buffer against the uncertainty of the weather." *Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation* (April 29, 2008) at 6. "The history of the development of the reservoir system, most recently Palisades, makes it clear that storage of water was a primary purpose to prevent disaster during periods of shortage as have been experienced in the recent past." *Id*. at 60. The purpose of carryover also is "insurance against the risk of future shortage." Order on Pet. for Jud. Rev., at 20, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009).

33. CM Rule 42.01 sets forth factors the Director "may consider in determining whether the holders of water rights are suffering material injury and using water efficiently and without waste." CM Rule 42.01 does not limit the Director's determination of reasonable carryover to consideration of the factors enumerated in CM Rule 42.01g, but only requires that the Director consider those enumerated factors. One such factor is "[t]he extent to which the requirements of the holder of a senior priority water right could be met with the user's existing facilities and water supplies." CM Rule 42.01g. This factor is qualified, however, by the provision that "the holder of a surface water storage right shall be entitled to maintain a reasonable amount of carry-over storage to assure water supplies for future dry years." CM Rule 42.01g. Thus, CM Rule 42.01g does not require water right holders to exhaust their storage water supplies prior to making a delivery call under the CM Rules. This is consistent with the purposes of the storage reservoirs and the carryover components of the storage water rights.

34. In considering CM Rule 42.01g in *American Falls*, the Idaho Supreme Court framed the SWC's challenge to the "reasonable carryover" provision as presenting the question of whether the holders of storage water rights are "entitled to insist on all available water to carryover for future years in order to assure that their full storage water is met (regardless of need)," *American Falls,* 143 Idaho at 879, 154 P.3d at 450, and answered this question in the negative:

> At oral argument, one of the irrigation district attorneys candidly admitted that their position was that they should be permitted to fill their entire storage water right, regardless of whether there was any indication that it was necessary to fulfill current or future needs and even though the irrigation districts routinely sell or lease the water for uses unrelated to the original rights. This is simply not the law of Idaho. While the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception. As previously discussed, the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost. Supra, paragraph 11.

Id. at 880, 154 P.3d at 451.

35. As discussed in the Findings of Fact, reasonable carryover is determined by projecting the water supply for the system. This is accomplished by projecting the 2002/2004 natural flow and average annual storage fill and the 2018 demand. Next, the Director examines the average annual rate of fill of each SWC entity's reservoir space to determine each entity's relative probability of fill. Finally, the Director examines the average annual carryover for prior comparable water conditions by reviewing Heise natural flow.

36. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of the SWC. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

37. Recognizing that reservoir space held by members of the SWC may fill, and to prevent the waste of water, junior ground water users are not required to deliver or assign the volume of reasonable carryover until after the Day of Allocation (defined in footnote 11, *infra*). Junior ground water users are obligated to hold the secured or optioned mitigation water until reservoir space held by the SWC fills. If the reservoir space does not fill, junior ground water right holders must deliver or assign the secured or optioned mitigation water to the senior water right holders up to the amount of storage space that did not fill.

ORDER

Consistent with the forgoing, the Director HEREBY ORDERS that, for purposes of determining material injury to RISD and reasonable carryover, the following steps will be taken:

1. Step 1: By April 1, members of the SWC will submit electronic shape files to the Department delineating the total anticipated irrigated acres for the upcoming year within their water delivery boundary or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent. Department staff will review submitted shapefiles and modify them as necessary to ensure that: (1) the total acreage count does not exceed the decreed number of acres; (2) all of the irrigated land is located within the decreed place of use; and (3) acres are not counted more than once due to overlapping polygons within a shape file or between shape files submitted by different SWC members. Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department. If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery. If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season. The Department will electronically post

electronic shape files for each member of the SWC for the current water year for review by the parties. In determining the total irrigated acreage, the Department may account for supplemental ground water use. The Department currently does not have sufficient information to accurately determine the contribution of supplemental ground water to lands irrigated with surface water by the SWC. If and when reliable data is available to the Department, the methodology will be amended to account for the supplemental ground water use.

2. If the acreage count is under reported by more than five percent of the irrigated acreage limit of the water right, then the Department will assess the impact of this reduction in use of the water right on any mitigation requirement.

3. Step 2: Typically within the first two weeks of April, the USBR and USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage for the period April 1 through July 31. Within fourteen (14) days after issuance of the Joint Forecast, the Director will issue a final order predicting the April FS for the water year for each SWC entity. The Director will compare the April FS for each SWC entity to the BD for each SWC entity to determine if an in-season demand shortfall ("IDS") is anticipated for the upcoming irrigation season. The April FS for each SWC entity is the sum of the forecasted natural flow supply and the forecasted storage allocation for each SWC entity. The forecasted natural flow supply will be computed with regression algorithms. The forecasted storage allocation will be determined by comparing storage accruals in an analogous year(s). A transient ESPAM simulation will be run to calculate the curtailment priority date predicted to produce a volume of water equal to the IDS in the near Blackfoot to Minidoka reach between May 1 and September 30 of the current year. Curtailment will be simulated within the area of common ground water supply as described by CM Rule 50.01.

4. Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April IDS unless the April IDS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

5. Step 4: As soon as practical after the deadline for junior ground water users with approved mitigation plans to provide notice of secured water, the Director will issue an order curtailing junior ground water users who: (1) do not have approved mitigation plans; (2) fail to secure the required water consistent with their approved mitigation plans; or (3) otherwise fail to comply with their approved mitigation plans.[26]

[26] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

6. If, at any time prior to the Director's final determination of the April FS, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected demand shortfall determination.

7. Step 5: If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall. If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report, which typically occurs soon after the Day of Allocation,[27] the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC. The amount of reasonable carryover to be provided shall not exceed the empty storage space on the Day of Allocation for that entity. If water is owed in addition to the reasonable carryover shortfall volume, this water shall be delivered or assigned to members of the SWC at the Time of Need, described below. The Time of Need will be no earlier than the Day of Allocation.

8. Step 6: Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS; and (3) estimate the Time of Need date.[28]

9. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The cumulative CWN volume will be calculated for all land irrigated with surface water within the boundaries of each member of the SWC. Volumetric values of CWN will be calculated using ET and precipitation values from the USBR's AgriMet program, irrigated areas provided by each entity, and crop distributions based on NASS data.

10. The FS for each SWC is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on regression analysis. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on an analogous year(s).

11. The calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

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[27] The Day of Allocation is the time in the irrigation season when the Water District 01 watermaster can issue allocations to storage space holders after the reservoir system has achieved its maximum physical fill, maximum water right accrual, and any excess spill past Milner Dam has ceased. Tr., at 902:7–25, 903:1–10.

[28] At the earliest established Time of Need for any member of the SWC, junior ground water users are required to provide remaining mitigation to all materially injured members of the SWC.

12. This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. The Director will then issue revised RISD and DS values. Any increase to the projected IDS for each SWC entity is an additional mitigation obligation of the junior ground water users.

13. Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water or to conduct other approved activities pursuant to an approved mitigation plan that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users.[29] A transient ESPAM simulation will be run to determine the priority date to produce the necessary additional mitigation obligation volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

14. Step 7: Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS; and (3) establish the Time of Need. The revised FS for each SWC entity is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on analogous year(s) with similar Blackfoot to Milner reach gains. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01.

15. This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The Director will then issue revised RISD and IDS values.

16. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the demand shortfall volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

17. Step 8: At the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised IDS calculated at the Time of Need. Alternatively, any additional mitigation obligation calculated in Step 6 and Step 7 can be satisfied from each SWC member's reasonable carryover if (a) the reasonable carryover exceeds the additional mitigation obligation, and (b) the junior ground water users secure sufficient water to replace the reasonable carryover pursuant to an approved mitigation plan.

[29] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

18. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water delivered by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

19. Step 9: Following the end of the irrigation season (on or before November 30), the Department will determine the total actual volumetric demand and total actual CWN for the entire irrigation season. This information will be used for the analysis of reasonable carryover shortfall, selection of future BLY, and for the refinement and continuing improvement of the method for future use.

20. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of SWC. These estimates will be based on, but not limited to, the consideration of the best available water diversion and storage data from Water District 01, return flow monitoring, comparative years, and RISD. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the reasonable carryover shortfall volume by September 30 of the following year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

IT IS FURTHER ORDERED that this Sixth Methodology Order supersedes all previously issued methodology orders in this matter.

Dated this 19th day of July 2023.



GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 19th day of July 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246 or 67-5247, Idaho Code.

Section 67-5246 provides as follows:

(1) If the presiding officer is the agency head, the presiding officer shall issue a final order.

(2) If the presiding officer issued a recommended order, the agency head shall issue a final order following review of that recommended order.

(3) If the presiding officer issued a preliminary order, that order becomes a final order unless it is reviewed as required in section 67-5245, Idaho Code. If the preliminary order is reviewed, the agency head shall issue a final order.

(4) Unless otherwise provided by statute or rule, any party may file a petition for reconsideration of any order issued by the agency head within fourteen (14) days of the service date of that order. The agency head shall issue a written order disposing of the petition. The petition is deemed denied if the agency head does not dispose of it within twenty-one (21) days after the filing of the petition.

(5) Unless a different date is stated in a final order, the order is effective fourteen (14) days after its service date if a party has not filed a petition for reconsideration. If a party has filed a petition for reconsideration with the agency head, the final order becomes effective when:

(a) The petition for reconsideration is disposed of; or
(b) The petition is deemed denied because the agency head did not dispose of the petition within twenty-one (21) days.

(6) A party may not be required to comply with a final order unless the party has been served with or has actual knowledge of the order. If the order is mailed to the last known address of a party, the service is deemed to be sufficient.

(7) A non-party shall not be required to comply with a final order unless the agency has made the order available for public inspection or the nonparty has actual knowledge of the order.

(8) The provisions of this section do not preclude an agency from taking immediate action to protect the public interest in accordance with the provisions of section 67-5247, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4) Idaho Code.

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days: a) of the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER REVISING APRIL 2023 FORECAST SUPPLY AND AMENDING CURTAILMENT ORDER** **(*METHODOLOGY STEPS 5 & 6*)**

The Director of the Idaho Department of Water Resources ("Department") finds, concludes, and orders as follows:

FINDINGS OF FACT

A. Background

1. On July 19, 2023, the Director issued the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"). The Methodology Order established nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies Steps 5 and 6 to the 2023 irrigation season.

2. On November 30, 2022, the Director issued the *Final Order Establishing 2022 Reasonable Carryover – Methodology Step 9* ("November Carryover Order") establishing a reasonable carryover shortfall of 49,309 AF. The Director ordered junior ground water users holding consumptive ground water rights within the Eastern Snake Plain Aquifer ("ESPA") area of common ground water supply with priority dates junior to May 31, 1989, to mitigate for their proportionate share of the reasonable carryover shortfall or be curtailed. *November Carryover Order* at 6.

3. On April 21, 2023, the Director issued his *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1 – 3)* ("April Forecast Supply Order"). The April Forecast Supply Order predicted a demand shortfall to the SWC of 75,200 acre-feet for the 2023 irrigation season. *April Forecast Supply Order* at 3. At that time, the only member of the SWC predicted to experience material injury during the 2023 irrigation season was the Twin Falls Canal Company ("TFCC"). The Director ordered that, by May 5, 2023, ground water users with consumptive water rights "junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted [demand shortfall] of 75,200 acre-feet in accordance with an approved mitigation plan . . . ." *Id.* at 5. The Director also ordered that, if

a junior ground water user cannot establish they can mitigate for their proportionate share of the predicted demand shortfall in accordance with an approved mitigation plan, "the Director will issue an order curtailing the junior-priority ground water user." *Id.* However, on May 1, 2023, the Director sent notice to affected water users that a hearing on the April Forecast Supply Order would be held June 6–10, 2023, and the Director would wait until after the hearing to decide whether to issue a curtailment order.

4. Step 5 of the Methodology Order addresses the final injury determination to reasonable carryover for members of the SWC. "If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall." *Methodology Order* at 43. On July 13, 2023, the Water District 01 published its 2023 Preliminary Storage Report ("Storage Report").[1] The Storage Report stated that TFCC had 1,088 acre-feet of last to fill (i.e., LTF) that did not fill. TFCC has 1,088 acre-feet of LTF space due to its lease of 1,088 acre-feet to the Supplemental Pool in 2020. Because the LTF storage space did not fill due to a lease by TFCC, TFCC's unfilled LTF space is not considered a reasonable carryover shortfall.

5. Step 6 states:

> Approximately halfway through the irrigation season . . . the Director will, for each member of the SWC: (1) recalculate RISD [Reasonable In-Season Demand]; (2) issue a revised FS [Forecast Supply]; and (3) estimate the Time of Need date.

Id. (footnote omitted).

B. April–June Climate

6. The April 2023 Joint Forecast prepared by the United States Army Corps of Engineers and the United States Bureau of Reclamation ("BOR") predicted 3,700,000 acre-feet of natural flow at the Heise gage for the period of April through July 2023. *April Forecast Supply Order* at 2. The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Methodology Order* at 19 (citation omitted).

7. Spring precipitation (April–June) was variable. According to Natural Resource Conservation Service SNOTEL sites, the Upper Snake received 96%, 64%, and 179% of average precipitation in April, May, and June, respectively. The National Weather Service's Twin Falls weather station reported 20%, 132%, 79% of normal precipitation in April, May, and June, respectively. Temperatures reported by the Twin Falls weather station were -1.6 degrees below normal for April, 4.1 degrees above normal for May, and -0.6 degrees below normal for June.[2]

[1] The *2023 Preliminary Storage Report* can be viewed on-line at the following link: https://www.waterdistrict1.com/media/5piix3cc/2023-prelim-storage-report.pdf .

[2] Precipitation and temperature data obtained from the NOAA National Weather Service Preliminary Monthly Climate Data for the Twin Falls 3SE weather station (Twin Falls Airport).

C. Reasonable In-Season Demand

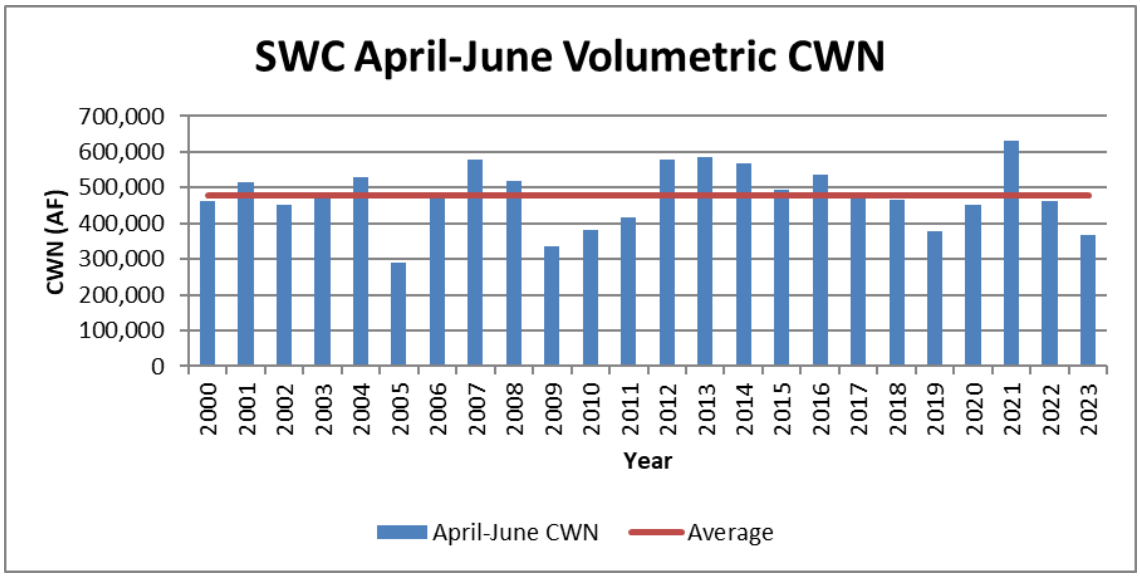
8. RISD "is the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the projected beneficial use of growing crops within the service area of the entity." *Methodology Order* at 13. In April, the demand from the 2018 BLY defines the RISD. *Id.* at 17. During the irrigation season, the RISD for the completed portion of the irrigation season is recalculated by dividing the actual crop water need ("CWN") for each entity by the project efficiency for that entity. *Id.* at 17, 43. For the remainder of the irrigation season, the RISD is the demand defined by the July–October 2018 BLY. *Id.* RISD is calculated on a monthly time step.

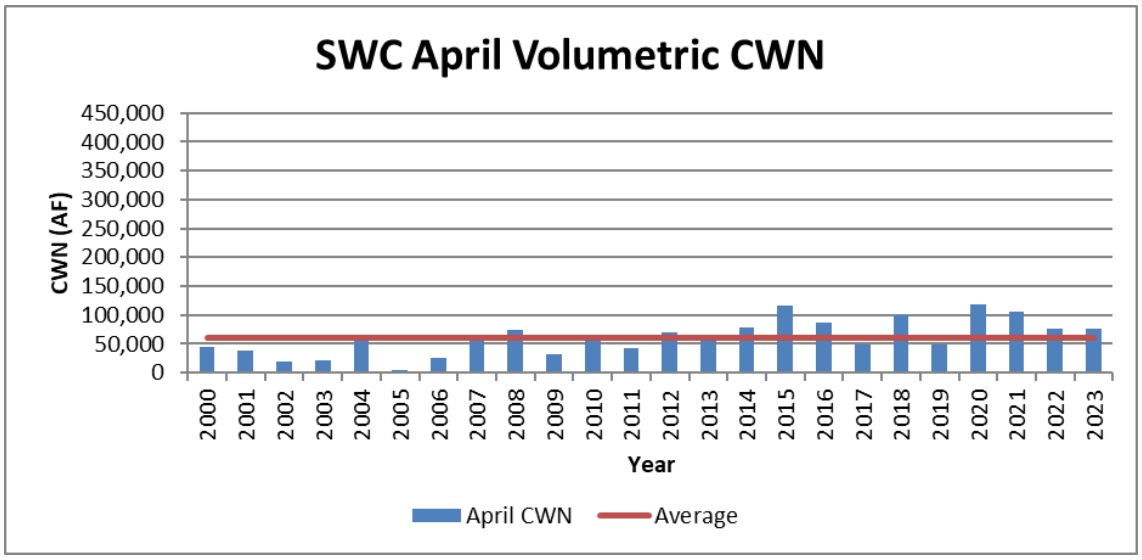
i. Crop Water Need

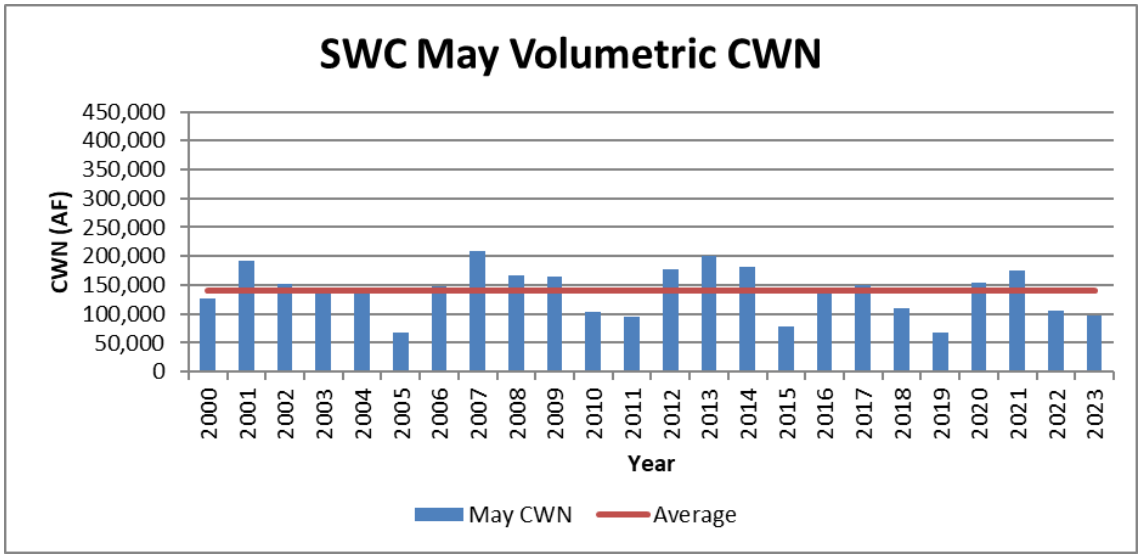
9. "CWN is the volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability." *Methodology Order* at 15. CWN is the difference between the fully realized consumptive use associated with crop growth, or [evapotranspiration], and effective precipitation . . . ." *Id.*

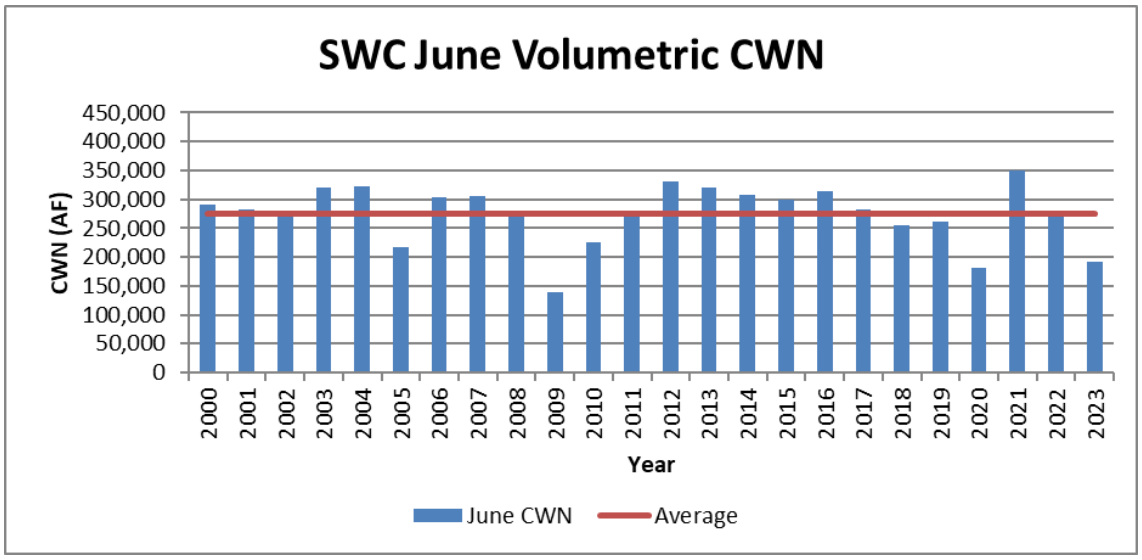
10. CWN is an input variable for calculating RISD for the completed portion of the irrigation season. *Id.* at 17. Actual RISD for the completed portion of the irrigation season is combined with monthly predicted baseline demands for the remaining months of the irrigation season to calculate a season-total RISD volume. *Id.* at 17-18. In-season demand shortfall is then calculated as the difference between the adjusted FS and the RISD. *Id.* at 23.

11. As calculated from the beginning of the irrigation season (April 1), the SWC's volumetric CWN for the current water year through the month of June is 367,222 acre-feet. This volume is 73% of the April 1–June 30 ten-year average CWN (2013–2022) and 79% of the April 1–June 30 CWN for the 2018 BLY. The following graphs summarize monthly volumetric CWN values:




SWC April Volumetric CWN
CWN (AF)
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year
April CWN
Average


SWC May Volumetric CWN
CWN (AF)
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year
May CWN
Average



ii. Extension of BLY

12. The RISD for the remaining portion of the irrigation season (July–October) is the July–October demand for 2018 BLY. The numeric values are shown in the table in Finding of Fact 13 below.

iii. Calculation of RISD

13. As calculated from the beginning of the irrigation season (April 1), the SWC's volumetric RISD for 2023 through the month of June is 991,737 acre-feet. This volume is 72% of the April 1–June 30 ten-year average RISD (2013–2022) and 70% of the April–June demand for the 2018 BLY. The recalculated RISD at this point of the 2023 irrigation season by entity is:

	April–June CWN (AF)	E_p (April - June)	April–June RISD (AF)	July–October Demand for 2018 BLY (AF)	Recalculated RISD (AF)
A&B	8,872	0.46-1.05	15,093	38,528	53,622
AFRD2	41,551	0.22-0.40	129,884	274,485	404,369
BID	31,241	0.31-0.49	78,538	145,546	224,085
Milner	8,578	0.38-0.87	15,353	36,432	51,786
Minidoka	58,753	0.35-0.55	131,152	196,968	328,121
NSCC	86,283	0.23-0.41	278,976	594,099	873,075
TFCC	131,944	0.29-0.51	342,740	653,473	996,214

D. Forecast Supply

14. When determined during the irrigation season, the FS is the sum of the actual natural flow supply from April through June, the predicted natural flow supply from July through

October, and the actual storage allocations. *Methodology Order* at 43. Actual natural flow diversions for the completed portion of the irrigation season are extracted from the Department's water rights accounting program. The natural flow diversions for the remainder of the irrigation season are estimated by regression analysis. *Id.* at 20–21, 43. Storage allocations are determined by Water District 01 after the Day of Allocation. *Id.* at 43.

i. Sum of Actual Natural Flow Diverted

15. Actual natural flow diverted in April through June for each SWC member is shown in the table contained in Finding of Fact 25 below, within the "Summary of Forecast Supply" section.

ii. Regression Models to Predict Natural Flow (July–October)

16. Natural flow diversions were predicted for the remainder of the irrigation season by regression analysis. The Methodology Order established the following variables as predictor variables in the regression models: natural flow in the Snake River near Heise as reported by the BOR, snow water equivalent ("SWE") data at Two Ocean Plateau SNOTEL site, Spring Creek discharge, and groundwater levels near American Falls Reservoir. *Methodology Order* at 20–21. Unique regression models with unique predictor variable groups are established in the Methodology Order for each SWC member.

17. Either June 15 or July 1 SWE values for the Two Ocean Plateau SNOTEL site are used as input variables in each of the regression models developed in the Methodology Order. Two Ocean Plateau SWE data was selected as a predictor variable in the Methodology Order based upon step-wise statistical analysis carried out in the development of each regression model. The Two Ocean Plateau SWE data is an optimum predictor variable for several reasons including: its elevation (the site is located above 9,000 ft and typically still has snow late in the runoff season (June 15 and July 1); its location (the site is in the headwaters of the Snake River above Jackson Reservoir); and its period of record, which is sufficiently long enough to support model development.

18. On July 1, 2023 the Two Ocean Plateau SNOTEL station reported 0.0 inches of SWE. When the snow water equivalent is zero on July 1, the predicted natural flow supplies for the period July 1–October 31 for A&B, AFRD2, and Milner are zero acre-feet. *Methodology Order* at 20.

19. The input variables used to predict the July–October natural flow volumes for BID, Minidoka, and NSCC in 2023 include: (1) 4.1 inches of the SWE reported by the Two Ocean Plateau SNOTEL site on June 15, 2023; (2) 2,935,356 acre-feet of natural flow runoff at the Snake River near Heise (April–June) as reported by the BOR; and (3) 27.61 feet depth to water at well 5S31E27ABA1 as measured by the Department on March 23,2023.

20. The input variables used to predict the July–October natural flow volumes for TFCC in 2023 include: (1) 4.1 inches of the SWE reported by the Two Ocean Plateau SNOTEL site on June 15, (2) 2,935,356 acre-feet of natural flow runoff at the Snake River near Heise

(April–June) as reported by the BOR, and (3) 76,428 acre-feet total discharge at Spring Creek (January–May) as measured and reported by the United States Geologic Survey for its *Spring Creek at Sheepskin Rd Nr Fort Hall ID* Gage (Gage No. 13075983).

iii. Storage Allocations

21. The preliminary storage allocations identified by Water District 01 in the Storage Report for each of the SWC members are reported in the table in Finding of Fact 23 below.

iv. Adjustments to Total Supply

22. The natural flow and storage water supplies were both adjusted as shown in the table in Finding of Fact 23 below. Adjustments to natural flow include wheeled water to Southwest Irrigation District through BID and Milner, 3,714 acre-feet and 3,011 acre-feet, respectively. The only adjustments to the stored water supply in the table below were for the Minidoka Credit. Water supplied to or from the rental pool was not included in the adjustments.

v. Summary of Forecast Supply

23. The following table contains the individual components of the FS for each of the SWC members:

	Natural Flow Diverted 4/1 to 6/30 (AF)	Predicted Natural Flow Diversions 7/1 to 10/31 (AF)	Natural Flow Adjustment (AF)	Preliminary Storage Allocation (AF)	Minidoka Credit Adjustment (AF)	FS (AF)
A&B	15,545	0	0	132,888	0	148,436
AFRD2	148,717	0	0	382,422	1,000	532,147
BID	105,323	10,972	(3,714)	220,083	5,130	337,799
Milner	19,449	0	(3,011)	86,922	0	103,362
Minidoka	137,692	15,529	0	336,711	8,370	498,310
NSCC	395,563	83,732	0	834,545	(7,750)	1,306,091
TFCC	426,135	418,779	0	237,918	(6,750)	1,076,089

E. Revised Shortfall Projection

24. In-season demand shortfall ("IDS") is calculated as the difference between RISD and the FS.

25. Based on the above, and as summarized in the table below, the Director predicts no mid-season IDS to the SWC.

	FS (AF)	RISD (AF)	Shortfall (AF)
A&B	148,436	53,622	0
AFRD2	532,147	404,369	0
BID	337,799	224,085	0
Milner	103,362	51,786	0
Minidoka	498,310	328,121	0
NSCC	1,306,091	873,075	0
TFCC	1,076,089	996,214	0
		Total	0

F. Time of Need

26. Step 5 of the Methodology Order requires that the Director estimate the Time of Need if there is water owed to SWC members that is in addition to the reasonable carryover shortfall volume. *Methodology Order* at 43. As stated in Finding of Fact 4, there is no reasonable carryover shortfall. Execution of Step 6 demonstrates there is no mid-season IDS to the SWC for 2023. With no additional water owed to SWC members, there is no need to establish a Time of Need as described in Step 6.

CONCLUSIONS OF LAW

1. Idaho Code § 42-602 authorizes the Director to supervise water distribution within water districts:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director. The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

2. Idaho Code § 42-607 states that the watermaster, under the direction of the Director, shall regulate diversions "when in times of scarcity of water it is necessary so to do in order to supply the prior rights of others in such stream or water supply . . . ."

3. Step 5 of the Methodology Order requires that the Director estimate the Time of Need if there is water owed to the SWC members that is in addition to the reasonable carryover shortfall volume. *Methodology Order* at 43. No member of the SWC is owed reasonable

carryover in 2023 for a reasonable carryover shortfall determined in 2022. Execution of Step 6 of the Methodology Order demonstrates there is no mid-season IDS to the SWC for 2023. With no additional water owed to SWC members, there is no need to establish a Time of Need as described in Step 6.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that there is no mid-season in-season demand shortfall to the SWC members.

Dated this 19th day of July 2023.

GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 19th day of July 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **POST-HEARING ORDER REGARDING FIFTH AMENDED METHODOLOGY ORDER**

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") as well as the *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order"). A hearing on these orders was held June 6–9, 2023. In this *Post-Hearing Order Regarding Fifth Amended Methodology Order*, the Director affirms the Fifth Methodology Order with a few modifications. Because there are some modifications, the Director simultaneously issues with this order a *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*.

BACKGROUND

A. General History of the Surface Water Coalition Delivery Call

In January of 2005, various holders of senior priority surface water rights authorizing diversion of water from the Snake River and tributary springs filed or joined in a delivery call against holders of junior priority ground water rights pursuant to the Department's Rules for Conjunctive Management of Surface and Ground Water Resources ("CM Rules"). In response to the delivery call, on May 2, 2005, then-Director Karl Dreher issued an order, which determined that water shortages were reasonably likely in 2005 and would materially injure the holders of senior priority surface water rights. Am. Order at 44, *In re Distribution of Water to Various Water Rights Held By or For the Benefit of A&B Irr. Dist., Am. Falls Reservoir Dist. No. 2, Burley Irr. Dist., Milner Irr. Dist., Minidoka Irr. Dist., North Side Canal Co., & Twin Falls Canal Co.* (Idaho Dep't of Water Res. May 2, 2005).

In response to Director Dreher's order, on August 15, 2005, the holders of senior surface water rights filed a declaratory judgment action in district court, challenging, among other subjects, the constitutionality of the CM Rules. The holders of senior surface water rights requested stays and continuances in a scheduled administrative hearing, and the action for declaratory judgment was heard by the district court. The district court issued its decision on summary judgment on June 2, 2006, finding that the CM Rules were facially unconstitutional.

Order on Pls.' Mot. for Summ. J., at 105, *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, No. CV-2005-600 (Gooding Cnty. Dist. Ct. Idaho June 2, 2006).

The decision by the district court was appealed to the Idaho Supreme Court. On appeal, the Idaho Supreme Court issued an opinion determining that the CM Rules were facially constitutional. *Am. Falls Reservoir Dist. No. 2 v. Idaho Dept. of Water Res.*, 143 Idaho 862, 882–83, 154 P.3d 433, 453–54 (2007).

The Idaho Supreme Court outlined processes for the Director to constitutionally apply the CM Rules and also assigned the burdens borne by the holders of senior surface water rights, junior ground water rights, and the Department. In outlining the acceptable "as-applied" processes, the Idaho Supreme Court stated:

> The [CM] Rules should not be read as containing a burden-shifting provision to make the petitioner re-prove or re-adjudicate the right which he already has . . . . [T]he burden is not on the senior water rights holder to re-prove an adjudicated right. The presumption under Idaho law is that the senior is entitled to his decreed water right . . . .

Am. Falls Reservoir Dist. No. 2, 143 Idaho at 877–78, 154 P.3d at 448–49.

Despite the presumption, the Court stated:

> [T]here certainly may be some post-adjudication factors which are relevant to the determination of how much water is actually needed. The [CM] Rules may not be applied in such a way as to force the senior to demonstrate an entitlement to the water in the first place; that is presumed by the filing of a petition containing information about the decreed right. The [CM] Rules do give the Director the tools by which to determine "how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts [others]." *A & B Irrigation Dist.,* 131 Idaho at 422, 958 P.2d at 579. Once the initial determination is made that material injury is occurring or will occur, the junior then bears the burden of proving that the call would be futile or to challenge, in some other constitutionally permissible way, the senior's call.

Id. at 878, 154 P.3d at 449.

After the Idaho Supreme Court's decision in *American Falls Reservoir District No. 2*, then-Director David Tuthill issued an Order appointing retired Idaho Supreme Court Chief Justice Gerald Schroeder to serve as a hearing officer for the administrative hearing. The hearing began on January 18, 2008, and ended February 5, 2008.

On April 29, 2008, Hearing Officer Schroeder issued his decision which recommended among other things that the Director establish a baseline for predicting the water needs of senior surface water users, which was necessary for projecting material injury. *Opinion Constituting*

Findings of Fact, Conclusions of Law and Recommendations at 51. On September 5, 2008, the Director issued his *Final Order Regarding the Surface Water Coalition Delivery Call,* adopting most of the hearing officer's findings and recommendations.

The order was appealed to district court and eventually appealed to the Idaho Supreme Court, which determined the Director had constitutionally "applied" the CM Rules. *In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irr. Dist.,* 155 Idaho 640, 647, 315 P.3d 828, 835 (2013). The Court also held it was proper for the Director to use a baseline year to predict and quantify material injury, and that the initial determination of material injury must depend on "how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts others." *Id.* at 652–53, 315 P.3d at 840 (internal citations and quotations omitted). Finally, the Court affirmed the district court's determination that the clear and convincing evidence standard is to be applied in determining material injury when a decreed senior priority water right is being evaluated for reduction. *Id*.

The Idaho Supreme was clear, however, that because the district court had not reviewed the findings of fact that shaped the methodology nor any modifications to the methodology order, those issues were not properly before the Court. *Id.* at 649, 315 P.3d at 837.

On September 26, 2014, the district court issued its *Memorandum Decision and Order on Petitions for Judicial Review*, wherein Judge Wildman squarely addressed the findings of fact shaping the methodology as well as the modifications to the methodology order. Mem. Decision & Order on Pets. for Judicial Review, *Idaho Ground Water Appropriators, Inc. v. Spackman*, No. CV-2010-382 (Gooding Cnty. Dist. Ct. Idaho Sep. 26, 2014) [hereinafter 2014 District Court Order]. Judge Wildman largely upheld the factual basis underlying the Department's methodology and as-applied orders, but remanded certain portions for further consideration. The groundwater users initially noticed their intent to appeal the 2014 District Court Order, but later filed a motion to withdraw, which the Idaho Supreme Court granted on January 23, 2015. Judge Wildman's 2014 District Court Order will be addressed in detail throughout this order.

B. History of the Fifth Methodology Order

The Director issued the Fifth Methodology Order as well as the 2023 As-Applied Order on April 21, 2023. The Fifth Methodology Order revised the nine steps used to determine material injury to members of the SWC. The 2023 As-Applied Order predicted a shortfall for the 2023 irrigation season, which required appropriators with water rights junior to December 30, 1953, to mitigate or curtail.

Anticipating that one or more parties would request a hearing pursuant to Idaho Code § 42-1701A(3) in response to one or both orders, the Director issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* ("Notice of Hearing") on April 21, 2023. The Notice of Hearing scheduled a prehearing conference for April 28, 2023, and an in-person evidentiary hearing on the Fifth Methodology Order and 2023 As-Applied Order for June 6–10, 2023.

Immediately before the April 28, 2023 prehearing conference, the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Idaho Falls, Jerome, Paul, Pocatello, Richfield, Rupert, Shoshone, and Wendell (collectively the "Cities") filed a *Motion for Continuance* ("Motion to Continue") requesting that the Director continue the June 6–10 evidentiary hearing "until a date in December or January 2024 . . . ." *Motion to Continue* at 8.

During the April 28, 2023 prehearing conference, the Cities presented argument in support of their Motion to Continue. The Idaho Ground Water Appropriators, Inc. ("IGWA"), Bonneville-Jefferson Groundwater District ("BJGWD"), and McCain Foods orally moved to join the Cities' Motion to Continue. The Cities requested that the hearing, currently scheduled for June 6–10, 2023, be delayed approximately six months. *Motion to Continue* at 8. The Cities asserted additional time was needed to conduct discovery, prepare witnesses, properly evaluate the updated Fifth Methodology Order and 2023 As-Applied Order, and because one of its attorneys (Ms. Candice McHugh) would be unable to appear in person June 6–10. *Id*. at 4–6. The Cities further asserted the Director should grant its request because no exigency exists given the above-average snowfall this year. *Id*. at 6–8. The SWC opposed the Cities' motion, arguing the hearing should remain as scheduled on June 6–10, 2023.

The Director orally denied the Cities' request to continue the hearing until December or January 2024. The Director stated he was, however, willing to hold the hearing anytime within the first three weeks of June 2023 so long as all parties agreed to the modified dates. In denying the Cities' requested continuance, the Director emphasized his court-ordered obligation to timely predict water supplies and issue orders to ensure senior water right holders are protected.

On May 5, 2023, the Director issued an *Order Denying the Cities' Motion for Appointment of Independent Hearing Officer and Motion for Continuance and Limiting Scope of Depositions* ("Order Denying Motion to Continue & Limiting Scope of Depositions"). In the order, the Director memorialized his oral denial of the Motion to Continue, but reiterated he was willing to move the hearing within the first three weeks of June 2023, so long as the parties filed a stipulated motion requesting the change. *Order Denying Motion to Continue & Limiting Scope of Depositions* at 2. The Director also ordered that the depositions of Department staff be limited "to preclude questions regarding the Director's deliberative process on legal and policy considerations" pursuant to IDAPA 37.01.01.521. *Id*. at 3. By separate order, the Director authorized Ms. McHugh to appear at the hearing remotely. Scheduling Order & Order Authorizing Remote Appearance at Hr'g at 3.

On May 5, 2023, the Cities, along with IGWA, BJGD, and Bingham Groundwater District (collectively the "Groundwater Users") filed a *Motion for Reconsideration of Denial of Continuance* ("Motion to Reconsider") requesting that the Director reconsider his order denying the Groundwater Users' request to continue the hearing. The Groundwater Users further argued that the June 6–10 hearing should be continued due to the unavailability of numerous witnesses and an attorney. *Motion to Reconsider* at 3–5. The Groundwater Users also claimed that a failure to continue the hearing would result in prejudice to the Groundwater Users. *Id.* at 5.

On May 8, 2023, the SWC filed *Surface Water Coalition's Opposition to Groundwater Users' Motion for Reconsideration of Order Denying Motion for Continuance* ("Objection to

Motion to Reconsider"). The SWC pointed out that the Department has already authorized Ms. McHugh to appear remotely to accommodate her travel, and that the SWC would stipulate to IGWA's expert witnesses, Sophia Sigstedt's, appearing remotely to accommodate her medical condition. *Objection to Motion to Reconsider* at 8–9 n.8. The SWC further argued that 6 weeks was plenty of time to prepare for a hearing, as evidenced by the fact that the First Methodology Order in this exact case was issued on April 7, 2010, with an evidentiary hearing held approximately six weeks later on May 24, 2010. *Id.* at 7–8. The SWC further argued that this type of scheduling in a conjunctive management administration should surprise no one. *Id*. Most importantly, the SWC argued they would be prejudiced were the hearing to be continued. *Id.* at 10.

On May 19, 2023, the Director issued his *Order Denying Motion for Reconsideration of Denial of Continuance* ("Order Denying Motion to Reconsider"). In denying the Groundwater Users motion, the Director expressed that, like the SWC, he was skeptical of the Groundwater Users contention that they had secured sufficient mitigation to ensure seniors would not be injured. *Order Denying Motion to Reconsider* at 5–6. The Director further emphasized his legal responsibility to timely respond to injury incurred by senior water users. *Id.* at 6 (citing *Am. Falls Reservoir Dist. No. 2,* 143 Idaho at 874, 154 P.3d at 445).

Also on May 19, 2023, the Cities, BJGWD, Bingham Groundwater District ("BGWD"), and McCain Foods filed in district court a *Complaint for Declaratory Relief, Petition for Writ of Prohibition, and Petition for Writ of Mandamus* ("Complaint & Petition") as well as a motion for order to show cause. On the same day, IGWA filed in district court a petition for judicial review along with a variety of motions including a motion to stay, a motion for injunctive relief, motion to compel, motion for order to show cause, and a motion for expedited decision. The purpose of the Groundwater Users' various petitions and motions was the same; they were an attempt to persuade the district court to step in and stop the administrative hearing set for June 6–10, 2023.

On June 1, 2023, the district court held a 3.5-hour hearing on the Ground Water Users' various petitions and motions. At the conclusion of the hearing the court ruled from the bench and orally dismissed the Cities writ applications and IGWA's petition for judicial review, and also denied the various other motions filed by the Groundwater Users.[1] The court reiterated that the Groundwater Users grievances have already been addressed in numerous previous cases:

> And I'm going to add one final conclusion here. You know, after reviewing the issues raised in these cases and preparing for these hearings, as I had mentioned earlier, I went back and reviewed the numerous opinions that have been addressed by this Court where substantially the same if not the same issues were raised in the context of conjunctive management delivery calls, including this same delivery call brought by the Surface Water Coalition. The issues are not new, and my reading of the prior decisions explicitly sets forth and reiterates the overriding principles that govern these types of matters. And I'm aware in every single one of those, parties attempt to distinguish that particular set of circumstances to justify the requirement

[1] On June 7, 2023, the Cities filed a motion to voluntarily dismiss their remaining complaint for declaratory relief, which the district court granted on June 14, 2023.

> of exhausting administrative remedies. But the issues raised -- and based on my review, the issues raised today in these cases are no different. And these include that the director's statutorily charged with administering water in priority; time is of the essence in responding to delivery calls; the director must act quickly to avoid injury to senior rights; due process is required but must account for the exigencies of the circumstances; the director has discretion in limiting the scope and timing of the hearings; and unless a statute or rule otherwise provides for a hearing, the director may issue an order and conduct a hearing after issuance of the order.

Excerpt from Hr'g on Admin. Appeals (Court's Ruling) Tr., at 11–12, *City of Pocatello v. Idaho Dep't of Water Res.*, No. CV01-23-08258 (Ada Cnty. Dist. Ct. Idaho June 1, 2023).

The previously scheduled administrative hearing began on June 6, 2023. The hearing was scheduled for five days but was completed in four. Prior to the hearing, the Department posted to its publicly available website the materials Department staff might rely upon at the hearing. The Director took official notice of the documents as authorized under the Department's Procedural Rule 602 (IDAPA 37.01.01.602). At the conclusion of the hearing, the Director requested that the parties submit post-hearing briefing by June 16, 2023. The parties submitted post-hearing briefs.

APPLICABLE LAW

1. "The agency's experience, technical competence, and specialized knowledge may be utilized in the evaluation of the evidence." Idaho Code § 67-5251(5); IDAPA 37.01.01.600.

2. The conjunctive management rules "give the Director the tools by which to determine 'how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts . . . other sources.'" *A & B Irr. Dist. v. Idaho Conservation League*, 131 Idaho 411, 422, 958 P.2d 568, 579 (1997).

3. CM Rule 42.01 lists factors the Director may consider when determining whether senior irrigation water right holders are suffering material injury and using water efficiently and without waste:

> a. The amount of water available in the source from which the water right is diverted.
>
> b. The effort or expense of the holder of the water right to divert water from the source.
>
> c. Whether the exercise of junior-priority ground water rights individually or collectively affects the quantity and timing of when water is available to . . . a senior-priority surface . . . water right. This may include the seasonal as well as the multi-year and cumulative impacts of all ground water withdrawals from the area having a common ground water supply.

d. If for irrigation, the rate of diversion compared to the acreage of land served, the annual volume of water diverted, the system diversion and conveyance efficiency, and the method of irrigation water application.

e. The amount of water being diverted and used compared to the water rights.

f. The existence of water measuring and recording devices.

g. The extent to which the requirements of the holder of a senior-priority water right could be met with the user's existing facilities and water supplies by employing reasonable diversion and conveyance efficiency and conservation practices; provided, however, the holder of a surface water storage right shall be entitled to maintain a reasonable amount of carry-over storage to assure water supplies for future dry years. In determining a reasonable amount of carry-over storage water, the Director shall consider the average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system.

h. The extent to which the requirements of the senior-priority surface water right could be met using alternate reasonable means of diversion or alternate points of diversion, including the construction of wells or the use of existing wells to divert and use water from the area having a common ground water supply under the petitioner's surface water right priority.

IDAPA 37.03.11.042.01

4. The Rule 42.01 factors are not comprehensive. The following are additional factors the Director has considered:

- Statistical Certainty for Predicting Water Supply (Regression r^2 values)
- Field Headgate Deliveries (3/4 inch/acre vs. 5/8 inch/acre)
- Model Uncertainty
- Futile Call
- Trim Line

5. CM Rule 43.03.c outlines a variety of factors the Director may consider in determining whether a proposed mitigation plan will prevent injury to senior rights:

Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right when needed during a time of shortage even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for multi season accounting of ground water withdrawals and provide for replacement water

> to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior priority right in the event the mitigation water source becomes unavailable.

IDAPA 37.03.11.043.03.c.

6. "Once a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence." *A & B Irr. Dist. v. Idaho Dep't of Water Res*., 153 Idaho 500, 524, 284 P.3d 225, 249 (2012).

7. "If the Director is going to administer to less than the full amount of acres set forth on the face of the [SWC's] Partial Decrees, such a determination must be supported by clear and convincing evidence." *2014 District Court Order* at 19.

8. Clear and convincing evidence is evidence indicating that the thing to be proved is "highly probable or reasonably certain." *In re Doe*, 157 Idaho 694, 699, 339 P.3d 755, 760 (2014).

9. "It seems self–evident that to divert water from a stream or its supplies or tributaries must in a large measure diminish the volume of water in the main stream, and, where an appropriator seeks to divert water on the grounds that it does not diminish the volume in the main stream or prejudice a prior appropriator, he should . . . produce clear and convincing evidence showing that the prior appropriator would not be injured or affected by the diversion. The burden is on him to show such facts." *Josslyn v. Daly*, 15 Idaho 137, 149, 96 P. 568, 571–72 (1908) (internal citations and quotations omitted).

10. The Idaho Supreme Court has expressly admonished that, if the Director is going to administer to less than the full amount of the decree, the burden of any uncertainty must be borne by junior water users:

> In making a determination of whether or not to regulate juniors, the Director is required to evaluate whether the quantity available meets or exceeds the quantity the senior can put to beneficial use. If the Director regulates juniors to satisfy the senior's decreed quantity, there is no risk of injury to the senior. However, if the Director regulates juniors to satisfy a quantity less than decreed, there is risk to the senior that the Director's determination is incorrect. There is no remedy for the senior if the Director's determination turns out to be in error and the senior comes up short of water during the irrigation season. Any burden of this uncertainty should be borne by the junior. . . . [I]f the Director's determination is only based on a finding "more probable than not." The senior's right is put at risk and the junior is essentially accorded the benefit of uncertainty. The requisite high standard accords appropriate presumptive weight to the decree.
> . . . .
>
> It is Idaho's longstanding rule that proof of "no injury" by a junior appropriator in a water delivery call must be by clear and convincing evidence. Once a decree is

> presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence.

A & B Irr. Dist., 153 Idaho at 524, 284 P.3d at 249 (internal citations and quotations omitted).

11. In responding to a delivery call under the CM Rules, the Director "may employ a baseline methodology as a starting point for considering material injury," provided the baseline methodology otherwise comports with the prior appropriation doctrine as established by Idaho law. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841; *see also 2014 District Court Order* at 17.

12. In his 2014 District Court Order, Judge Wildman stated:

> The Director did not err in his intentional adoption of a baseline year based on above average temperatures and evapotranspiration and below average precipitation. The Court agrees that use of such data is necessary to protect senior rights if the Director is going to administer to an amount less than the full decreed quantity of the [SWC's] rights. The arguments set forth by the City of Pocatello and IGWA that the Director must use data associated with an average year fail to take into account the legal limitations placed on the Director in responding to a delivery call . . . .
> . . . .
>
> If the Director determined the needs of the [SWC] based on historic use data associated with an average year, any decision to administer to less than the full quantity of the [SWC's] decreed rights based on that data would not adequately protect its senior rights. Using data associated with an average year by its very definition would result in an under-determination of the needs of the [SWC] half of the time. The Director simply cannot rely upon such data if he is going to administer to less than the decreed quantity of the [SWC's] water rights as his analysis would not be supported by clear and convincing evidence.
> . . . .
>
> As set forth above, using data associated with an average year in order to administer to less than the full decreed quantity of the [SWC's] water rights would not meet a clear and convincing evidenced standard. Therefore, the arguments set forth by IGWA and the City of Pocatello are unavailing.

2014 District Court Order at 34.

13. Throughout the 2014 District Court Order, Judge Wildman analyzed and applied the Rule 42.01 factors referenced above and reiterated that the proper evidentiary standard is clear and convincing evidence and that the junior ground water users bear the burden of proof.

a. Reduction of Decreed Place of Use: (See Rule 42.01.d.)

Regarding a reduction of the decreed place of use (Rule 42.01.d), Judge Wildman stated:

> If the Director is going to administer to less than the full amount of acres set forth on the face of the [SWC's] *Partial Decrees,* such a determination must be supported by clear and convincing evidence. *See. e.g., A&B Irr. Dist., v. Idaho Dept. of Water Res.,* l53 Idaho 500, 524,284 P.3d 225, 249 (holding, "Once a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence").

2014 District Court Order at 19.

b. Efficiency and Waste of Water (see Rule 42.01 preface and Rule 42.01.f–g):

Regarding efficiency and the waste of water (Rule 42.01 preface and Rule 42.01.f–g), Judge Wildman stated:

> [I]f the junior users believe for some reasons that the seniors will receive water they cannot beneficially use, it is their burden under the established evidentiary standards and burdens of proof to prove that fact by clear and convincing evidence. For example, the juniors may assert that the Director in their opinion is considering some, but not *all* acres that are no longer irrigated by the seniors. Or it may be their opinion that the Director is considering some, but not *the full extent* of water diverted by the seniors for use by others. In that scenario, it is then their burden under the established evidentiary standards and burdens of proof [to] get evidence supporting their position before the Director in an appropriate fashion.
> . . . .
>
> If junior users believe that administering to the full decreed amount of the [SWC's] water rights will result in waste, they must come forth with clear and convincing evidence establishing that fact. *A&B lrr. Dist.,* 153 Idaho at 524, 284 P.3d at 249.

2014 District Court Order at 31, 45 (emphasis in original).

c. Transactions of Surface Water that Could Diminish Senior Water Right Entitlement (see Rule 42.01.e):

Regarding transactions of surface water that could diminish senior water right entitlements (Rule 42.01.e), Judge Wildman stated:

> The fact that such transaction may have occurred is not . . . sufficient if the Director is going to use that data to administer to less than the full amount of the Coalition's decreed rights. *A&B Irr. Dist.,* 153 Idaho at 524, 284 P.3d at 249 (holding, "Once a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence").

2014 District Court Order at 46–47.

d. Acres irrigated with supplemental ground water rights:

When determining total irrigated acreage, the Department may consider supplemental groundwater use. *Fifth Methodology Order* ¶ 23, at 10, ¶ 1, at 40.

Regarding supplemental acres, Judge Wildman stated:

> If it is established that acreage accounted for under the Coalition's senior surface water rights is being irrigated from a supplemental ground water source, that is a factor the Director has the authority to consider in the context of a delivery call. If the supplemental ground water rights being used are themselves subject to curtailment under the senior call, (as suggested may be the case here by the Hearing Officer), that factor should also be accounted for by the Director.

2014 District Court Order at 18 (internal citations and quotations omitted).

ANALYSIS

A. Hydrologic connectivity.

1. Groundwater in the ESPA is hydrologically connected to the Snake River

Rule 42.01.c authorizes the Director to determine whether pumping by junior ground water appropriators is affecting downstream senior surface water users. IDAPA 37.03.11.042.01.c; *see also Am. Falls Reservoir Dist. No. 2*, 143 Idaho at 878, 154 P.3d at 449. The conjunctive management rules "give the Director the tools by which to determine 'how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts others.'" *Am. Falls Reservoir Dist. No. 2*, 143 Idaho at 878, 154 P.3d at 449 (quoting *A & B Irrigation Dist*., 131 Idaho at 422, 958 P.2d at 579).

The evaluation of the hydraulic relationship between ground water and surface water, and whether, because of an established relationship, pumping from ground water will deplete the source of water upon which the holders of senior priority surface water rights depend is not a proposed change to the decree. *Am. Falls Reservoir Dist. No. 2*, 143 Idaho at 877, 154 P.3d at 448.

The hydraulic relationship between ground water and surface water has been established in previous proceedings in this matter by expert testimony. "The surface and ground waters in the Snake River Basin are hydraulically connected, such that ground water pumping can decrease the natural flows in the Snake River and its tributaries." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist*., 155 Idaho at 643, 315 P.3d at 831. "[G]eneral interconnection of all water in the Snake River system is well settled . . . unless the

party claiming otherwise proves by a preponderance of the evidence that the water is from a separate source." *A & B Irr. Dist.*, 131 Idaho at 421–22, 958 P.2d at 578–79. A general provision was added to each water basin in the ESPA, advising that all water rights in the Snake River Basin are connected sources to the Snake River and shall be administered conjunctively unless otherwise specifically provided.[2]

2. Quantifying Depletion

Quantifying the magnitude of the depletion caused by ground water pumping is not a change to the decree. *A & B Irr. Dist. v. Idaho Dep't of Water Res.*, 153 Idaho 500, 523, 284 P.3d 225, 248 (2012). These hydraulic relationships must be established by the preponderance of evidence, as a prerequisite, if possible, to any attempt to adjust the elements of a decreed water right.

The magnitude of the depletion on the Near Blackfoot to Minidoka Reach has previously been quantified by various ground water models for the Eastern Snake Plain Aquifer, although the magnitude of depletion on the reach has fluctuated for each new version of the ground water model. Differences in the predictions result from differences in the methods and time periods used to quantify irrigated acres, evapotranspiration, and consumptive use of ground water, along with improvements in the model representation of the near Blackfoot to Minidoka reach and changes in calibrated model parameters. Off. Noticed Doc. CurtScen22_FinalwApp, at 8, 17.[3] In ESPAM versions 1.1, 2.1, and 2.2, predictions of the depletion to the near Blackfoot to Minidoka reach caused by ground water pumping within the model boundary have ranged from approximately 860,000 to 1.2 million acre-feet per year. The predicted depletions to the near Blackfoot to Minidoka reach ranged from 42% to 46% of the modeled volume of ground water use. All three versions of the model have quantified a significant depletion to the near Blackfoot to Minidoka reach resulting from ground water pumping. Off. Noticed Doc. CurtScen22_FinalwApp, at B-2; Off. Noticed Doc. iwdl-200601, at 22.[4]

In 2022, ESPAM 2.2 predicted that the long-term junior ground water pumping within the ESPA area of common ground water supply depletes reach gains in the near Blackfoot to Minidoka reach by approximately 1.1 million acre-feet per year. Ex. 318, at 13, 21.

3. Quantifying Material Injury

Predicting and documenting whether the depletion caused by groundwater pumping is reducing the delivery of senior surface water rights is difficult because the seniors' Snake River

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[2] *See* SRBA General Provisions for Basins 01, 21, 22, 23, 24, 25, 27, 29, 31, 35, 36, 41, 43, 45, and 47, access at: https://idwr.idaho.gov/water-rights/adjudication/srba/documents/ (last visited June 29, 2023).

[3] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: ESPAM Report\ESPAM22_Reports\Scenarios\ CurtScen22_FinalwApp.

[4] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathways: ESPAM Report\ESPAM22_Reports\Scenarios\ CurtScen22_FinalwApp; ESPAM Report\ESPAM_Legacy_Reports\ iwdl-200601.

water supply relies on both ground water inflow (aquifer discharge entering the Snake River), as well as surface water inflow (snowpack runoff into the Snake River). Predictions of material injury must therefore include a combination of surface water runoff forecasts and surrogate ground water data for estimating ground water inflow to the Snake River.

Because of the variability in Snake River runoff and aquifer levels, the evaluation of whether ground water pumping depletions reduce the delivery and beneficial use of senior water right entitlements must be completed annually. As a result, the methodology order must simultaneously analyze the annual hydrologic data to: (1) determine whether reduced aquifer discharge to the Snake River caused by ground water pumping will result in a demand shortfall for senior water rights given the forecasted snowmelt runoff; and (2) evaluate possible reductions of senior water right elements under the clear and convincing evidence standard. Because these evaluations are concurrent in the methodology order, the Director employs safety factors when considering data that might adjust elements of the decreed senior water rights. As addressed in more detail below, these safety factors are necessary to ensure any adjustment to senior decreed water rights satisfy the requirement for clear and convincing evidence.

B. Challenges to the Fifth Methodology's Order's Method for Calculating Shortfall

Once the prerequisite hydrologic relationships have been established, the presumption is that the holder of the senior priority water right is entitled to delivery and beneficial use of the decreed water right elements, and any diminishment of the decreed elements must be proven by clear and convincing evidence. *A & B Irr. Dist*., 153 Idaho at 524, 284 P.3d at 249 (Holding that "[o]nce a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence."). "If the Director is going to administer to less than the full amount of acres set forth on the face of the Coalition's Partial Decrees, such a determination must be supported by clear and convincing evidence . . . ." *2014 District Court Order*, at 19. "It is Idaho's longstanding rule that proof of 'no injury' by a junior appropriator in a water delivery call must be by clear and convincing evidence." *A & B Irr. Dist.*, 153 Idaho at 524, 284 P.3d at 249.

1. Baseline Year

A baseline year is a year or average of years when irrigation demand represents conditions that can predict need in the current year. The predicted irrigation demands of the current irrigation season are derived from the baseline year and are compared to estimated water supplies to predict material injury to senior appropriators. *Fifth Methodology Order* ¶ 7, at 3. The Idaho Supreme Court has affirmed that data from a baseline year can be used to determine reasonable in-season demand and predict material injury. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist*., 155 Idaho at 653, 315 P.3d at 841.

The baseline year is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) current irrigation practices. *Fifth Methodology Order* ¶ 8, at 3. A baseline year is selected from recent year(s) to ensure the baseline year accurately represents current irrigation practices, recent climate conditions, and a year when the senior water rights received a full supply of waters. *Fifth Methodology Order* ¶ 19, at 9, ¶ 24,

at 11. Because the baseline year data is used to *predict* reasonable in-season demand for senior appropriators, safety factors must be employed to ensure the senior water rights will be satisfied. *See 2014 District Court Order*, at 34. Safety factors include selecting a baseline year(s) with above average diversions, above average temperatures, and below average precipitation. *Fifth Methodology Order* ¶ 9, at 3. These safety factors protect the senior water rights from an underprediction of water need because, under Idaho law, a senior appropriator is presumed entitled to his or her fully decreed water right. *Am. Falls Reservoir Dist. No. 2*, 143 Idaho at 877–78, 154 P.3d at 448–49.

In previous methodology orders, no single year during the period from 2000–2014 satisfied all necessary criteria for selecting a baseline year. Off. Noticed Doc.BLYReview_2022_used for TWG_used for order, "Summary" tab.[5] For instance, one year might have been hotter than normal, resulting in greater than average evapotranspiration, but the rainfall might have been higher than normal too, disqualifying the single year. To ensure that all factors were satisfied, the Director combined several years to create an adequate safety factor to ensure senior priority surface water rights were protected.

For example, in the Fourth Methodology Order, the Department's baseline year averaged the SWC diversion volumes for 2006, 2008, and 2012 ("BLY 6/08/12"). *Fifth Methodology Order* ¶ 26, at 11. When averaged, 2006, 2008, and 2012 resulted in a baseline year diversion volume slightly above average (101%). *Fourth Methodology Order* ¶ 27, at 12. The Fourth Methodology Order averaged SWC diversion volumes for three years because no single year met all necessary criteria. *Fourth Methodology Order* ¶ 27, at 12.

For the Fifth Amended Methodology Order, the Director reviewed data from the recent years of 2014–2021. *Fifth Methodology Order* ¶ 26, at 11. Unlike in the Fourth Methodology Order, there were two years, 2018 and 2020, that satisfied all necessary criteria for a baseline year. *Compare Fourth Methodology Order* ¶ 27, at 12 *with Fifth Methodology Order* ¶ 27, at 12; *see also* Off. Noticed Doc. BLY_SWC_TWG_11-16-22, at 12.[6]

After thoroughly reviewing the data, the Director concludes that 2018 best satisfies the criteria for a baseline year. In 2018 the SWC's diversion volume was above average at 104%, ranking fourth in total diversions (from 2000–2021). *Fifth Methodology Order* ¶ 27, at 12; *see also* Off. Noticed Doc. BLYReview_2022_used for TWG_used for order, "Summary" tab.[7] A safety factor of 4% is reasonable. Additionally, 2018 had below average precipitation with above average temperatures and associated growing degree days. Year 2018 therefore satisfies all

[5] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: 2023 5th Amended Methodology Order\BLY\BLYReview_2022_used for TWG_used for order.

[6] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: 2022 Technical Working Group (TWG)\Meeting 11-16-22 Methodology Overview & BLY\BYL_SWC_TWG_11-16-22.

[7] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: 2023 5th Amended Methodology Order\BLY\BLYReview_2022_used for TWG_used for order.

criteria for a baseline year and sufficiently protects senior appropriators. *Fifth Methodology Order* ¶ 27, at 12.

The Ground Water Users propose averaging 2006 and 2018, which produces a diversion volume that is 101%, or just 1% above average, a percentage closer to that used in previous methodology orders. Ex. 837A, at 18; *see also Fourth Methodology Order* ¶ 27, at 12. The purpose of selecting a baseline year with diversions above average is to protect the senior surface water rights, not to select a number closest to the average diversion volume. Historical data illustrates the risk to senior appropriators when the Department selects a BLY with diversion volumes only slightly above average. The data shows that averaging SWC diversion volumes from 2006/2008/2012 for the baseline year resulted in shortfalls in four out of eight years from 2015 to 2022. Ex. 837A, at 82; see also *Fourth Methodology Order* ¶ 27, at 12.

As Judge Wildman previously advised:

> The Director did not err in his intentional adoption of a baseline year based on above average temperatures and evapotranspiration and below average precipitation. The Court agrees that use of such data is necessary to protect senior rights if the Director is going to administer to an amount less than the full decreed quantity of the Coalition's rights. The arguments set forth by the City of Pocatello and IGWA that the Director must use data associated with an average year fail to take into account the legal limitations placed on the Director in responding to a delivery call. . . .
>
> If the Director determined the needs of the Coalition based on historic use data associated with an average year, any decision to administer to less than the full quantity of the Coalition's decreed rights based on that data would not adequately protect its senior rights. Using data associated with an average year by its very definition would result in an under-determination of the needs of the Coalition half of the time. The Director simply cannot rely upon such data if he is going to administer to less than the decreed quantity of the Coalitions' water rights as his analysis would not be supported by clear and convincing evidence.

2014 District Court Order, at 33–34.

The Ground Water Users further contend selecting 2018 as the baseline year was improper "because it falls on the extreme end of the spectrum for precipitation" given that, "from 1992-2021, 2018 was the only irrigation season where there was zero precipitation from July to September." IGWA's Post-Hr'g Br., at 12.

It is true that 2018 was an outlier for lack of precipitation from July–September, and in this regard 2020 would have been a better choice. Off. Noticed Doc. BLY_SWC_TWG_11-16-

22, at 8.[8] The Director did not select 2020 as the baseline year, given the SWC's abnormally high diversion volumes of 110.5% of average. *Id*. at 17.

In sum, after thoroughly reviewing the data, the Director concludes that a safety factor of 4% is reasonable. Year 2018 best satisfies the criteria for a baseline year and sufficiently protects senior appropriators.

2. The R-Squared Value for TFCC's Natural Flow Forecast

The predictive power for accuracy of the TFCC's natural flow multi-linear model can be evaluated by the "R-squared" value on a regression line. Hr'g Tr. vol. III, at 49; Hr'g Tr. vol. I, at 186–87. The R-squared value is a statistical measurement of how closely data points fit on a regression line. Hr'g Tr. vol. I, at 186–87. R-squared values are decimal numbers that range from zero to one. The higher the decimal value, the closer the data are to the regression line, and the greater the percent of variability in the data is explained by the model. Hr'g Tr. vol. I, at 187.

The R-squared value for the TFCC's April predicted natural flow model is 0.72. Ex. 901, at 9. Department employee Matt Anders testified that this R-squared value has declined in recent years, but that the Department is still confident the regression equation is accurately predicting TFCC's natural flow. Hr'g Tr. vol. I, at 224–25.

The ground water users challenge the accuracy of TFCC's natural flow prediction and imply that TFCC's 0.72 R-squared is evidence that the Department's TFCC natural flow forecast is unreliable. Hr'g Tr. vol. I, at 162-65; Hr'g Tr. vol. III, at 49–51, 187–89, 230–33; *see also* Ex. 837A at 23. While not entirely clear, the ground water users appear to believe that the Heise Gage is a poor predictor of TFCC's surface water supply given the number of tributaries that enter the Snake downstream from the Heise Gage. Hr'g Tr. vol. I, at 162-65; Hr'g Tr. vol. III, at 49–51, 187–89, 230–33.

The ground water users also appear to challenge the Department's use of ground-water-derived spring flow from Box Canyon Springs, which the ground water users appear to believe has no correlation with reach gains from the near Blackfoot to Minidoka stretch. Hr'g Tr. vol. I, at 162-65; Hr'g Tr. vol. III, at 49–51, 187–89, 230–33; *see also* Ex. 837A at 23.

The ground water users failed to offer sufficient evidence that TFCC's natural flow forecast is flawed or that TFFC's 0.72 R-squared value is unreasonable. Accordingly, the Director concludes TFFC's 0.72 R-squared value is reasonable and the TFCC's natural flow forecast is sufficiently accurate.

[8] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: 2022 Technical Working Group (TWG)\Meeting 11-16-22 Methodology Overview & BLY\BYL_SWC_TWG_11-16-22.

3. Cumulative Bias

In its April shortfall calculation, the Department employs two bias or safety factors to protect senior water right holders. First, the 2018 BLY diversion volumes must be above average; and second, the forecasted natural flow supply is reduced by one standard deviation. In its July shortfall calculation, the Department employs one bias factor; the diversion volumes for July–October are above average.

The ground water users contend "[t]hese biases compound to aggressively over-predict DS. The *Fifth Methodology Order* takes the overprediction to new heights by adopting a new BLY that is much more aggressive than the BLY used in prior iterations of the Methodology Order." IGWA's Post-Hr'g Br. at 11.

The Director disagrees that the new BLY "aggressively" over-predicts demand shortfall and is "much more aggressive than the BLY used in prior iterations . . . ." As discussed in the baseline year section above, historical data indicates that the Fourth Methodology Order, which averaged diversions for 2006/2008/2012, was not biased enough to protect senior water right holders. In four out of eight years from 2015 to 2022, the April demand shortfall was *less* than the actual demand shortfall in November. Ex. 837A, at 82; see also *Fourth Methodology Order* ¶ 27, at 12. In other words, under the Fourth Methodology Order the safety factors failed to protect seniors 50% of the time.

The 2018 BLY is not anticipated to result in extreme over predictions of the SWC's demand shortfall as alleged by the ground water users. Historical data indicates that if the 2018 BLY had been used from 2015–2022, in one of eight years the April demand shortfall would have been less than the actual demand shortfall in November and in two of eight years, the July demand shortfall would have been less than the actual demand shortfall in November. *Id.*

The Director concludes that the Department's safety factors do not aggressively overpredict demand shortfall.

4. Reduction of TFCC's Decreed Place of Use

CM Rules 42.01.d–e state that, in determining whether a senior irrigator is using water efficiently yet still suffering injury, the Director may consider:

d. [T]he rate of diversion compared to the acreage of land served . . . .

e. The amount of water being diverted and used compared to the water rights.

Collectively, TFCC's natural flow Snake River water rights authorize their shareholders to irrigate 196,162 acres. Ex. 184, at 9, 13, 18; *see also* Hr'g Tr. vol. II, at 81. This 196,162-acre figure represents the number of acres TFCC irrigated in 1987 when the Snake River Basin Adjudication was commenced. Ex. 184, at 2; *see also* Hr'g Tr. vol. II, at 82. It is undisputed TFCC no longer irrigates 196,162 acres, as acreage has been removed from irrigation for various reasons. Hr'g Tr. vol. II, at 82.

TFCC concedes its members are currently irrigating no more than 194,732 acres. Ex. 4, at 1. The 194,732 irrigated acre figure is derived from a 2013 shapefile created by TFCC. *Id.* The Department used the 2013 shapefile to predict TFCC's irrigated acres for 2023. *Fifth Methodology Order* ¶ 22, at 10; *see also 2023 As-Applied Order* ¶ 3, at 1, ¶ 6, at 2; Ex. 337.

Using aerial imagery and Landsat photography from 2017, the Department's GIS staff created what has been commonly referred to as the "2017 irrigated lands dataset" (hereinafter "2017 shapefile"). Hr'g Tr. vol. II, at 68. The 2017 shapefile classified irrigated fields into three categories, irrigated, semi-irrigated, and non-irrigated. *Id.* at 68–69. The shapefile indicated that, in 2017, TFCC members irrigated 180,956 acres. Ex. 4, at 3. The purpose of the 2017 shapefile was to assist Department staff in determining TFCC's irrigation demand in 2017 for use in model calibration. Hr'g Tr. vol. II, at 68, 140–41.

The ground water users argue that, in predicting TFCC's 2023 irrigated acreage, the Director should rely on the Department's 2017 shapefile—not the 2013 shapefile created by TFCC. IGWA's Post-Hr'g Br., at 13–14. The Director disagrees.

The 2017 shapefile is more recent than the 2013 shapefile, but it does not necessarily represent the number of acres TFCC may irrigate in 2023. The 2017 shapefile was a snapshot in time. It does not necessarily predict *future* irrigated acres. In compiling the 2017 shapefile, Department staff did not distinguish "hardened acres" —i.e., fields that have been permanently removed from irrigation—from fields that were not irrigated in 2017 but could be in future years. Hr'g Tr. vol. II, at 194–95.

The same is not true for the 2013 shapefile as explained by its author, a TFCC consultant named David Shaw. Mr. Shaw testified that when he compiled the 2013 shapefile, he specifically excluded hardened acres and included acres that could have been irrigated in 2013 but were not. Hr'g Tr. vol. IV, at 152–53. Unlike the 2013 shapefile, the 2017 shapefile includes only acres that *were irrigated* in 2017 and excludes the acres that *were not irrigated* in 2017 but *could be* irrigated in future years, e.g., 2023. This is a critical distinction because, as Mr. Shaw explains in the SWC's expert report, TFCC "has no way of knowing whether land covered by shares will or will not be irrigated and must prepare to meet the share delivery obligation." Ex. 4 ¶ 7, at 2.

Mr. Shaw also testified that in his opinion the 2013 shapefile currently represents the best available information for determining TFCC's actual irrigated acreage. Hr'g Tr. vol. IV, at 164–65. Finally, the Director has letters from TFCC's counsel stating that from 2014–2022 the number of acres TFCC irrigated has not varied by more than 5% from the previous (2013) shapefile numbers. Ex. 337.

The Ground Water Users also contend that "Jennifer Sukow testified that [the 2017 lands] data set[] represent[s] the best science available to determine actual irrigated acreage . . . ." IGWA's Post-Hr'g Br. at 14. The ground water users are mistaken. During the hearing, Ms. Sukow testified that the 2017 irrigated lands data set was the best data for *model calibration*. Hr'g Tr. vol. I, at 69. Model calibration employs hindcasts, not forecasts. As noted above, the

2017 shapefile was created to assist Department staff in determining historic irrigation demand within the ESPAM boundary during 2017 for use in model calibration. *Id.* at 68, 140–41.

At the hearing and in their post-hearing briefing, the ground water users state that the burden is on TFCC or the Department to create a new shapefile that identifies the number of acres TFCC can irrigate in 2023. The ground water users are mistaken. To reduce TFCC's predicted irrigated acreage below 194,732 acres, the burden is on the junior ground water users to establish the accuracy of a lesser number (e.g., 180,956) by clear and convincing evidence. "Once a decree is presented to an administrating agency or court, all changes to that decree, permanent or temporary, must be supported by clear and convincing evidence." *A & B Irr. Dist.*, 153 Idaho at 524, 284 P.3d at 249. The ground water users did not establish an alternative number of acres irrigated by clear and convincing evidence. In short, the ground water users failed to satisfy their burden of proof.

5. Supplemental acres

When determining the total acreage irrigated with surface water by SWC entities, the Department may consider supplemental ground water use. *Fifth Methodology Order* ¶ 23, at 10, ¶ 1, at 40. If acreage is irrigated with ground water instead of surface water, less surface water is needed for irrigation, and any surface water demand shortfall should decrease. In the Fifth Methodology Order, the Department determined that it was without sufficient information to determine the extent of supplemental irrigation on lands within the service areas of the SWC entities. *See Id.* Without sufficient information on supplemental ground water use, the Director is prohibited from reducing a water user's full decreed entitlement. *2014 District Court Order*, at 19 (Holding that the Director was prohibited from administering less than the seniors full decree given that "the record d[id] not contain evidence that acres accounted for . . . [we]re being irrigated from a supplemental ground water source . . . ."). The record in this matter equally lacks sufficient evidence to justify a reduction of the total number of acres irrigated with surface water by SWC members.

IGWA argues that at least some TFCC members have supplemental rights. IGWA's Post-Hr'g Br., at 15. The Department agrees that TFCC's manager and expert Chuck Brockway testified that some TFCC members have supplemental water rights, but he also opined the number is very low. Hr'g Tr. vol. IV, at 52–53.

In his 2014 District Court Order, Judge Wildman noted that:

> [T]he parties fail to cite the Court anything submitted before the Department in either written form or via oral testimony establishing the use of supplemental ground water by individual irrigators within the Coalition.

2014 District Court Order at 19.

The Ground Water Users bear the burden of proving by clear and convincing evidence that SWC acreage was irrigated with supplemental ground water. The Ground Water Users failed to proffer sufficient evidence concerning the quantity of acres TFCC members could

irrigate with supplemental ground water rights. Assertions that IDWR records should identify overlapping ground water rights or that ground water pumping information is best known by the SWC does not change the standard of proof and does not shift the burden of proof borne by the ground water users.

6. The Department's adjustments for "wheeled water"

At times canal companies transport water for third parties through their respective water delivery systems. This transported water, which does not go to meet the canal company member's water supply, is often called "wheeled water." When calculating reasonable in-season demand, it is important to remove wheeled water from SWC diversions. For example, suppose the SWC diverted 3,500,000 acre-feet on a particular year, but 200,000 of those acre-feet was wheeled water. It is necessary to remove the 200,000 acre-feet of wheeled water when calculating SWC's demand, lest it appear SWC members were diverting and using 3,500,000 acre-feet, rather than 3,300,000.

IGWA's expert Sophia Sigstedt advised that her calculations revealed, in determining SWC's 2018 diversion, that IDWR failed to account for approximately 5,000 acre-feet of water wheeled by AFRD2. Ex. 837A, at 20. According to Ms. Sigstedt, IDWR failed to properly subtract all AFRD2's wheeled water in 2018, resulting in a diversion that was 5,000 ac. ft. too high. *Id.* at 16.

On rebuttal, Matt Anders testified that AFRD2's diversion was inaccurately calculated, and the inaccuracy resulted in AFRD2's diversion being 5,000 ac. ft. *too low*. Hr'g Tr. vol. IV, at 173–74. In other words, the miscalculation benefited the Groundwater Users and harmed the SWC, not the other way around.

In sum, there is no evidence that storage water wheeled by the SWC was incorrectly added to the SWC's 2018 surface water demand.

7. 5/8 inch per acre vs. 3/4 inch per acre

At hearing and in its summary brief, IGWA argues that "TFCC shareholders can raise crops on 5/8 inch per acre [headgate delivery] without suffering material injury." IGWA Post Hearing Brief, at 7, 9, 10. However, TFCC's seasonal headgate delivery rate is not the basis for evaluating injury in the current methodology. As IGWA acknowledges, "the Methodology Order does not actually utilize a 3/4-inch headgate delivery, 5/8-inch headgate delivery, or any other headgate delivery as part of its material injury determination for TFCC." *Id.* at 8.

Rather, as IGWA correctly states, the Methodology predicts injury using a baseline year. The baseline year is selected by analyzing climate, available water supply, and current irrigation practices from a single year or average of years. *Fifth Methodology Order* ¶ 8, at 3. The Idaho Supreme Court has affirmed that data from a baseline year can be used to determine reasonable in-season demand and predict material injury. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841.

Undaunted, IGWA compares baseline year injury determinations to historical TFCC seasonal headgate delivery rates and concludes, "a hindcast of the Fifth Methodology Order applying it to the time period 2000-2022 shows it generating DS predictions . . ., even though TFCC rarely suffers injury in reality." IGWA's Post-Hr'g Br. at 11–12. IGWA presumably determined there was no "injury in reality" because the Methodology predicted a demand shortfall in years when TFCC received a seasonal or partial season 3/4-inch headgate delivery. IGWA's argument is unpersuasive because, by its own admission, it is relying on a determination of injury that is not a component of this or past methodologies.

C. Efficiency & Waste

CM Rule 42.01.d and g advise that two of the factors the Director may consider in determining whether senior irrigation water right holders are using water efficiently and without waste, while still suffering material injury, are:

> d. [T]he rate of diversion compared to the acreage of land served, the annual volume of water diverted, the system diversion and conveyance efficiency, and the method of irrigation water application[;] [and]
>
> . . . .
>
> g. The extent to which the requirements of the holder of a senior-priority water right could be met with the user's existing facilities and water supplies by employing reasonable diversion and conveyance efficiency and conservation practice . . . .

In substance, 42.01.d and g authorize the Director to consider whether senior appropriators are wasting water via various unreasonable or inefficient practices.

Project efficiency for each surface water delivery system is unique, depending on numerous factors, including but not limited to: (1) length of delivery system; (2) geological materials through which the system delivers water; (3) nature of structures that deliver water; and (4) method of application of irrigation water. *Fifth Methodology Order* ¶¶ 29–30, at 12–13. In the *Fifth Methodology Order*, the Director calculated recent historical project efficiency (as compared to general "project efficiency") for each SWC member for the 15-year period from 2008 through 2022. *Fifth Methodology Order* ¶ 32, at 14.

The crop water need ("CWN") for each SWC entity for the upcoming season is calculated by averaging each entity's crop mix for the previous three previous years. Off. Noticed Doc. NRT METRIC_SWC_TWG_11-17-22, at 6.[9] Averaging crop mix for the preceding three years is necessary to reflect possible changes in irrigation demands caused by variability in annual crop mix. The SWC's projected reasonable in-season demand ("RISD") for the upcoming season is calculated by dividing each entity's CWN by its recent historical project efficiency.

[9] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: 2022 Technical Working Group (TWG)\Meeting 11-17-22 Forecast Supply & NRT METRIC\NRT METRIC_SWC_TWG_11-17-22.

The Ground Water Users contend the Director's efficiency analysis is inadequate because it fails to adjust for on-the-ground efficiency projects, e.g., canal lining. IGWA's Post-Hr'g Br., at 15. The Ground Water Users argue the Director should require the SWC to satisfy a higher efficiency standard than the recent historical project efficiencies.

The Ground Water Users also criticize the calculation of recent project efficiencies as being circular. Cities' Closing Br., at 7; *see also* IGWA's Post-Hr'g Br., at 15. In effect, the ground water users argue that if the SWC's irrigated acreage number is reduced, but the amount of water delivered doesn't change, the only result will be a reduced efficiency value. IGWA's Post-Hr'g Br., at 15. While the mathematical argument is correct, the purpose of the argument is unclear. It appears the purpose may be to establish that the calculated efficiency numbers are valueless.

To remedy the perceived efficiency calculation errors, the Ground Water Users contend the Department should jettison its historical efficiency analysis and instead judge SWC members efficiencies by comparing them to industry standards. Cities' Closing Br., at 7. The Director disagrees.

The Cities' expert, Greg Sullivan, conceded that the Court has previously rejected the industry standard approach for which the ground water users currently advocate. Hr'g Tr. vol. II, at 201. The Court has already determined that the methodology order's approach to calculating the efficiencies of SWC members is acceptable. *2014 District Court Order*, at 30–31. Mr. Sullivan further admitted that there were no per acre industry standard diversion rates for large open canal systems—as each entity would be different—and that he used the term "industry standard" to mean reasonableness of TFCC's operation compared to its irrigation efficiencies. Hr'g Tr., vol. II, at 225, 237.

Calculating efficiency for large open canal systems is extremely difficult. Hr'g Tr. vol. IV, at 146. TFCC's operation is enormous, with over 1,000 miles of canal, over 4,000 headgates, and over 10,000 concrete structures. Hr'g Tr. vol. II, at 16–18. Evaluating the efficiency of each mile of canal or headgate is a large undertaking. The Ground Water Users, the parties that bear the burden of proof, have not evaluated the SWC's canal and lateral efficiencies.

The Ground Water Users also contend the Director should instruct the Technical Working Group to "develop a mechanism to track real canal efficiency based on real efficiency factors." IGWA's Post-Hr'g Br., at 16. The Ground Water users' proposal attempts to misdirect the burden of proof. "[I]f the junior users believe for some reasons that the seniors will receive water they cannot beneficially use, it is their burden under the established evidentiary standards and burdens of proof to prove that fact by clear and convincing evidence." *2014 District Court Order*, at 31.

TFCC's general manager Jay Barlogi testified that his organization's diversions were reasonable and that TFCC worked hard to improve its efficiency, for example by annually cleaning its canals, lining canals, and replacing over 100 concrete structures per year. Hr'g Tr. vol. II, at 18–20. Mr. Shaw testified that TFCC does a good job maintaining its infrastructure compared to other water delivery organizations, and that TFCC's delivery system is reasonable. Hr'g Tr. vol. IV, at 146.

Lastly, the Ground Water Users imply TFCC is wasting significant quantities of water as evidenced by TFCC's return flows. Hr'g Tr. vol. II, at 191–196. For example, the Cities offered into evidence a document that purports to show TFCC's return flows from 2009–2022. Ex. 365.

Exhibit 365 does not distinguish between natural flow in tributary creeks (e.g., Rock Creek) from water TFCC diverted from the Snake and later returned to the Snake. This matters because measured flows can include irrigation returns as well as water from tributaries. Hr'g Tr. vol. II, at 241. The Cities' exhibit does not prove how much water TFCC diverted from the Snake and later returned.

Return flow data are difficult to obtain. Mr. Anders testified that the Department monitors some of TFCC's return flow, but does not monitor some of the smaller return flows. Hr'g Tr. vol. I, at 128. TFCC's general manager Jay Barlogi testified that he did not believe TFCC was returning a significant amount of water. Hr'g Tr. vol. II, at 43.

The SWC's surface water delivery systems were designed to divert large flow rates delivered to many farmers through long and complex networks of canals and laterals. At the beginning of the irrigation season, these networks must fill over the course of several days. The time needed to fill the canals has a relationship to the time necessary to respond to changes in delivery or emergency. If a large rainstorm reduces the demand for delivery of irrigation water in the canals and laterals, and many users along the delivery system reduce deliveries, the canal company cannot immediately reduce the water being delivered in its system at the diversion from the Snake River. Furthermore, the SWC entity also cannot immediately refill the canals and laterals when the rain stops and the crops demand an immediate water supply. Finally, an emergency on a canal or lateral, like a bank failure, might require that water in the delivery system be discharged from the canals to relieve the system of excess water.

The SWC entities must be able to discharge some water out of its system to ensure delivery of water to its patrons and to operate efficiently within the limits of the delivery system. Testimony at the hearing established that the SWC entities operated efficiently within the limits of their delivery system. *See* Hr'g Tr. vol. II, at 75, 90–91, 94–96; Hr'g Tr. vol. IV, at 146.

The Director concludes TFCC's diversions and efficiency are reasonable.

D. Curtailment

1. Transient vs. Steady-State Modeling

In previous years, the Director used steady-state modeling when determining the curtailment priority date.

In surface water administration, uses by holders of junior priority surface water rights are curtailed until the senior surface water rights are fully satisfied, absent a futile call and if the senior surface water users need the water to accomplish a beneficial use. Under surface water administration, junior surface water rights are generally curtailed unless the senior receives water in the quantity and at the time and place required.

As previously stated in *Am. Falls Reservoir Dist. No. 2*, 143 Idaho at 878, 154 P.3d at 449, "[t]he presumption under Idaho law is that the senior is entitled to his decreed water right . . . ." Entitlement to the decreed water right includes receiving water in the quantity and at the time and place required. The Director has a responsibility to respond timely to injury incurred by senior water users; there should be no unnecessary delays in that process. *Id.* "Clearly, a timely response is required when a delivery call is made and water is necessary to respond to that call." *Id.* This is common sense because "[i]n practice, an untimely decision effectively becomes the decision; i.e. 'no decision is the decision.'" Order on Pls.' Mot. for Summ. J., at 97, *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, No. CV-2005-600 (Gooding Cnty. Dist. Ct. Idaho June 2, 2006)

Rule 43 of the CM Rules mandates that when the Director evaluates a mitigation plan, the mitigation plan must ensure that water is delivered to holders of senior priority surface water rights in both the quantity and at the time and place required by the senior. In considering a proposed mitigation plan pursuant to Rule 43.03, the Director must evaluate:

> b. Whether the mitigation plan will provide replacement water, *at the time and place required by the senior-priority water right*, sufficient to offset the depletive effect of ground water withdrawal on the water available in the surface or ground water source *at such time and place as necessary* to satisfy the rights of diversion from the surface or ground water source. Consideration will be given to the history and seasonal availability of water for diversion so as not to require replacement water at times when the surface right historically has not received a full supply, such as during annual low-flow periods and extended drought periods.
>
> c. Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right *when needed during a time of shortage* even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for multi-season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior-priority right in the event the mitigation water source becomes unavailable.

IDAPA 37.03.11.043.03.b–c (emphasis added). In other words, there is an assumption that senior water right holders calling for delivery of water under the CM Rules will receive, by curtailment or by mitigation, "replacement water, at the time and place required by the senior priority water right, sufficient to offset the depletive effect of ground water withdrawal . . . ." The plan must "assure protection of the senior-priority right in the event the mitigation water source becomes unavailable."

The Director has an obligation to address a mitigation deficiency in the year it occurs. Mem. Decision & Order on Pet. for Jud. Rev., at 10, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-2446 (Twin Falls Cnty. Dist. Ct. Idaho Dec. 3, 2014); Mem. Decision & Order, at 8–9, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-4970 (Twin Falls Cnty. Dist. Ct. Idaho June 1, 2015).

Curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the *full* predicted IDS unless the shortfall exceeds the accruals to the near Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights. This methodology order depends on an annual evaluation of material injury and should also employ curtailment and or mitigation that supplies replacement water at the time and place required by the senior-priority water right in a quantity sufficient to offset the shortfall resulting from ground water withdrawal and to assure protection of the senior-priority right. Curtailment dates, periodically determined at time of recalculating in season demand shortfall (IDS), should be calculated by a transient model simulation that will return the full quantity of water to the senior priority rights at the time and place required, or the maximum quantity that can be returned by curtailing all junior water rights.

The Ground Water Users argue the Director should have determined a priority date for curtailment by steady state modeling of a continuous curtailment that would eventually deliver a volume of water to satisfy the demand shortfall of SWC entities, and require continuous mitigation from holders of ground water rights junior to the calculated priority date. Curtailment would be the threat to ensure the holders of junior ground water rights comply with the mitigation plan. This proposal, while lofty in its equitable ambition, does not follow the legal progression of water administration. In a delivery call proceeding in Idaho, the Director does not impose mitigation plans upon the holders of junior priority water rights. Mitigation plans are proposed by holders of junior priority ground water rights and may be approved by the Director to allow for out-of-priority pumping. Curtailment, or the threat of curtailment, is the tool employed by the Director to force the development of a mitigation plan. Only a threat of continuous curtailment of ground water rights bearing priority dates junior to some unknown priority date would prevent shortfalls to calling parties.

This argument fails because of extreme fluctuations in the Snake River flows caused by fluctuating flows from snowmelt, there are years when there is plentiful surface water for beneficial use and there is no material injury to the calling parties. Water may be flowing past Milner Dam, down the Snake River, and out of the State of Idaho. If there were a curtailment, these facts could be viewed as a waste of water, the antithesis of optimizing the beneficial use of the water of the State of Idaho.

Furthermore, when there is a demand shortfall, the magnitude of the shortfall varies. Choosing a single priority date for continuous curtailment to match one year's shortfall would be inaccurate.

As stated by the CM Rules and by the Courts, out of priority diversion is only allowed by an approved mitigation plan. Junior water right holders can develop or adhere to an approved mitigation plan to avoid curtailment in years of demand shortfalls and allow for out of priority diversions.

2. Futile Call

CM Rule 42.01.c alludes to delayed depletions caused by ground water pumping that affect the "quantity and timing" of water availability to the senior surface water rights. The Director must consider whether "the holders of [senior priority] water rights are suffering material injury" even though the full depletion is not immediate and may be delayed for multiple years:

> Whether the exercise of junior-priority ground water rights individually or collectively affects the quantity and timing of when water is available to . . . a senior-priority surface . . . water right. This may include the seasonal as well as the multi-year and cumulative impacts of all ground water withdrawals from the area having a common ground water supply.

CM Rule 42.01.c.

Delay in the depletive effect of ground water pumping is not grounds for the Ground Water Users to be excused from water administration under the CM Rules. If there is a significant depletion to the senior water rights, even if the impact is spread over multiple years, junior Ground Water Users are subject to water administration.

In support of this conclusion, CM Rule 43.03.c outlines a variety of factors the Director may consider in determining whether a proposed mitigation plan will prevent injury to senior rights including:

> Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right when needed during a time of shortage even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for multi season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior priority right in the event the mitigation water source becomes unavailable.

If the Director were to determine that curtailment of some ground water rights would not immediately accrue water to the senior priority surface water rights, even though the cumulative impact is significant, and that the delivery call is futile because there is no immediate benefit for the surface water rights, the holders of junior priority ground water rights could recurringly avoid curtailment. Avoiding obligation because of delayed cumulative impact is contrary to the intent of the CM Rules. The Director concludes the delivery call is not futile.

3. Trim line

Establishing a trim line is a close relative to determining a futile call. In the Rangen delivery call, the Director previously established a trim line when the cumulative benefits

of curtailment to a remote spring tributary to the Snake River were de minimus. On appeal, the Idaho Supreme Court stated:

> In light of this challenging balancing requirement, it is necessary that the Director have some discretion to determine in a delivery call proceeding whether there is a point where curtailment is unjustified because vast amounts of land would be curtailed to produce a very small amount of water to the caller. As discussed, Idaho law contemplates a balance between the "bedrock principles" of priority of right and beneficial use. *In Matter of Distribution of Water to Various Water Rights Held By or For Benefit of A & B Irrigation Dist.*, 155 Idaho 640, 650, 315 P.3d 828, 838 (2013). The Director is authorized to undertake this balancing act, subject, as he acknowledged here, to the limitations of Idaho law.

Idaho Ground Water Assoc. v. Idaho Dep't of Water Res., 160 Idaho 119, 132, 369 P.3d 897, 910 (2016).

The spatial distribution of long-term impacts of Ground Water Users on aquifer discharge to the near Blackfoot to Minidoka reach is documented in the record. In Ms. Sigstedt's expert report, Figure 3-6 shows the steady state response function, which is the long-term impact of pumping on the near Blackfoot to Minidoka reach as a percentage of the volume of ground water used. Ex. 837 at 38. Figure 3-6 shows that Ground Water Users on both sides of the Great Rift (the boundary applied to the Rangen delivery call trim line) have significant long-term impacts on aquifer discharge to the nB-Min reach. As a result, the Director concludes that a trimline is not appropriate.

4. Model Uncertainty

Prior to the issuance of the Fifth Methodology Order and 2023 April As-Applied Order, three versions of ESPAM (1.1, 2.1, and 2.2) quantified depletions to surface water supply caused by junior ground water pumping or calculated priority dates for curtailment for this delivery call. These three model versions have also quantified depletions to surface water supply caused by ground water pumping in support of water right administration, including the approval or denial of water right transfer applications. In transfer evaluations, the current and previous versions of ESPAM have calculated the transient impacts of ground water pumping on Snake River reach gains, similar to the transient calculation of curtailment benefit implemented in the Fifth Methodology Order and 2023 April As-Applied Order. Ex. 3, at 7.

The current version, ESPAM version 2.2 was completed in May 2021 and superseded ESPAM version 2.1 as the best available scientific tool for these purposes. Improved representation of ground water and surface water interaction in the near Blackfoot to Neeley reach was identified as one of the priorities for development of ESPAM version 2.2 and significant improvements to the Department's monitoring network and the ESPAM model were implemented with the guidance of the Eastern Snake Hydrologic Modeling Committee to achieve this objective. Off. Noticed Doc. ModelCalibration22_Final, at 1, 3; Off. Noticed Doc.

CurtScen22_FinalwApp, at 10.[10] A predictive uncertainty analysis of ESPAM version 2.2 was performed and presented to the Eastern Snake Hydrologic Modeling Committee in conjunction with the release of the new version. Off. Noticed Doc. E22PredUnc_Final.[11]

While the predictive uncertainty analysis did not specifically quantify the uncertainty of the model predictions applied in the 2023 April As-Applied Order, it does provide a general understanding of the contribution of model calibration to predictive uncertainty for steady-state and transient model scenarios. *Id.* at 41. Model uncertainty is not so significant to suggest that a transient simulation of a single season curtailment will not provide a more accurate estimate of the increase in reach gains expected to occur during the current irrigation season than a steady-state simulation of a continuous curtailment. In other words, there is no evidence that model uncertainty is so significant that a curtailment date calculated using a steady-state simulation, which results in a predicted in-season accrual of approximately 10% of the IDS, could possibly result in an actual in-season accrual approaching 100% of the IDS.

Further, any administrative allowance for uncertainty in the prediction of the volume of water obtained by applying a given curtailment date would be applied to reduce the risk to the senior water user and would result in applying an earlier curtailment date. Because of the safety factor already applied in the calculation of the shortfall, the Director does not find that an additional safety factor needs to be applied to calculation of the priority date. Further, the senior water users did not request that the Director add an additional safety factor to account for ESPAM predictive uncertainty.

E. Due process

The Ground Water Users contend the Department violated their due process rights and the Idaho Administrative Procedures Act by issuing the methodology order before holding a hearing, and by failing to provide the Ground Water Users sufficient time to prepare for the hearing. IGWA's Post-Hr'g Br., at 18. The Ground Water Users are mistaken.

Idaho Code § 42-1701A governs hearings before the Director, and provides among other things that:

> Unless the right to a hearing before the director . . . is otherwise provided by statute, any person aggrieved by any action of the director, including any decision, determination, order or other action, including action upon any . . . approval . . . or similar form of permission required by law to be issued by the director, who is aggrieved by the action of the director, and who has not previously been afforded

[10] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathways: ESPAM Report\ESPAM22_Reports\ ModelCalibrationRpt \ ModelCalibration22_Final; ESPAM Report\ESPAM22_Reports\Scenarios\ CurtScen22_FinalwApp.

[11] Available for download at https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/, "Materials Department Witnesses May Rely Upon at Hearing—May 5, 2023". Downloaded folder pathway: ESPAM Report\ESPAM22_Reports\ESPAM22_Reports\UncertaintyRpt\ E22PredUnc_Final.

an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action.

The Methodology Order constitutes an "order" under § 42-1701A(3), meaning there is no statutory right to a pre-decision hearing concerning an amendment to the Methodology Order. The Idaho Supreme Court has already held that "[t]he Director may develop and implement a pre-season management plan for allocation of water resources that employs a baseline methodology . . . [and is] made available in advance of the applicable irrigation season . . . ." *In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irrigation Dist*., 155 Idaho at 653, 315 P.3d at 841.

The Idaho Supreme Court has also clearly expressed that the Director has a legal responsibility to *timely* respond to injury incurred by senior water users. Am. Falls Reservoir Dist. No. 2, 143 Idaho at 874, 154 P.3d at 445. The District Court has already ruled in this matter that the process the Department afforded "provides due process consistent with the exigencies of the circumstances and the director's duty to timely administer water rights in priority. And frankly, setting a hearing after the irrigation season as requested is not a tangible alternative . . . ." Excerpt from Hr'g on Admin. Appeals (Court's Ruling) Tr., at 8–9, *City of Pocatello v. Idaho Dep't of Water Res.*, No. CV01-23-08258 (Ada Cnty. Dist. Ct. Idaho June 1, 2023).

In sum, the Ground Water Users' due process rights were not violated, which the District Court has already determined.

ORDER

IT IS HEREBY ORDERED that the Director affirms the Fifth Methodology Order with a few modifications. Because there are some modifications, the Director will simultaneously issue with this order a *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*.

DATED this 19th day of July 2023.

Gary Spackman
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 19th day of July 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246 or 67-5247, Idaho Code.

Section 67-5246 provides as follows:

(1) If the presiding officer is the agency head, the presiding officer shall issue a final order.

(2) If the presiding officer issued a recommended order, the agency head shall issue a final order following review of that recommended order.

(3) If the presiding officer issued a preliminary order, that order becomes a final order unless it is reviewed as required in section 67-5245, Idaho Code. If the preliminary order is reviewed, the agency head shall issue a final order.

(4) Unless otherwise provided by statute or rule, any party may file a petition for reconsideration of any order issued by the agency head within fourteen (14) days of the service date of that order. The agency head shall issue a written order disposing of the petition. The petition is deemed denied if the agency head does not dispose of it within twenty-one (21) days after the filing of the petition.

(5) Unless a different date is stated in a final order, the order is effective fourteen (14) days after its service date if a party has not filed a petition for reconsideration. If a party has filed a petition for reconsideration with the agency head, the final order becomes effective when:

(a) The petition for reconsideration is disposed of; or
(b) The petition is deemed denied because the agency head did not dispose of the petition within twenty-one (21) days.

(6) A party may not be required to comply with a final order unless the party has been served with or has actual knowledge of the order. If the order is mailed to the last known address of a party, the service is deemed to be sufficient.

(7) A non-party shall not be required to comply with a final order unless the agency has made the order available for public inspection or the nonparty has actual knowledge of the order.

(8) The provisions of this section do not preclude an agency from taking immediate action to protect the public interest in accordance with the provisions of section 67-5247, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4) Idaho Code.

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days: a) of the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **NOTICE THAT QUESTIONS CONCERNING THE SUFFICIENCY OF IGWA'S MITIGATION NOTICES ARE MOOT**

BACKGROUND

On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"). Step 3 of the Methodology Order states that by May 1, or within fourteen days from issuance of a final order predicting a shortfall, "junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share" of any predicted shortfall. *Methodology Order* at 40.

On April 21, 2023, the Director also issued his *Final Order Regarding April 2023 Forecast Supply* ("April 2023 As-Applied Order"), wherein the Director predicted the Twin Falls Canal Company ("TFCC") would suffer a 75,200 acre-feet shortfall. *April 2023 As-Applied Order* at 3. To ensure TFCC was protected, the Director ordered that on or before May 5, 2023:

> [G]round water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted [demand shortfall] of 75,200 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted [demand shortfall] of 75,200 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

April 2023 As-Applied Order at 6.

On May 5, 2023, the Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of certain water districts[1] (collectively the "Districts"), filed a *Notice of Ground Water District Mitigation* ("Mitigation Notice").

IGWA's *Mitigation Notice* explained that "IGWA has three approved mitigation plans." *Mitigation Notice* at 2. IGWA asserted its first plan (the "2009 Storage Water Mitigation Plan") authorized the Districts to mitigate by delivering storage water to the Surface Water Coalition ("SWC"). *Id*. IGWA contends its second plan (the "Aquifer Enhancement Plan") authorized the Districts to "obtain mitigation credit" for various activities, e.g., fallowing acres irrigated by groundwater. *Id*. IGWA asserted its third plan (known as the "2015 Settlement Agreement Mitigation Plan") authorized the Districts to "obtain mitigation protection by complying with a 2015 settlement agreement between the Districts and the SWC. *Id*.

IGWA then advised that certain districts intended to mitigate under the 2009 Storage Water Mitigation Plan, while other districts intended to mitigate under the 2015 Settlement Agreement Mitigation Plan. *Id*. at 2–3.

On May 23, 2023, the Director issued an *Order Determining Deficiency in IGWA's Notice of Secure Water* ("Deficiency Order"). Of import here, the Director concluded IGWA's *Mitigation Notice* was deficient as it was improper for some Districts to mitigate under the 2009 Storage Water Mitigation Plan while others mitigated under the 2015 Settlement Agreement Mitigation Plan. *Deficiency Order* ¶¶ 2, 7, 9, 20, 21. The Director also determined IGWA's *Mitigation Notice* was deficient given IGWA's failure to tender fees to Water District 01 along with proof of legally enforceable contracts as required under the 2009 Storage Water Mitigation Plan. *Deficiency Order* ¶¶ 8, 9.

On June 1, 2023, IGWA submitted *IGWA's Amended Notice of Mitigation* ("Amended Mitigation Notice"), advising that IGWA would mitigate under the 2009 Storage Water Mitigation Plan. *Amended Mitigation Notice* at 3. IGWA also attached "copies of storage lease contracts secured by IGWA's member ground water districts totaling 77,714 acre-feet." *Id.*; *see also Amended Mitigation Notice* app. A. IGWA also objected to the Director's requiring IGWA to pay Water District 01's fees, but advised it had paid the fees notwithstanding its objection. *Amended Mitigation Notice* at 3.

On June 5, 2023, the SWC submitted *Surface Water Coalition's Response to IGWA's Amended Notice of Mitigation* ("SWC's Response"). The SWC argues IGWA's *Amended Mitigation Notice* is unclear whether IGWA members are agreeing to mitigate only for their proportionate shares, or instead for all ground water users as mandated under the 2009 Storage Water Mitigation Plan. *SWC's Response* at 2. The SWC further argues that IGWA's *Amended Mitigation Notice* fails to "address all of IGWA's storage water mitigation obligations for 2023", which include additional requirements beyond those articulated in the 2009 Storage Water Plan. *Id*. at 2–3.

[1] IGWA's submitted the Notice of Mitigation on behalf of: North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District. *Mitigation Notice* at 1.

On June 6, 2023, IGWA submitted a *Petition for Reconsideration of Order Determining Deficiency in IGWA's Notice of Secured Water* ("Petition for Reconsideration"), wherein IGWA requested that the Director "withdraw the new requirement that Water District 1 fees be paid before the Director will accept signed storage water lease or option contracts as proof of IGWA's ability to provide storage water as mitigation." *Petition for Reconsideration* at 1.

Also on June 6, 2023, IGWA submitted its *Reply to SWC's Response to IGWA's Amended Notice of Mitigation* ("IGWA's Reply"). In its reply, IGWA argued it was not required to mitigate for all ground water users under the 2009 Mitigation Plan, and further argued it was in compliance with all its mitigation obligations. *IGWA's Reply* at 2.

On June 12, 2023, the SWC submitted *Surface Water Coalition's Response to IGWA's Reply* ("SWC's Response to IGWA's Reply"). The SWC reiterated that "[i]f IGWA is relying on the [2009 Mitigation Plan] to mitigate, it must mitigate for all ground water users, not just its members . . . ." *SWC Response to IGWA's Reply* at 2. The SWC emphasized that "IGWA cannot ignore the comprehensive terms of the Settlement Agreement Plan and mitigate only with the [2009] Storage Water Mitigation Plan to satisfy its 2023 obligation." *Id*. at 5. The SWC also reiterated that IGWA must supply an additional 30,000 acre-feet in 2023 as a remedy for IGWA's breach in 2021. *Id*. 2–3.

On July 19, 2023, the Director issued the Department's *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, as well an *Order Revising April 2023 Forecast Supply (Methodology Steps 5 & 6)* ("July 2023 As-Applied Order"). Of import here, in the *July 2023 As-Applied Order* the Director concluded that members of the SWC will not suffer a demand shortfall in 2023. *July 2023 As-Applied Order* at 9.

ANALYSIS

A matter "is moot if it presents no justiciable controversy and a judicial determination will have no practical effect upon the outcome." *Goodson v. Nez Perce Cnty. Bd. of Cnty. Comm'rs*, 133 Idaho 851, 853, 993 P.2d 614, 616 (2000). As noted above, the Director recently issued the July 2023 As-Applied Order, which found that no SWC members would suffer a demand shortfall in 2023. Because there is no demand shortfall, ground water users are no longer required to mitigate. Since ground water users are no longer required to mitigate, questions regarding the sufficiency of IGWA's *Mitigation Notice* or *Amended Mitigation Notice* no longer present a justiciable controversy and are therefore moot.

NOTICE

Having concluded that questions concerning the sufficiency of IGWA's mitigation notices are moot, the Director provides notice that the Department will not issue orders responding to *IGWA's Petition for Reconsideration of Order Determining Deficiency in IGWA's Notice of Secured Water* or *IGWA's Amended Notice of Mitigation*.

Dated this 20th day of July 2023.

GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 20th day of July 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Megan Jenkins
Administrative Assistant II

RECEIVED
Jul 31, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. BOX 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 CM-MP-2016-001 **SURFACE WATER COALITION'S PETITION FOR RECONSIDERATION & CLARIFICATION** **REQUEST FOR ENFORCEMENT OF ORDERS APPROVING 2016 STIPULATED PLAN**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGAITON DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and pursuant to I.C. § 67-5246(4) and IDAPA 37.01.01.740.02.a and 770, hereby submits this petition for reconsideration and clarification concerning the Director's *Order Revising April*

2023 Forecast Supply and Amending Curtailment Order ("Step 5/6 Order") and the *Notice that Questions Concerning the Sufficiency of IGWA's Mitigation Notices are Moot* ("Notice").

The Coalition further requests that the Director address IGWA's 2022 breach of the 2016 mitigation plan and enforce the orders approving the same.

BACKGROUND

On March 9, 2016, the Surface Water Coalition and the nine signatory ground water districts (hereinafter collectively "IGWA") filed a *Stipulated Mitigation Plan and Request for Order* ("*Stipulated Plan*") regarding mitigation in this delivery call. The Director approved the plan by final order on May 2, 2016. The history of that plan and order, and what is required under both, are set forth in the Director's recent *Amended Final Order Regarding Compliance with Approved Mitigation Plan* ("Compliance Order") issued on April 24, 2023.[1]

On April 1, 2023, IGWA submitted its 2022 performance report to the Coalition and the Steering Committee. The Committee met on April 12, 2023 and disagreed on whether or not IGWA breached the agreement and mitigation plan in 2022. The Coalition reported the impasse to the Director by letter. *See* Ex. A (*Travis L. Thompson Letter to Director Spackman*, April 13, 2023). Pursuant to the terms of the *Stipulated Plan* and its amendments, following such notification, resolving the issue of whether a breach occurred and expediting resolution was turned over to the Director.

IDWR completed its review of IGWA's annual performance report on June 29, 2023. According to IDWR, IGWA only completed 188,095 acre-feet of conservation actions in 2022, well short of the required 240,000 acre-feet. *See* Ex. B (*IDWR Verification Memo*, June 29, 2023).

[1] IGWA has appealed this order to district court, but the order remains in effect and has not been stayed by the agency or the court. *See generally*, *IGWA v. IDWR* (Ada County Dist. Ct., Fourth Jud. Dist., Case No. CV01-23-7893).

The Director indicated that he would not address curtailment or the 2022 breach issue until after the administrative hearing concerning the *Fifth Methodology Order* and *April As Applied Order* was completed. That hearing was held before the agency on June 6-9, 2023. The Director further initially addressed IGWA's attempted "hybridization" of mitigation plans and indicated there were "serious questions about whether mixing of mitigation plans is allowable and whether there is compliance with a mitigation plan at all." *See Order Denying Motion for Reconsideration of Denial of Continuance* (May19, 2023). Since that time IGWA has assigned the following to the Surface Water Coalition through letters to Water District 01: 30,000 acre-feet for purposes of the 2022 Settlement regarding the 2021 breach (*see T.J. Budge July 10, 2023 Letter to Tony Olenichak*); and 50,000 acre-feet (*see Elisheva Patterson July 21, 2023 Letter to Tony Olenichak*). *See* Ex. C (copies of letters without leases).

On July 19, 2023 the Director issued the Step 5/6 Order and the Notice. The mid-season evaluation predicted no in-season demand shortfall to any Coalition member. Consequently, the Director stated "there is no need to establish a Time of Need as described in Step 6." In addition, in the Notice the Director stated "[b]ecause there is no demand shortfall, ground water users are no longer required to mitigate." Notice at 3. The Coalition requests reconsideration and clarification of these statements and requests the Director to address IGWA's 2022 breach as required under the *Second Addendum* and the May 2017 Order approving the same.

ARGUMENT

I. IGWA Has a Continuing Obligation to Annually Mitigate Under the 2016 Stipulated Plan and Orders Approving the Same.

The Director's implementation of the methodology order and mid-season review under Steps 5/6 does not obviate IGWA's obligation to mitigate under the *Stipulated Plan* and the Director's orders approving the same. Although IGWA recently assigned 50,000 acre-feet as

required, there are serious questions as to whether the individual groundwater districts are complying with the remaining long-term obligations as agreed to and ordered by the Director.

Notably, only five districts provided notice of their intent to comply with the 240,000 acre-feet groundwater conservation requirement in 2023. *See Notice of Ground Water District Mitigation* at 2 (May 5, 2023). Members of the Bingham, Bonneville-Jefferson, and Jefferson-Clark Ground Water Districts are presumably not complying with that requirement but yet are continuing to pump their junior priority ground water rights in 2023 without the required reductions, as they apparently did in 2022. IGWA has not formally provided the Director and the Coalition with any information that would indicate otherwise. Whereas the mitigation requirements in the *Stipulated Plan* are not dependent upon an injury finding in the implementation of the methodology order, the Director should reconsider the statement and review of IGWA's mitigation notices. In sum, there is no verification that IGWA is complying with its stipulated mitigation plan and the Director's orders as set forth in the *Compliance Order*.

As such, the Director should reconsider or clarify the statement that "ground water users are no longer required to mitigate," particularly to the extent that statement may be interpreted to obviate any requirements under the *Stipulated Plan* and orders.

II. Implementation of Step 7 May Result in an In-Season Demand Shortfall.

The *Sixth Methodology Order* requires the Director to analyze and adjust the reasonable in-season demand and available water supply at the "time of need." *See* Sixth Order at 44. Further, the order states that "The Director will then issue revised RISD and IDS values." *Id.* The Step 5/6 Order states "there is no need to establish a Time of Need." *See* Step 5/6 Order at 9. When that statement is read together with the above (i.e. "ground water users are no longer required to mitigate"), it is unclear what the Director intends for the rest of the irrigation season.

At a minimum, the Director should reconsider or clarify this statement to provide the parties with notice that this statement is not definitive for the rest of the 2023 irrigation season, and that additional adjustments may be made depending upon climatic conditions and available water supplies. Given the state of Snake River reach gains in July, the available supply for natural flow for the rest of the year is likely to be far less than what was identified in the forecast supply in the Step 5/6 Order. In other words, the Coalition presumes that a "time of need" will be established at some point and that Step 7 will be implemented as required by the Sixth Order. Moreover, such clarification would be necessary and consistent with mitigation being provided "in-time, in-place, and in-kind."

III. Request for Enforcement of Orders Approving 2016 Stipulated Plan.

Given the April impasse of the Steering Committee, and IDWR's recent verification of IGWA's failure to perform as required in 2022, the Coalition requests the Director to enforce the orders approving the *Stipulated Plan* and its amendments.

Since the parties did not agree on whether or not a breach occurred in 2022, and the Director has been notified of such impasse, the Director should evaluate all available information and determine if a breach occurred, and issue an order specifying what actions that must be taken to cure the breach. *See Final Order Approving Amendment to Stipulated Mitigation Plan* at 5, ¶ b (identifying approval does not limit Director's enforcement discretion). The Districts' failure to perform in 2022, and at least the apparent uncertainty of whether the three districts are performing at all in 2023, is contributing to declining Near Blackfoot to Milner Snake River reach gains (which dropped to their lowest ever recorded levels in July). Given certain ground water districts' failure to perform in 2022, their members with junior priority ground water rights are not operating in conformance with their stipulated plan. Consequently, the Director has an

obligation to evaluate this information and take action as referenced in the September 2022 *Compliance Order*:

> In this case, certain holders of junior-priority water rights failed to satisfy their mitigation obligations in 2021. Out-of-priority diversions by the IGWA members in Table 3 above were not "pursuant to a mitigation plan that has been approved by the Director." IDAPA 37.03.11.040.01.b. The approved Mitigation Plan was not "effectively operating" with respect to those IGWA members in 2021. IDAPA 37.03.11.042.02. Consequently, the holders of senior water rights have been and are being materially injured by the failure of the juniors to fully mitigate during the 2021 irrigation season.

Compliance Order at 15.

Whereas the Coalition previously agreed to limit the quantity of direct storage mitigation to 50,000 acre-feet per year in exchange for the additional reduction actions (240,000 af), it is clear now that IGWA is not complying with its mitigation plan but yet its members are still enjoying the benefits of safe harbor from curtailment. Further, when viewed in the context of IGWA not meeting the spring 2023 sentinel well benchmark, the continued disparity in the receipt of benefits of the *Stipulated Plan* is even more apparent. Reach gains continue to decline year after year yet ground water users continue to pump their junior rights without shortage. If the Director does not enforce the ordered conservation obligations, then the Surface Water Coalition's stipulation to 2016 mitigation plan was all for naught, and it effectively turns the prior orders into a "storage only" mitigation requirement to the detriment of the Coalition and its water supply.

Stated another way, IGWA should not be permitted to "mix and match" mitigation plans, and choose to comply with a prior "storage only" plan in years when there is no predicted demand shortfall. Yet that is what IGWA has proposed to do in 2023, and the issue of whether or not that is allowed is not "moot." Finally, where IGWA's members have received safe harbor

in 2022 and 2023, yet they are not in compliance with the *Stipulated Plan*, the Director should evaluate the available information and enforce the orders as previously indicated.

CONCLUSION

The Coalition requests reconsideration/clarification of the Step 5/6 Order and Notice as requested above. The Coalition further requests enforcement of the Director's prior orders approving the *Stipulated Plan* and its amendments.

DATED this 31st day of July, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

for W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 31st day of July, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Max C. Bricker Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

_____

Jessica Nielsen
Assistant for Travis L. Thompson

Exhibit A

MARTEN LAW

April 13, 2023

Via U.S. Mail & Email

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
P.O. Box 83720
Boise, Idaho 83720-0098

RE: Ground Water Districts' 2022 Performance Report / Steering Committee Meeting

Dear Director Spackman:

I am writing on behalf of our Surface Water Coalition clients (A&B et al.) and am joined by Kent Fletcher on behalf of his Coalition clients (AFRD#2 & MID) and T.J Budge on behalf of his ground water district clients (Districts). This letter pertains to the Coalition's delivery call and the Districts' stipulated mitigation plan (including addendums) that was approved by you by final orders in 2016 and 2017.

For your information, the Districts submitted their 2022 implementation report to the Coalition on April 1, 2023, a copy of which is enclosed as Exhibit A. The Coalition met and reviewed the report, and, based on the conservation obligations set by the Director in the *Final Order Regarding Compliance with Approved Mitigation Plan* issued Sept. 8, 2022 ("Compliance Order"), I submitted a letter on behalf of the Coalition to the Districts' counsel on April 6, 2023, identifying certain Districts that did not meet their 2022 obligations. *See* Exhibit B.

The Coalition met with the Districts via Zoom on April 12, 2023 pursuant to the Steering Committee procedures identified in the *Second Addendum* and the Director's order approving the same. The Coalition submits that the four Districts identified in my April 6th letter breached the mitigation plan and the Director's order in irrigation season 2022. Pursuant to the *Second Addendum* paragraph 2(c), the Coalition asked the Districts if they agree that a breach occurred.

The Districts are of the position that they can neither agree nor disagree that a breach occurred in 2022, or to the magnitude of the alleged breach, until the Director issues a final decision on their challenge to the *Compliance Order* based on the evidence submitted at the hearing held February 8, 2023. It is the Districts' position that the Director's final decision will in any case affect the manner in which compliance is measured, as explained in the Districts' performance report.

D – 208 . 735 . 2227 | E - tthompson@martenlaw.com | P.O. Box 63, Twin Falls, ID 83303-0063

MARTEN LAW

At the April 12th Steering Committee meeting, the Districts requested that the breach issue be tabled until the Director issues a final decision on the *Compliance Order*. However, the Coalition is not willing to table the matter for an indefinite period. Therefore, the Coalition submits that a breach occurred in 2022 and the Districts' disagree.

Pursuant to the Second Addendum paragraph 2(c)(iv) attached to the *Final Order Approving Amendment to Stipulated Mitigation Plan* dated May 9, 2017, when the parties do not agree that a breach has occurred, the Steering Committee will report the same to the Director and request that the Director evaluate all available information, determine if a breach has occurred, and issue an order specifying actions that must be taken by the breaching party to cure the breach or be subject to curtailment.

Thank you for your attention to this matter.

Sincerely,

Travis Thompson
Partner

Direct: (208) 735-2227
Email: tthompson@martenlaw.com

cc: W. Kent Fletcher
John K. Simpson
T.J. Budge
Surface Water Coalition

Exhibit B

State of Idaho
DEPARTMENT OF WATER RESOURCES

322 E Front Street, Suite 648 • PO Box 83720 • Boise ID 83720-0098
Phone: (208) 287-4800 • Fax: (208) 287-6700
Website: idwr.idaho.gov • Email: idwrinfo@idwr.idaho.gov

BRAD LITTLE
Governor

GARY SPACKMAN
Director

June 29, 2023

To: **SWC-IGWA Steering Committee**
From: **Idaho Department of Water Resources**
Re: **Verification of IGWA's 2022 Diversion and Recharge Data**

This document is submitted by the Idaho Department of Water Resources ("Department") to the Surface Water Coalition ("SWC") and Idaho Ground Water Appropriators ("IGWA") Settlement Agreement Steering Committee to satisfy Covenant 2.b.iii of the Second Addendum to the Settlement Agreement ("Agreement") dated December 14, 2016 which states:

"The Parties will request the Department to verify each District's annual diversion volume, and other reduction data (recharge, CREP, conversions, end-gun removals, etc.) to confirm the accuracy of the data. The Department's analysis shall be provided to the Steering Committee no later than July 1 for the previous irrigation season."

On April 1, 2023, IGWA submitted their 2022 Settlement Agreement Performance Report ("Performance Report") to the Steering Committee. The Department has reviewed the Performance Report including electronic Excel spreadsheets, data tables and supplemental scanned documents. Data for each ground water district in the Performance Report included the five-year average baseline usage from 2010 through 2014, the total 2022 diversion volume, and the resultant difference between the five-year average baseline and 2022 diversion volume. These values are reported in column 2 of Tables 1, 2 and 3 in this memo. The five-year average baseline and 2022 diversion volume data came from the Department's Water Management Information System ("WMIS") database. IGWA adjusted the five-year average baseline and 2022 diversion volume for some WMIS records and explained the adjustments in their Excel spreadsheet.

Department staff independently queried the five-year average baseline and 2022 diversion volumes from the WMIS database for each WMIS record reported by IGWA to compare against the five-year average baseline and 2022 diversion volume amounts contained in the Performance Report. This was done to capture revisions to historic data in WMIS and account for membership changes within the ground water districts. Data resulting from these queries are reported by ground water district and shown in column 3 of Tables 1 and 2. The 2022 diversion volume reduction from the five-year baseline average is shown in column 3 of Table 3.

Some wells in Henry's Fork Ground Water District ("HFGWD") and Fremont Madison Irrigation District ("FMID") do not have a WMIS record assigned to them because they are exchange wells measured and reported by Water District 01 ("WD01"). Regarding HFGWD, IGWA and Department staff retrieved FMID data and Teton River exchange well data from the WD01 Water Rights Accounting database available on the Department's website. WD31 data, which are included in the reported volumes for Jefferson-Clark Ground Water District, were obtained from the 2022 WD31 Watermaster Annual Report.

The Department also attempted to verify IGWA's reported private lease-rental recharge amounts for the 2022 calendar year. Confirmation of actual recharge volumes is difficult due to the complexity of tracking surface water deliveries, transactions and return flow amounts to the Snake River. Therefore, the Department's review is limited to confirming the existence and delivery volumes of private lease-rental contracts within WD01, Temporary Water Permits, Natural Flow Permits and Water Supply Bank Rentals.

The following tables summarize the five-year average baseline, 2022 diversion volume, resultant reductions, and recharge contract volumes as determined by IGWA and the Department. The verification results are presented objectively with no assumption as to which dataset is correct or incorrect. Notes are provided under each table explaining additional details specific to that particular table or dataset. Possible explanations are offered regarding differences between IGWA and Department datasets.

The Department did not review or include data for A&B Irrigation District or the Southwest Irrigation District. The Department will consider reporting data for these districts to the Steering Committee upon request.

Table 1: Five-Year Baseline Comparison

2010 through 2014

1	2	3	4
Ground Water District	**IGWA Reported 5-Yr Baseline (AF)**	**IDWR Database 5-Yr Baseline (AF)**	**IDWR % Difference Compared to IGWA (negative = IDWR < IGWA)**
American Falls -Aberdeen GWD	283,815	282,200	-0.6
Bingham GWD	277,011	277,359	0.1
Bonneville - Jefferson GWD	158,133	155,292	-1.8
Carey Valley GWD	5,671	5,484	-3.3
Henry's Fork GWD	73,901	73,340	-0.8
Jefferson - Clark GWD	445,393	445,144	-0.1
Madison GWD (estimated data)	78,095	79,134	1.3
Magic Valley GWD	256,188	256,561	0.1
North Snake GWD	208,795	203,541	-2.5
Total	1,787,002	1,778,055	-0.5

Table 1 Notes:

- Madison GWD: Baseline data determined by IGWA and IDWR via the method described on the "Madison GWD" tab of the IGWA submittal Excel spreadsheet. The average usage for each diversion from 2019 and 2020 was estimated to be 92% of the baseline volume. The average use in 2019/2020 for each well was increased by a factor of 1.0869565 to get to a 100% baseline volume. IGWA estimated the 92% value by comparing usage in the adjoining Henry's Fork GWD area.
- Henry's Fork GWD: IGWA's revised the baseline volume in their April 1 report from 69,979 acre-feet to 73,901 acre-feet.
- Both the IGWA and IDWR baseline volume for North Snake included a volume of 21,305 acre-feet of conversions

Table 2: 2022 Usage Volume Comparison

1	2	3	4
Ground Water District	**IGWA Reported Usage (AF)**	**IDWR Database Usage (AF)**	**IDWR % Difference Compared to IGWA (negative = IDWR < IGWA)**
American Falls -Aberdeen GWD	269,322	269,197	0.0
Bingham GWD	269,088	268,126	-0.4
Bonneville - Jefferson GWD	151,245	150,996	-0.2
Carey Valley GWD	1,889	1,447	-23.4
Henry's Fork GWD	65,177	66,780	2.5
Jefferson - Clark GWD	408,112	408,308	0.0
Madison GWD	76,919	75,939	-1.3
Magic Valley GWD	218,759	218,721	0.0
North Snake GWD	174,838	174,710	-0.1
Total:	1,635,349	1,634,224	-0.1

Table 2 Notes:

- Carey Valley GWD: Data used by IGWA and IDWR for three WMIS records account for this 442 acre-feet difference.

Table 3: 2022 Reduction Comparison

1	2	3	4
Ground Water District	**IGWA Reported Reduction (AF)**	**IDWR Database Reduction (AF)**	**IDWR % Difference Compared to IGWA (negative = IDWR < IGWA)**
American Falls -Aberdeen GWD	14,493	13,003	-10.3
Bingham GWD	7,923	9,233	16.5
Bonneville - Jefferson GWD	6,888	4,296	-37.6
Carey Valley GWD	3,782	4,037	6.7
Henry's Fork GWD	8,724	6,560	-24.8
Jefferson - Clark GWD	37,281	36,836	-1.2
Madison GWD	1,176	3,195	171.7
Magic Valley GWD	37,429	37,840	1.1
North Snake GWD	33,957	28,831	-15.1
Total:	151,653	143,831	-5.2

Table 3 Notes:

- Data in this table are generated by subtracting the 2022 usage volume for each district in table 2 from the 5-year average baseline for each district in table 1.

Table 4: 2022 Recharge Contract Confirmation

Ground Water District	IGWA Volume (AF)	IDWR Volume (AF)
American Falls-Aberdeen	23,550	16,866
Bingham	516	516
Bonneville - Jefferson	9,285	9,285
Carey Valley	5	5
Hen. Fork & Madison	3,000	3,000
Jefferson Clark	7,647	7,647
Magic Valley	3,378	3,378
North Snake	3,568	3,567
Grand Total	50,948	44,264

Table 4 Notes:

- The difference of 6,684 acre-feet for American Falls-Aberdeen is specific to recharge activities under the City of Gooding permit number 37-23059. IDWR has requested additional information on this line item and is awaiting the response.
- The timeframe within which recharge activities are counted is the calendar year 2022.
- Recognizing the challenges and difficulties due to the current data gaps in regard to accurately knowing and measuring where, when and how much water was actually recharged, the Department limited its review to confirmation of private lease/rental contracts, temporary water permits, natural flow permits, water supply bank rentals and the contract volume amounts.

Respectfully,

Brian Ragan

Brian W. Ragan, PG
Water Compliance Bureau

Exhibit C

RACINE OLSON
ATTORNEYS PROBLEM SOLVED

July 10, 2023

Tony Olenichak, Water Master
Water District 1
900 N. Skyline Drive, Suite A
Idaho Falls, Idaho 83402
Email: Tony.Olenichak@idwr.idaho.gov

Re: Assignment of 30,000 acre-feet to the Surface Water Coalition

Dear Tony:

By this letter, IGWA hereby assigns to the SWC 30,000 acre-feet of storage under the following lease contracts, copies of which are enclosed:

- 5,988 acre-feet under the Multi-Year Tribal Water Lease Agreement between IGWA and the Shoshone-Bannock Tribes.
- 4,000 acre-feet under the Storage Water Lease between Bonneville-Jefferson Ground Water District and Enterprize Canal Company.
- 4,000 acre-feet under the Storage Water Lease between Bonneville-Jefferson Ground Water District and Snake River Valley Irrigation District.
- 3,826 acre-feet under the Storage Water Lease lease between Bonneville-Jefferson Ground Water District and Idaho Irrigation District.
- 3,500 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Aberdeen-Springfield Canal Company.
- 5,009 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Snake River Valley Irrigation District.
- 400 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and United Canal Company.
- 334 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Sunnydell Irrigation Company.
- 50 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Watson Canal Company.
- 150 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Wearyrick Ditch Company.
- 500 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Blackfoot Irrigation Company.
- 750 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Corbett Slough Ditch Company.

- 1,343 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Enterprize Canal Company.
- 100 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Parsons Ditch Company.
- 50 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Riverside Canal Company.

The Water District 1 fees associated with these leases have already been paid. Kent Fletcher, Travis Thompson, or another representative of the SWC will direct you as to which SWC storage accounts this water should be credited.

Thank you for your assistance. If you have any questions, please contact me.

Sincerely,



Thomas J. Budge

c: IGWA Board of Directors
Bob Turner, IGWA Executive Director
Kent Fletcher
Travis Thompson

RACINE OLSON
ATTORNEYS PROBLEM SOLVED

July 21, 2023

Tony Olenichak, Water Master
Water District 1
900 N. Skyline Drive, Suite A
Idaho Falls, Idaho 83402
Email: Tony.Olenichak@idwr.idaho.gov

Re: Assignment of 50,000 acre-feet to the Surface Water Coalition

Dear Tony:

By this letter, IGWA hereby assigns to the SWC 50,000 acre-feet of storage under the following lease contracts, copies of which are enclosed:

- 19,000 acre-feet under the Multi-Year Tribal Water Lease Agreement between IGWA and the Shoshone-Bannock Tribes.
- 2,500 acre-feet under the One-Year Tribal Water Lease Agreement between IGWA and the Shoshone-Bannock Tribes.
- 2,514 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Peoples Canal & Irrigation Company.
- 327 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Enterprize Canal Company.
- 6,678 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Idaho Irrigation District.
- 5,009 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and New Sweden Irrigation District.
- 1,000 acre-feet under the Storage Water Lease between American Falls-Aberdeen Ground Water District and Falls Irrigation District.
- 2,674 acre-feet under the Storage Water Lease between Bonneville-Jefferson Ground Water District and Idaho Irrigation District.[1]
- 5,000 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Harrison Canal and Irrigation Company.
- 2,270 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Peoples Canal & Irrigation Company.
- 500 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Blackfoot Irrigation Company.
- 50 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Wearyrick Ditch Company.

[1] 174 acre-feet under one Storage Water Lease between Bonneville-Jefferson Ground Water District and Idaho Irrigation District, dated April 21, 2023; 2,500 acre-feet under a second Storage Water Lease between the same, dated May 9, 2023.

- 1,500 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Corbett Slough Canal.
- 192 acre-feet under the Water District #1 Rental Pool – Private Lease Agreement between Bingham Ground Water District and Palisades Water Users, Inc.

The Water District 1 fees associated with these leases have already been paid. Kent Fletcher, Travis Thompson, or another representative of the SWC will direct you as to which SWC storage accounts this water should be credited.

Thank you for your assistance. If you have any questions, please contact me.

Sincerely,



Elisheva M. Patterson

c: IGWA Board of Directors
Bob Turner, IGWA Executive Director
Kent Fletcher
Travis Thompson

RECEIVED
Aug 03, 2023
DEPARTMENT OF
WATER RESOURCES

Sarah A. Klahn (ISB #7928)
Maximilian C. Bricker (ISB #12283)
SOMACH SIMMONS & DUNN, P.C.
1155 Canyon St., Suite 110
Boulder, CO 80302
303-449-2834
sklahn@somachlaw.com
mbricker@somachlaw.com
Attorneys for City of Pocatello

Robert L. Harris (ISB #7018)
HOLDEN KIDWELL HAHN & CRAPO
rharris@holdenlegal.com
Attorneys for City of Idaho Falls

Candice M. McHugh (ISB #5908)
Chris M. Bromley (ISB #6530)
MCHUGH BROMLEY, PLLC
cbromley@mchughbromley.com
cmchugh@mchughbromley.com
Attorneys for the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell ("Coalition of Cities")

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **CITY OF POCATELLO'S, CITY OF IDAHO FALLS', AND COALITION OF CITIES' REQUEST FOR HEARING AND ORDER AUTHORIZING DISCOVERY**

COME NOW the City of Pocatello, City of Idaho Falls, and the Coalition of Cities[1] (collectively, the "Cities")[2], by and through their respective attorneys of record, and hereby request a hearing in the above-captioned matter and an order authorizing discovery.

[1] 1 The Coalition of Cities is composed of the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell.
[2] For purposes of economy, these requests are filed jointly, however, each party herein reserves the right to amend, supplement, or withdraw its requests individually without prejudice to the requests of another party to this filing.

A. Request for Hearing

Pursuant to Idaho Code § 42-1701(A)(3), the Cities request a hearing on the Idaho Department of Water Resource's ("Department") *Sixth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover*, issued July 19, 2023 ("Sixth Methodology Order"). Among the issues the Cities have identified for hearing:

a) Whether the members of the Surface Water Coalition ("SWC") operate reasonably and without waste;

b) Whether the irrigated acreage numbers for the SWC members in the *Sixth Methodology Order* are accurate;

c) Whether the number of acres irrigated with supplemental groundwater rights within the service areas of the SWC members can be accurately determined;

d) Whether the number of acres irrigated with enlargement rights within the service areas of the SWC members can be accurately determined;

Because they need sufficient time to adequately conduct discovery and prepare for an evidentiary hearing, the Cities request that the Director set a four (4) day hearing pursuant to this request no sooner than September 1, 2024.

B. Request for Permission to Conduct Discovery

Pursuant to the Department's Procedure Rule 521, IDAPA 37.01.01.521, the Cities request that the Director issue an order authorizing discovery so that they can investigate

SWC members' operations and obtain the information and data necessary to properly litigate the issues listed above.

CONCLUSION

The Cities request that the Director (1) hold a status conference to set this matter for hearing; and (2) issue an order authorizing discovery.

Respectfully submitted this 3rd day of August 2023.

SOMACH SIMMONS & DUNN, P.C.

By 
Sarah A. Klahn (ISB # 7928)
Maximilian C. Bricker (ISB #12283)

Attorneys for City of Pocatello

HOLDEN KIDWELL HAHN & CRAPO

By /s/ Robert L. Harris
Robert L. Harris (ISB# 7018)

Attorneys for City of Idaho Falls

MCHUGH BROMLEY, PLLC

By /s/ Candice M. McHugh
Candice M. McHugh (ISB# 5908)
Chris M. Bromley (ISB # 6530)

Attorneys for the Coalition of Cities

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 3rd day of August 2023, the foregoing document was served via email to the following:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP
P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, &
LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org



Maximilian C. Bricker (ISB #12283)

RECEIVED
Aug 03, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
(208) 232-6109 – fax
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA's Petition for Reconsideration**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, Henry's Fork Ground Water District, Bonneville-Jefferson Ground Water District, and Bingham Ground Water District, submits this petition for reconsideration of the *Notice that Questions Concerning the Sufficiency of IGWA's Mitigation Notices are Moot* ("*Notice*") issued July 20, 2023, by the Director of the Idaho Department of Water Resources ("Department").

Background

On April 21, 2023, the Director issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-season Demand and Reasonable Carryover* ("*Fifth Methodology Order*"), and the *Final Order Regarding April 2023 Forecast Supply* ("*April 2023 As-Applied Order*"). The application of the two required IGWA to establish

that it could mitigate for its proportionate share of the predicted demand shortfall of 75,200 acre-feet in accordance with an approved mitigation plan, or else face curtailment. (*April 2023 As-Applied Order*, p. 6.)

On May 5, 2023, IGWA filed a *Notice of Ground Water District Mitigation* ("*Mitigation Notice*"). On May 23, 2023, the Director issued an *Order Determining Deficiency in IGWA's Notice of Secured Water* ("*Deficiency Order*"). The *Deficiency Order* concluded that: (1) some of IGWA's member ground water districts cannot mitigate under the 2009 Storage Water Plan while others mitigate under the 2015 Settlement Agreement Mitigation Plan; and (2) IGWA must tender fees to Water District 01 along with proof of legally enforceable contracts to demonstrate compliance with the 2009 Storage Water Mitigation Plan. (*Deficiency Order*, p. 5, 7.)

On June 1, 2023, IGWA filed *IGWA's Amended Notice of Mitigation* ("*Amended Mitigation Notice*") informing the Director that all IGWA districts would mitigate under the 2009 Storage Water Plan, and, while objecting to the new fee requirement, stated it had paid the Water District 01 fees. (*Amended Mitigation Notice*, p. 3.) On June 6, 2023, IGWA filed *IGWA's Petition for Reconsideration* formally objecting to the new requirement that Water District 01 fees be paid before the Director will accept signed storage water lease or option contracts as proof of IGWA's ability to provide storage water as mitigation.

On July 19, 2023, the Director issued the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-season Demand and Reasonable Carryover*, as well as an *Order Revising April 2023 Forecast Supply (Methodology Steps 5 & 6)* ("*July As-Applied Order*"). The *July As-Applied Order* found no demand shortfall was predicted for the Surface Water Coalition ("SWC"). (*July As-Applied Order*, p. 6.)

On July 20, 2023, the Director issued the *Notice that Questions Concerning the Sufficiency of IGWA's Mitigation Notices are Moot*, finding that because ground water users are no longer required to mitigate injury to the SWC, there is no longer a present justiciable controversy regarding IGWA's *Amended Mitigation Notice* or *IGWA's Petition for Reconsideration* related thereto. (*Notice*, p. 3.)

Argument

Generally, administrative bodies and courts refrain from issuing declaratory judgments where no live actual or justiciable controversy exists; however, there are important exceptions to this doctrine. A ruling on a moot issue may be made when: (1) "there is the possibility of collateral legal consequences imposed on the person raising the issue;" (2) "the challenged conduct is likely to evade judicial review and thus is capable of repetition;" and (3) "an otherwise moot issue raises concerns of substantial public interest." *Wylie v. State, Idaho Transp. Bd*., 151 Idaho 26, 31-32, 253 P.3d 700, 705-06 (2011); *Stephen v. Sallaz & Gatewood, Chtd*., 150 Idaho 521, 528, 248 P.3d 1256, 1263 (2011). Here, all three exceptions are met. This petition addresses exceptions 2 and 3 as they have the most obvious application.

A. The short period of time between issuance of the As-Applied Orders means challenges to the orders are likely to evade judicial review and repetition is all but assured.

Under the Methodology Orders, the Director is required to determine whether the SWC faces a demand shortfall during different times in the irrigation season. The Director makes these findings under a series of As-Applied Orders, the first of which is generally issued in April; the second, applying Steps 5 and 6 of the Methodology Order, in July; the third, applying Steps 7 and 8, in August; and, finally, the fourth, applying Step 9, in November. Under each of these As-Applied Orders, if a demand shortfall is predicted then junior ground water users must mitigate their proportionate share of the shortfall according to an approved mitigation plan.

Mitigation obligations may change with each As-Applied Order. For example, in 2023, the April As-Applied Order predicted a Demand Shortfall of 75,200 acre-feet, whereas the July As-Applied Order predicted no Demand Shortfall. This fluctuation in predicted Demand Shortfall, coupled with the short period of time between As-Applied Orders, means that issues concerning mitigation obligations by junior-priority groundwater users may evade judicial review. By the time an issue is raised under an April As-Applied Order, the July As-Applied Order has changed the conditions, potentially rendering the issue moot.

IGWA has a mitigation plan approved June 3, 2010, in IDWR Docket No. CM-MP-2009-007, which allows IGWA to provide mitigation by delivering storage water to the SWC. The order approving this plan allows IGWA to comply by providing "proof of rental or an option to rent storage water" evidenced by "fully executed and irrevocable contracts with holders of Snake River storage." (*Order Approving Mitigation Plan*, IDWR Docket No. CM-MP-2009-007, June 3, 2010.) Despite this, the Director's recent *Deficiency Order* requires, for the first time, that IGWA pay Water District 01 fees in addition to fully executed and irrevocable contracts with holders of Snake River storage.

If IGWA's objection to the new fee payment requirement is rendered moot every time a new As-Applied Order is issued, the objection is likely to evade review.

B. Compliance with As-Applied Orders is of substantial public interest because non-compliance could result in massive water right curtailments.

Common in the As-Applied Orders is the following statement: "If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted [Demand Shortfall] . . . in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user." (*April 2023 As-Applied Order*, p. 6.) IGWA's members irrigate almost one million acres of farmland, all of which are at risk of curtailment unless IGWA complies with an approved mitigation plan. Consequently, it is critical that IGWA understand what is required to demonstrate compliance with the 2009 Storage Water Mitigation Plan.

The Director's new fee payment requirement is very problematic because it may close the door to option contracts as a tool for securing storage water for mitigation purposes. The *Order Approving Mitigation Plan* issued in 2010 specifically authorizes option contracts as a tool to

demonstrate compliance. Under an option contract, IGWA does not hold an interest in the water until the option is exercised. Requiring IGWA to pay Water District 01 fees before IGWA exercises an option is problematic for obvious reasons. And further, is inconsistent with the *Order Approving Mitigation Plan*. If IGWA is no longer allowed to mitigate under option contracts, IGWA needs to know.

Moreover, requiring IGWA to pay Water District 01 fees in advance is unnecessary. IGWA has historically waited until July or August to pay Water District 01 fees on storage water that is provided to SWC as mitigation, and IGWA has never failed to pay such fees. A bar on option contracts may also have the unintended consequence of causing more harm to the SWC. If option contracts cannot be utilized by IGWA in the future, then that leaves IGWA fewer options to secure storage water and ensure the SWC receives the mitigation it needs.

Therefore, if the Director is adding new requirements to IGWA's approved mitigation plan, then the appropriate changes to the *Order Approving Mitigation Plan* must be made before the next As-Applied Order triggers a mitigation requirement. Given the large number of acres involved, and the magnitude of curtailment, it is of substantial public interest that this compliance issue be resolved.

CONCLUSION

For the foregoing reasons, IGWA respectfully requests the Director reconsider his *Notice that Questions Concerning the Sufficiency of IGWA's Mitigation Notices are Moot* and find that the 2009 Storage Water Mitigation Plan does not require payment of Water District 01 fees at the time of the notice of mitigation. This issue remains ripe for review because the issue is of substantial public interest and is likely to evade review.

Dated this 3rd day of August, 2023.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 3rd day of August, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com mbricker@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

RECEIVED
Aug 03, 2023
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
(208) 232-6101 – phone
(208) 232-6109 – fax
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 Docket No. CM-DC-2016-001 **IGWA's Response to Surface Water Coalition's Petition for Reconsideration & Clarification and Request for Enforcement of Orders Approving 2016 Stipulated Plan**

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting on behalf of North Snake Ground Water District, Carey Valley Ground Water District, Magic Valley Ground Water District, Aberdeen-American Falls Area Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, Henry's Fork Ground Water District, Bonneville-Jefferson Ground Water District, and Bingham Ground Water District, hereby responds to *Surface Water Coalition's Petition for Reconsideration & Clarification and Request for Enforcement of Orders Approving 2016 Stipulated Plan* ("SWC Petition") filed July 31, 2023, in IDWR Docket Nos. CM-DC-2010-001 and CM-MP-2016-001.

IGWA's Amended Notice of Mitigation filed June 1, 2023, states that IGWA will mitigate in 2023 in accordance with its "Storage Water Plan" approved in 2010 in IDWR Docket No. CM-MP-2009-007. Notwithstanding, the SWC asks the Director to rule that certain ground water districts are not in compliance in 2023 with IGWA's "Settlement Agreement Plan" approved in 2016 in IDWR Docket No. CM-MP-2016-001. The SWC argues that certain of IGWA's member ground water districts are "presumably not complying" with the Settlement Agreement Plan, and "there is no verification that IGWA is complying with its stipulated mitigation plan." (SWC

Petition, p. 4.) The premise of the SWC's argument is that even if IGWA complies with the approved Storage Water Plan, it is contractually obligated to also comply with the Settlement Agreement Plan. The Director should deny the SWC Petition for three reasons.

First, the SWC Petition is a collateral attack on issues that were raised in, and properly belong in, the SWC's challenge of the Director's *Final Order Regarding April 2023 Forecast Supply* ("April As-Applied Order") issued April 21, 2023. The April As-Applied Order states that junior priority groundwater users may mitigate "in accordance with an approved mitigation plan." (Emphasis added.) It does not obligate IGWA to mitigate under the Settlement Agreement Plan; it allows mitigation under any approved plan. This is consistent with Conjunctive Management Rule 30.07.g which requires the Director to "take into consideration the existence of any approved mitigation plan before issuing any order prohibiting or limiting withdrawal of water from any well," Conjunctive Management Rule 40.01.b which authorizes out-of-priority diversions "pursuant to a mitigation plan that has been approved by the Director," Conjunctive Management Rule 41.02.c which requires the Director to "consider the expected benefits of an approved mitigation plan," and Conjunctive Management Rule 42.02 which allows out-of-priority diversions if "the junior-priority right is covered by an approved and effectively operating mitigation plan."

The SWC requested a hearing on the April As-Applied Order and filed a statement of issues including: "Whether the order provides that IGWA has an option to comply with the mitigation plan approved in CM-MP-2016-001 to avoid curtailment by complying with the mitigation plan approved in CM-MP-2009-007 instead." (SWC Req. for Hrg. / Stmt. of Issues, May 5, 2023.) An evidentiary hearing was held June 6-9, 2023, post-hearing briefs were filed, and a decision was entered July 19, 2023. The SWC did not present any evidence at the hearing concerning the foregoing issue, and the Director did not change either the Methodology Order or the As-Applied Order to mandate that IGWA mitigate under the Settlement Agreement Plan. The SWC's attempt to raise that issue for a second time here is a collateral attack on the Director's *Post-Hearing Order Regarding Fifth Amended Methodology Order* issued July 19, 2023; therefore, it must be denied.

Second, even if the Director elects to address the SWC's mitigation plan argument, the Director has no legal basis for precluding IGWA from complying with any approved mitigation plan. The Storage Water Plan is an approved mitigation plan that has not been withdrawn or terminated. Nor do the terms of the Settlement Agreement Plan preclude IGWA from mitigating under the Storage Water Plan. If the SWC contends that IGWA has a contractual obligation to comply with the Settlement Agreement Plan irrespective of its compliance with the Storage Water Plan, the SWC must bring an action in district court for breach of contract. As to the Director's authority, it is limited to evaluating compliance with any approved mitigation plan.

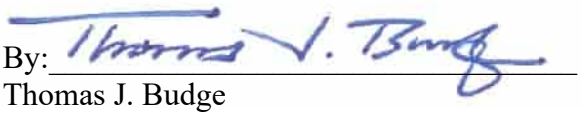
Third, even if the Director were to rule that IGWA must comply with the Settlement Agreement Plan irrespective of its compliance with the Storage Water Plan, the SWC is not in a position to assert that IGWA is out of compliance. As noted in the SWC Petition, IGWA has delivered 50,000 acre-feet of storage to the SWC consistent with section 3.b.i of the IGWA-

SWC Settlement Agreement.[1] Any questions concerning IGWA's compliance with diversion reductions under section 3.a of the Agreement are not ripe for review until IGWA submits a performance report prior to April 1, 2024, in accordance with section 2.a.i of the Second Addendum to Settlement Agreement dated December 14, 2016.

For the foregoing reasons, IGWA respectfully requests that the Director deny the SWC Petition.

Dated this 3rd day of August, 2023.

RACINE OLSON, PLLP

By: 
Thomas J. Budge
Attorneys for IGWA

[1] Although IGWA elected to mitigate the April As-Applied Order demand shortfall under the Storage Water Plan, IGWA still delivered 50,000 acre-feet of storage water to the SWC, in a good faith effort to maintain the relationship. However, IGWA maintains that it may use the delivered 50,000 acre-feet of storage water to mitigate possible Methodology Order Step 7-8 demand shortfall, should injury be found later in the irrigation season. A letter from IGWA to the SWC, dated July 19, 2023, regarding the delivery of 50,000 acre-feet of storage water made this same reservation.

CERTIFICATE OF SERVICE

I hereby certify that on this 3rd day of August, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Director Gary Spackman Garrick Baxter Sarah Tschohl Idaho Department of Water Resources 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
Dylan Anderson DYLAN ANDERSON LAW PO Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A PO Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov

David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn Max Bricker Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov

Corey Skinner IDWR-Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	corey.skinner@idwr.idaho.gov
Tony Olenichak IDWR-Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	Tony.Olenichak@idwr.idaho.gov
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318	wparsons@pmt.org

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 CM-MP-2016-001 **ORDER GRANTING PETITION FOR RECONSIDERATION/CLARIFICATION IN PART AND DENYING REQUEST FOR ENFORCEMENT**

BACKGROUND

On July 19, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Sixth Methodology Order") and *Order Revising April 2023 Forecast Supply and Amending Curtailment Order (Methodology Steps 5 & 6)* ("April 2023 As-Applied Order"). The Sixth Methodology Order comprises nine steps to determine material injury to members of the Surface Water Coalition ("SWC"). The April 2023 As-Applied Order applies Steps 5 and 6 to the 2023 irrigation season.

On July 20, 2023, the Director issued his *Notice that Questions Concerning the Sufficiency of IGWA's Mitigation Notices are Moot* ("Notice"). The Notice concluded that questions concerning the sufficiency of IGWA's mitigation notices are moot. Because of mootness, the Department did not respond to *IGWA's Petition for Reconsideration of Order Determining Deficiency in IGWA's Notice of Secured Water*, filed June 6, 2023, or *IGWA's Amended Notice of Mitigation*, filed June 1, 2023.

The Department received the *Surface Water Coalition's Petition for Reconsideration and Clarification; Request for Enforcement of Orders Approving 2016 Stipulated Plan* ("SWC's Petition") on July 31, 2023. The SWC's Petition requests the Director reconsider and clarify a statement made in the April 2023 As-Applied Order— "there is no need to establish a Time of Need as described in Step 6"—and a statement made in the Notice— "[b]ecause there is no demand shortfall, ground water users are no longer required to mitigate." *SWC's Petition* at 3. Additionally, the SWC's Petition requests the Director address IGWA's 2022 breach through enforcement of the orders approving the March 9, 2016 *Stipulated Mitigation Plan and Request for Order* and its amendments. *Id*. at 3, 5.

On August 3, 2023, the Idaho Ground Water Appropriators, Inc. ("IGWA") filed with the Department *IGWA's Response to Surface Water Coalition's Petition for Reconsideration and Clarification and Request for Enforcement of Orders Approving 2016 Stipulated Plan*.

ANALYSIS

A. April 2023 As-Applied Order

The April 2023 As-Applied Order states "[w]ith no additional water owed to SWC members, there is no need to establish a Time of Need as described in Step 6." *April 2023 As-Applied Order* at 8.

The SWC asks the Director to "reconsider or clarify this statement to provide the parties with notice that this statement is not definitive for the rest of the 2023 irrigation season, and that additional adjustments may be made depending upon climatic conditions and available water supplies." *SWC's Petition* at 5.

The Director will clarify this statement. This statement is not definitive for the rest of the 2023 irrigation season. "The Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover." *Sixth Methodology Order* at 21. Because there was no shortfall calculated in the April 2023 As-Applied Order, it was not necessary to predict the Time of Need in that order. However, the Department is tracking the Time of Need and will issue an order prior to the Time of Need as described in Step 7 of the Methodology Order.[1]

B. Notice

The Notice states "[b]ecause there is no demand shortfall, ground water users are no longer required to mitigate." *Notice* at 3.

The SWC asks the Director to "reconsider or clarify the statement that 'ground water users are no longer required to mitigate,' particularly to the extent that statement may be interpreted to obviate any requirements" under an approved mitigation plan. *SWC's Petition* at 4.

The Director will clarify this statement. The statement was not intended to suggest that ground water users seeking protection of an approved mitigation plan do not need to continue to comply with the obligations described in the mitigation plan.

C. Request for Enforcement

The SWC states "[g]iven the April impasse of the Steering Committee, and IDWR's recent verification of IGWA's failure to perform as required in 2022, the [SWC] requests the Director to enforce the orders approving the *Stipulated Plan* and its amendments." *SWC's Petition* at 5.

---

[1] Step 7 states "Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS; and (3) establish the Time of Need." *Sixth Methodology Order* at 44.

On August 3, 2023, after the SWC's request was filed, the Director issue his *Final Order Regarding IGWA's 2022 Mitigation Plan Compliance* related to IGWA's breach in 2022 of the mitigation plan approved in 2016 in Docket No. CM-MP-2016-001. Issues related to IGWA's compliance with the mitigation plan should be addressed in proceedings related to that order.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED as follows:

The Director GRANTS IN PART the SWC's petition for reconsideration/clarification.

The Director DENIES the SWC's request for enforcement as the Director recently issued his *Final Order Regarding IGWA's 2022 Mitigation Plan Compliance*.

DATED this 11th day of August 2023.

GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 11th day of August 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☐ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

RECEIVED
Aug 22, 2023
DEPARTMENT OF
WATER RESOURCES

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

W. Kent Fletcher, ISB #2248
FLETCHER LAW OFFICE
P.O. Box 248
Burley, Idaho 83318
Telephone: (208) 678-3250
Email: wkf@pmt.org

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

BEFORE THE DEPARTMENT OF WATER RESOUCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **SURFACE WATER COALITION'S RESPONSE TO CITIES' REQUEST FOR HEARING AND ORDER AUTHORIZING DISCOVERY**

COME NOW, A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY ("Surface Water Coalition" or "Coalition"), by and through counsel of record, and hereby respond to the *City of Pocatello's, City of Idaho Falls', and Coalition of Cities' Request for Hearing and Order Authorizing Discovery* ("Request") filed on August 3,

2023. The Coalition requests the Director to deny the Cities' Request for the reasons set forth below.

BACKGROUND

The Director issued the *Fifth Amended Methodology Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") on April 21, 2023. The Cities challenged that order and filed several requests for hearing. *See Pocatello's Request for Hearing* (April 28, 2023); *Coalition of Cities' Amended Request for Hearing* (April 28, 2023); *City of Idaho Falls Challenge and Request for Hearing* (May 4, 2023). The Cities later filed additional statements of issues. *See Pocatello's Statement of Issues* (May 4, 2023); *Coalition of Cities' Statement of Issues* (May 4, 2023); *City of Idaho Falls Statement of Issues* (May 4, 2023). Notably, the Cities raised the following issues subject to the administrative hearing that was held from June 6-9, 2023:

> c) Whether the Surface Water Coalition's ("SWC") actual irrigated acreage was properly determined for use in determining reasonable in-season demand; . . .
>
> e) The reasonableness of Project efficiencies of the SWC members, trends in said efficiencies in recent years, and how the efficiency values are used in determining reasonable in-season demands;
>
> f) IDWR's failure to consider all sources of supply to the SWC;

Pocatello's Request for Hearing at 2; *see also Pocatello's Statement of Issues* at 2.

> b) IDWR's failure to properly identify the Surface Water Coalition's ("SWC") irrigated acreage used in the determination of reasonable in-season demand; . . .
>
> d) IDWR's failure to consider changes in the efficiency of the SWC's operations;
>
> e) IDWR's failure to consider all sources of supply available to the SWC;

Coalition of Cities' Amended Request for Hearing at 2.

> 4. IDWR's failure to consider changes and reasonableness of the project efficiencies of the SWC's operations; . . .

> 11. IDWR's failure to investigate whether the SWC members are using the water they divert efficiently and without waste, and in compliance with the terms of their decreed water rights;

Coalition of Cities' Statement of Issues at 2-3.

> 4. The reasonableness of Project efficiencies of the SWC members, trends in the efficiencies in recent years, and how the efficiency values are used in determining reasonable in-season demands;
>
> 5. Whether IDWR failed to consider all sources of water supply to the SWC; . . .
>
> 12. Whether IDWR's failure to investigate whether the SWC members are using the water they divert efficiently and without waste, and in compliance with the terms of their decreed water rights;

City of Idaho Falls Statement of Issues at 2-3.

The parties were allowed to address the above issues at hearing through both lay and expert testimony and through exhibits.[1] The parties also submitted post-hearing briefing on all issues that were raised, or could have been raised, at the hearing. *See generally, Cities' Closing Brief* (June 16, 2023). The Director issued the *Post-Hearing Order Regarding Fifth Amended Methodology Order* and the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-season Demand and Reasonable Carryover* ("Sixth Methodology Order") on July 19, 2023.

The Sixth Methodology Order was issued as a "final" administrative order subject to reconsideration and/or appeal to district court. *See* I.C. §§ 67-5246; 67-5270 to 5272; *see also*, Explanatory Information to Accompany a Final Order (attached to the Director's Sixth Methodology Order).

[1] These issues are essentially the same issues identified in the Cities' present Request. *See Request* at 2 (i.e. "operate reasonably and without waste," "irrigated acreage," "supplemental groundwater" and "enlargement rights"). All of these issues address the Coalitions' use of water and the Cities had an opportunity to discover and present this information at the June hearing.

ARGUMENT

I. IDWR Already Provided a Hearing on the Cities' Issues and the Statute Does Not Provide for a Second Hearing.

The Cities have erroneously petitioned for an administrative hearing on the Sixth Methodology Order pursuant to Idaho Code § 42-1701A(3). The statute only allows an aggrieved person to have a hearing on a director's action or order when that person "has not previously been afforded an opportunity for hearing on the matter." *See* I.C. § 42-1701A(3). The Cities do not fall into that category. Instead, IDWR provided the Cities with an opportunity for hearing on the issues listed in their recent *Request for Hearing* June 6-9, 2023. Issues related to the SWC's reasonable use of water, irrigated acres, supplemental groundwater, and enlargement rights were all subject to the hearing on the Fifth Amended Methodology Order held before the Director this past June. The Director specifically addressed these issues in the Post-Hearing Order. *See Post-Hearing Order* at 17-23. Although the Cities may disagree with the Director's decision, their remedy is not a "second" administrative hearing. Since the Cities had an opportunity for a hearing on their issues, Idaho law does not afford them a right to a "second" hearing. The Cities' request should be denied accordingly.

Moreover, the Sixth Methodology Order was issued as a "final" agency order. Pursuant to section 42-1701A(4) the Cities' statutory remedy is judicial review of that order. Idaho's APA provides the right to ask for reconsideration and/or appeal that decision to district court. The Cities did not ask for reconsideration and have yet to appeal the Sixth Methodology Order, however IGWA did ask for judicial review. *See IGWA's Petition for Judicial Review* (Ada County Dist. Ct., Fourth Jud. Dist., Case No. CV01-23-13713, Aug. 16, 2023). Since the Director's Sixth Methodology Order is on appeal to the district court it is not subject to any

further administrative process or hearing, unless ordered by the court. *See* I.R.C.P. 84. The Cities' request for a "second" hearing should be denied accordingly.

II. The Sixth Methodology Order Updates the Fifth Methodology Order Based on Information Produced at Hearing.

Notwithstanding the Sixth Methodology Order was issued as a "final" agency order subject to reconsideration and/or judicial review, the Director updated the Fifth Order based upon information produced at hearing. In other words, the issues that the Cities seek to address with a hearing on the Sixth Methodology Order were already addressed in the June hearing. There is nothing new in the final order that would warrant an additional administrative hearing. The Cities' request in this regard is unduly burdensome and would cost the parties and agency time and additional resources without any legal basis.

Notably, the Director stated "[t]his Sixth Methodology Order relies on the same data included in the Fifth Methodology Order." *See* Sixth Methodology Order at 8, n. 8, at 9, n. 9, at 10, n .10, at 15, n. 13, at 24, n. 18, at 26, n. 20, at 28-29, n. 21 (emphasis added). All of this information was available to the Cities as of April 21, 2023. However, the Director did identify certain limited corrections to the Fifth Methodology Order:

> As discussed in footnote 12, during the June 2023 Hearing the Department identified an error in AFRD's 2018 diversion data. Hr'g T. vol. IV, at 173-74. This correction was resolved in his Sixth Methodology Order, which relies on the updated data. The updated data did not result in an appreciable increase in 2018's diversion value.

Sixth Methodology Order at 12, n. 11.

> In this Sixth Methodology Order, AFRD2's 2018 diversion value has been increased by 5,000 acre-feet. This increase was necessary to remedy the error committed by Department staff in calculating AFRD2's 2018 adjusted diversion value for the Fifth Methodology Order, which was identified during the June 6 Hearing.

Id. at 13, n. 12.

IDWR staff member Matt Anders addressed the above data correction during the June hearing. He was available for cross-examination by the parties and the Cities had a full and fair opportunity to rebut or contest this information if they disagreed with it. Moreover, the Cities had a full and fair opportunity to rebut and contest any of IDWR's updates to the Fifth Methodology Order that were carried over to the Sixth Methodology Order. Stated another way, there is nothing new in the recent order that was not subject to the June hearing on the Fifth Methodology Order. All of the Cities' issues identified in their *Request for Hearing* were either expressly raised or could have been raised at the June hearing and finally addressed in the Director's *Post-Hearing Order* which resulted in the final Sixth Methodology Order.[2]

Alternatively, and without waiving any right to contest the granting of such a hearing, if the Director grants the Cities' request then the hearing should be limited to the issue of the updated data regarding AFRD2's 2018 diversion volume. The Director has such discretion and has limited review of amended methodology orders in that fashion before. This is the only change in the Sixth Methodology Order that could even be considered subject to another hearing. *See Order Limiting Scope of Evidence and Offering Witnesses (Methodology Order)* (May 21, 2010).

Similar to the request for hearing, the Director should deny or limit the Cities' request for discovery. Any issues that were already addressed at the hearing on the Fifth Methodology Order would be beyond the scope of discovery regarding a hearing on the additional data regarding AFRD2's 2018 diversion volume. Moreover, the Cities' request would be unduly

[2] The Cities have requested judicial review of the July 19, 2023 *Post-Hearing Order*. *See Notice of Appeal and Petition for Judicial Review* (Ada County Dist. Ct., Fourth Jud. Dist., Case No. CV01-23-13238, Aug. 16, 2023). It is anticipated that this appeal will be consolidated with IGWA's appeal of the Sixth Order.

repetitious and burdensome to the SWC in both time and expense. The Director should deny or limit the request accordingly.

CONCLUSION

The Cities' request for hearing on the Sixth Methodology Order is an impermissible attempt at a "second" hearing not authorized by statute. Moreover, Idaho law does not allow an agency to hold a "redo" administrative hearing of a final agency order that is pending on appeal to the district court. Since the Cities' issues were already addressed at the underlying hearing held in June, there is no basis to grant a second hearing on the Sixth Methodology Order.

The Coalition respectfully requests the Director to deny or limit the Cities' request for hearing and an order authorizing discovery accordingly.

DATED this 22nd day of August, 2023.

MARTEN LAW LLP

Travis L. Thompson

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company

FLETCHER LAW OFFICE

W. Kent Fletcher

Attorneys for American Falls Reservoir District #2 and Minidoka Irrigation District

CERTIFICATE OF SERVICE

I hereby certify that on this 22nd day of August, 2023, I served a true and correct copy of the foregoing on the following by the method indicated:

Director Gary Spackman Garrick Baxter Sarah Tschohl State of Idaho Dept. of Water Resources 322 E Front St. Boise, ID 83720-0098 *** service by electronic mail gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation 1150 N. Curtis Rd. Boise, ID 83706-1234 *** service by electronic mail only mhoward@usbr.gov	Tony Olenichak IDWR – Eastern Region 900 N. Skyline Dr., Ste. A Idaho Falls, ID 83402-1718 *** service by electronic mail only tony.olenichak@idwr.idaho.gov
T.J. Budge Elisheva Patterson Racine Olson P.O. Box 1391 Pocatello, ID 83204-1391 *** service by electronic mail only tj@racineolson.com elisheva@racineolson.com	Sarah A. Klahn Max C. Bricker Diane Thompson Somach Simmons & Dunn 2033 11th St., Ste. 5 Boulder, CO 80302 *** service by electronic mail only sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	David Gehlert ENRD – DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 *** service by electronic mail only david.gehlert@usdoj.gov
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83201 *** service by electronic mail only rdiehl@pocatello.us.	William A. Parsons Parsons, Smith & Stone LLP P.O. Box 910 Burley, ID 83318 *** service by electronic mail only wparsons@pmt.org	Corey Skinner IDWR – Southern Region 650 Addison Ave W, Ste. 500 Twin Falls, ID 83301-5858 *** service by electronic mail only corey.skinner@idwr.idaho.gov
W. Kent Fletcher Fletcher Law Offices P.O. Box 248 Burley, ID 83318 *** service by electronic mail only wkf@pmt.org	Kathleen Carr U.S. Dept. Interior, Office of Solicitor Pacific Northwest Region, Boise 960 Broadway, Ste. 400 Boise, ID 83706 *** service by electronic mail only kathleenmarion.carr@sol.doi.gov	Candice McHugh Chris M. Bromley McHugh Bromley, PLLC 380 South 4th Street, Ste. 103 Boise, ID 83702 *** service by electronic mail only cbromley@mchughbromley.com cmchugh@mchughbromley.com

Robert E. Williams Williams, Meservy & Lothspeich, LLP P.O. Box 168 Jerome, ID 83338 *** service by electronic mail only rewilliams@wmlattys.com	Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC P.O. Box 50130 Idaho Falls, ID 83405 *** service by electronic mail only rharris@holdenlegal.com	Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 *** service by electronic mail only rfife@idahofallsidaho.gov
Skyler Johns Steven Taggart Nathan Olsen Olsen Taggart PLLC P.O. Box 3005 Idaho Falls, ID 83403 *** service by electronic mail only sjohns@olsentaggart.com staggart@olsentaggart.com nolsen@olsentaggart.com	Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, ID 83440 *** service by electronic mail only dylan@dylanandersonlaw.com	

Jessica Nielsen
Assistant for Travis L. Thompson

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING IGWA'S PETITION FOR REVIEW**

BACKGROUND

On July 20, 2023, the Director issued his *Notice that Questions Concerning the Sufficiency of IGWA's Mitigation Notices are Moot* ("Notice"). The Notice concluded that questions concerning the sufficiency of IGWA's mitigation notices are moot, therefore, the Department would not respond to *IGWA's Petition for Reconsideration of Order Determining Deficiency in IGWA's Notice of Secured Water*, filed June 6, 2023, or *IGWA's Amended Notice of Mitigation*, filed June 1, 2023.

On August 3, 2023, the Department received *IGWA's Petition for Reconsideration* ("Petition"). The Petition seeks reconsideration of the Department's Notice, specifically, it asks the Department to "find that the 2009 Storage Water Mitigation Plan does not require payment of Water District 01 fees at the time of the notice of mitigation." *Petition* at 4.

ANALYSIS

The Department's Notice was not issued as a recommended, preliminary, or final order, as defined in the Department's Rules of Procedure 720, 730, or 740, IDAPA 37.01.01. Therefore, the Notice is not subject to a petition for reconsideration. The Department will treat IGWA's Petition as a petition to review an interlocutory order, in accordance with IDAPA 37.01.01.711.[1]

IGWA argues that exceptions to the mootness doctrine apply to the Water District 01 fees question and asks the Director to address the Water District 01 fees now. *Petition* at 4. IGWA argues that

> A ruling on a moot issue may be made when: (1) "there is the possibility of collateral legal consequences imposed on the person raising the issue;" (2) "the challenged conduct is likely to evade judicial review and thus is capable of

[1] IDAPA 37.01.01.711 states in part: "[a]ny party or person affected by an interlocutory order may petition the presiding officer to review the interlocutory order."

repetition;" and (3) "an otherwise moot issue raises concerns of substantial public interest." *Wylie v. State, Idaho Transp. Bd.*, 151 Idaho 26, 31-32, 253 P.3d 700, 705-06 (2011); *Stephen v. Sallaz & Gatewood, Chtd.*, 150 Idaho 521, 528, 248 P.3d 1256, 1263 (2011). Here, all three exceptions are met. This petition addresses exceptions 2 and 3 as they have the most obvious application.

Id. at 2.

The Director disagrees that the issue is likely to evade judicial review in the future. IGWA argues that its "objection to the new fee payment requirement is rendered moot every time a new As-Applied Order is issued." *Id*. at 3. This is not correct. In this season, the issue was rendered moot because a mid-season order determined that there was no longer an obligation. There is no guarantee that future mid-season orders will result in a determination that there is no longer an obligation. Thus, the issue is not likely to evade judicial review.

With regards to the substantial public interest exception, the Director declines to exercise this exception because there is no substantial interest in having the issue decided now. The subject matter is not likely to evade judicial review and a presiding officer can decline to exercise this exception where the matter will not escape judicial review. *See Freeman v. Idaho Dep't of Correction*, 138 Idaho 872, 877, 71 P.3d 471, 476 (Ct. App. 2003) ("Further, even if Freeman's allegation of constitutional violations involving inmates' meaningful court access issue were deemed to be of substantial public interest, the number of such claims that reach the courts render it unlikely that recurrences of denied meaningful court access will escape judicial review.")

ORDER

IT IS HEREBY ORDERED that the Director DENIES *IGWA's Petition for Reconsideration*.

DATED this 23rd day of August 2023.

GARY SPACKMAN
Director

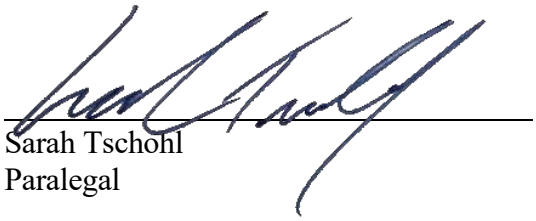
CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 23rd day of August 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
COURTESY COPY TO: Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

COURTESY COPY TO: Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email



Sarah Tschohl
Paralegal

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING REQUEST FOR HEARING AND MOTION AUTHORIZING DISCOVERY**

BACKGROUND

On June 6–9, 2023 a hearing was held on the Department's April 21, 2023 *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order"). On July 19, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Post-Hearing Order Regarding Fifth Amended Methodology Order* ("Post-Hearing Order") and *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Sixth Methodology Order"). The Sixth Methodology Order corrects data in the Department's Fifth Methodology Order found to be in error during the hearing held in this matter. The Sixth Methodology Order, like the Fifth Methodology Order, comprises nine steps to determine material injury to members of the Surface Water Coalition ("SWC").

On August 3, 2023, the Department received the *City of Pocatello's, City of Idaho Falls', and Coalition of Cities' Request for Hearing and Order Authorizing Discovery* ("Request for Hearing and Discovery"). The Request for Hearing and Discovery asks the Director to hold a status conference to schedule a four-day hearing, pursuant to Idaho Code § 42-1701(A)(3), on the Sixth Methodology Order and for an order authorizing discovery, pursuant to IDAPA 37.01.01.521. *Request for Hearing and Discovery* at 2–3. Four issues for hearing are identified in the Request for Hearing and Discovery:

> a) Whether the members of the Surface Water Coalition ("SWC") operate reasonably and without waste;
>
> b) Whether the irrigated acreage numbers for the SWC members in the Sixth Methodology Order are accurate;
>
> c) Whether the number of acres irrigated with supplemental groundwater rights within the service areas of the SWC members can be accurately determined; [and]

d) Whether the number of acres irrigated with enlargement rights within the service areas of the SWC members can be accurately determined[.]

Id. at 2.

On August 22, 2023, the Department received the *Surface Water Coalition's Response to Cities' Request for Hearing and Order Authorizing Discovery* ("SWC's Response"). The SWC's Response requests the Director "deny or limit the Cities' request for hearing and an order authorizing discovery . . . ." *SWC's Response* at 7.

ANALYSIS AND CONCLUSIONS OF LAW

A. Request for hearing.

Idaho Code § 42-1701A(3) states in relevant part:

> Unless the right to a hearing before the director . . . is otherwise provided in by statute, any person aggrieved by any action of the director, including any decision, determination, order or other action . . . who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action.

I.C. § 42-1701A(3) (emphasis added). The parties have previously been afforded an opportunity for hearing on the issues identified related to the Sixth Methodology Order and are not entitled to a hearing pursuant to Idaho Code § 42-1701A(3).

Over the course of four days, the Director heard testimony regarding the Fifth Methodology Order, including testimony on the reasonableness of the SWC's efficiency and waste and the accuracy of the irrigated acreage numbers utilized. "Testimony at the hearing established that the SWC entities operated efficiently within the limits of their delivery system." *Post-Hearing Order* at 23. "The ground water users did not establish an alternative number of acres irrigated by clear and convincing evidence." *Id*. at 19. "The record in this matter . . . lacks sufficient evidence to justify a reduction of the total number of acres irrigated with surface water by SWC members." *Id*.

A hearing on the Fifth Methodology Order was held less than one month before the Request for Hearing and Discovery was filed. The Sixth Methodology Order was issued as a direct result of the hearing. While methodology orders in this matter are subject to review and revision as conditions and the best available science change, *see In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irrigation Dist.*, 155 Idaho 640, 653, 315 P.3d 828, 841 (2013), that review cannot reasonably be interpreted to equate to a right to a revolving door of administrative hearings. The Director therefore denies the request for hearing.[1]

[1] The Director emphasizes that this denial does not prevent the ground water users from presenting updated scientific information or data to the Director in the future. For example, if the ground water users prepare a new

B. Motion to Authorize Discovery.

The Request for Hearing and Discovery requests "an order authorizing discovery so that they can investigate SWC members' operations and obtain the information and data necessary to properly litigate the issues listed above." *Request for Hearing and Discovery* at 2–3. Because the Director is denying the request for hearing, the request to authorize discovery is moot. The Director therefore denies the request for discovery.

ORDER

IT IS HEREBY ORDERED that the *City of Pocatello's, City of Idaho Falls', and Coalition of Cities' Request for Hearing and Order Authorizing Discovery* is DENIED.

DATED this 23rd day of August 2023.

GARY SPACKMAN
Director

analysis of hardened acres within the boundary of a SWC member, this would be new information the Director may consider in the future.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 23rd day of August 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson Dylan Anderson Law PLLC P.O. Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
COURTESY COPY TO: Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

COURTESY COPY TO: Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER CURTAILING GROUND WATER RIGHTS JUNIOR TO OCTOBER 11, 1900**

The Director of the Idaho Department of Water Resources ("Department") finds, concludes, and orders as follows:

FINDINGS OF FACT

1. On July 19, 2023, the Director issued the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*").[1] The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC").[2]

2. On April 16, 2025, the Director issued his *Final Order Regarding April 2025 Forecast Supply (Methodology Steps 1–3)* ("*April Forecast Supply Order*"). The *April Forecast Supply Order* predicted an in-season demand shortfall ("IDS") to the SWC of 63,000 acre-feet for the 2025 irrigation season. *April Forecast Supply Order*, at 3. At that time, the only member of the SWC predicted to experience material injury during the 2025 irrigation season was Twin Falls Canal Company ("TFCC"). *Id* at 3–4.

3. As a result, the Director ordered that:

> On or before May 1, 2025, ground water users holding consumptive water rights bearing priority dates junior to August 28, 1955, within the Eastern Snake Plain Aquifer area of common ground water supply [("ESPA ACGWS")] shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate

[1] Shortly after the *Methodology Order* was issued, the Idaho Ground Water Appropriators, Inc. ("IGWA") and certain Idaho cities filed petitions for judicial review in Ada County (Nos. CV01-23-13173 and CV01-23-13238). IGWA's petition for judicial review is stayed until December 31, 2027. The cities' petition for judicial review is pending before the Idaho Supreme Court. The filing of a petition for judicial review does not stay the effectiveness of an order. I.C. § 67-5274. No party to the judicial review proceedings has requested a stay of the *Methodology Order*.

[2] The SWC is comprised of A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

> share of the predicted April IDS of 63,000 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

April Forecast Supply Order, at 6.

4. On May 16, 2025, the Director issued a *Final Order Curtailing Ground Water Rights Junior to August 28, 1955* ("*Curtailment Order*"). The Director ordered that:

> [E]ffective May 31, 2025, ground water users holding water rights bearing priority dates junior to August 28, 1955, within the ESPA ACGWS, and listed in Attachment A to this order, shall curtail/refrain from diversion and use of ground water pursuant to those water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

Curtailment Order, at 4.

5. On July 10, 2025, the Director issued the *Order Revising April 2025 Forecast Supply and Continuing May 16, 2025 Curtailment Order (Methodology Steps 5 & 6)* ("*July As-Applied Order*"), which applied steps 5 and 6 of the *Methodology Order*. The Director predicted a revised IDS of 75,300 acre-feet. *July As-Applied Order*, at 8. Once again, he found TFCC to be the only member of the SWC predicted to experience material injury during the 2025 irrigation season, with an estimated Time of Need of August 28, 2025. *Id*. at 8–9.

6. Consequently, the Director ordered that by "July 24, 2025, ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, within the [ESPA ACGWS] shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted IDS of 75,300 acre-feet in accordance with an approved mitigation plan." *Id.* at 12. He ordered that if such a junior ground water user cannot establish that they can mitigate for their proportionate share of the updated predicted IDS "in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user." *Id.* Additionally, the Director ordered "that the May 16, 2025 *Curtailment Order* remains in full force and effect." *Id*.

7. There are currently five approved mitigation plans in place responding to the SWC delivery call:

(1) Docket No. CM-MP-2010-001 for the benefit of the Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID");

(2) Docket No. CM-MP-2019-001 for the benefit of certain cities commonly referred to as the "Coalition of Cities";

(3) Docket No. CM-MP-2015-003 for the benefit of the A&B Irrigation District ("A&B");

(4) Docket No. CM-MP-2007-001 for the benefit of certain entities commonly referred to as the "Water Mitigation Coalition"; and

(5) Docket No. CM-MP-2024-003 for the benefit of certain ground water districts commonly referred to as the "Ground Water Districts."

8. In both the *April Forecast Supply Order* and *July As-Applied Order*, the Director concluded that due to the nature of the approved mitigation plans for SWID, the Coalition of Cities, the Water Mitigation Coalition, and the Ground Water Districts, these entities do not need to establish they can mitigate for their proportionate share of the predicted IDS. *April Forecast Supply Order*, at 5 n.8; *July As-Applied Order*, at 11 n.6.

9. However, in the *July As-Applied Order* the Director concluded that A&B must mitigate for its proportionate share of the predicted July IDS of 75,300 acre-feet and determined that A&B's proportionate share is 5,039 acre-feet. *July As-Applied Order*, at 11 n.6. Although, he did note that in response to the *April Forecast Supply Order*, A&B previously demonstrated that it "already secured 164 acre-feet of storage water for the 2025 irrigation season." *Id*.

10. On July 24, 2025, A&B and the other members of the SWC submitted a *Joint Motion for Order Approving 2025 Stipulation* ("*Joint Motion*"). The motion explains that A&B and the other members of the SWC entered into a stipulation, referred to as the "*2025 Stipulation*," to "define A&B's mitigation obligation for the 2025 irrigation season." *Joint Motion*, at 2. In the stipulation, which is included as Attachment A to the *Joint Motion*, A&B proposes to continue its ground water conversions projects and deliver 1,252 acre-feet of storage water to TFCC (the injured SWC member) in accordance with its approved mitigation plan. *2025 Stipulation*, at 2. A&B and the other members of the SWC request the Director approve the *2025 Stipulation* as "stipulated compliance with [A&B's] approved mitigation plan for the 2025 irrigation season." *Joint Motion*, at 2. In an order issued concurrently with this order, the Director issued his *Order Approving 2025 Stipulation as Compliance with Approved Mitigation Plan*.

CONCLUSIONS OF LAW

1. Idaho Code § 42-602 authorizes the Director to supervise water distribution within water districts:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director. The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

2. As explained above, by July 24, 2025, ground water users with consumptive water rights "junior to October 11, 1900, within the [ESPA ACGWS]" had to "establish, to the

satisfaction of the Director, that they can mitigate for their proportionate share of the predicted IDS of 75,300 acre-feet in accordance with an approved mitigation plan." *July As-Applied Order*, at 12. If a junior ground water user does not establish that they can mitigate for their proportionate share of the predicted July IDS "in accordance with an approved mitigation plan" the ground water user will be subject to this "order curtailing the junior-priority ground water user." *Id.*

3. Due to the nature of the approved mitigation plans for SWID, the Coalition of Cities, the Water Mitigation Coalition, and the Ground Water Districts, these entities do not need to establish that they can mitigate for their proportionate share of the predicted July IDS. Junior ground water users entitled to the protection of SWID, the Coalition of Cities, the Water Mitigation Coalition, and the Ground Water Districts mitigation plans continue to not be subject to curtailment during the 2025 irrigation season.

4. Under a separate order, the Director approved the *2025 Stipulation* between A&B and the other members of the SWC because it is consistent with A&B's approved mitigation plan in Docket No. CM-MP-2015-003. Accordingly, A&B's water rights will not be subject to curtailment during the 2025 irrigation season.

5. Consistent with the *July As-Applied Orde*r, Idaho Code § 42-602, and decisions of the courts, the Director must order curtailment of junior-priority ground water users that have not established they can mitigate in accordance with an approved mitigation plan. Junior-priority ground water users subject to curtailment are listed in the updated Attachments A to this order.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that effective July 25, 2025, ground water users holding water rights bearing priority dates junior to October 11, 1900, within the ESPA ACGWS, and listed in Attachment A to this order, shall curtail/refrain from diversion and use of ground water pursuant to those water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

IT IS FURTHER ORDERED that holders of ground water rights listed in Attachment A to this order, who were not previously listed in Attachment A to the May 16, 2025 *Curtailment Order*, may seek to participate in an approved mitigation plan through a ground water district and shall have fifteen days from the date of this order to join, solely for mitigation purposes, the ground water district situated nearest the lands to which the water rights are appurtenant. *See* H.B. 737a, 58th Leg., 2d Reg. Sess. (Idaho 2006) (*Act Relating to the Administration of Ground Water Rights Within the Eastern Snake River Plain*); *see also* I.C. § 42-5259. The water rights that have fifteen days to join a ground water district are identified in Attachment A.

IT IS FURTHER ORDERED that watermasters for the water districts within the ESPA ACGWS who regulate ground water are directed to review the water rights listed in Attachment A to this order and begin the curtailment process.

IT IS FURTHER ORDERED that this order shall apply to consumptive ground water rights, including but not limited to, agricultural, commercial, industrial, and municipal uses. This order excludes ground water rights used for *de minimis* domestic purposes where such domestic use is within the limits of the definition set forth in Idaho Code § 42-111 and ground water rights used for *de minimis* stock watering where such stock watering use is within the limits of the definitions set forth in Idaho Code § 42-1401A(11), pursuant to IDAPA 37.03.11.020.11.

Dated this 25th day of July 2025.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 25th day of July 2025, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP PO Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abigail Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com jnielsen@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Michael A. Kirkham City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 mkirkham@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
COURTESY COPY TO: Craig Chandler IDWR—Eastern Region craig.chandler@idwr.idaho.gov	☒ Email
COURTESY COPY TO: Corey Skinner IDWR—Southern Region corey.skinner@idwr.idaho.gov	☒ Email

COURTESY COPY TO: William A. Parsons PARSONS, LOVELAND, SHIRLEY & MILLER, LLP wparsons@pmt.org wparsons@magicvalley.law	☒ Email
COURTESY COPY TO: Jerry R. Rigby RIGBY, ANDRUS & RIGBY LAW, PLLC PO Box 250 Rexburg, ID 83440 jrigby@rex-law.com	☒ Email
COURTESY COPY TO: Andrew J. Waldera SAWTOOTH LAW OFFICES, PLLC 1101 W. River Street, Suite 110 Boise, Idaho 83702 andy@sawtoothlaw.com	☒ Email

Megan Jenkins
Executive Assistant to the Director

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to October 11, 1900
(highlighted rights have 15-days to join a ground water district)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
1523 LLC	35-14566	Decreed	11/3/1972	IRRIGATION	0.05	2.6	
288S 500W LLC	36-17158	Decreed	2/1/1961	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
4 BROS DAIRY INC	37-2622	Decreed	10/6/1959	IRRIGATION	1.39	80.0	
ADAMS, CHERYL L; ADAMS, H LYLE; ADAMS, RODDY L	37-7078	Decreed	10/12/1970	COMMERCIAL, STOCKWATER	0.06	0.0	
AEI CORP	29-8037	License	11/13/1990	DOMESTIC, INDUSTRIAL	0.06	0.0	
AGRICULTURAL SERVICES INC	35-8857	License	9/6/1989	COMMERCIAL	0.04	0.0	
AGUEDA, JOE E; AGUEDA, SANDRA	36-14860	Decreed	12/31/1942	DOMESTIC, STOCKWATER	0.09	0.0	
ALLEN, CECIL; ALLEN, FLORENCE I	31-7398	Decreed	6/16/1983	COMMERCIAL, DOMESTIC	0.06	0.0	
AMERICAN FALLS RESERVOIR DISTRICT #2	36-11120	Decreed	11/27/1962	DOMESTIC, IRRIGATION	0.07	1.5	
ANDERSON, SAM; ANDERSON, STACIE	25-7490	License	3/15/1989	COMMERCIAL	0.04	0.0	
ARKOOSH, BONNIE; ARKOOSH, MICHAEL A	37-4273	Decreed	1/1/1925	DOMESTIC, STOCKWATER	0.11	0.0	
ARKOOSH, BONNIE; ARKOOSH, MICHAEL A	37-4274	Decreed	1/1/1949	DOMESTIC, STOCKWATER	0.11	0.0	
ARNOLD FEED LOT INC	25-12634	Decreed	7/1/1930	COMMERCIAL	0.04	0.0	
ARTCO INC	22-7473	License	12/23/1983	INDUSTRIAL, IRRIGATION	0.84	17.0	
ATKINSON, ANDREW ; ATKINSON, MARY	29-13736	License	2/21/2006	DOMESTIC	0.08	0.0	
B & F DISTRIBUTING CO	25-7555	License	10/12/1989	COMMERCIAL	0.04	0.0	
BABEL, PAUL; HAMPTON, WALLACE; PARKS, FRED A	25-7083	License	1/28/1976	DOMESTIC	0.06	0.0	
BAGBY, JESSICA; BAGBY, NASH	45-14561	Decreed	6/1/1939	IRRIGATION	0.09	7.0	
BAH REXBURG AC PROPERTY LLC	22-11451	Decreed	8/31/1960	IRRIGATION	0.04	2.0	
BAISCH, ROBERT L	35-7481	License	2/21/1975	DOMESTIC	0.08	0.0	
BARBEN, GORDON E; SAMPSON, KEN	27-7025	License	4/2/1973	DOMESTIC	0.08	0.0	
BARNA, BASIL; SNARR, DELMAR; SNARR, MARGARET; SNARR, MERLAND E; SNARR, ROBERT B; SUMMERS, RON	35-12291	Decreed	6/1/1945	DOMESTIC	0.11	0.0	
BARRUS, KEITH; MINKS, ROY; PLOCK, STEPHEN R; SCHNEIDER, SCOT L	25-7080	Decreed	1/28/1976	DOMESTIC	0.11	0.0	
BASIC AMERICAN INC	22-13806	Decreed	6/30/1945	COMMERCIAL, DOMESTIC, STOCKWATER	0.38	0.0	
BASIC AMERICAN POTATO CO INC	35-12853	Decreed	12/31/1948	COMMERCIAL	1.52	0.0	
BASIC AMERICAN POTATO CO INC	35-12062	Decreed	12/31/1957	COMMERCIAL	1.00	0.0	
BATES, ROBERT W; BATES, SHARON H; WILKINS, ELMA; WILKINS, LLOYD	25-7357	Decreed	6/16/1983	DOMESTIC	0.06	0.0	
BEAN, BRENT	45-14562	Decreed	6/1/1939	IRRIGATION	0.03	2.0	
BECO CONSTRUCTION CO INC	25-10226	Decreed	8/27/1953	DOMESTIC	0.28	0.0	
BECO CONSTRUCTION CO INC	25-4114	Decreed	8/27/1953	DOMESTIC	0.33	0.0	
BENJAMIN FARMS LLC	36-16649	Decreed	1/1/1940	DOMESTIC, IRRIGATION	0.03	0.6	
BENNETT, UDO	29-13940	Decreed	10/3/1977	IRRIGATION	0.13	7.5	
BEORCHIA, MICHAEL; BEORCHIA, REVA	35-14830	Decreed	1/26/1962	IRRIGATION	0.02	2.3	
BETTENCOURT, LUIS M; BETTENCOURT, SHARON L	36-17137	Decreed	6/1/1946	IRRIGATION	0.18	9.0	
BEVAN, DONNA; BEVAN, THOMAS	35-14773	Decreed	4/27/1964	IRRIGATION	0.08	2.0	
BEYER, PATRICK	25-7313	Decreed	4/11/1983	DOMESTIC, IRRIGATION	0.05	0.7	
BIG FIVE WATER ASSN	25-7199	Decreed	7/24/1980	DOMESTIC	0.11	0.0	
BIG SKY DAIRY	37-12832	Decreed	5/31/1919	DOMESTIC, STOCKWATER	0.04	0.0	
BIG SKY DAIRY	37-12831	Decreed	1/1/1940	DOMESTIC, STOCKWATER	0.07	0.0	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
BIGGS, DONALD; BIGGS, HELEN ; BUSH, ROBERT; OCKERMAN, JOY ; WINGERT, JEAN M	25-7082	Decreed	1/28/1976	DOMESTIC	0.16	0.0	
BINGHAM COUNTY	35-14757	License	9/21/1989	COMMERCIAL	0.13	0.0	
BINGHAM INVESTMENTS	29-14017	Decreed	12/31/1953	IRRIGATION	0.55	42.1	
BINGHAM INVESTMENTS	29-14018	Decreed	12/31/1953	INDUSTRIAL	0.11	0.0	
BINGHAM, BOYD A; BINGHAM, SHERRY R	36-8425	License	6/23/1989	IRRIGATION	0.88	105.0	
BINGHAM, JENNIFER; BINGHAM, JOSEPH	37-23385	Decreed	11/30/1965	IRRIGATION	0.31	30.0	
BINGHAM, JENNIFER; BINGHAM, JOSEPH	37-23384	Decreed	2/4/1976	IRRIGATION	0.24	30.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2183D	Decreed	9/5/1950	IRRIGATION	1.73	156.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2202B	Decreed	8/9/1951	DOMESTIC, IRRIGATION	4.80	285.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2266	Decreed	10/9/1952	IRRIGATION	3.10	391.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2269G	Decreed	10/23/1952	IRRIGATION	4.35	391.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-12226	Decreed	4/1/1987	IRRIGATION	0.59	285.0	Yes
BIRD, WARREN A; FARNES, LYLE R; RICKS, RICHARD; TOMCHAK, TYE	25-7375	Decreed	6/29/1983	DOMESTIC	0.10	0.0	
BLACK, KENNETH S; BLACK, NINA E	45-12776	Decreed	10/30/1960	DOMESTIC, STOCKWATER	0.23	0.0	
BLACKER, LOVEL L; BLACKER, MARVIN L	45-14141	Decreed	7/19/1954	IRRIGATION	0.07	3.7	
BLAINE COUNTY SCHOOL DISTRICT #61	37-22931	Decreed	11/25/1962	IRRIGATION	0.05	2.3	
BLEDSOE, HELEN M; HACKMAN, ERNEST A	35-7916	License	9/16/1980	DOMESTIC	0.08	0.0	
BLUE SAGE PROPERTIES LLC	36-14759	Decreed	7/15/1955	DOMESTIC, STOCKWATER	0.04	0.0	
BOAM, LARRY J	25-4204	Decreed	1/4/1940	DOMESTIC, IRRIGATION, STOCKWATER	0.17	1.0	
BOISE PACKAGING & NEWSPRINT LLC	45-2568	Decreed	4/1/1958	DOMESTIC, FIRE PROTECTION FROM STORAGE, FIRE PROTECTION STORAGE, FIRE PROTECTION	0.09	0.0	
BOLINDER, CATHERINE L	27-7322	License	6/8/1982	DOMESTIC	0.06	0.0	
BONNIE BARTON BANDY IRREVOCABLE TRUST	36-17287	Decreed	5/14/1974	IRRIGATION	0.08	4.0	
BOOTJACK LTD PARTNERSHIP	37-10146	Decreed	1/1/1950	DOMESTIC, STOCKWATER	0.04	0.0	
BORAN , MICHAEL J	35-11390	Decreed	6/1/1941	FISH PROPAGATION	20.00	0.0	
BORAN , MICHAEL J	35-4271B	Decreed	6/1/1945	FISH PROPAGATION	50.00	0.0	
BORAN , MICHAEL J	35-8635B	Decreed	12/17/1986	FISH PROPAGATION	0.72	0.0	
BORAN , MICHAEL J	35-8782	License	5/23/1989	FISH PROPAGATION	4.64	0.0	
BOWDEN, CHEREE; BOWDEN, GUY	31-12543	Decreed	7/31/1930	IRRIGATION	0.05	7.2	
BOWDEN, CHEREE; BOWDEN, GUY	31-12541	Decreed	8/19/1931	IRRIGATION	0.06	7.2	
BOWDEN, CHEREE; BOWDEN, GUY	31-12540	Decreed	9/4/1947	IRRIGATION, STOCKWATER	0.03	7.2	
BOWEN, BRAD	25-12253	Decreed	12/17/1951	DOMESTIC, IRRIGATION	0.07	1.0	
BRAGA, BRYAN	34-14685	Decreed	12/31/1955	DOMESTIC, IRRIGATION	0.04	2.0	
BRAY, CLAUDETTE; CAREY, JUNE G	45-11902	Decreed	3/15/1934	IRRIGATION	0.08	2.7	
BRIGGS, DAVID L; BRIGGS, JEANIE K	25-7466	License	11/17/1988	COMMERCIAL	0.04	0.0	
BRINKMANN, GEORGE	35-8893	License	3/29/1990	COMMERCIAL	0.01	0.0	
BROADHEAD, LYNN	35-8765	License	5/23/1989	COMMERCIAL	0.05	0.0	
BROWN, HAROLD	31-7513	License	11/23/1988	COMMERCIAL, DOMESTIC	0.07	0.0	
BROWN, HEATHER; BROWN, WAYNE W	36-14878	Decreed	12/31/1956	DOMESTIC, STOCKWATER	0.06	0.0	

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BROWN, JAN A; BROWN, SID E; MOMBERGER, JESSE C	31-7510	License	11/14/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.11	2.0	
BROWN, KAMI; BROWN, SPENCER	31-12545	Decreed	6/1/1941	IRRIGATION	0.07	35.0	
BURDETTE INC	25-7532	License	9/20/1989	COMMERCIAL	0.04	0.0	
BURGESS SUBDIVISION WATER ASSN INC	25-7457	License	10/27/1988	DOMESTIC	0.11	0.0	
BURLEY IRRIGATION DISTRICT	45-10390	Decreed	6/19/1909	DOMESTIC	0.05	0.0	
BURNS CONCRETE INC	25-13982	License	12/18/2002	COMMERCIAL	3.53	0.0	
BURNS, KIRK E; SZIMHARDT, LINDA J	25-7426	License	6/6/1988	IRRIGATION	0.08	5.6	
BURRELL, GEORGE W; BURRELL, LURANA J; KEETCH, SHYANN; KEETCH, STETSON	29-13900	License	4/3/2009	DOMESTIC	0.08	0.0	
BURRUP, JOHN R; BURRUP, JON R	25-13085	Decreed	7/6/1958	COMMERCIAL, STOCKWATER	0.12	0.0	
BURT, DEBRA L; LIVERMORE, SEAN	25-14531	Decreed	8/1/1975	IRRIGATION	0.10	5.0	
CALLEN JR, JERRY R; CALLEN, PATRICIA	36-14326	Decreed	7/15/1919	DOMESTIC, STOCKWATER	0.04	0.0	
CALLEN JR, JERRY R; CALLEN, PATRICIA	36-15514	Decreed	9/30/1919	STOCKWATER	0.03	0.0	
CAMPBELL, ALTA	25-4136	Decreed	6/1/1955	IRRIGATION	0.02	0.3	
CANNERS SEED CORP	25-7449	License	10/13/1988	COMMERCIAL, DOMESTIC	0.04	0.0	
CANNON SHELLEY PROPERTY LTD PARTNERSHIP	27-12235	Decreed	8/19/1952	COMMERCIAL, STOCKWATER	0.43	0.0	
CARPENTER, BARBARA; CARPENTER, MAURICE	25-7193B	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	
CARRENO, OSCAR	36-15669	Decreed	2/18/1971	COMMERCIAL, STOCKWATER	0.02	0.0	
CARRENO, OSCAR	36-16240	Decreed	1/7/1974	COMMERCIAL, STOCKWATER	0.01	0.0	
CARSTENS, JULIUS M J	25-7481	License	12/22/1988	IRRIGATION	0.04	1.4	
CASA DEL NORTE LP	37-7081	Decreed	12/8/1970	IRRIGATION	1.67	840.0	
CASSIDY, FRANCIS J; HOFFMAN, RICHARD P; MEYER, DAVID DANIEL; MEYER, JENNY CLUFF; TANNER, TOMMY C	25-7638	License	4/25/1995	DOMESTIC	0.10	0.0	
CASTLE CONCRETE CO INC	27-10010	Decreed	6/20/1952	INDUSTRIAL	0.08	0.0	
CASTRO JR, VICENTE; CASTRO, PATRICIA	36-17297	Decreed	2/4/1976	IRRIGATION	0.06	3.1	
CEYNAR, MARCENE; FANN, LAVEDA A; FANN, R E; FARNSWORTH, BETH; FARNSWORTH, JAY; PICKERING, CRAIG; PICKERING, VICKY	25-7272	Decreed	2/4/1982	DOMESTIC	0.10	0.0	
CHALLENGER PALLET & SUPPLY	25-7451	License	12/1/1988	COMMERCIAL	0.04	0.0	
CHAMBERS, BOYD; HARRIS, JAMES; HARRIS, MARI; LOREN, RICHAN; STUEVE, KENNETH; SWEARINGER, ALDON; WADE, BILL	25-4210	Decreed	3/21/1960	DOMESTIC, IRRIGATION	0.19	2.4	
CHAMBERS, RALEIGH R	25-7343	License	6/27/1983	DOMESTIC	0.06	0.0	
CHAPMAN, GARY RAY; CHAPMAN, REBECCA LYNN	22-14405	Decreed	4/22/1979	IRRIGATION	0.04	2.0	
CHENEY, TAMARA	25-14466	Decreed	6/2/1931	IRRIGATION	0.01	0.5	
CHERRY, MARY ANN; CHERRY, ROBERT	25-14402	Decreed	7/19/1973	IRRIGATION	0.02	1.2	
CHRISTENSEN, ADAM W; NELSON, DIANE K	37-23133	Decreed	9/20/1974	IRRIGATION	0.02	0.8	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	25-14347	Decreed	8/19/1952	IRRIGATION	0.05	3.1	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	25-14348	Decreed	8/19/1952	IRRIGATION	0.04	2.5	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	25-14349	Decreed	8/19/1952	IRRIGATION	0.03	5.4	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	25-14350	Decreed	8/19/1952	IRRIGATION	0.04	2.6	
CITY OF BUTTE CITY	34-4028	Decreed	5/10/1952	FIRE PROTECTION, MUNICIPAL	0.23	0.0	
CITY OF BUTTE CITY	34-4027	Decreed	6/20/1960	FIRE PROTECTION, MUNICIPAL	0.23	0.0	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
CITY OF DUBOIS	31-10002	Decreed	1/1/1921	MUNICIPAL	0.78	0.0	
CITY OF DUBOIS	31-7011	Decreed	5/29/1968	MUNICIPAL	1.35	0.0	
CITY OF DUBOIS; UNION PACIFIC RAILROAD CO	31-10001	Decreed	2/16/1903	MUNICIPAL	0.33	0.0	
CITY OF MINIDOKA	36-15504	Decreed	9/1/1905	MUNICIPAL	0.53	0.0	
CITY OF MUD LAKE	31-10379	Decreed	2/7/1956	MUNICIPAL	1.00	0.0	
CITY OF MUD LAKE	31-7146	Decreed	11/15/1974	FIRE PROTECTION, MUNICIPAL	2.23	0.0	
CLARK, ELLEN	45-12773	Decreed	7/15/1952	DOMESTIC, IRRIGATION	0.14	3.4	
CLAYSON, CASEY; CLAYSON, SHANE	45-7496	Decreed	1/27/1982	DOMESTIC, IRRIGATION	0.06	0.7	
CLIMER, KATHY	35-14879	Decreed	12/10/1948	IRRIGATION	0.20	10.0	
CLINGER, ILA; CLINGER, LELAND	29-2267A	Decreed	10/16/1949	DOMESTIC	0.08	0.0	
CLOSE, ROBERT; CLOSE, SALLY	25-11547	Decreed	1/31/1959	DOMESTIC, IRRIGATION	0.07	1.0	
COMMUNITY WELL PROJECT; VAUGHN, BILL	25-4103	Decreed	12/31/1958	DOMESTIC	0.11	0.0	
COOK, CHARLES S; COOK, JUDITH; SORENSEN, BARRY	35-10512	Decreed	6/15/1952	COMMERCIAL, DOMESTIC, STOCKWATER	0.11	0.0	
COOK, DANNY; COOK, DARRELL L	35-7979	License	5/5/1981	DOMESTIC	0.06	0.0	
COOK, DONALD J	35-7362	License	12/27/1973	DOMESTIC, STOCKWATER	0.05	0.0	
COOK, JESSICA; COOK, STEVEN MATTHEW	45-14570	Decreed	6/1/1939	IRRIGATION	0.09	7.5	
COOK, STEVEN MATTHEW; COOK, TRISTA	45-14571	Decreed	6/1/1939	IRRIGATION	0.06	4.5	
CORDES, RONALD A	25-7488	License	2/14/1989	DOMESTIC, IRRIGATION	0.10	3.0	
CORDON TRAILER COURT	25-10195	Decreed	3/11/1960	COMMERCIAL	0.13	0.0	
CORP OF THE PRESIDING BISHOP	25-4237	Decreed	5/8/1935	DOMESTIC	0.16	0.0	
CORP OF THE PRESIDING BISHOP	25-4200	Decreed	1/1/1951	DOMESTIC, IRRIGATION	0.07	0.6	
CORP OF THE PRESIDING BISHOP	22-12780	Decreed	10/1/1953	DOMESTIC, IRRIGATION	0.07	2.4	
COUNTRY CLUB WATER	25-14447	Decreed	1/27/1976	IRRIGATION	0.03	18.7	
COUNTRY CLUB WATER	25-14448	Decreed	10/31/1986	IRRIGATION	0.01	18.7	Yes
COUNTRY LIFE ESTATES WATER USERS ASSN	25-7033	Decreed	3/27/1973	DOMESTIC	0.20	0.0	
COUNTRY LIFE ESTATES WATER USERS ASSN	25-7046	Decreed	3/8/1974	DOMESTIC	0.73	0.0	
COUNTY OF JEFFERSON	25-13985	License	5/13/2003	RECREATION STORAGE	0.00	0.0	
COUNTY OF JEROME AIRPORT	36-14477	Decreed	1/13/1954	COMMERCIAL, DOMESTIC	0.08	0.0	
COX, CHAD; COX, STACY	29-14511	Decreed	12/28/1948	IRRIGATION	0.05	2.5	
CRANDALL, JEFF; CRANDALL, SUSAN	35-8658	License	11/2/1985	DOMESTIC	0.06	0.0	
CRANE, CALVIN C	45-7303	Decreed	5/10/1977	IRRIGATION, STOCKWATER	1.28	62.0	
CRANE, JIM; CRANE, SHERRIE	45-14564	Decreed	6/1/1939	IRRIGATION	0.05	3.5	
CRANE, KARI L; CRANE, TROY W	45-4067B	Decreed	8/1/1962	IRRIGATION	1.46	73.0	
CRARY INDUSTRIES INC	36-11369	Decreed	8/20/1959	COMMERCIAL	0.03	0.0	
CRESPO TRUCKING INC	37-8355	License	8/9/1988	COMMERCIAL, DOMESTIC	0.04	0.0	
CRM CO	25-7554	License	9/8/1989	COMMERCIAL	0.04	0.0	
CROMWELL, VERNAL D	25-7446	License	10/21/1988	DOMESTIC	0.06	0.0	
CRONQUIST, CAMERON; CRONQUIST, LORI	35-14895	Decreed	8/19/1977	IRRIGATION	0.09	5.0	
CROP PRODUCTION SERVICES	25-4250	Decreed	3/8/1963	COMMERCIAL	0.10	0.0	

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CROP PRODUCTION SERVICES	27-7371	Decreed	6/29/1983	COMMERCIAL	0.04	0.0	
CROP PRODUCTION SERVICES	35-8627	Decreed	4/4/1989	COMMERCIAL	0.16	0.0	
CROTTS, RICHARD S; MC CONNELL, FRANCES L	37-23627	Decreed	9/20/1974	IRRIGATION	0.08	6.4	
CROWN OF LIFE LUTHERAN CHURCH	25-7434	License	8/30/1988	COMMERCIAL	0.04	0.0	
CRUMLEY, DUSTIN R; CRUMLEY, FELICIA	35-14875	Decreed	4/1/1951	IRRIGATION	0.07	5.0	
CRUMRINE, ERIC R; CRUMRINE, SAMANTHA MARIE	36-11149	Decreed	5/20/1965	DOMESTIC, STOCKWATER	0.04	0.0	
CS PROPERTY DEVELOPMENT LLC	36-16189	Decreed	8/10/1973	IRRIGATION	0.04	3.0	
D & M WATER ASSN	29-7281	Decreed	8/4/1975	DOMESTIC	0.26	0.0	
D & M WATER ASSN	29-7367	Decreed	2/7/1977	DOMESTIC	0.40	0.0	
DALTON, DOUG	29-7858	License	2/22/1989	COMMERCIAL	0.08	0.0	
DANCE, DAVID P; DANCE, KARAN D	35-8822	License	7/3/1989	COMMERCIAL	0.01	0.0	
DANCING DRAGONFLY LLC	25-4165	Decreed	6/19/1959	DOMESTIC, IRRIGATION	0.16	2.0	
DANIEL, BRENDA	25-7447	License	10/25/1988	IRRIGATION	0.02	1.0	
DANIEL, BRENDA; DANIEL, DAVID S	25-7261	Decreed	10/8/1981	DOMESTIC, IRRIGATION, STOCKWATER	0.04	2.0	
DANIEL, MELVIN R JR	25-7538	License	9/19/1989	COMMERCIAL	0.07	0.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14588	Decreed	12/31/1940	IRRIGATION	0.16	15.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14587	Decreed	3/5/1948	IRRIGATION	0.11	15.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14589	Decreed	9/28/1981	IRRIGATION	0.01	15.0	
DAVENPORT, KENDALL E; DAVENPORT, YOLANDA L	22-10395	Decreed	4/1/1947	DOMESTIC, IRRIGATION	0.06	1.1	
DAVIS, ERNIE; DAVIS, RHONDA	35-8814	License	9/5/1989	COMMERCIAL	0.04	0.0	
DAVISON, NANCY; DAVISON, RANDY LEE	25-7017A	Decreed	3/20/1972	IRRIGATION	0.42	21.0	
DE GIULIO RANCHES INC	35-10346	Decreed	6/1/1901	DOMESTIC, STOCKWATER	0.09	0.0	
DE MOSS, GARY A; DE MOSS, HELEN	37-22168	Decreed	9/20/1974	IRRIGATION, STOCKWATER	1.61	802.0	
DE MOTT, WILLIAM J; GROVER, LA VAR; RIGBY, WILLIAM F	25-7537	License	9/20/1989	COMMERCIAL	0.08	0.0	
DE VRIES, KRISTY; DE VRIES, WIETZE	45-14556	Decreed	3/10/1960	COMMERCIAL	0.10	0.0	
DE VRIES, KRISTY; DE VRIES, WIETZE	45-14557	Decreed	12/8/1981	COMMERCIAL	0.06	0.0	
DEAN, DONALD K; DEAN, LINDA J	45-11743	Decreed	9/30/1949	IRRIGATION	0.02	0.7	
DECKER, JENNY	25-10609	Decreed	6/30/1940	DOMESTIC, IRRIGATION	0.14	5.0	
DEES, ELDON G; DEES, KATHALINE; DEES, RONALD K; DEES, SHIRLEY	25-7351	Decreed	6/24/1983	DOMESTIC, STOCKWATER	0.06	0.0	
DERBYHAWK LLC	25-7553	License	9/27/1989	DOMESTIC	0.11	0.0	
DIAMOND A LIVESTOCK INC	37-21492	Decreed	6/1/1971	COMMERCIAL	0.04	0.0	
DIETRICH SCHOOL DISTRICT #314	37-4317	Decreed	8/1/1935	DOMESTIC	0.09	0.0	
DILWORTH, ALMA L; DILWORTH, THOMAS R	37-10029	Decreed	1/1/1917	DOMESTIC	0.05	0.0	
DIXON, ANNIE; JAHN, ROBERT	35-7823	License	11/22/1978	DOMESTIC, STOCKWATER	0.05	0.0	
DOMINICK, TERESA	25-7073F	Decreed	8/1/1975	IRRIGATION	0.10	5.0	
DOUG ANDRUS DISTRIBUTING INC	35-12529	Decreed	1/1/1950	COMMERCIAL	0.18	0.0	
DOWNS, LONNIE W	45-11932	Decreed	5/25/1953	COMMERCIAL	0.01	0.0	
DREW, STAN	29-8237	License	4/17/2000	DOMESTIC	0.11	0.0	
DUFFY & CONNIE ENTERPRISES LLC	22-7605	License	10/19/1988	COMMERCIAL	0.02	0.0	

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E Z LIVIN TRAILER COURT	45-10479	Decreed	12/31/1958	COMMERCIAL	0.20	0.0	
EAMES, LINDA J	25-7643	License	12/4/1995	DOMESTIC	0.18	0.0	
EAST FAIRVIEW WATER WELL CO	25-12791	Decreed	4/1/1961	DOMESTIC	0.11	0.0	
EAST RIVER COMMONS HOME OWNER ASSN	25-7143	Decreed	3/12/1978	DOMESTIC	0.16	0.0	
EDEN, GARY; EDEN, GLENNA R	37-10188	Decreed	1/1/1944	DOMESTIC, STOCKWATER	0.04	0.0	
EDSTROM CONSTRUCTION PROPERTIES LLP	22-14542	Permit	3/27/2023	INDUSTRIAL STORAGE, INDUSTRIAL, RECREATION STORAGE	4.00	0.0	
EGANS GREEN HOUSE	25-7433	License	7/25/1988	COMMERCIAL	0.04	0.0	
ELDREDGE, DALE C; ELDREDGE, RENEE J	37-10142	Decreed	5/1/1951	COMMERCIAL, DOMESTIC, STOCKWATER	0.08	0.0	
ELK RIDGE RV LLC	36-17282	Decreed	2/2/1954	COMMERCIAL	0.11	0.0	
ELK RIDGE RV LLC	36-17283	Decreed	3/1/1975	COMMERCIAL	0.03	0.0	Yes
ESKELSON, BRANDON	35-14508	Decreed	5/1/1959	DOMESTIC, IRRIGATION	0.05	2.0	
EVANS GRAIN & ELEVATOR CO	35-8848	License	11/6/1989	COMMERCIAL	0.04	0.0	
FALL RIVER TRADING POST	21-7412	License	3/1/1989	COMMERCIAL, DOMESTIC	0.04	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2262	Decreed	1/24/1946	IRRIGATION	2.00	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2267	Decreed	10/16/1949	IRRIGATION	0.44	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2288	Decreed	5/19/1950	IRRIGATION	2.00	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13388	Decreed	6/18/1950	IRRIGATION	2.30	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13389	Decreed	6/18/1950	IRRIGATION	0.21	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2306	Decreed	7/2/1951	IRRIGATION	2.80	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2307	Decreed	7/2/1951	IRRIGATION	2.00	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13426	Decreed	1/15/1952	IRRIGATION	2.02	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13427	Decreed	1/15/1952	IRRIGATION	0.73	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2614	Decreed	2/16/1953	IRRIGATION	1.52	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2341	Decreed	10/29/1953	IRRIGATION	2.00	0.0	
FALLS WATER CO INC	25-14383	Decreed	8/19/1952	IRRIGATION	0.08	77.5	
FALLS WATER CO INC	25-14385	Decreed	8/19/1952	IRRIGATION	0.05	77.5	
FALLS WATER CO INC	25-14442	Decreed	10/28/1953	IRRIGATION	0.07	13.0	
FANNING, DAWN	29-2344D	Decreed	12/31/1953	IRRIGATION	0.04	3.0	
FARMERS MERCHANT INC	35-7723	Decreed	7/4/1977	DOMESTIC, INDUSTRIAL	0.04	0.0	
FAULKNER LAND & LIVESTOCK CO INC	37-10597	Decreed	12/31/1949	DOMESTIC, STOCKWATER	0.17	0.0	
FEATHERSTON, SHIRLEY K	35-10999	Decreed	12/31/1927	DOMESTIC, IRRIGATION, STOCKWATER	0.10	1.3	
FEHRINGER, MARTIN	29-14051	Decreed	2/23/1966	IRRIGATION	0.02	1.5	
FELD, TODD	35-13284	Decreed	2/23/1972	COMMERCIAL, STOCKWATER	0.30	0.0	
FERGUSON, JEANINE; FERGUSON, LARRY G	25-10022	Decreed	12/31/1937	DOMESTIC, IRRIGATION, STOCKWATER	0.14	1.0	
FERGUSON, ROGER N	21-7385	License	9/30/1988	COMMERCIAL	0.04	0.0	
FIELDS, KAREN C; FIELDS, VIRGIL	37-7699	Decreed	2/23/1978	DOMESTIC, STOCKWATER	0.20	0.0	
FMC IDAHO LLC	29-2255C	Decreed	5/22/1939	INDUSTRIAL	0.64	0.0	
FMC IDAHO LLC	29-2255E	Decreed	9/16/1949	IRRIGATION	0.04	2.0	
FMC IDAHO LLC	29-11342	Decreed	9/1/1953	MUNICIPAL	1.10	0.0	

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FOSTER FAMILY FARMS INC	35-8773	License	6/7/1989	COMMERCIAL, DOMESTIC	0.04	0.0	
FOSTER FAMILY FARMS INC	35-8774	License	6/20/1989	COMMERCIAL	0.04	0.0	
FOUR SEASONS WATER CO	27-7351	License	4/20/1983	DOMESTIC	0.29	0.0	
FOUR SQUARE WATER WELL CORP	25-7327	Decreed	2/4/1985	DOMESTIC, IRRIGATION	0.16	3.0	
FOWLER, GARY L; SOMSEN, DIANNE L; SOMSEN, G FRANK; SOMSEN, KRISTINE P; SOMSEN-FOWLER, SARA D	45-13574	Decreed	4/28/1954	IRRIGATION	0.49	321.0	
FOWLER, GARY L; SOMSEN, DIANNE L; SOMSEN, G FRANK; SOMSEN, KRISTINE P; SOMSEN-FOWLER, SARA D	45-2491	Decreed	3/25/1955	IRRIGATION	3.14	321.0	
FRANKLIN DON WIXOM & ZOE FAR WIXOM FAMILY TRUST	45-10575	Decreed	3/15/1939	IRRIGATION, STOCKWATER	0.10	5.0	
FREMONT COUNTY	22-4015	Decreed	4/1/1962	INDUSTRIAL	0.33	0.0	
FULLMER, APRIL; FULLMER, NICHOLAS	25-4106	Decreed	4/1/1959	IRRIGATION	0.05	1.7	
FUNK, LEROY; FUNK, RONDA	45-2672	Decreed	10/26/1961	IRRIGATION	1.00	71.0	
GARDNER FARMS	35-14829	Decreed	6/30/1950	COMMERCIAL, STOCKWATER	0.86	0.0	
GARDNER FARMS	35-14825	Decreed	6/4/1954	IRRIGATION	0.20	320.0	
GARY & PAMELA ROGERS FAMILY TRUST	34-7118B	Decreed	11/24/1975	IRRIGATION	8.81	440.0	
GENERAL MILLS OPERATIONS INC	35-2857B	Decreed	1/16/1967	INDUSTRIAL	0.23	0.0	
GERRATT, LARRY	45-2180	Decreed	10/13/1934	IRRIGATION	2.00	151.0	
GERRATT, LARRY	45-11613	Decreed	7/22/1955	IRRIGATION	0.60	151.0	
GILLEN, NORMAN	27-7585	License	4/20/1999	DOMESTIC	0.14	0.0	
GLEN CAPPS INC	36-8176	Decreed	3/31/1983	COMMERCIAL, DOMESTIC	0.04	0.0	
GO LLC	27-12180	Decreed	9/30/1905	COMMERCIAL, INDUSTRIAL	0.76	0.0	
GOLDEN VALLEY MEAT LLC	35-7642	Decreed	10/1/1976	COMMERCIAL	0.05	0.0	
GOLDEN VALLEY MEAT LLC	35-8710	License	3/8/1989	COMMERCIAL	0.94	0.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7238	Decreed	10/31/1974	DOMESTIC, IRRIGATION	0.11	8.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7984	Decreed	4/23/1990	IRRIGATION	0.03	8.0	
GONZALEZ, LAURA; ORTIZ, JULIO	29-14346	Decreed	12/16/1963	IRRIGATION	0.03	2.0	
GOOCH, BEATRICE; GOOCH, ELLIS	37-21156	Decreed	2/18/1971	COMMERCIAL, STOCKWATER	0.02	0.0	
GOUGH, SHAUN	37-23373	License	8/22/1988	IRRIGATION	0.03	1.5	
GRAFF, MICHAEL R	36-4206	Decreed	1/1/1952	DOMESTIC, IRRIGATION	0.04	2.0	
GRAVES, FRANCES M; GRAVES, RICHARD L	37-7371	Permit	7/31/1974	DOMESTIC, IRRIGATION, STOCKWATER	6.49	320.0	
GRAYBEAL, EMILY; GRAYBEAL, JASON	37-4052	Decreed	4/1/1962	DOMESTIC, IRRIGATION	0.08	1.4	
GRISENTI, CHEYANNA; GRISENTI, TYSON	36-17209	Decreed	6/21/1960	IRRIGATION	0.08	4.0	
GROVER, ALICE MAE; GROVER, MELVIN G	25-7480	License	1/9/1989	DOMESTIC, IRRIGATION, STOCKWATER	0.07	3.0	
GROVER, JACK H; GROVER, ROBERTA CAROL	35-10496	Decreed	4/1/1948	COMMERCIAL	0.02	0.0	
GUMMERSON, CHARLES E; GUMMERSON, REBECCA M	45-4033A	Decreed	8/1/1935	DOMESTIC, IRRIGATION, STOCKWATER	0.08	1.8	
GUNDERSON, ADEN	35-14176	Decreed	12/31/1940	IRRIGATION	0.21	20.0	
GUNDERSON, ADEN	35-14174	Decreed	3/5/1948	IRRIGATION	0.15	20.0	
GUNDERSON, ADEN	35-14178	Decreed	9/28/1981	IRRIGATION	0.01	20.0	
GUNDERSON, BONNIE; GUNDERSON, GARTH	35-14584	Decreed	12/31/1940	IRRIGATION	0.03	3.2	
GUNDERSON, BONNIE; GUNDERSON, GARTH	35-14583	Decreed	3/5/1948	IRRIGATION	0.02	3.2	

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GUNDERSON, BRENT G	35-4275B	Decreed	6/1/1938	IRRIGATION	0.08	5.7	
H & T PROPERTIES LLC	36-8312	License	8/15/1986	STOCKWATER	0.05	0.0	
HAFFNER, JOYCE; HAFFNER, WAYNE	36-16650	Decreed	1/1/1940	DOMESTIC, IRRIGATION	0.03	0.4	
HAMILTON LAND & LIVESTOCK	32-4049	Decreed	1/28/1926	DOMESTIC, IRRIGATION, STOCKWATER	0.15	1.0	
HAMMOND, LORNA O; THE SHELTERED TRUST	35-8016	License	1/18/1982	DOMESTIC, STOCKWATER	0.06	0.0	
HANCOCK, DEAN	25-14496	Decreed	4/22/1979	IRRIGATION	0.02	1.0	
HANSEN, WILLIAM KORBY	25-7458	License	11/8/1988	DOMESTIC, IRRIGATION	0.09	1.7	
HARDY, ANITA KAY	36-17152	Decreed	11/7/1974	IRRIGATION	0.63	31.5	
HAROLDSEN, G ERIC; HAROLDSEN, GRANT O	25-7300	Decreed	1/5/1983	DOMESTIC, STOCKWATER	0.06	0.0	
HARPER, DAVID; HARPER, HEATHER	35-14725	Decreed	12/31/1940	IRRIGATION	0.18	17.2	
HARPER, DAVID; HARPER, HEATHER	35-14722	Decreed	3/5/1948	IRRIGATION	0.12	17.2	
HARPER, DAVID; HARPER, HEATHER	35-14728	Decreed	9/28/1981	IRRIGATION	0.01	17.2	
HARRIS, BILL B	25-7489	License	2/23/1989	DOMESTIC, STOCKWATER	0.06	0.0	
HART, BOB; HART, MELANIE	25-7520	License	10/16/1989	COMMERCIAL	0.04	0.0	
HART, BOB; HART, NORMA; JOHNSTON, JACOB; JONES, ROBERT I; STIBAL, JOHN	25-7081	Decreed	1/28/1976	DOMESTIC	0.19	0.0	
HASLAM, LAVORE	35-8629	License	4/8/1986	DOMESTIC, STOCKWATER	0.06	0.0	
HAYES, AMY; HAYES, DESTRY	35-14638	Decreed	6/1/1938	IRRIGATION	0.04	3.3	
HAYES, AMY; HAYES, DESTRY	35-14639	Decreed	9/28/1981	IRRIGATION	0.02	3.3	
HEATH, AFTON M; HEATH, CLEM J	35-8617	Decreed	8/18/1985	COMMERCIAL	0.04	0.0	
HELENA CHEMICAL CO	22-7520	Decreed	11/7/1985	COMMERCIAL	0.02	0.0	
HELSLEY HENDRIX, JEANINE P; HELSLEY, BRIAN T	36-16561	Decreed	2/8/1971	IRRIGATION	0.03	3.0	
HENRIE, JAREM	25-7302	Decreed	1/25/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.05	2.0	
HENSLEY, FLOYD W; LOCKES, DAROLD; REYNOLDS, LYNN; WESSEL, TERESA	25-7084	Decreed	1/28/1976	DOMESTIC	0.06	0.0	
HERITAGE DEVELOPMENT	29-8173	License	7/19/1996	DOMESTIC	0.27	0.0	
HIGHWAY ESTATES WATER USERS INC	25-7038	Decreed	9/20/1973	DOMESTIC	0.20	0.0	
HIGLEY DEVELOPMENTS LLC	25-14444	Decreed	10/28/1953	IRRIGATION	0.05	2.8	
HILLSDALE HIGHWAY DISTRICT	45-13664	Decreed	4/28/1951	IRRIGATION	0.33	18.4	
HINCKLEY, LA PREAL	25-14005	License	10/12/2003	IRRIGATION	0.06	3.0	
HOBBS, LAURA LEE	25-7540	License	8/18/1989	DOMESTIC	0.10	0.0	
HOFFBUHR INVESTMENT CO LLC	45-13668	Decreed	4/28/1951	IRRIGATION	0.02	1.0	
HOLDAWAY, CHAD	31-4069	Decreed	12/31/1961	DOMESTIC, STOCKWATER	0.16	0.0	
HOLLY FARMS LTD	37-12380	Decreed	12/31/1920	DOMESTIC, STOCKWATER	0.23	0.0	
HONDO, AKIYE I; HONDO, DANIEL A	45-2664	Decreed	8/30/1961	IRRIGATION	2.00	157.0	
HOOPER, LLOYD C	25-7531	License	10/22/1989	COMMERCIAL	0.04	0.0	
HOPKINS PACKING CO	35-13636	Decreed	9/2/1911	COMMERCIAL, STOCKWATER	0.11	0.0	
HUETTIG, BRIAN J; HUETTIG, LARRY; HUETTIG, NANCY	36-16866	Decreed	1/8/1951	COMMERCIAL	0.03	0.0	
HUFF CREEK LLC	37-2676	Decreed	12/11/1961	IRRIGATION	1.85	450.4	
HULSE, BETTY J; HULSE, VERNON R	25-14185	Decreed	4/1/1903	IRRIGATION	0.06	2.0	
HULTS , JOSEPH; HULTS, KAY A	36-17221	Decreed	1/5/1966	IRRIGATION	1.41	100.4	

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HULTZ, JEAN ISLAY	35-4187	Decreed	7/1/1962	COMMERCIAL, DOMESTIC	0.06	0.0	
HUNSTMANS PROPERTIES	27-7511	License	4/20/1990	COMMERCIAL	0.33	0.0	
HURD, KENNETH L; HURD, PATRICIA L	37-10987	Decreed	1/1/1929	DOMESTIC	0.06	0.0	
ID DEPARTMENT OF LANDS	37-12535	Decreed	1/1/1962	COMMERCIAL	0.04	0.0	
ID DEPARTMENT OF LANDS	37-7372	License	6/30/1999	IRRIGATION, STOCKWATER	6.40	287.0	
ID DEPARTMENT OF PARKS AND RECREATION	41-7006	Decreed	5/20/1971	IRRIGATION	0.18	3.0	
ID DEPARTMENT OF PARKS AND RECREATION	36-17147	Decreed	8/7/1973	IRRIGATION	0.06	5.0	
ID DEPARTMENT OF TRANSPORTATION	25-2111	Decreed	1/28/1953	DOMESTIC	0.38	0.0	
ID DEPARTMENT OF TRANSPORTATION	36-15466	Decreed	10/1/1955	COMMERCIAL	0.04	0.0	
ID DEPARTMENT OF TRANSPORTATION	22-7317	Decreed	1/31/1980	COMMERCIAL, DOMESTIC	0.04	0.0	
ID DEPARTMENT OF TRANSPORTATION	31-7372	Decreed	1/28/1982	INDUSTRIAL	0.05	0.0	
ID DEPARTMENT OF TRANSPORTATION	35-8625	License	1/13/1986	DOMESTIC	0.06	0.0	
IDAHO FALLS COUNTRY CLUB INC	25-13372	Decreed	12/31/1961	COMMERCIAL, IRRIGATION	0.67	132.0	
IDAHO FALLS FARMS LLC	35-14677	Decreed	2/3/1953	IRRIGATION	5.08	1079.5	
IDAHO POTATO PACKERS CORP	35-8909	License	8/3/1990	COMMERCIAL	0.01	0.0	
INGREDION INC	25-4162	Decreed	6/30/1952	COMMERCIAL	0.86	0.0	
INTERSTATE MFG	36-8454	License	9/14/1989	COMMERCIAL	0.04	0.0	
IRELAND ACRES #2	25-7273	Decreed	2/1/1982	DOMESTIC	0.05	0.0	
IRELAND ACRES MOBILE HOME PARK	25-7195	Decreed	6/4/1980	DOMESTIC	0.54	0.0	
J & D PROPERTIES LLC	31-7511	License	11/30/1988	COMMERCIAL	0.03	0.0	
J & L HOLDINGS LLC	25-14481	Decreed	3/20/1959	IRRIGATION	0.03	2.5	
J & L HOLDINGS LLC	25-14509	Decreed	4/22/1979	IRRIGATION	0.04	2.0	
J D HEISKELL HOLDINGS LLC	37-22664	Decreed	8/19/1952	COMMERCIAL	0.01	0.0	
J R SIMPLOT CO	29-7036	Decreed	9/10/1969	DOMESTIC, INDUSTRIAL	0.03	0.0	
J T LAND LLC	36-15271	Decreed	7/10/1947	DOMESTIC, STOCKWATER	0.07	0.0	
JACOBS, GEORGE J	25-7321	License	5/9/1983	DOMESTIC, STOCKWATER	0.08	0.0	
JANSSEN, KARLEEN A	25-12143	Decreed	2/8/1985	COMMERCIAL	0.04	0.0	
JARVIS, WADE DEE	29-11410	Decreed	5/14/1960	DOMESTIC, IRRIGATION, STOCKWATER	0.08	1.2	
JEFFERSON SCHOOL DISTRICT #251	35-8683	License	12/2/1988	INDUSTRIAL	0.02	0.0	
JEFFERSON SCHOOL DISTRICT #251	25-7472	License	1/23/1989	DOMESTIC	0.07	0.0	
JENKINS, FRANK L	22-11197	Decreed	6/6/1980	COMMERCIAL, DOMESTIC	0.04	0.0	
JENKINS, JOEL	25-11303	Decreed	4/1/1930	COMMERCIAL	0.04	0.0	
JENSON, RONALD; JENSON, SHARON	25-10156	Decreed	10/1/1959	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.5	
JENTZSCH, RODNEY A	36-13599	Decreed	4/15/1956	COMMERCIAL, DOMESTIC	0.04	0.0	
JEROME CHEESE CO	35-14253	Decreed	8/19/1952	MITIGATION	0.06	0.0	
JEROME COUNTY ROD & GUN CLUB	36-8620	License	11/14/1991	COMMERCIAL, IRRIGATION	0.02	0.5	
JOHNSON, DON A; JOHNSON, LAURIE	25-7493	License	3/8/1989	DOMESTIC	0.06	0.0	
JOHNSON, MELISSA	25-7455	License	10/21/1988	DOMESTIC, IRRIGATION	0.07	1.0	
JOHNSON, RODNEY M; JOHNSON, SHERRY L	36-17277	Decreed	11/28/1977	IRRIGATION	0.04	2.0	

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
JONES, CLYDE R; JONES, HELEN	25-12037	Decreed	12/31/1948	IRRIGATION	0.11	5.4	
JOSEPHSON, JEANETTE; JOSEPHSON, JOHN	35-8719	License	4/14/1989	INDUSTRIAL	0.04	0.0	
JOURNEYS END HOMEOWNERS ASSN	35-13612	License	11/24/2003	DOMESTIC	0.40	0.0	
JOURNEYS END HOMEOWNERS ASSN	35-13611	License	1/13/2007	COMMERCIAL, DOMESTIC	0.11	0.0	
K & J HOLDING LLC	31-10737	Decreed	12/12/1948	COMMERCIAL, DOMESTIC, STOCKWATER	0.04	0.0	
K & M LAND COMPANY LLC	36-15028	Decreed	5/1/1910	DOMESTIC, STOCKWATER	0.06	0.0	
K & M LAND COMPANY LLC	36-16301	Decreed	6/11/1957	COMMERCIAL, STOCKWATER	0.02	0.0	
KAREY LANE WELL ASSN	35-7698	Decreed	8/11/1983	DOMESTIC	0.14	0.0	
KAREY LANE WELL ASSN	35-8943	License	5/3/1991	DOMESTIC	0.09	0.0	
KAY, JUSTINE; KAY, THOMAS F; LEVESQUE, GLENDA R	34-2484	Decreed	8/12/1966	IRRIGATION	0.01	2.0	
KEITH SKAAR FARMS INC	25-13312	Decreed	5/1/1962	COMMERCIAL	0.04	0.0	
KERBS OIL CO INC	45-7644	License	5/22/1989	COMMERCIAL	0.04	0.0	
KEYBANK NATIONAL ASSOC	25-7517	License	8/24/1989	COMMERCIAL	0.50	0.0	
KING, FERRIL; KING, RENE	36-8440	License	9/7/1989	COMMERCIAL	0.02	0.0	
KINGHORN, KAYLYNN; KINGHORN, LORAN; PARSONS, KARLA M; PARSONS, WILLIAM T	35-13441	Decreed	5/1/1960	COMMERCIAL	0.04	0.0	
KIRBY, DORIS F; KIRBY, ELWOOD	35-7860	License	6/20/1979	DOMESTIC	0.08	0.0	
KIT CIRCLE LLC	22-7296	Decreed	6/19/1979	DOMESTIC	0.16	0.0	
KITS FOUNDRY & MACHINE SHOP INC	27-7460	License	5/16/1989	DOMESTIC, INDUSTRIAL	0.05	0.0	
KLASSEN, HAROLD J	35-8724	License	4/10/1989	COMMERCIAL	0.02	0.0	
KLOEPFER INC	45-13665	Decreed	4/28/1951	IRRIGATION	0.42	24.0	
KOCH MATERIALS CO	35-12087	Decreed	5/1/1962	COMMERCIAL, FIRE PROTECTION, INDUSTRIAL	0.11	0.0	
KOON, JACK E	22-7751	License	9/18/1992	DOMESTIC	0.06	0.0	
KOYLE, JOHN DENNIS; KOYLE, SHANNA	37-2663	Decreed	5/31/1961	IRRIGATION	2.12	156.0	
KREMER, RUTH; KREMER, W B	25-12184	Decreed	6/1/1950	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.9	
KROGSTAD, RYAN	25-11545	Decreed	4/1/1927	DOMESTIC, IRRIGATION, STOCKWATER	0.06	0.7	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14727	Decreed	12/31/1940	IRRIGATION	0.02	2.4	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14724	Decreed	3/5/1948	IRRIGATION	0.02	2.4	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14730	Decreed	9/28/1981	IRRIGATION	0.01	2.4	
KUNZLER, KAREN; KUNZLER, WILLIAM JUNIOR	45-2375E	Decreed	4/28/1951	IRRIGATION	0.03	1.5	
L & S LAND HOLDINGS LLC	36-10098	Decreed	1/1/1935	DOMESTIC, STOCKWATER	0.05	0.0	
L & S LAND HOLDINGS LLC	36-10899	Decreed	1/31/1950	STOCKWATER	0.04	0.0	
L2 LTD PARTNERSHIP	31-12500	Decreed	6/22/1953	IRRIGATION	0.02	5.5	
L2 LTD PARTNERSHIP; L3 LTD PARTNERSHIP	32-4058	Decreed	7/1/1953	DOMESTIC, STOCKWATER	0.16	0.0	
L3 LTD PARTNERSHIP	31-12501	Decreed	6/22/1953	IRRIGATION	0.07	5.5	
LAIRD, WILLIAM G	36-15071	Decreed	12/31/1947	COMMERCIAL, DOMESTIC	0.11	0.0	
LAKESHORE FARMS 2 LLC	31-10665	Decreed	12/31/1925	DOMESTIC	0.10	0.0	
LAMBERT, LYLE; LAMBERT, NADINE	29-7640	Decreed	5/17/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.0	
LAMBERT, R J	35-8670	License	9/14/1988	COMMERCIAL	0.04	0.0	
LAND VIEW FERTILIZER INC	36-15347	Decreed	1/1/1961	COMMERCIAL	0.08	0.0	

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to October 11, 1900
(highlighted rights have 15-days to join a ground water district)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
LAND VIEW INC	36-11048	Decreed	9/1/1954	COMMERCIAL, DOMESTIC	0.15	0.0	
LARSEN, HELEN	35-8127	License	4/28/1983	DOMESTIC, STOCKWATER	0.08	0.0	
LARSEN, PEGGY A; LARSEN, RICHARD J	31-7129	License	7/30/1974	DOMESTIC, STOCKWATER	0.08	0.0	
LARSON, BECKY J; LARSON, CHARLES W	45-4160	Decreed	3/15/1962	IRRIGATION	1.70	173.0	
LAZY EIGHT ESTATES DIVISION 2 HOMEOWNERS ASSN INC	25-14189	License	10/26/2006	DOMESTIC	0.50	0.0	
LEBSACK, KENNETH L; LEBSACK, LEANNE H	35-10634	Decreed	7/1/1950	COMMERCIAL	0.04	0.0	
LEE, MARTIN R	36-8410	License	2/10/1989	COMMERCIAL	0.03	0.0	
LEISHMAN ELECTRIC	22-7558	License	8/30/1988	COMMERCIAL	0.02	0.0	
LEZAMIZ, SID	37-10363	Decreed	9/1/1959	COMMERCIAL	0.11	0.0	
LIMA, GUADALUPE	36-17128	Decreed	9/20/1973	IRRIGATION	0.02	1.2	
LITTLE SKY FARMS LLLP	37-2526A	Decreed	11/28/1951	IRRIGATION	3.59	208.0	
LOJA LLC	25-13579	Decreed	9/1/1945	COMMERCIAL, DOMESTIC	0.27	0.0	
LOJA LLC	25-7424	License	4/1/1988	IRRIGATION	0.09	3.0	
LONE STAR WATER USERS COOP ASSN INC	37-4344	Decreed	4/1/1940	COMMERCIAL, DOMESTIC, STOCKWATER	0.07	0.0	
LOPES, JOE S; LOPES, VERNA F	37-10175	Decreed	10/11/1934	DOMESTIC, STOCKWATER	0.15	0.0	
LORDS, DARRELL M	35-8778	License	5/31/1989	IRRIGATION	0.10	4.5	
LOST RIVER FARMS	34-14346	Decreed	8/12/1966	IRRIGATION	0.38	177.0	
LOVELL, HOPE; LOVELL, JAMES R	25-7598	License	9/25/1991	IRRIGATION	0.03	1.9	
LYNCH, LESLIE R	36-7154	Decreed	1/25/1971	INDUSTRIAL	0.02	0.0	
M & B INVESTMENTS LLC	25-14163	License	12/9/2004	DOMESTIC	0.30	0.0	
M & B INVESTMENTS LLC	25-14379	License	8/13/2012	DOMESTIC	0.39	0.0	
MAD MOOSE PIZZA IDAHO LLC	22-7633	License	3/2/1989	COMMERCIAL	0.04	0.0	
MADISON SCHOOL DISTRICT #321	22-14474	Permit	5/13/2022	DOMESTIC	0.26	0.0	
MAEBE, RICHARD	36-10527	Decreed	5/1/1948	DOMESTIC, IRRIGATION	0.08	2.6	
MAGIC VALLEY GROWERS LTD	37-20612	Decreed	6/1/1956	INDUSTRIAL	0.10	0.0	
MAGIC VALLEY PRODUCE INC	36-13763	Decreed	10/1/1955	COMMERCIAL	0.04	0.0	
MAGNIFY LAND CONSULTING LLC	36-17208	Decreed	4/13/1976	IRRIGATION	0.20	10.0	
MARSHALL, DON W	25-7462	License	11/10/1988	DOMESTIC, IRRIGATION	0.07	1.0	
MARTIAN, ERICA; MARTIAN, PETER	35-7855	Decreed	5/1/1979	COMMERCIAL, HEATING	0.04	0.0	
MASON, JOHN D; MASON, VALERIE	29-7294	Decreed	11/4/1975	DOMESTIC, IRRIGATION	0.12	8.0	
MASONER, MRS MERLE	36-11978	Decreed	1/1/1963	COMMERCIAL	0.02	0.0	
MASONS	35-8828	License	7/28/1989	COMMERCIAL	0.04	0.0	
MAUGHAN, GAYLORD L	31-12220	Decreed	8/22/1955	IRRIGATION	0.07	3.5	
MAUPIN, JESSICA; MAUPIN, JUSTIN DEELANE	22-7656	License	11/21/1989	COMMERCIAL	0.04	0.0	
MC ALISTER, G P; MC ALISTER, JEN	36-11921	Decreed	4/23/1947	DOMESTIC	0.14	0.0	
MC CALL OIL & CHEMICAL	25-7045	Decreed	2/25/1974	DOMESTIC, INDUSTRIAL	0.08	0.0	
MC COWIN, BRENDA	25-7544	License	8/16/1989	DOMESTIC	0.07	0.0	
MC COY, VALERIE	34-10329	Decreed	12/31/1955	IRRIGATION	0.02	1.0	
MC GARRY, THERON R; MC GARRY, TIM R	22-4150	Decreed	9/1/1948	DOMESTIC, STOCKWATER	0.23	0.0	

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
MEADOW LARK COURT LLC	22-10170	Decreed	6/15/1960	COMMERCIAL, STOCKWATER	0.20	0.0	
MENAN PRODUCE INC	25-12178	Decreed	11/1/1953	DOMESTIC, INDUSTRIAL	0.10	0.0	
MERRILL, CHRISTOPHER; MERRILL, CINDY	25-13580	Decreed	1/1/1963	DOMESTIC, IRRIGATION	0.14	5.0	
MERRILL, KENT	25-14364	License	2/28/1992	IRRIGATION	0.19	12.2	
MEYER LAND COMPANY LLC	25-11617	Decreed	12/31/1950	COMMERCIAL	0.17	0.0	
MEYERS, M JAY	29-2407	Decreed	3/6/1959	IRRIGATION	2.54	127.0	
MICHAUD CREEK RANCHES INC	29-2515	Decreed	1/5/1966	IRRIGATION	2.00	196.0	
MICHAUD CREEK RANCHES INC	29-7089	Decreed	6/9/1972	IRRIGATION	1.08	196.0	
MICKELSEN, LINDON A; MICKELSEN, LOREEN A	27-10416	Decreed	6/1/1962	COMMERCIAL, DOMESTIC, STOCKWATER	0.09	0.0	
MIKESELL, ELEANOR	31-10268	Decreed	5/1/1957	COMMERCIAL, DOMESTIC	0.04	0.0	
MIKKOLA, ARTHUR; MIKKOLA, MARK	25-7389	Decreed	11/2/1983	DOMESTIC, STOCKWATER	0.06	0.0	
MILES, BETTY; MILES, KENNETH RICK	25-14502	Decreed	4/22/1979	IRRIGATION	0.03	1.5	
MILES, BETTY; MILES, KENNETH RICK	25-14524	Decreed	4/22/1979	IRRIGATION	0.02	1.0	
MILLER, CHARLES; MILLER, RACHEL	25-7442	License	9/8/1988	DOMESTIC, IRRIGATION	0.05	1.0	
MILLER, LYNETTE R; MILLER, MARVIN G	25-4194	Decreed	11/1/1960	IRRIGATION	0.13	7.0	
MILLER, PAMELLA K	36-16655	Decreed	4/1/1961	STOCKWATER	0.03	0.0	
MILLERCOORS USA LLC	45-11838	Decreed	6/15/1936	COMMERCIAL	0.04	0.0	
MILNER IRRIGATION DISTRICT	45-4171	Decreed	1/1/1941	COMMERCIAL, DOMESTIC	0.06	0.0	
MILO WATER ASSN	25-4266	Decreed	10/30/1946	DOMESTIC, IRRIGATION	0.17	2.9	
MINIDOKA COUNTY HIGHWAY DISTRICT	45-13662	Decreed	4/28/1951	IRRIGATION	1.84	103.0	
MINIDOKA IRRIGATION DISTRICT	36-13480	Decreed	5/31/1962	COMMERCIAL	0.04	0.0	
MISTY VALLEY LLC	22-14350	Decreed	3/20/1959	AESTHETIC STORAGE, DIVERSION TO STORAGE, FIRE PROTECTION STORAGE	0.01	0.0	
MODEL WATER USERS ASSN INC	35-7986	Decreed	6/1/1981	DOMESTIC	0.10	0.0	
MODERN MILLS ROCKFORD INC	35-13014	Decreed	4/1/1960	COMMERCIAL	0.05	0.0	
MONK, AUBRIE; MONK, STEVEN	35-14753	Decreed	2/2/1952	IRRIGATION	0.06	6.0	
MONK, AUBRIE; MONK, STEVEN	35-14754	Decreed	4/23/1961	IRRIGATION	0.04	6.0	
MORGAN, CODY G; MORGAN, KATHY	36-17092	Decreed	3/11/1954	COMMERCIAL, STOCKWATER	0.04	0.0	
MORGANS PASTURE LAND CO LLC	35-14551	Decreed	1/6/1955	IRRIGATION	4.20	279.0	
MORRISS, JUDITH L; MORRISS, VIRGIL R	25-7483	License	12/22/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.04	3.0	
MOUNTAIN RIVER SPORTSMANS RV PARK & CAMP	25-14229	License	9/2/2008	COMMERCIAL	0.20	0.0	
MOUNTAIN WEST BARK PRODUCTS INC	22-7573	License	8/8/1988	COMMERCIAL	0.08	0.0	
MOYLE, KEVIN A; MOYLE, TAYLOR N	36-17240	License	3/16/1989	COMMERCIAL, DOMESTIC, STOCKWATER	0.33	0.0	
MULLINS, CODY; MULLINS, KRISTY TADDONIO	45-14569	Decreed	6/1/1939	IRRIGATION	0.06	4.5	
NAPOLI, MARIA; ULIAN, PETER	34-7211	Decreed	1/6/1978	DOMESTIC, IRRIGATION	0.10	4.0	
NEIBAUR, RYAN	25-7561	License	3/2/1990	IRRIGATION	4.00	360.5	
NELSEN DAIRY	36-8745	License	11/7/1995	COMMERCIAL, STOCKWATER	0.11	0.0	
NELSON, MERLA	22-11385	Decreed	6/8/1935	DOMESTIC, IRRIGATION	0.05	2.5	
NEST EGG INVESTMENTS LLC	25-14419	License	12/27/2014	COMMERCIAL	0.07	0.0	
NEW PHASE INVESTMENTS LLC	25-14186	License	9/18/2006	COMMERCIAL	0.05	0.0	

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
NICKELSON, DALENE C	25-7193A	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.9	
NORTH HIGHLANDER FARMS INC	25-7438	License	8/8/1988	COMMERCIAL	0.04	0.0	
NORTHLAND TERRACE WATER USERS ASSN INC	27-7138	License	5/18/1979	DOMESTIC	0.68	0.0	
NORTHSIDE RANCH CO LLC	36-2318B	Decreed	2/28/1957	STOCKWATER	0.05	0.0	
NORTHWEST PIPELINE CORP	45-2531	Decreed	7/6/1956	DOMESTIC, INDUSTRIAL	0.04	0.0	
NULPH BROTHERS INC	27-7466	License	5/3/1989	COMMERCIAL	0.04	0.0	
NUR WATER CORP INC	25-7035	Decreed	6/13/1973	DOMESTIC	0.62	0.0	
NUTTALL, ALIESHA DAWN; NUTTALL, JEFFREY DOUGLAS	25-7275	Decreed	2/8/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
OLSEN, GARY; OLSEN, PATRICIA	25-12353	Decreed	10/7/1953	COMMERCIAL, DOMESTIC	0.16	0.0	
OLTMANNS, JAN	25-12862	Decreed	12/31/1935	COMMERCIAL, DOMESTIC	0.06	0.0	
ON TIME FINANCIAL LLC	22-14478	Permit	7/14/2022	COMMERCIAL, DOMESTIC	0.21	0.0	
OSTERHOUT, DANA; OSTERHOUT, GAYLEN; OSTERHOUT, LORRIE; OSTERHOUT, VIRGINIA M	45-10587	Decreed	6/30/1958	COMMERCIAL, DOMESTIC, IRRIGATION	0.08	0.5	
OVERLOOK MHP LLC	45-10950	Decreed	1/30/1961	DOMESTIC, IRRIGATION	0.15	2.0	
PALACIO, WILLIAM M	37-19847	Decreed	3/15/1952	IRRIGATION	0.44	22.0	
PARKER, BRENT E; PARKER, KRISTINE	25-7073E	Decreed	8/1/1975	IRRIGATION	0.20	10.0	
PARKINSON FARMS	34-2289	Decreed	5/13/1949	IRRIGATION	1.00	306.0	
PARKINSON FARMS	34-2497	Decreed	9/27/1966	IRRIGATION	0.57	480.0	
PARKINSON FARMS	34-2490	Decreed	10/25/1966	IRRIGATION	2.09	306.0	
PARKINSON FARMS	34-2506	Decreed	3/2/1967	IRRIGATION	1.17	480.0	
PARKINSON FARMS	34-2505	Decreed	3/3/1967	IRRIGATION	1.06	480.0	
PARKINSON FARMS	34-4008	Decreed	4/1/1967	IRRIGATION	2.60	480.0	
PARKINSON FARMS	34-10393	Decreed	5/1/1976	IRRIGATION	0.26	306.0	Yes
PARNELL, KEVIN	37-21266	Decreed	2/27/1979	IRRIGATION, MITIGATION	0.07	3.6	
PATTON & LINTON INC	29-10994	Decreed	3/1/1956	INDUSTRIAL	0.13	0.0	
PAUL, LILAH; PAUL, WALTER T	45-2259	Decreed	5/24/1948	IRRIGATION	0.12	4.1	
PAULS, DEBBRAH; PAULS, RONALD	37-4390	Decreed	7/1/1916	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.2	
PAULS, DEBBRAH; PAULS, RONALD	37-4391	Decreed	7/1/1941	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.2	
PERFORMIX NUTRITION SYSTEMS LLC	36-17195	Decreed	12/24/1948	COMMERCIAL	0.09	0.0	
PERFORMIX NUTRITION SYSTEMS LLC	36-17196	Decreed	5/27/1974	COMMERCIAL	0.06	0.0	
PETERSEN, KIMBERLY ANN; PETERSEN, RYAN CLAIR	34-7219	Decreed	7/4/1978	COMMERCIAL, HEATING, IRRIGATION, MITIGATION	0.92	69.8	
PHINNEY, DAVID; RICHARDS, DEBORA	35-14870	Decreed	6/27/1983	DOMESTIC, IRRIGATION	0.02	0.5	
PILKINTON, C R; PILKINTON, THOMAS R	36-7650B	Decreed	7/30/1976	IRRIGATION	0.08	4.0	
PINGREE LAND CO LLC	29-7806	Decreed	12/10/1985	COMMERCIAL	0.01	0.0	
PIONEER WATER USERS ASSN INC	35-7671	Decreed	2/7/1977	DOMESTIC	0.11	0.0	
POCATELLO CHUBBUCK SCHOOL DISTRICT #25	29-11688	Decreed	8/10/1914	DOMESTIC, IRRIGATION	0.12	5.7	
PONY ACRES WATER ASSN	29-7625	Decreed	12/15/1981	DOMESTIC, IRRIGATION	0.16	2.0	
POPE, CAROL C	34-4133	Decreed	5/1/1960	DOMESTIC, IRRIGATION	0.12	6.2	
POWER COUNTY	29-2284	Decreed	3/2/1949	INDUSTRIAL, MITIGATION BY NON-USE	4.50	0.0	
POWER COUNTY	29-2301	Decreed	4/24/1951	INDUSTRIAL, MITIGATION BY NON-USE	4.00	0.0	

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PRICE, MARJORIE	22-14447	Permit	2/16/2022	COMMERCIAL	0.02	0.0	
PRINCE, CARI L; PRINCE, JAMES J	36-17191	Decreed	2/20/1964	IRRIGATION	1.94	97.0	
PRODUCERS LIVESTOCK MARKETING ASSN	36-14310	Decreed	12/31/1948	COMMERCIAL, DOMESTIC, STOCKWATER	0.19	0.0	
PROW, REBECCA; PROW, SCOTT E	45-13972	Decreed	11/12/1957	IRRIGATION	0.04	2.8	
QUALITY INSULATION & CONSTRUCTION INC	25-7539	License	8/18/1989	COMMERCIAL	0.04	0.0	
QUINTON, BERNADENE L; QUINTON, RAY E	25-7536	License	9/18/1989	COMMERCIAL	0.02	0.0	
R C WILLEY HOME FURNISHINGS	35-14596	Permit	5/25/2018	COMMERCIAL	0.78	0.0	
RABURN, JAYNEE N; RABURN, LENARD H	29-7143B	Decreed	7/2/1973	DOMESTIC, IRRIGATION	0.03	1.0	
RANCH PROPERTIES LLC	45-11969	Decreed	6/1/1939	IRRIGATION	0.86	65.2	
RANDALL, GLADYS	22-7594	License	8/25/1988	COMMERCIAL	0.04	0.0	
RANDALL, JULIA; RANDALL, SCOTT	25-10298	Decreed	12/31/1949	DOMESTIC	0.08	0.0	
RANSTROM, GENE M	45-13667	Decreed	4/28/1951	IRRIGATION	0.21	13.0	
RAYMOND, W CRAIG	25-13401	Decreed	6/28/1954	IRRIGATION, STOCKWATER	0.09	3.5	
REED, CHARLES LE ROY	35-12258	Decreed	6/1/1955	COMMERCIAL, DOMESTIC, STOCKWATER	0.09	0.0	
REED, DEBORAH	25-14465	Decreed	6/2/1931	IRRIGATION	0.01	0.2	
REED, GREGG	25-14464	Decreed	6/2/1931	IRRIGATION	0.01	0.2	
REED, SANDRA F; REED, TERRY H	25-14456	Decreed	6/2/1931	DOMESTIC, IRRIGATION, STOCKWATER	0.10	4.6	
REES, CARL C; REES, PATRICIA	29-7240	Decreed	11/29/1974	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.3	
REESE, REBECCA J; REESE, RICHARD D	35-14774	Decreed	4/1/1951	IRRIGATION	0.08	5.5	
RHODEHOUSE, KEVIN	35-2924	Decreed	7/21/1965	INDUSTRIAL, STOCKWATER	1.11	0.0	
RHODEHOUSE, KEVIN	35-8659	License	10/15/1987	COMMERCIAL, STOCKWATER	0.15	0.0	
RICHAN, CLYDE L; RICHAN, ELVERA L	36-8486	License	9/19/1989	COMMERCIAL, DOMESTIC	0.03	0.0	
RICHARDS, DENICE	27-7343	Decreed	3/2/1983	DOMESTIC, IRRIGATION	0.08	5.0	
RICHARDSON, BRIAN	35-8769	License	5/31/1989	COMMERCIAL, DOMESTIC	0.07	0.0	
RICHESIN, CLIFTON; RICHESIN, REBA	36-4120	Decreed	6/16/1916	DOMESTIC, IRRIGATION	0.06	0.7	
RICKS, CONNIE	25-7183	Decreed	1/14/1980	DOMESTIC, STOCKWATER	0.06	0.0	
RIGBY AIR VILLAGE LLC	25-14182	License	3/24/2006	COMMERCIAL	0.20	0.0	
RIM ROCK LEASING LLC	36-8512	License	2/27/1990	COMMERCIAL	0.02	0.0	
RINDFLEISCH, JAMES A	34-7511	Permit	6/12/1989	IRRIGATION	1.85	92.4	
RINGEL, LORI; RINGEL, MERLYN R	35-14629	Decreed	12/31/1940	IRRIGATION	0.05	4.7	
RINGEL, LORI; RINGEL, MERLYN R	35-14628	Decreed	3/5/1948	IRRIGATION	0.03	4.7	
RINGEL, LORI; RINGEL, MERLYN R	35-14630	Decreed	9/28/1981	IRRIGATION	0.01	4.7	
RIVERBEND ESTATES	29-8015	License	6/22/1990	DOMESTIC	0.25	0.0	
RIVERVIEW ACRES #2 WATER CORP	35-11348	Decreed	6/1/1960	DOMESTIC	0.16	0.0	
RIVERVIEW TWO LLC	35-8632	Decreed	1/19/1981	COMMERCIAL, INDUSTRIAL	0.04	0.0	
ROBINSON WATER ASSN INC	25-4064	Decreed	6/1/1942	DOMESTIC	0.10	0.0	
ROBINSON, TIMOTHY L	36-17115	Decreed	3/15/1963	IRRIGATION	0.02	1.0	
ROEDER, JAMES L; ROEDER, JOHN	29-7177	License	3/4/1974	DOMESTIC, STOCKWATER	0.08	0.0	
ROSENBERG RANCH & FARMS LLC	25-11823	Decreed	7/16/1927	DOMESTIC, STOCKWATER	0.74	0.0	

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ROWLAND, ROBERT	29-13892	Decreed	10/28/1953	IRRIGATION, STOCKWATER	2.12	117.6	
ROY E HANSON JR MFG	25-11479	Decreed	12/31/1925	COMMERCIAL	0.04	0.0	
RUDY, THOMAS A	45-7278	Decreed	12/6/1976	DOMESTIC	0.24	0.0	
S E M LARSEN TRUST	35-14855	Decreed	4/21/1948	IRRIGATION	0.04	2.1	
SAKOTA, MABEL S	22-10886	Decreed	7/29/1953	DOMESTIC, IRRIGATION	0.04	0.5	
SAND BOX RV LLC	21-13334	Decreed	2/24/1953	COMMERCIAL	0.03	0.0	
SAND BOX RV LLC	21-13335	Decreed	6/7/1957	COMMERCIAL	0.02	0.0	
SAND BOX RV LLC	21-13333	Decreed	8/4/1979	COMMERCIAL	0.03	0.0	
SCC PROPERTIES LLC	37-23469	Decreed	11/25/1962	IRRIGATION	0.38	19.0	
SCHAEFFER, DIANNE RAE	36-17234	Decreed	1/22/1958	STOCKWATER	0.18	0.0	
SCHNEIDER, ARLYNN; SCHNEIDER, FRED	35-11852	Decreed	4/1/1934	COMMERCIAL, DOMESTIC	0.08	0.0	
SCHREINER FARMS IDAHO LLC	35-2488	Decreed	1/10/1957	IRRIGATION	0.02	2.0	
SCHREINER FARMS IDAHO LLC	35-2922	Decreed	4/7/1958	IRRIGATION	0.01	2.0	
SCHREINER FARMS IDAHO LLC	35-8951	License	7/29/1991	IRRIGATION	0.88	44.0	
SCHROEDER, MICHELLE; SCHROEDER, NATHAN	29-4104	Decreed	7/28/1955	IRRIGATION	3.00	150.0	
SCHWANS SALES ENTERPRISES INC	27-7439	License	8/14/1987	COMMERCIAL	0.04	0.0	
SCOTT, LAMOND; SCOTT, RUTH	35-10855	Decreed	1/4/1954	COMMERCIAL, DOMESTIC	0.04	0.0	
SELENSKY, CATHY; SELENSKY, CLARENCE J	25-7392B	License	12/16/1983	IRRIGATION	0.15	5.0	
SERR, DALLAS	36-2730	Decreed	7/30/1954	IRRIGATION	1.00	50.0	
SHOSHONE BANNOCK TRIBES	29-13779	Decreed	11/22/1919	IRRIGATION, STOCKWATER	0.58	29.2	
SHOSHONE BANNOCK TRIBES	27-7000	Decreed	7/27/1967	MUNICIPAL	0.50	0.0	
SHOSHONE BANNOCK TRIBES	29-7326	Decreed	4/28/1976	IRRIGATION	2.53	160.0	
SHOSHONE BANNOCK TRIBES	29-13941	Decreed	10/3/1977	IRRIGATION	0.18	10.5	
SHURTLIFF, MERLENE; SHURTLIFF, RODNEY	35-8855	License	9/7/1989	DOMESTIC, STOCKWATER	0.08	0.0	
SILVER CREEK DISTILLERS INC	25-7194	License	12/1/1988	INDUSTRIAL	0.11	0.0	
SIMPER, HAIZER ONEAL; SIMPER, JENSEN BRYN	35-14901	Decreed	8/19/1977	IRRIGATION	0.11	6.0	
SIMPSON, DANNY V; SIMPSON, JULIE M	37-22930	Decreed	11/25/1962	IRRIGATION	0.05	2.3	
SIX S RANCH LLC	45-2454	Decreed	8/18/1953	IRRIGATION	1.48	263.3	
SJC PROPERTIES LLC	35-14873	Decreed	7/20/1976	STOCKWATER	2.70	0.0	
SLAGOWSKI, JOE; SLAGOWSKI, NICOLE	31-12232	Decreed	12/31/1943	STOCKWATER	0.12	0.0	
SMITH, BLAINE; SMITH, GARRY	22-7554	License	8/8/1988	COMMERCIAL	0.02	0.0	
SMITH, EDWARD A	29-2275	Decreed	8/13/1948	IRRIGATION	2.20	200.3	
SMITH, EDWARD A	29-2339	Decreed	9/17/1953	IRRIGATION	2.68	140.0	
SMITH, JOAN; SMITH, SCOTT	34-14313	License	7/8/1992	IRRIGATION	0.01	1.0	
SMITH, K DARBY; SMITH, RACHELLE	25-14533	Decreed	1/25/1965	IRRIGATION	0.05	5.5	
SMITH, K DARBY; SMITH, RACHELLE	25-14532	Decreed	3/4/1974	IRRIGATION	0.03	5.5	
SMITH, NORBERT DARRELL	29-7171	Decreed	2/4/1974	DOMESTIC	0.16	0.0	
SMITH, RICHARD F	22-14612	Decreed	7/5/1973	MUNICIPAL	0.25	0.0	
SNAKE RIVER BUSINESS PARK BLDG #1 LLC	35-14787	Permit	8/19/2022	COMMERCIAL	0.20	0.0	

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SNAKE RIVER SCHOOL DISTRICT #52	35-11206	Decreed	6/15/1924	COMMERCIAL	0.03	0.0	
SNELL, MARK	29-7696	License	3/16/1983	DOMESTIC, IRRIGATION	0.08	2.0	
SOHN, EDNA G; SOHN, HERBERT F; SOHNS INC	35-8333	Decreed	12/12/1983	COMMERCIAL, DOMESTIC	0.08	0.0	
SOMSEN, DIANNE L; SOMSEN, G FRANK	45-2428	Decreed	12/15/1952	IRRIGATION	1.30	432.0	
SOMSEN, DIANNE L; SOMSEN, G FRANK	45-2485	Decreed	11/8/1954	IRRIGATION	2.68	432.0	
SOUTH INTERCHANGE PROPERTIES LLC	35-14700	Decreed	12/24/1948	IRRIGATION	0.13	23.8	
SOUTH LANDS LLC C/O BARRY SOUTH	25-14390	License	10/15/2013	COMMERCIAL	0.50	0.0	
SOUTH PARK ESTATES WATER & SEWER INC	27-7052	Decreed	3/12/1975	DOMESTIC, FIRE PROTECTION	0.33	0.0	
SOUTH PARK ESTATES WATER & SEWER INC	27-7581	License	10/21/1997	DOMESTIC, FIRE PROTECTION	0.69	0.0	
SOUTH, BARRY; SOUTH, ELINOR	35-14616	Decreed	12/31/1940	IRRIGATION	0.04	3.3	
SOUTH, BARRY; SOUTH, ELINOR	35-14614	Decreed	3/5/1948	IRRIGATION	0.02	3.3	
SOUTH, BARRY; SOUTH, ELINOR	35-14618	Decreed	9/28/1981	IRRIGATION	0.01	3.3	
SPAHR, ARIANNE; SPAHR, JASON	35-14585	Decreed	9/28/1981	IRRIGATION	0.01	3.2	
SPENCER, DAVID R; SPENCER, MICHELLE	31-11946	Decreed	6/22/1953	COMMERCIAL, STOCKWATER	0.12	0.0	
SPENCER, DAVID R; SPENCER, MICHELLE	31-11942	Decreed	7/25/1955	COMMERCIAL, STOCKWATER	0.03	0.0	
STANDING 16 RANCH LAND CO LLC	36-14504	Decreed	11/12/1945	DOMESTIC, STOCKWATER	0.03	0.0	
STANDING 16 RANCH LAND CO LLC	36-14505	Decreed	11/26/1946	COMMERCIAL, DOMESTIC	0.03	0.0	
STANGER, KARA; STANGER, SPENCER	35-14726	Decreed	12/31/1940	IRRIGATION	0.06	5.2	
STANGER, KARA; STANGER, SPENCER	35-14723	Decreed	3/5/1948	IRRIGATION	0.04	5.2	
STANGER, KARA; STANGER, SPENCER	35-14729	Decreed	9/28/1981	IRRIGATION	0.01	5.2	
STANGER, MARILYN	25-7541	License	7/12/1989	COMMERCIAL	0.02	0.0	
STARMARC LLC	36-12462	Decreed	12/31/1958	COMMERCIAL	0.07	0.0	
STATE OF IDAHO	35-4271A	Decreed	6/1/1945	FISH PROPAGATION	50.00	0.0	
STEEL, KEVIN J	35-8756	License	5/11/1989	COMMERCIAL, DOMESTIC	0.02	0.0	
STOKES, ELIZABETH DORTHEA; STOKES, JOSHUA WYNNDALE	37-8112	Decreed	6/2/1983	COMMERCIAL, COOLING	0.02	0.0	
STROMBERG REPAIR INC	25-7445	License	10/18/1988	COMMERCIAL	0.04	0.0	
STUBBS, AVIS B; STUBBS, ROSS A	35-8210	License	6/16/1983	DOMESTIC	0.06	0.0	
SULLIVAN HOLDINGS LLC	35-8775	License	5/26/1989	COMMERCIAL	0.01	0.0	
SUMMERS, RICHARD K; SUMMERS, STELLA F	25-7518	License	8/24/1989	COMMERCIAL, DOMESTIC	0.08	0.0	
SUNDOWN CORP INC	35-10256	Decreed	5/1/1920	COMMERCIAL, STOCKWATER	0.07	0.0	
SUNROC CORPORATION	25-14562	Decreed	2/24/1953	INDUSTRIAL	0.07	0.0	
SUNROC CORPORATION	29-13891	Decreed	10/28/1953	IRRIGATION, STOCKWATER	0.90	48.0	
SUNROC CORPORATION	25-14563	Decreed	6/7/1957	INDUSTRIAL	0.03	0.0	
SUNROC CORPORATION	25-14561	Decreed	8/4/1979	DIVERSION TO STORAGE, INDUSTRIAL STORAGE, INDUSTRIAL	0.08	0.0	
SUNROC CORPORATION	29-7754	License	6/17/1983	COMMERCIAL	0.81	0.0	
SUNROC CORPORATION	25-14559	Permit	10/24/2024	DIVERSION TO STORAGE, INDUSTRIAL FROM STORAGE, INDUSTRIAL STORAGE, INDUSTRIAL	0.82	0.0	
SUNSET FARM & RANCH LLC	34-2277	Decreed	10/3/1946	IRRIGATION	2.00	728.4	
SUNSET FARM & RANCH LLC	34-2480B	Decreed	9/11/1966	IRRIGATION	2.00	728.4	

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SUNSET FARM & RANCH LLC	34-14772	Decreed	8/18/1974	IRRIGATION	6.86	728.4	
SUNSET SUBDIVISION WATER USERS ASSN	35-10715	Decreed	9/21/1959	DOMESTIC	0.15	0.0	
SWENDSEN, BRENT; SWENDSEN, NANCY	25-7464	License	11/30/1988	COMMERCIAL	0.04	0.0	
SWENSON, HANS	37-23303	Decreed	9/20/1974	IRRIGATION	0.12	6.0	
TABER, DONALD E	37-10161	Decreed	4/1/1955	COMMERCIAL	0.04	0.0	
TABLE ROCK HOLDINGS	35-13320	License	8/7/2001	DOMESTIC	0.10	0.0	
TANNER, BLAINE; TANNER, TORI	25-10634	Decreed	4/1/1958	DOMESTIC, IRRIGATION, STOCKWATER	0.10	2.0	
TANNER, KATHY; TANNER, REYNOLD	25-2139	Decreed	10/30/1961	IRRIGATION	1.54	38.0	
TAYLOR, CHRISTY; TAYLOR, MICHAEL	29-14367	Decreed	12/24/1948	IRRIGATION	0.06	6.0	
TAYLOR, CHRISTY; TAYLOR, MICHAEL	29-14369	Decreed	5/27/1974	IRRIGATION	0.03	6.0	
TAYLOR, LOIS; TAYLOR, LYLE D	25-7110	Decreed	5/9/1977	IRRIGATION	1.30	65.0	
TAYLOR, RODNEY R; TAYLOR, STEPHANIE A	37-2526B	Decreed	11/28/1951	IRRIGATION	0.06	3.0	
TAYLORS QUIK STOP INC	25-7450	License	10/25/1988	COMMERCIAL	0.04	0.0	
TELFORD, MARK; TELFORD, PAIGE	34-4132	Decreed	6/1/1955	IRRIGATION	2.00	480.0	
TELFORD, MARK; TELFORD, PAIGE	34-10058	Decreed	7/7/1955	IRRIGATION	1.67	480.0	
TELFORD, MICHAEL S; TELFORD, ROBERT	37-8212	Decreed	5/11/1983	COMMERCIAL, STOCKWATER	0.01	0.0	
TELFORD, MICHAEL S; TELFORD, SHANNON J	34-2401A	Decreed	9/1/1961	IRRIGATION	3.70	2223.8	
TELFORD, MICHAEL S; TELFORD, SHANNON J	34-4015	Decreed	9/1/1961	IRRIGATION	1.64	2223.8	
TERRETON PUMP NO 2	31-7515	License	1/7/1989	COMMERCIAL, DOMESTIC	0.10	0.0	
TERRETON TRACTOR INC	31-7346	Decreed	12/2/1980	COMMERCIAL, DOMESTIC	0.04	0.0	
TETON WATER WORKS LLC	27-7359C	License	6/3/1983	COMMERCIAL, DOMESTIC	0.03	0.0	
TFT LLC	21-7419	License	3/9/1989	COMMERCIAL, DOMESTIC	0.02	0.0	
THATCHER SUMMIT INC	22-7626	License	4/8/1989	COMMERCIAL	0.04	0.0	
THE DAVID JAY BROWN & DEBRA L BROWN LTD PARTNERSHIP	37-2670	Decreed	7/24/1961	IRRIGATION	3.00	155.0	
THE LOVELAND FAMILY TRUST	27-11205	Decreed	1/31/1939	DOMESTIC, STOCKWATER	0.44	0.0	
THE LOVELAND FAMILY TRUST	27-7069	Decreed	12/3/1976	IRRIGATION	3.42	171.0	
THOMASON, TIMOTHY D	36-4243	Decreed	9/1/1952	DOMESTIC, STOCKWATER	0.06	0.0	
THOMPSON, BETTY L; THOMPSON, LYNN	29-7075A	Decreed	2/4/1972	IRRIGATION	0.10	5.6	
THOMPSON, HOWARD M	25-7508	License	6/19/1989	DOMESTIC, STOCKWATER	0.11	0.0	
TOWN & COUNTRY MOBILE HOME PARK LLC	35-4258	Decreed	6/1/1962	DOMESTIC	0.22	0.0	
TRAINOR, LISA; TRAINOR, MARK	25-7392A	License	12/16/1983	IRRIGATION	0.14	7.0	
TURNER LAND & LIVESTOCK LLC	45-4033	Decreed	8/1/1935	IRRIGATION	1.67	80.0	
TYLER, ALDON	25-7542	License	7/14/1989	DOMESTIC	0.06	0.0	
UNION PACIFIC RAILROAD CO	36-4204	Decreed	8/18/1903	COMMERCIAL, DOMESTIC, MUNICIPAL	0.33	0.0	
UNION PACIFIC RAILROAD CO	36-4201	Decreed	3/24/1913	INDUSTRIAL, STOCKWATER	0.22	0.0	
UNION PACIFIC RAILROAD CO	29-4332	Decreed	5/14/1913	INDUSTRIAL	0.05	0.0	
UNION PACIFIC RAILROAD CO	36-4205	Decreed	5/4/1918	STOCKWATER	0.06	0.0	
UNION PACIFIC RAILROAD CO	36-4202	Decreed	6/5/1925	INDUSTRIAL	0.04	0.0	
UNION PACIFIC RAILROAD CO	36-4203	Decreed	9/13/1957	COMMERCIAL, DOMESTIC, MUNICIPAL	0.22	0.0	

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UNITED ALLIANCE & FIDELITY CORP	25-7387	Decreed	12/4/1983	IRRIGATION	0.10	5.0	
US BUREAU OF INDIAN AFFAIRS	29-12559	Decreed	8/23/1954	IRRIGATION	2.06	102.6	
US BUREAU OF INDIAN AFFAIRS	29-12560	Decreed	8/23/1954	IRRIGATION	3.75	187.9	
US BUREAU OF INDIAN AFFAIRS	29-12565	Decreed	8/23/1954	COOLING	0.04	0.0	
US BUREAU OF LAND MANAGEMENT	35-14177	Decreed	12/31/1940	IRRIGATION	0.47	44.0	
US BUREAU OF LAND MANAGEMENT	35-14175	Decreed	3/5/1948	IRRIGATION	0.32	44.0	
US BUREAU OF LAND MANAGEMENT	35-4068	Decreed	5/31/1948	IRRIGATION	0.62	31.0	
US BUREAU OF LAND MANAGEMENT	35-4072	Decreed	5/1/1950	IRRIGATION	2.37	152.0	
US BUREAU OF LAND MANAGEMENT	37-20839	Decreed	2/6/1974	IRRIGATION	0.19	64.0	
US BUREAU OF LAND MANAGEMENT	36-7466	Decreed	4/10/1974	STOCKWATER, WILDLIFE	0.10	0.0	
US BUREAU OF LAND MANAGEMENT	36-7497	Decreed	8/21/1974	STOCKWATER, WILDLIFE	0.05	0.0	
US BUREAU OF LAND MANAGEMENT	35-7685	Decreed	3/22/1977	IRRIGATION	2.48	124.0	
US BUREAU OF LAND MANAGEMENT	21-7517	License	2/27/1992	STOCKWATER, WILDLIFE	0.07	0.0	
US BUREAU OF LAND MANAGEMENT	36-8726	Permit	4/28/1994	STOCKWATER, WILDLIFE	0.12	0.0	
US BUREAU OF LAND MANAGEMENT	21-13032	License	2/24/2006	STOCKWATER, WILDLIFE	0.02	0.0	
US BUREAU OF LAND MANAGEMENT	34-14459	Permit	8/26/2014	STOCKWATER, WILDLIFE	0.15	0.0	
US DEPT OF INTERIOR	31-2322	Decreed	5/9/1953	WILDLIFE	5.78	0.0	
US FISH & WILDLIFE SERVICE	31-2251	Decreed	11/4/1931	IRRIGATION	2.20	109.9	
US FISH & WILDLIFE SERVICE	31-4066	Decreed	11/12/1936	DOMESTIC, IRRIGATION	0.06	1.0	
US FISH & WILDLIFE SERVICE	31-4016	Decreed	6/15/1955	IRRIGATION	1.60	80.0	
US FISH & WILDLIFE SERVICE	31-2350	Decreed	10/20/1955	WILDLIFE	11.06	0.0	
US FISH & WILDLIFE SERVICE	31-2362	Decreed	5/13/1957	WILDLIFE	10.60	0.0	
US FISH & WILDLIFE SERVICE	31-2363	Decreed	5/13/1957	WILDLIFE	39.00	0.0	
US FISH & WILDLIFE SERVICE	31-11229	Decreed	11/5/1957	WILDLIFE	7.12	0.0	
US FISH & WILDLIFE SERVICE	31-11230	Decreed	3/20/1962	WILDLIFE	11.06	0.0	
US FISH & WILDLIFE SERVICE	31-11231	Decreed	5/7/1962	WILDLIFE	15.70	0.0	
US FISH & WILDLIFE SERVICE	31-11232	Decreed	5/7/1962	WILDLIFE	43.30	0.0	
US FISH & WILDLIFE SERVICE	31-7301	Decreed	6/2/1978	WILDLIFE	8.78	0.0	
US NATIONAL PARK SERVICE	34-12383	Decreed	5/2/1924	COMMERCIAL, DOMESTIC, IRRIGATION	0.00	0.0	
US NATIONAL PARK SERVICE	34-12385	Decreed	7/23/1928	COMMERCIAL, DOMESTIC, IRRIGATION	0.00	0.0	
USDA ARS SHEEP EXPERIMENT STATION	31-11201	Decreed	10/30/1915	ADMINISTRATIVE	0.27	0.0	
USDA ARS SHEEP EXPERIMENT STATION	31-11202	Decreed	10/30/1915	ADMINISTRATIVE	0.33	0.0	
USDA ARS SHEEP EXPERIMENT STATION	31-11200	Decreed	11/21/1916	ADMINISTRATIVE	0.23	0.0	
USDA ARS SHEEP EXPERIMENT STATION	34-7546	Decreed	6/29/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.25	2.8	
VALLEY READY MIX INC	25-7167	License	1/29/1979	INDUSTRIAL	0.36	0.0	
VALLEY SCHOOL DISTRICT #262	36-15190	Decreed	9/1/1954	DOMESTIC, IRRIGATION	0.15	0.2	
VALLEY VIEW DAIRY LLC	36-17182	Decreed	4/27/1954	COMMERCIAL, STOCKWATER	0.13	0.0	
VALLEY WIDE COOP INC	22-7622	License	12/30/1988	COMMERCIAL, DOMESTIC	0.03	0.0	
VAN BEEK, JOHN W	36-11075B	Decreed	12/31/1944	STOCKWATER	0.05	0.0	

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to October 11, 1900
(highlighted rights have 15-days to join a ground water district)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
VAN BEEK, JOHN W	36-11076B	Decreed	12/31/1944	STOCKWATER	0.05	0.0	
VAN DYKE, VIRGINIA	37-10019	Decreed	2/1/1961	COMMERCIAL, STOCKWATER	0.06	0.0	
VAN ORDEN, JAY; VAN ORDEN, SHELLI	35-8713	License	4/1/1989	COMMERCIAL	0.02	0.0	
VEENSTRA FAMILY LIMITED PARTNERSHIP	37-4051	Decreed	9/1/1961	IRRIGATION, STOCKWATER	1.34	235.0	
VEENSTRA, FRANK W	36-17233	Decreed	1/31/1961	STOCKWATER	0.38	0.0	
VERBREE LAND HOLDINGS LLC	36-10668	Decreed	1/1/1918	DOMESTIC, STOCKWATER	0.20	0.0	
WADE, NANCY; WADE, RONALD	25-7425	License	6/6/1988	DOMESTIC, IRRIGATION	0.05	1.0	
WAGNER JR, EDWARD P; WAGNER, KRISTIE L	35-8856	Decreed	8/11/1989	DOMESTIC, STOCKWATER	0.10	0.0	
WALKER, ROLAND L	25-11822	Decreed	5/15/1935	DOMESTIC, STOCKWATER	0.70	0.0	
WALKER, ROLAND L	25-11825	Decreed	11/18/1955	COMMERCIAL	0.30	0.0	
WALKER, ROLAND L	25-11821	Decreed	6/19/1962	DOMESTIC, STOCKWATER	1.32	0.0	
WALKER, YOUNG HARVEY	34-2440	Decreed	10/10/1961	IRRIGATION, STOCKWATER	1.55	190.0	
WALKER, YOUNG HARVEY	34-10473	Decreed	8/10/1977	IRRIGATION	0.36	190.0	Yes
WALL, DIANA R; WALL, LARRY G	36-8451	License	9/28/1989	COMMERCIAL	0.02	0.0	
WALTERS, BRUCE A; WALTERS, MARCEY L	25-7596	License	6/26/1991	DOMESTIC, IRRIGATION	0.15	10.0	
WANSTROM, JOSEPH SCOTT	34-2339A	Decreed	6/3/1957	IRRIGATION	0.17	18.0	
WANSTROM, JOSEPH SCOTT	34-7172	Decreed	3/13/1977	IRRIGATION	0.94	47.0	
WARD, OPAL M; WARD, OWEN K	35-8892	License	3/28/1990	DOMESTIC	0.18	0.0	
WARNER, KAREN; WARNER, VAN H	25-14072	Decreed	10/31/1938	IRRIGATION, STOCKWATER	0.11	3.0	
WASSERLEIN, WILLIAM	45-14563	Decreed	6/1/1939	IRRIGATION	0.02	1.8	
WATTERSON, CONNIE; WATTERSON, LARRY	45-13663	Decreed	4/28/1951	IRRIGATION	0.08	4.3	
WELLS, DELOS H	35-8220	License	8/4/1983	DOMESTIC, IRRIGATION	0.11	9.5	
WELLS, DELOS H; WELLS, LUELLA	35-10874	Decreed	10/1/1962	DOMESTIC, IRRIGATION	0.20	8.0	
WESTERN AG PRODUCTS LLC	45-10305	Decreed	6/15/1949	DOMESTIC, INDUSTRIAL	0.04	0.0	
WESTERN SLOPE LLC	35-14615	Decreed	12/31/1940	IRRIGATION	0.88	83.0	
WESTERN SLOPE LLC	35-14613	Decreed	3/5/1948	IRRIGATION	0.61	83.0	
WESTERN SLOPE LLC	35-14617	Decreed	9/28/1981	IRRIGATION	0.05	83.0	
WESTOVER RANCH CORP	22-7543	License	12/14/1988	DOMESTIC	0.10	0.0	
WHEELER, DEE RAY; WHEELER, LINDA	36-8488	License	10/10/1989	COMMERCIAL	0.03	0.0	
WHITWORTH, BOYD	45-7638	License	3/10/1989	INDUSTRIAL	0.06	0.0	
WILDE, CECIL; WILDE, NANCY JO	25-11653	Decreed	5/1/1942	IRRIGATION	0.09	4.5	
WILLIAMS, LYNETTE D; WILLIAMS, ROBERT E	35-12733	Decreed	4/1/1945	DOMESTIC	0.17	0.0	
WILLMORE, JUDY	31-7551	License	8/26/1991	COMMERCIAL	0.04	0.0	
WILSON, JOHN CHARLES	29-7916	License	3/20/1990	IRRIGATION	0.09	4.5	
WOOD, HOWARD; WOOD, SHEILA	34-2478	Decreed	6/16/1966	IRRIGATION	0.76	38.0	
WOOD, KENT; WOOD, MELANIE	45-14177	Decreed	4/29/1954	IRRIGATION	0.08	6.4	
WOOD, RODERICK BARRY	37-11243	Decreed	12/31/1940	DOMESTIC, STOCKWATER	0.04	0.0	
WOODLAND HEIGHTS WATER USERS ASSN	35-7576	Decreed	1/28/1976	DOMESTIC	0.38	0.0	
WOODVILLE WATER & SEWER DISTRICT	35-11318	Decreed	5/1/1939	COMMERCIAL, DOMESTIC	0.35	0.0	

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to October 11, 1900
(highlighted rights have 15-days to join a ground water district)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
WRIGHT, DEE; WRIGHT, RUBY	25-7256	Decreed	5/12/1981	IRRIGATION	0.10	1.4	
WRIGHT, MARK; WRIGHT, SUSAN MARIE	36-17286	Decreed	6/7/1968	IRRIGATION	0.09	4.5	
Y DELL BOWL LLC	45-11850	Decreed	2/16/1937	COMMERCIAL, DOMESTIC	0.04	0.0	
YANCEY, CLEM R	35-7955	License	3/10/1981	DOMESTIC, STOCKWATER	0.06	0.0	
YOUNG & YOUNG LIVESTOCK LLC	25-14494	Permit	8/3/2021	DOMESTIC	0.23	0.0	
YOUNG, DE VONA; YOUNG, WILLIAM N	25-7437	License	8/26/1988	DOMESTIC, STOCKWATER	0.07	0.0	
YOUNG, JUDY D; YOUNG, KENNETH A	25-7436	License	9/14/1988	IRRIGATION	0.03	1.5	

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

The accompanying document is a "**Final Order**" issued by the Idaho Department of Water Resources ("Department") pursuant to Idaho Code § 67-5246.

PETITION FOR RECONSIDERATION

(*See* Idaho Code § 67-5246(4))

Any party may file a petition for reconsideration of this final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The presiding officer will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law.

REQUEST FOR HEARING

(*See* Idaho Code § 42-1701A(3))

Unless the right to a hearing before the Department or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order or action of the Director, and who has not previously been afforded an opportunity for a hearing on the matter may request a hearing pursuant to Idaho Code § 42-1701A(3). A written petition to the Director contesting this final order and requesting a hearing must be filed with the Department by any aggrieved person **within fifteen (15) days after service of this final order**.

CERTIFICATE OF SERVICE

(*See* IDAPA 37.01.01.053, 37.01.01.202)

All documents filed with the Department in connection with a petition for reconsideration or a request for hearing of this final order shall be served on all other parties to the proceedings in accordance with Rules of Procedure 53 and 202.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER REVISING JULY 2025 FORECAST SUPPLY** ***(METHODOLOGY STEPS 7–8)***

The Director of the Idaho Department of Water Resources ("Department") finds, concludes, and orders as follows:

FINDINGS OF FACT

A. Background

1. On July 19, 2023, the Director issued the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies Steps 7 and 8 of the *Methodology Order*.

2. On April 16, 2025, the Director issued the *Final Order Regarding April 2025 Forecast Supply (Methodology Steps 1–3)* ("*April Forecast Supply Order*"). The *April Forecast Supply Order* predicted a demand shortfall to the SWC of 63,000 acre-feet for the 2025 irrigation season. *April Forecast Supply Order* at 3. At that time, the only member of the SWC predicted to experience material injury during the 2025 irrigation season was Twin Falls Canal Company ("TFCC"). The Director ordered that, by May 1, 2025, ground water users with consumptive water rights "junior to August 28, 1955, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS [(in-season demand shortfall)] of 63,000 acre-feet in accordance with an approved mitigation plan." *Id.* at 6. The Director also ordered that, "[i]f a junior ground water user cannot establish . . . that they can mitigate for their proportionate share of the predicted April IDS in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user." *Id.*

3. On May 16, 2025, the Director issued a *Final Order Curtailing Ground Water Rights Junior to August 28, 1955* ("*First Curtailment Order*"). The Director ordered that:

> [E]ffective May 31, 2025, ground water users holding water rights bearing priority dates junior to August 28, 1955, within the ESPA ACGWS, and listed in Attachment A to this order, shall curtail/refrain from diversion and use of ground

water pursuant to those water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

First Curtailment Order at 4.

4. On July 10, 2025, the Director issued the *Order Revising April 2025 Forecast Supply and Continuing May 16, 2025 Curtailment Order (Methodology Steps 5 & 6)* ("*July Forecast Supply Order*"), revising the IDS to 75,300 acre-feet. *July Forecast Supply Order* at 8. The Director ordered that:

> On or before July 24, 2025, ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted IDS of 75,300 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted IDS of 75,300 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

Id. at 12 (footnote omitted).

5. Step 7 of the *Methodology Order* requires:

> Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) recalculate RISD [(reasonable in-season demand)]; (2) issue a revised FS [(forecast supply)]; and (3) establish the Time of Need. The revised FS for each SWC entity is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on analogous year(s) with similar Blackfoot to Milner reach gains. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR [(United States Bureau of Reclamation)] and Water District 01.
>
> This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. RISD will be calculated utilizing the project efficiency, BD [(baseline year demand)], and the cumulative actual CWN [(crop water need)] determined up to that point in the irrigation season. The Director will then issue revised RISD and IDS values.
>
> A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the demand shortfall volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

Methodology Order at 44.

6. Effective July 1, 2024, Senate Bill 1341 added a new section to Idaho Code, Idaho Code § 42-233c, which codified the description of the ESPA area of common ground water supply. S.B. 1341, 67th Leg., 2d Reg. Sess. (Idaho 2024). The current area of common ground water supply for the Eastern Snake Plain Aquifer is defined as the aquifer underlying the Eastern Snake River Plain as described in the model calibration report for ESPAM2.2, dated May 2021. I.C. § 42-233c(1).

7. Step 8 of the *Methodology Order* requires:

> At the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised IDS calculated at the Time of Need. Alternatively, any additional mitigation obligation calculated in Step 6 and Step 7 can be satisfied from each SWC member's reasonable carryover if (a) the reasonable carryover exceeds the additional mitigation obligation, and (b) the junior ground water users secure sufficient water to replace the reasonable carryover pursuant to an approved mitigation plan.
>
> The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water delivered by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

Methodology Order at 44–45.

B. Climate

8. The April 2025 Joint Forecast prepared by the United States Army Corps of Engineers and the United States Bureau of Reclamation ("BOR") predicted 3,380,000 acre-feet of natural flow at the Heise gage for the period April–July 2025. *April Forecast Supply Order* at 2. The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Methodology Order* at 19.

9. The April through July precipitation was below average, while the April through July temperature was above average.[1] The National Weather Service's Twin Falls weather station reported 9%, 38%, 0%, and 68% of normal precipitation in April, May, June, and July, respectively. Twin Falls temperatures were 2.5, 3.8, 3.4, and 2.2 degrees above normal for April, May, June, and July, respectively. According to data measured at the Natural Resources Conservation Service's SNOTEL sites in the Upper Snake River Basin, the basin received 73%, 74%, 19%, and 66% of average precipitation in April, May, June, and July, respectively.[2]

[1] Precipitation and temperature data obtained from the NOAA National Weather Service Preliminary Monthly Climate Data for the Twin Falls weather station (Twin Falls Airport).

[2] Natural Resources Conservation Service's (NRCS) SNOTEL precipitation in the Upper Snake River Basin has been updated by the NRCS since the *Order Revising April 2025 Forecast Supply and Continuing May 16, 2025 Curtailment Order* was issued.

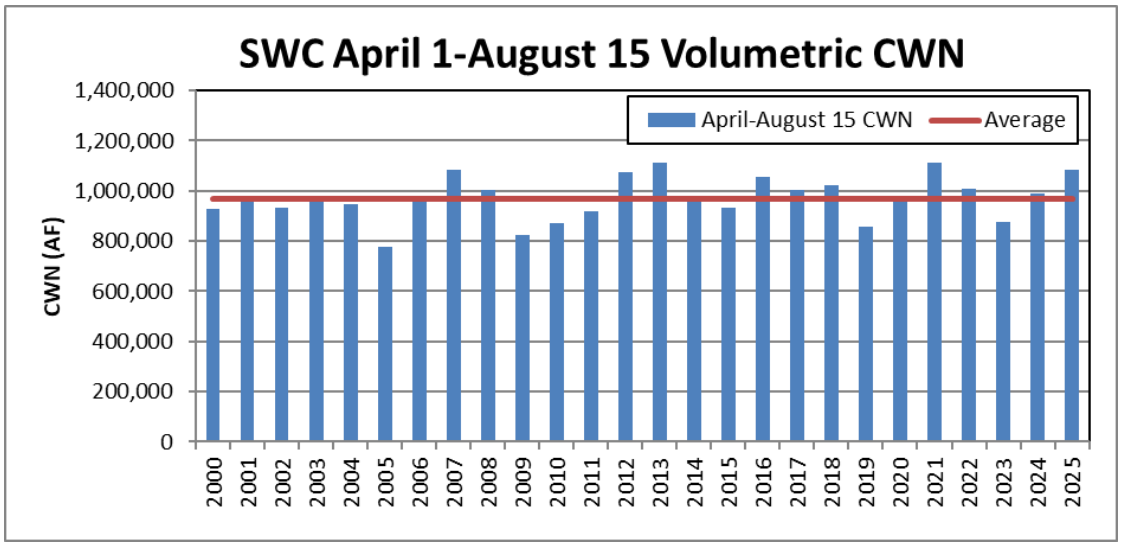
C. Reasonable In-Season Demand

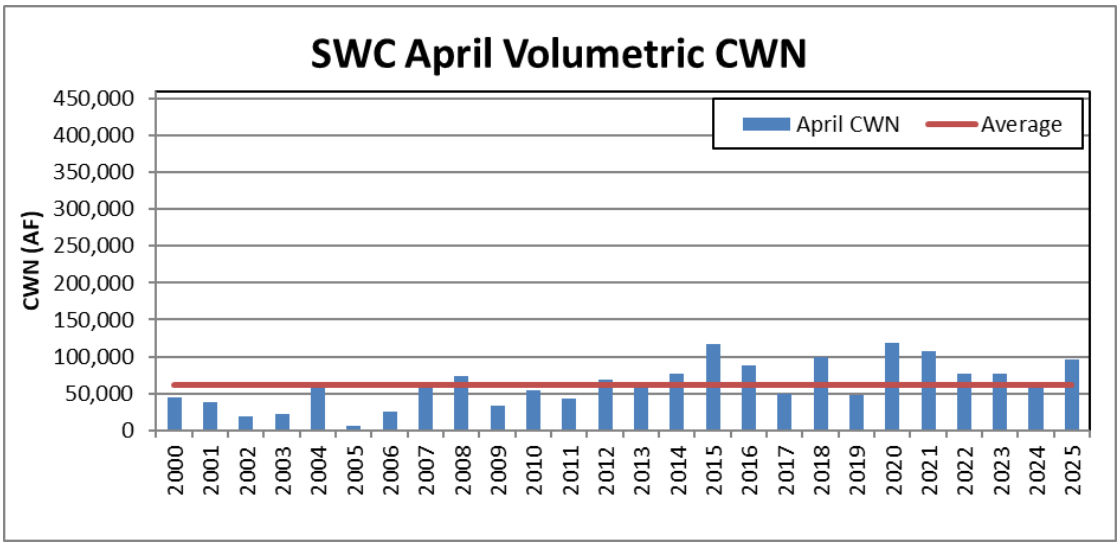
10. RISD is the volume of water that would be required to be diverted at the point of diversion during the year of evaluation to grow the specific crops within the service area of the entity. In April, the demand from the 2018 baseline year (BLY) represents the RISD. During the irrigation season, the RISD for the already expired portion of the irrigation season is recalculated by dividing the actual crop water need (CWN) for each entity by the project efficiency for that entity. For the future remainder of the irrigation season, the RISD is the demand predicted from the 2018 BLY. RISD is calculated on a monthly timestep.

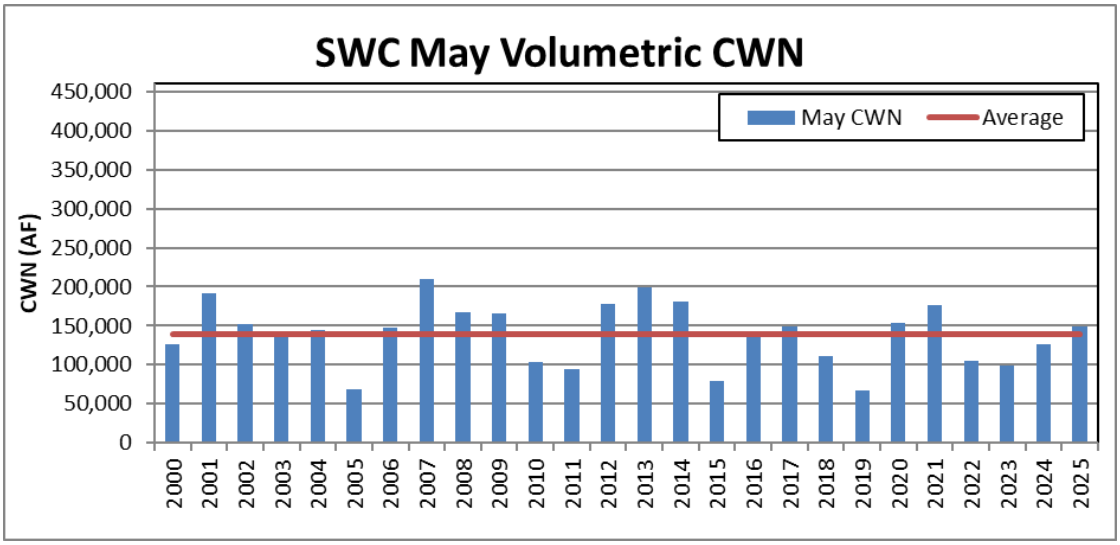
i. Crop Water Need

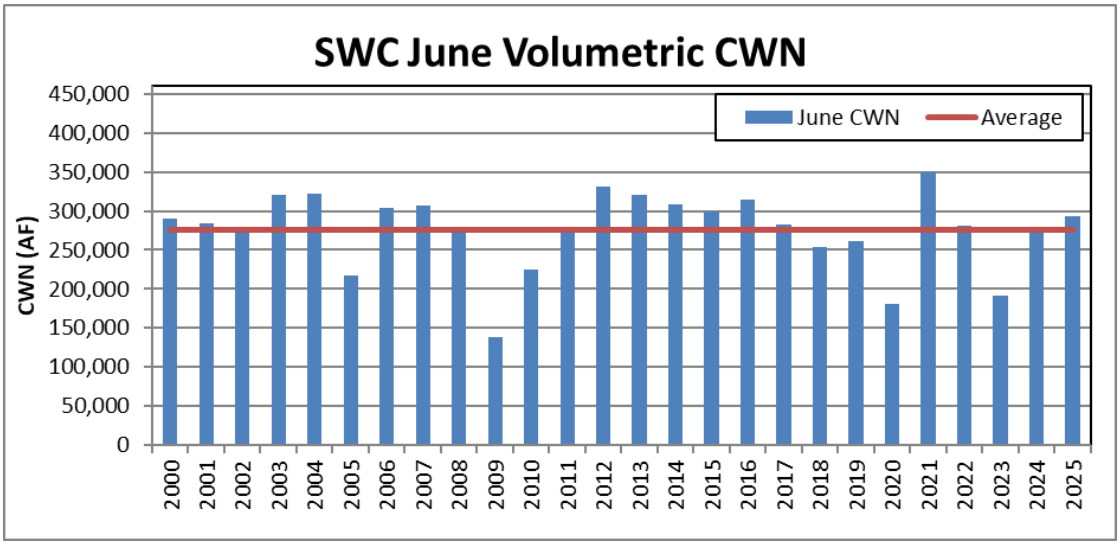
11. CWN is the project wide volume of irrigation water required for crop growth so crop development is not limited by water availability. CWN is the difference between the fully realized consumptive use associated with crop development, or evapotranspiration, and effective precipitation. CWN is an input variable for calculating RISD for those months of the irrigation season that are complete. Actual RISD for the completed portion of the irrigation season is combined with monthly predicted baseline demands for the remaining months of the irrigation season to calculate a season-total RISD volume. Demand shortfall is then calculated as the difference between the adjusted forecast supply and the RISD. For specifics regarding determination of CWN, see page 15 of the *Methodology Order*.

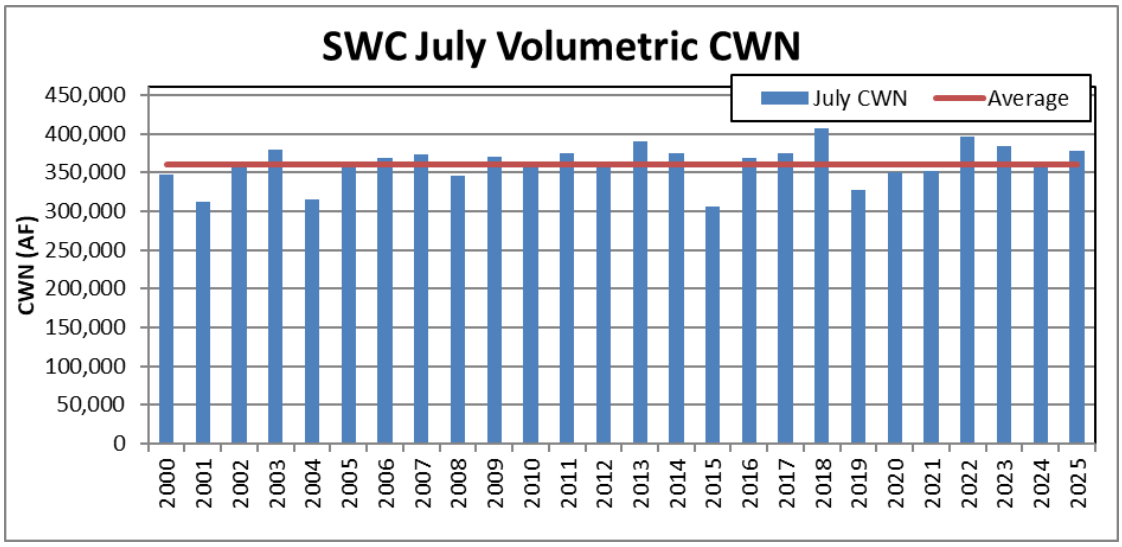
12. As calculated from the beginning of the irrigation season (April 1), the SWC's volumetric CWN for the current water year through August 15 is 1,083,069 acre-feet. This volume is 110% of the April 1 through August 15 ten-year average CWN (2015-2024) and 106% of the CWN for the (2018) BLY. As calculated from April 1 through August 15, from the year 2000 to now, 2025 has the fourth largest CWN volume of any irrigation season. The following graphs summarize monthly volumetric CWN values.

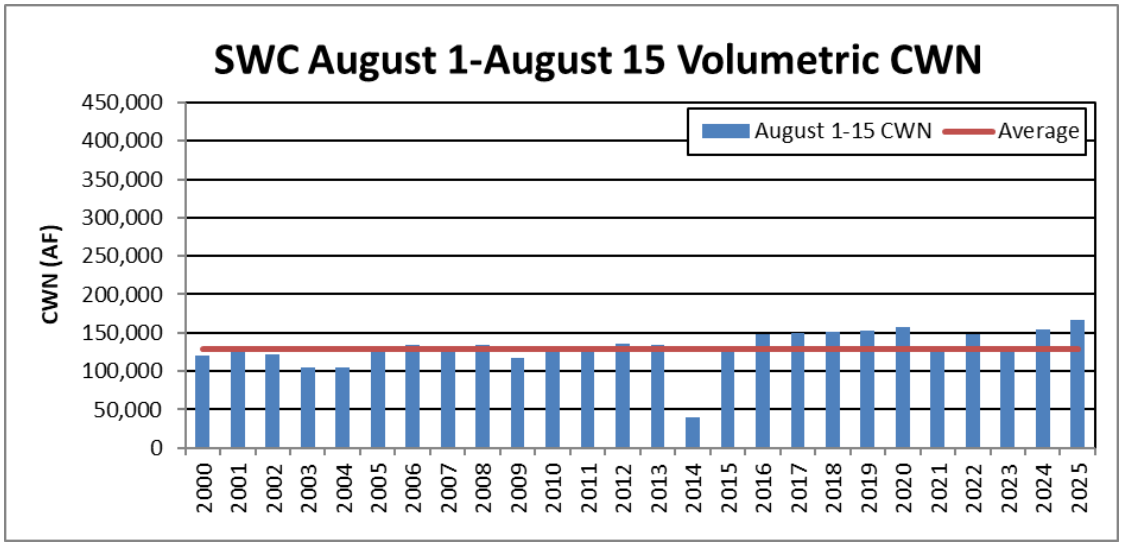



SWC April Volumetric CWN
CWN (AF)
April CWN
Average
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025


SWC May Volumetric CWN
CWN (AF)
May CWN
Average
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025


SWC June Volumetric CWN
CWN (AF)
June CWN
Average
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025





ii. Extension of BLY

13. The RISD for the future portion of the irrigation season is the August 16–October 31 demand for (2018) BLY. The numeric August 16–October 31 demand values are shown in the table in Finding of Fact 14 below.

iii. Calculation of RISD

14. As calculated from the beginning of the irrigation season (April 1), the SWC's volumetric RISD for 2025 through August 15 is 2,537,439 acre-feet. This volume is 112% of the April 1–August 15 ten-year average RISD (2015-2024) and 105% of the April 1–August 15 demand for the (2018) BLY. As calculated from April 1 to August 15, from the year 2000 until this year, 2025 has the fifth largest RISD volume of any irrigation season. The recalculated RISD on August 15 of the 2025 irrigation season by entity is summarized in column six of the following table:

	April 1–August 15 CWN (AF)	Range of April 1–August 15 Monthly Project Efficiencies	April 1–August 15 RISD (AF)	August 16–October 31 Demand for 2018 BLY (AF)	Recalculated RISD (AF)
A&B	29,276	0.41-0.92	47,932	16,216	64,148
AFRD2	121,490	0.20-0.44	339,309	138,946	478,255
BID	88,126	0.30-0.52	201,896	63,932	265,828
Milner	25,828	0.36-0.68	45,207	16,031	61,238
Minidoka	159,119	0.36-0.65	307,036	86,518	393,554
NSCC	281,341	0.21-0.48	752,214	276,703	1,028,917
TFCC	377,888	0.27-0.59	843,845	330,074	1,173,919

D. Forecast Supply

15. When determined during the irrigation season, the forecast supply (FS) is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and storage allocations for each member of the SWC. *Methodology Order* at 43. Actual natural flow diversions for the already expired portion of the irrigation season are extracted from the Department's water rights accounting program. The forecasted natural flow supply for the remainder of the irrigation season is based on the selection of an analogue year with similar Blackfoot to Milner reach gains. *Id*. at 44. Storage allocations are established by the BOR and Water District 01 ("WD1") after the day of allocation. *Id*.

i. Sum of Actual Natural Flow Diverted

16. Actual natural flow diverted for the period April 1 through August 15 for each SWC member are summarized in the table contained within the Summary of Forecast Supply section in Finding of Fact 21.

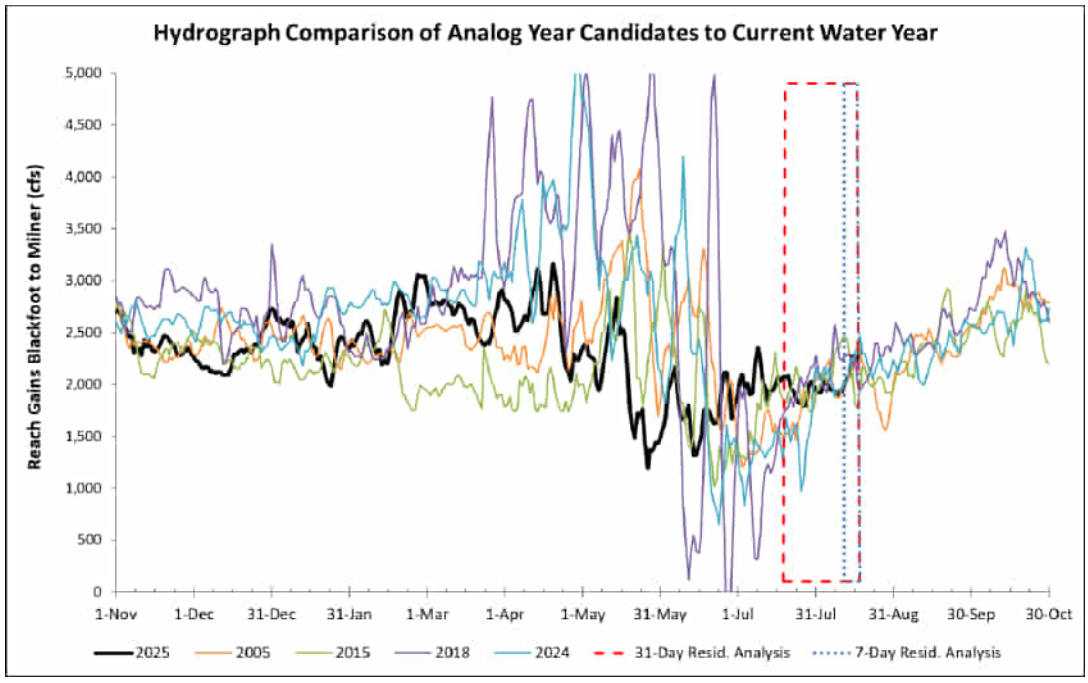
ii. Selection of an Analogous Year to Predict Remaining Natural Flow

17. Natural flow diversions for the remainder of the irrigation season were predicted by choosing an analogue year. The Department used a residual analysis[3] completed on a daily time step to compare the reach gains from July 19 to August 18 for the current water year to historical reach gains for the same period for the 1991–2024 water years. Based on its residual analysis and a qualitative review, the Department selected four candidate years: 2005, 2015, 2018, and 2024. These years represent the four years with the most similar reach gains (i.e., the lowest average residual value over a specified range) over the analysis period and the residuals are summarized in the following table:

Summary of Residual Analysis of Candidate Years

Time Period	2005	2015	2018	2024
7-Day (8/12 – 8/18)	0.2%	1.9%	-0.7%	-2.4%
31-Day (7/19 – 8/18)	3.3%	-2.3%	-4.9%	7.9%

18. The following hydrograph compares the current water year to the four candidate years with the most similar reach gains as determined by the residual analysis and qualitative review. The Department examined natural flow diversions for each of the candidate years and selected 2005 as the analogue year used to predict natural flow diversions for the remainder of the irrigation season. The Department chose 2005 because the residual analysis and qualitative review demonstrated 2005 was most like 2025 conditions when considering the reach gains for the most recent 7-day and 31-day periods.



[3] The daily residual is expressed as a percentage and defined as the difference between the current water year reach gain (CY) and the historical reach gain (HY) divided by the current water year reach gain: R = (CY – HY)/CY.

iii. Storage Allocations

19. Preliminary storage allocation values for each member of the SWC were established by the BOR and WD1 and published in WD1's preliminary Storage Report on July 15, 2025.[4] Storage allocation values for each SWC member are summarized in the table in Finding of Fact 21 below.

iv. Adjustments to Total Supply

20. The natural flow and storage water supplies were both adjusted as shown in the table in Finding of Fact 21 below. Adjustments to natural flow include water delivered to Southwest Irrigation District by BID and Milner, 691 acre-feet and 560 acre-feet, respectively . Adjustments to natural flow also include 1,441 acre-feet and 400 acre-feet of recharge water, delivered by the AFRD2 and BID, respectively, for the Idaho Water Resource Board. The only adjustments made to the stored water supply were for the Minidoka Return Flow Credit.[5] The Department did not adjust SWC water supplies for wheeled storage water published in WD1's weekly reports because wheeled water does not increase the amount of water available for use by the SWC. The Department did not adjust SWC water supplies to account for water supplied to or from the rental pool because these transactions artificially increase or decrease the shortfall obligation.

v. Summary of Forecast Supply

21. The table below contains the individual components of the FS for each of the SWC members.

	April 1–August 15 Natural Flow Diverted (AF)	August 16–October 31 Predicted Natural Diversions Flow (AF)	Natural Flow Adjustment (AF)	Preliminary Storage Allocation (AF)	Minidoka Credit Adjustment (AF)	Forecast Supply (AF)
A&B	9,547	0	0	120,473	0	130,020
AFRD2	90,640	0	(1,441)	383,912	1,000	474,111
BID	123,935	8,282	(1,091)	214,990	5,130	351,246
Milner	14,114	305	(560)	80,506	0	94,365
Minidoka	156,842	10,480	0	338,930	8,370	514,622
NSCC	385,639	54,218	0	798,776	(7,750)	1,230,883
TFCC	626,598	261,530	0	232,941	(6,750)	1,114,319

[4] The preliminary Storage Report may be viewed at: https://www.waterdistrict1.com/media/yxefjahy/2025-07-15-preliminary-storage-report.pdf.

[5] For an explanation of the Minidoka Credit, see pages 126-127 of *Concepts, Practices, and Procedures Used to Distribute Water Within Water District #1*, which can be found at: https://www.waterdistrict1.com/media/uabos05r/wd01-procedures-manual-4-12-2023.pdf

E. Revised Shortfall Prediction

22. Demand Shortfall is calculated as the difference between RISD and the FS.

23. Based on the methods described above, and as summarized in the following table, the Director predicts, at this time, that AFRD2 and TFCC will be materially injured by junior ground water pumping.

	Forecast Supply (AF)	RISD (AF)	Shortfall (AF)
A&B	130,020	64,148	0
AFRD2	474,111	478,255	4,100
BID	351,246	265,828	0
Milner	94,365	61,238	0
Minidoka	514,622	393,554	0
NSCC	1,230,883	1,028,917	0
TFCC	1,114,319	1,173,919	59,600
		Total	63,700

24. The current, predicted shortfall to the SWC's RISD is 63,700 acre-feet.

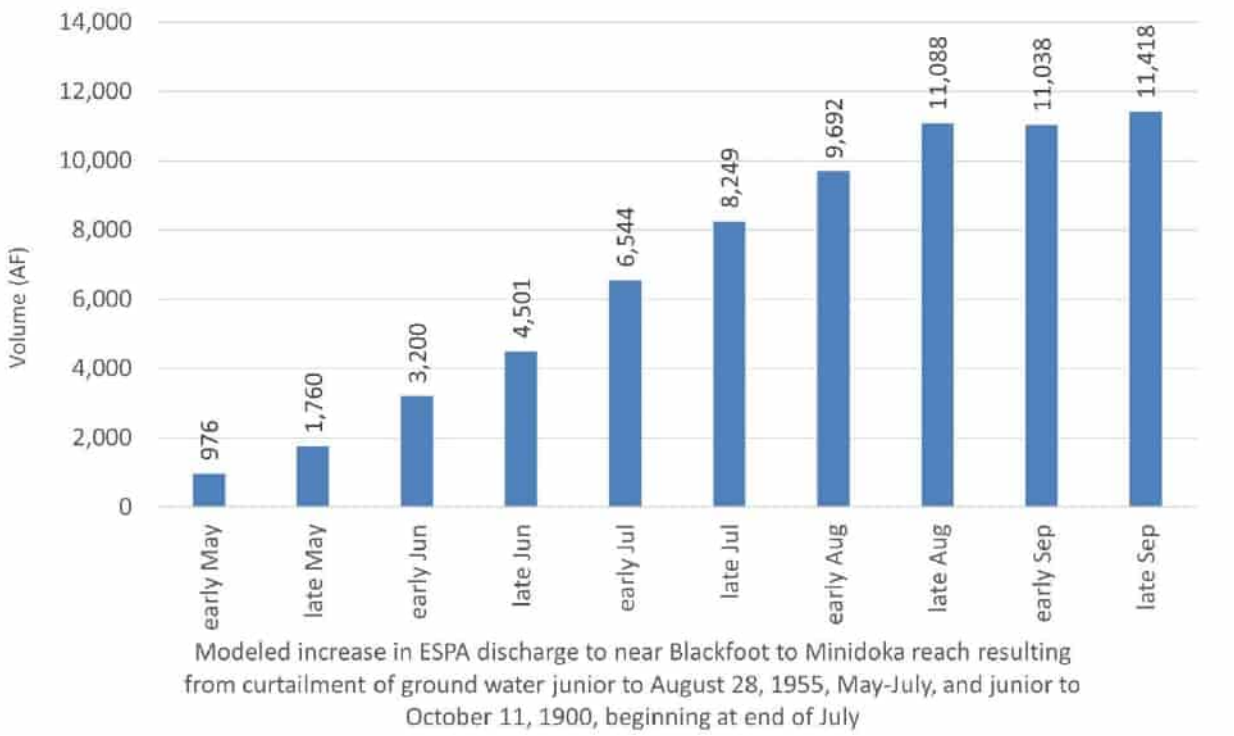
F. Time of Need

25. The Department established the Time of Need by predicting when the remaining storage balance for TFCC was equal to their reasonable carryover volume of 37,400 acre-feet and the remaining storage balance for AFRD2 was equal to their reasonable carryover volume of 16,700 acre-feet. As described above, the Department selected 2005 as the analogue year it used to predict the storage use for TFCC and AFRD2 for the remainder of this season. Anticipating that TFCC's and AFRD2's storage use for the remainder of the 2025 season will be similar to their storage use in 2005, TFCC's Time of Need occurred on August 16, 2025, and AFRD2's Time of Need will occur on September 28, 2025.

G. Priority and Curtailment

26. In April 2025, pursuant to the *Methodology Order*, the Department ran the Eastern Snake Plain Aquifer Model version 2.2 ("ESPAM2.2") to calculate the priority curtailment date, such that the curtailment of all water rights junior to the date within the area of common ground water supply, would produce a volume of water equal to the April IDS in the Snake River between May 1 and September 30. The ESPAM2.2 simulation predicted curtailment of ground water rights bearing priority dates junior to August 28, 1955, would produce the volume of water equal to the predicted April IDS of 63,000 AF in the near Blackfoot to Minidoka reach. *April Forecast Supply Order*, at 4.

27. In the *July Forecast Supply Order*, the Director predicted a demand shortfall to the SWC of 75,300 acre-feet. In July 2025, the Department ran the ESPAM2.2 to simulate the effect of adjusting the curtailment priority date at the end of July. The ESPAM2.2 simulation calculated that the curtailment of ground water rights junior to August 28, 1955, through the end of July followed by curtailment of groundwater rights junior to October 11, 1900,[6] would produce a volume of water of 58,000 AF in the near Blackfoot to Minidoka reach between July 1 and September 30 of this irrigation season. The following figure summarizes the results of the ESPAM2.2 simulation:



Modeled increase in ESPA discharge to near Blackfoot to Minidoka reach resulting from curtailment of ground water junior to August 28, 1955, May-July, and junior to October 11, 1900, beginning at end of July

28. The ESPAM2.2 simulation calculated that the curtailment of ground water rights junior to August 28, 1955, through the end of July followed by curtailment of groundwater rights junior to October 11, 1900, will produce a volume of water of 33,500 AF in the near Blackfoot to Minidoka reach between August 16 and September 30 of this irrigation season.

29. The predicted mid-August through September benefits to the near Blackfoot to Minidoka reach from curtailment of ground water rights bearing priority dates junior to August 28, 1955, through the end of July followed by curtailment of groundwater rights junior to October 11, 1900, are less than the August IDS of 63,700 acre-feet. Continuing the curtailment of ground water rights junior to October 11, 1900, will offset as much of the August IDS as possible.

[6] October 11, 1900, is the priority date equal to TFCC's Water Right No. 1-209, the most senior SWC natural flow water right predicted to be injured.

CONCLUSIONS OF LAW

1. Based on Findings of Fact 8 through 29 above, TFCC and AFRD2 are being materially injured. The updated predicted IDS is 63,700 acre-feet. The predicted shortfall to TFCC is 59,400 acre-feet. The predicted shortfall to AFRD2 is 4,100 acre-feet.

2. Based on current information, the Time of Need for TFCC occurred on August 16, 2025, and the Time of Need for AFRD2 will occur on September 28, 2025.

3. Pursuant to Step 8, at the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised IDS calculated at the Time of Need. Alternatively, any additional mitigation obligation calculated in Step 6 and Step 7 can be satisfied from each SWC member's reasonable carryover if (a) the reasonable carryover exceeds the additional mitigation obligation, and (b) the junior ground water users secure sufficient water to replace the reasonable carryover pursuant to an approved mitigation plan.

4. Using the ESPAM2.2, the Department has determined that the curtailment of ground water rights bearing priority dates junior to August 28, 1955, through the end of July followed by curtailment of groundwater rights junior to October 11, 1900, would result in a volume of water less than the predicted IDS of 63,700 acre-feet in the near Blackfoot to Minidoka reach between August 16 and September 30 of this irrigation season. Accordingly, continuing the curtailment to include ground water rights junior to October 11, 1900, is necessary for curtailment to offset as much of the IDS as possible.

5. Junior ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer area of common ground water supply must mitigate for their proportionate share of the predicted July IDS in accordance with an approved mitigation plan.[7] For the 2025 irrigation season, there are no junior ground water users mitigating for their proportionate share of the predicted July IDS with a secured volume of water. Accordingly, no junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised IDS calculated at the Time of Need.

[7] There are five approved mitigation plans responding to the SWC delivery call, the SWC stipulates to each: (1) No. CM-MP-2015-003 for the benefit of A&B; (2) No. CM-MP-2010-001 for the benefit of Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID"); (3) No. CM-MP-2024-003 for the benefit of the Ground Water Districts; (4) No. CM-MP-2019-001 for the benefit of the Coalition of Cities; and (5) No. CM-MP-2007-001 for the benefit of the Water Mitigation Coalition. Given the nature of A&B's mitigation plan, the Department normally calculates A&B's proportionate share of the predicted IDS. However, A&B and the SWC entered into a stipulation to define A&B's mitigation obligation for the 2025 irrigation season. In the stipulation, A&B agreed to continue its ground water conversions projects and assign and deliver 1,252 acre-feet of storage water to TFCC. The Director has confirmed that 1,252 acre-feet of storage water has been assigned to A&B. Because the SWC agreed that the above actions satisfy A&B's obligation to the SWC for the 2025 irrigation season, A&B does not need to establish that they can mitigate for its proportionate share of the predicted IDS. Due to the nature of the mitigation plans for SWID, the Ground Water Districts, the Coalition of Cities, and the Water Mitigation Coalition, these entities do not need to establish that they can mitigate for their proportionate share of the predicted IDS.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED the Director's revised in-season prediction is an in-season demand shortfall of 63,700 acre-feet.

IT IS FURTHER ORDERED that the July 25, 2025 *Curtailment Order* remains in full force and effect. All ground water users holding water rights listed in Attachment A to the July 25, 2025 *Curtailment Order* bearing priority dates junior to October 11, 1900, shall continue to be curtailed from diversion and use of ground water pursuant to those water rights unless they are mitigating in accordance with an approved mitigation plan or are notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

Dated this 11th day of September 2025.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 11th day of September 2025, a true and correct copy of the foregoing was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP PO Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com *jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email

Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Michael A. Kirkham City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 mkirkham@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

Jerry R. Rigby
RIGBY, ANDRUS & RIGBY LAW, PLLC
PO Box 250
Rexburg, ID 83440
jrigby@rex-law.com

Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
1101 W. River Street, Suite 110
Boise, Idaho 83702
andy@sawtoothlaw.com

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

The accompanying document is a "**Final Order**" issued by the Idaho Department of Water Resources ("Department") pursuant to Idaho Code § 67-5246.

PETITION FOR RECONSIDERATION

(*See* Idaho Code § 67-5246(4))

Any party may file a petition for reconsideration of this final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The presiding officer will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law.

REQUEST FOR HEARING

(*See* Idaho Code § 42-1701A(3))

Unless the right to a hearing before the Department or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order or action of the Director, and who has not previously been afforded an opportunity for a hearing on the matter may request a hearing pursuant to Idaho Code § 42-1701A(3). A written petition to the Director contesting this final order and requesting a hearing must be filed with the Department by any aggrieved person **within fifteen (15) days after service of this final order**.

CERTIFICATE OF SERVICE

(*See* IDAPA 37.01.01.053, 37.01.01.202)

All documents filed with the Department in connection with a petition for reconsideration or a request for hearing of this final order shall be served on all other parties to the proceedings in accordance with Rules of Procedure 53 and 202.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER ESTABLISHING 2025 REASONABLE CARRYOVER** ***(METHODOLOGY STEP 9)***

FINDINGS OF FACT

1. On July 19, 2023, the Director ("Director") of the Idaho Department of Water Resources ("Department") issued the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The *Methodology Order* establishes nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies step nine, the final step of the *Methodology Order*, for the 2025 water year.

2. The *Methodology Order* describes step 9 as follows:

> Step 9: Following the end of the irrigation season (on or before November 30), the Department will determine the total actual volumetric demand and total actual [crop water need] for the entire irrigation season. This information will be used for the analysis of reasonable carryover shortfall, selection of future [base line years], and for the refinement and continuing improvement of the method for future use.
>
> On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of SWC. These estimates will be based on, but not limited to, the consideration of the best available water diversion and storage data from Water District 01, return flow monitoring, comparative years, and [reasonable in-season demand]. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover shortfall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the reasonable

> carryover shortfall volume by September 30 of the following year. Curtailment will be simulated within the area of common ground water supply, as described by [Rule 50.01 of the Department's Rules for Conjunctive Management of Surface and Ground Water Resources].[1]

Methodology Order, at 45 (footnote added).

3. The following table summarizes the 2025 irrigation season diversions and crop water need for each SWC entity. All values are reported in acre-feet ("AF"). These values are used to determine entity-specific season-ending reasonable in-season demand ("RISD") values for the in-season demand shortfall table.

Entity	Demand[2]	Crop Water Need
A&B	66,772	33,341
AFRD2	478,369	152,966
BID	282,546	101,624
Milner	68,320	31,448
Minidoka	362,365	188,837
NSCC	1,053,354	353,302
TFCC	1,135,302	462,347

4. The following table summarizes the final calculated 2025 in-season demand shortfall values in AF, if any, for each member of the SWC. The values in this table are different from those in the April 16, 2025 *Final Order Regarding April 2025 Forecast Supply (Methodology Steps 1–3)* ("*April Forecast Supply Order*"), the July 10, 2025 *Order Revising April 2025 Forecast Supply and Continuing May 16, 2025 Curtailment Order (Methodology Steps 5 & 6)* ("*July Order*"), and the September 11, 2025 *Order Revising July 2025 Forecast Supply (Methodology Steps 7–8)* ("*September Order*"). The differences are due to changes in total supply and RISD that reflect diversion and ET data not available when the *April Forecast Supply Order*, the *July Order*, and the *September Order* were issued. The second column of the summary table contains the total natural flow diversions from April 1 to October 31 for each SWC member.[3] The third column summarizes the natural flow adjustments, which include natural flow delivered for recharge[4] and natural flow delivered to Southwest Irrigation District

[1] In 2024, the Idaho Legislature established a new area of common ground water supply boundary for the Eastern Snake Plain Aquifer in Idaho Code § 42-233c. The new boundary is currently the ESPAM2.2 model boundary, but the boundary may be expanded by the Director in the future. I.C. § 42-233c(1)–(2). The Department used the ESPAM2.2 model boundary in the model simulation for this order.

[2] The "Demand" for each SWC entity is equal to each entity's 2025 April–October diversions.

[3] The natural flow diverted was calculated from the preliminary daily water right accounting records located here: https://research.idwr.idaho.gov/apps/Hydrologic/Accounting/.

[4] Natural flow recharge values represent accomplished recharge through the Idaho Water Resource Board's recharge water rights as of October 31, 2025.

("SWID").[5] The fourth column contains the preliminary storage allocations reported from the July 15, 2025 Water District 01 storage report.[6] The fifth column summarizes storage adjustments due to the application of the Minidoka Credit.[7] The sixth column contains the total supply available to each SWC member and is calculated by summing columns two through five. The seventh column contains the calculated RISD. RISD is calculated for each SWC entity using demand, crop water need, and project efficiency. The demand shortfall in the last column is calculated by subtracting the RISD from the total supply. The demand shortfall is zero when the total supply exceeds the RISD. The completed application of the methodology order results in a final net in-season demand shortfall volume of 49,100 AF to TFCC for the 2025 irrigation season.

Entity	Natural Flow Diverted through 10/31	Natural Flow Adjustment	Preliminary Storage Allocation	In-Season Storage Allocation Adjustment	Total Supply	RISD	Demand Shortfall
A&B	9,547	-	120,473	-	130,020	56,868	0
AFRD2	90,666	(1,441)	383,912	1,000	474,137	443,825	0
BID	128,387	(2,197)	214,990	5,130	346,310	240,938	0
Milner	14,687	(1,111)	81,420	-	94,996	57,470	0
Minidoka	162,476	-	338,930	8,370	509,776	376,548	0
NSCC	448,541	(12,466)	798,776	(7,750)	1,227,101	968,232	0
TFCC	880,736	(988)	233,880	(6,750)	1,106,878	1,155,974	49,100

5. The following table summarizes the end of season reasonable carryover shortfall calculation for 2025. All values are reported in AF. The second column of the table contains the preliminary storage allocations reported from the July 15, 2025 Water District 01 storage report. The third column summarizes adjustments for storage water due to the application of the Minidoka Credit. The fourth column contains the total storage water use reported from the October 31, 2025 Water District 01 water right accounting report.[8] The fifth column summarizes adjustments for water delivered through the SWC member's canals for use by non-SWC members.[9] The sixth column contains the actual carryover volumes as defined by the *Methodology Order*, *see Methodology Order*, at 45, and is calculated by subtracting the sum of columns four and five from the sum of columns two and three. The seventh column contains the

[5] Further information regarding these adjustments is provided in Attachment A. *See* "Natural Flow Adjustment" column *infra* Attachment A.

[6] The preliminary storage allocations can be found on Water District 01's website: https://www.waterdistrict1.com/current-data/.

[7] The Minidoka Credit is a long existing exchange of stored water among AFRD2, BID, MID, NSCC, and TFCC that has been incorporated into an agreement of those entities and accepted by the SRBA district court. Further information regarding these adjustments is provided in Attachment A. *See* "In-Season Storage Adjustment" column *infra* Attachment A.

[8] Data retrieved from the preliminary daily water right accounting database between November 5–10, 2025.

[9] Further information regarding these adjustments is provided in Attachment A. *See* "Storage Use Adjustment" column *infra* Attachment A (Storage Use Adjustment values include storage assignments reported on the Water District 01 Rental Pool and Adjustment Worksheet as of November 5, 2025).

reasonable carryover volumes established in the *Methodology Order*. *Methodology Order*, at 31. The reasonable carryover shortfall in the last column is zero when the actual carryover is greater than the reasonable carryover, otherwise it is calculated as the difference between reasonable carryover and the actual carryover volume for each member of the SWC. Completed application of the Methodology determines AFRD2 has a reasonable carryover shortfall of 20,932 AF and TFCC has a reasonable carryover shortfall of 65,824 AF. No other members of the SWC have a reasonable carryover shortfall.

Entity	Preliminary Storage Allocation	In-Season Storage Allocation Adjustment	Storage Use	Storage Use Adjustment	Actual Carryover	Reasonable Carryover	Reasonable Carryover Shortfall
A&B	120,473	-	57,225	0	63,248	22,700	0
AFRD2	383,912	1,000	395,244	(6,100)	(4,232)	16,700	20,932
BID	214,990	5,130	157,262	0	62,858	0	0
Milner	81,420	-	55,878	(1,134)	26,676	16,100	0
Minidoka	338,930	8,370	199,017	(35)	148,318	0	0
NSCC	798,776	(7,750)	630,279	(13,000)	173,747	113,300	0
TFCC	233,880	(6,750)	257,166	(1,612)	(28,424)	37,400	65,824

6. The above determinations are based on water diversion and storage data from Water District 01. Although these preliminary numbers are subject to revision by Water District 01 during its final accounting for 2025, revisions will not become available until after issuance of this order. For this reason, these estimates establish the final obligation of junior ground water users in supplying water to the SWC for reasonable carryover shortfall. The above determination of reasonable carryover shortfall is carried forward from the *Methodology Order* and considers the best available water diversion and storage data, comparative water years, and RISD. *Methodology Order*, at 45.

CONCLUSIONS OF LAW

1. The *Methodology Order* states that, on or before November 30, the Director will estimate the SWC's reasonable carryover shortfall, if any, for 2025. *Id*. If a reasonable carryover shortfall is established, junior-priority ground water users shall have fourteen days to demonstrate, to the satisfaction of the Director, "their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC." *Id*.

2. The evidentiary standard to apply in conjunctive administration of hydraulically connected water rights is clear and convincing. *A&B Irr. Dist. v. Idaho Dept. of Water Resources*, 153 Idaho 500, 524, 284 P.3d 225, 249 (2012).

3. "Clear and convincing evidence refers to a degree of proof greater than a mere preponderance." *Idaho State Bar v. Topp*, 129 Idaho 414, 416, 925 P.2d 1113, 1115 (1996) (internal quotations removed). "Clear and convincing evidence is generally understood to be '[e]vidence indicating that the thing to be proved is highly probable or reasonably certain.'" *State*

v. Kimball, 145 Idaho 542, 546, 181 P.3d 468, 472 (2008) (citing *In re Adoption of Doe*, 143 Idaho 188, 191, 141 P.3d 1057, 1060 (2006)); *see also Idaho Dept. of Health & Welfare v. Doe*, 150 Idaho 36, 41, 244 P.3d 180, 185 (2010).

4. Consistent with Finding of Fact 5, the Director concludes by clear and convincing evidence there is a 20,932 AF volume of material injury to AFRD2's reasonable carryover and a 65,824 AF volume of material injury to TFCC's reasonable carryover. No other members of the SWC have a reasonable carryover shortfall.

5. Because not all junior ground water users are participants in an approved mitigation plan, the Director must determine a priority date for curtailment that will result in an accumulation of water to the reaches of the Snake River from which the SWC members divert, in an amount equal to the established reasonable carryover shortfall. The water must accrue to the near Blackfoot to Minidoka reach by September 30 of the following year. Using the Eastern Snake Plain Aquifer Model ("ESPAM") Version 2.2, the Director determines curtailment of ground water rights junior to August 15, 1952, is predicted to produce a volume of at least 86,756 AF in the near Blackfoot to Minidoka reach by September 30, 2026.

6. According to the *Methodology Order*, fourteen days following issuance of this order, which establishes the reasonable carryover shortfall obligation, junior ground water users must "establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC." *Methodology Order*, at 45. Otherwise, "the Director will issue an order curtailing junior ground water rights." *Id*.

ORDER

Based upon the foregoing, IT IS HEREBY ORDERED that, junior ground water users holding consumptive ground water rights within the Eastern Snake Plain Aquifer area of common ground water supply bearing priority dates junior to August 15, 1952, must mitigate for the reasonable carryover shortfall of 86,756 AF in accordance with an approved mitigation plan.[10] If, within fourteen days following issuance of this order, a junior ground water user fails to establish, to the satisfaction of the Director, their ability to mitigate for the reasonable carryover shortfall of 86,756 AF in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water use.

[10] Participants in the mitigation plans approved for the Ground Water Districts, SWID, the Coalition of Cities, and the Water Mitigation Coalition do not need to establish their ability to mitigate for their proportionate share of the reasonable carryover shortfall. However, due to the nature of A&B Irrigation District's approved mitigation plan, A&B must establish to the satisfaction of the Director its ability to mitigate for its proportionate share of the reasonable carryover shortfall, which is 457 AF.

IT IS FURTHER ORDERED that this final order concludes the application of the *Methodology Order* to the climatic, hydrologic, and agronomic facts of the 2025 irrigation season.

DATED this 21st day of November 2025.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of November 2025, the above and foregoing was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP PO Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com jks@idahowaters.com[11]	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

[11] The Department has been made aware that John Simpson is no longer associated with the firm on record for him in this matter: Marten Law LLP. To ensure Mr. Simpson receives a copy of this order, the Department has included his IdaH2O, PLLC email address in the service list. However, this inclusion does not remove any duty that counsel may have to formally notify the Department and the parties in this matter of his change of firm or representation in this matter.

Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83702 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Michael A. Kirkham City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 mkirkham@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

Jerry R. Rigby
RIGBY, ANDRUS & RIGBY LAW, PLLC
PO Box 250
Rexburg, ID 83440
jrigby@rex-law.com

Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
1101 W. River Street, Suite 110
Boise, Idaho 83702
andy@sawtoothlaw.com

Sarah Tschohl, Paralegal

Attachment A

2025 SWC Adjustments

Entitiy	Adjustment Volume (AF)	Description	Natural Flow Adjustment	In-Season Storage Adjustment	Storage Use Adjustment
A&B	(164)	Twin Falls Canal Company (A&B Irrigation District)	No	No	No
		Total A&B	**0**	**0**	**0**
AFRD2	2,000	Minidoka Irrigation District (Conservation Infrastructure)	No	No	Yes
	3,500	Minidoka Irrigation District (North Snake GWD)	No	No	Yes
	833	Minidoka Irrigation District (Water Mitigation Coalition)	No	No	No
	1,000	Minidoka Credit	No	Yes	No
	600	Shoshone-Bannock Tribes (American Beef Ranch)	No	No	Yes
	16,439	IGWA	No	No	No
AFRD2	1,465	City of Pocatello (City of Pocatello)	No	No	No
	2,846	City of Pocatello (Signatory Cities)	No	No	No
	1,441	IWRB Recharge	Yes	No	No
		Total AFRD	**1,441**	**1,000**	**6,100**
BID	638	Minidoka Irrigation District (Water Mitigation Coalition)	No	No	No
	5,130	Minidoka Credit	No	Yes	No
	1,797	SWID Natural Flow	Yes	No	No
	400	IWRB Recharge	Yes	No	No
		Total BID	**2,197**	**5,130**	**0**
Milner	1,134	Artesian	No	No	Yes
	170	Minidoka Irrigation District (Water Mitigation Coalition)	No	No	No
	1,111	SWID Natural Flow	Yes	No	No
		Total Milner	**1,111**	**0**	**1,134**
MID	18	Sundt Construction	No	No	Yes
	3	Lucky Lake	No	No	Yes
	14	Whitaker Construction	No	No	Yes
	(2,000)	AFRD2 (Conservation Infrustructure)	No	No	No
	(5,000)	Magic Valley GWD	No	No	No
	(11,500)	Northside Canal (North Snake GWD)	No	No	No
	(3,500)	AFRD2 (North Snake GWD)	No	No	No
	(5,000)	Southwest Irrigation District	No	No	No
	(10,000)	Water Mitigation Coalition	No	No	No
	1,029	Minidoka Irrigation District (Water Mitigation Coalition)	No	No	No
	8,370	Minidoka Credit	No	Yes	No
	(5,000)	Magic Valley GWD	No	No	No
		Total MID	**0**	**8,370**	**35**
NSCC	11,500	Minidoka Irrigation Disrict (Northsnake GWD)	No	No	Yes
	1,500	Minidoka Irrigation Disrict (Water Mitigation Coalition)	No	No	Yes
	2,065	Minidoka Irrigation District (Water Mitigation Coalition)	No	No	No
	(7,750)	Minidoka Credit	No	Yes	No
	12,466	IWRB Recharge	Yes	No	No
		Total NSCC	**12,466**	**(7,750)**	**13,000**
TFCC	1,612	Artesian	No	No	Yes
	164	A&B Irrigation District	No	No	No
	1,088	Minidoka Irrigation Disrict (Water Mitigation Coalition)	No	No	No
	2,678	Minidoka Irrigation District (Water Mitigation Coalition)	No	No	No
	704	Simplot	No	No	No
	(6,750)	Minidoka Credit	No	Yes	No
	58,561	IGWA	No	No	No
	988	IWRB Recharge	Yes	No	No
		Total TFCC	**988**	**(6,750)**	**1,612**

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

The accompanying document is a "**Final Order**" issued by the Idaho Department of Water Resources ("Department") pursuant to Idaho Code § 67-5246.

PETITION FOR RECONSIDERATION

(*See* Idaho Code § 67-5246(4))

Any party may file a petition for reconsideration of this final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The presiding officer will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law.

REQUEST FOR HEARING

(*See* Idaho Code § 42-1701A(3))

Unless the right to a hearing before the Department or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order or action of the Director, and who has not previously been afforded an opportunity for a hearing on the matter may request a hearing pursuant to Idaho Code § 42-1701A(3). A written petition to the Director contesting this final order and requesting a hearing must be filed with the Department by any aggrieved person **within fifteen (15) days after service of this final order**.

CERTIFICATE OF SERVICE

(*See* IDAPA 37.01.01.053, 37.01.01.202)

All documents filed with the Department in connection with a petition for reconsideration or a request for hearing of this final order shall be served on all other parties to the proceedings in accordance with Rules of Procedure 53 and 202.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER CURTAILING GROUND WATER RIGHTS JUNIOR TO AUGUST 15, 1952**

The Director of the Idaho Department of Water Resources ("Department") finds, concludes, and orders as follows:

FINDINGS OF FACT

1. On July 19, 2023, the Department issued its *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC").[1]

2. On November 21, 2025, the Director issued the *Final Order Establishing 2025 Reasonable Carryover (Methodology Step 9)* ("*Step 9 Order*"). Therein, the Director concluded there is a 65,824-acre-foot ("AF") volume of material injury to Twin Falls Canal Company's reasonable carryover and a 20,932 AF volume of material injury to AFRD2. *Step 9 Order*, at 5. The Director concluded no other members of the SWC have a reasonable carryover shortfall. *Id*.

3. The Director ordered that within fourteen days of November 21, 2025, "junior ground water users holding consumptive ground water rights within the Eastern Snake Plain Aquifer area of common ground water supply bearing priority dates junior to August 15, 1952, must mitigate for the reasonable carryover shortfall of 86,756 AF in accordance with an approved mitigation plan." *Id*. The Director also ordered that, if such junior ground water users cannot establish that they can mitigate for the reasonable carryover shortfall "in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water use." *Id.*

[1] The SWC is comprised of A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

4. There are currently five approved mitigation plans in place responding to the SWC delivery call:[2]

(1) Docket No. CM-MP-2007-001 for the benefit of J.R. Simplot Company, Basic American Foods, and ConAgra Foods Packaged Foods Company, Inc., d/b/a Lamb-Weston (collectively, the "Water Mitigation Coalition");

(2) Docket No. CM-MP-2010-001 for the benefit of the Southwest Irrigation and Goose Creek Irrigation Districts (collectively, "SWID");

(3) Docket No. CM-MP-2015-003 for the benefit of the A&B Irrigation District ("A&B");

(4) Docket No. CM-MP-2019-001 for the benefit of certain cities commonly referred to as the "Coalition of Cities," the City of Idaho Falls, and the City of Pocatello (collectively, the "Cities").

(5) Docket No. CM-MP-2024-003 for the benefit of Aberdeen-American Falls Ground Water District, Bingham Ground Water District, Bonneville-Jefferson Ground Water District, Carey Valley Ground Water District, Henry's Fork Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, Magic Valley Ground Water District, and North Snake Ground Water District (collectively, the "Ground Water Districts");

5. In the *Step 9 Order*, the Director found that due to the nature of the approved mitigation plans for the Water Mitigation Coalition, SWID, the Cities, and the Ground Water Districts, these entities do not need to establish that they can mitigate for their proportionate share of the reasonable carryover shortfall. *Step 9 Order*, at 5 n.10. However, the Director found that due to the nature of A&B's mitigation plan, A&B must establish to the satisfaction of the Director its ability to mitigate for its proportionate share of the reasonable carryover shortfall, which is 457 AF. *Id.*

6. In response to the *Step 9 Order's* requirement for A&B to establish how it will mitigate its proportionate share of the reasonable carryover shortfall, A&B submitted *A&B Irrigation District's Request for Hearing/Evidence of Ability to Mitigate* ("*Mitigation Response*"). In the *Mitigation Response*, A&B stated that it does not intend to submit a lease demonstrating that it has secured the required storage for the benefit of the injured SWC members at this time. *Mitigation Response* at 3. A&B acknowledged that this may result in the Director including A&B's junior priority water rights in the list of water rights subject to this curtailment order. *Id*.

CONCLUSIONS OF LAW

1. Idaho Code § 42-602 authorizes the Director to supervise water distribution within

[2] In addition, there are currently five mitigation plans pending before the Department that have not been approved: (1) CM-MP-2025-004 (Big Lost River Ground Water District); (2) CM-MP-2025-003 (Bingham); (3) CM-MP-2025-001 (Pancheri); (4) CM-MP-2024-004 (Falls Water Co.); and (5) CM-MP-2024-002 (Falls Irrigation District). Because these plans are unapproved, water users may not rely on them for protection from curtailment at this time. In addition, CM-MP-2025-002 (Simplot) is no longer an effective mitigation plan because it was approved only for the 2025 irrigation season.

water districts:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director.
>
> The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

2. As explained above, within fourteen days of November 21, 2025, "junior ground water users holding consumptive ground water rights within the Eastern Snake Plain Aquifer area of common ground water supply bearing priority dates junior to August 15, 1952, must mitigate for the reasonable carryover shortfall of 86,756 AF in accordance with an approved mitigation plan." *Step 9 Order*, at 5. If a junior ground water user does not establish that they can mitigate for the reasonable carryover shortfall in accordance with an approved mitigation plan, the ground water user will be subject to this "order curtailing the junior-priority ground water use." *Id.*

3. Due to the nature of the approved mitigation plans for the Water Mitigation Coalition, SWID, the Cities, and the Ground Water Districts, these entities do not need to establish that they can mitigate for their proportionate share of the reasonable carryover shortfall. Junior ground water users entitled to protection under the Water Mitigation Coalition's, SWID's, the Cities', or the Ground Water Districts' approved mitigation plans will not be subject to curtailment related to the reasonable carryover shortfall.

4. A&B has failed to provide timely documentation that it has adequately secured the storage water necessary to mitigate fully for its obligation under its approved mitigation plan. Accordingly, to ensure that A&B's ground water rights junior to August 15, 1952, are curtailed during the 2026 irrigation season, the Director will include A&B's water rights junior to August 15, 1952, on the curtailment list in Attachment A to this order.

5. The Director concludes that junior-priority ground water users who have not established that they can mitigate for the reasonable carryover shortfall in accordance with an approved mitigation plan should be curtailed. Junior-priority ground water users subject to curtailment are listed in Attachment A to this order.[3]

[3] On November 26, 2025, the Director expanded the ESPA ACGWS to include the Little Lost River Tributary basin. The administration of the newly included area of the Little Lost River Tributary Basin will be phased-in to the SWC delivery call proceeding and junior ground water rights newly included in the ESPA ACGWS are not included in the attached curtailment list. The Director anticipates issuing additional orders related to the expansion of the ESPA ACGWS. After that, the Director will issue an order addressing how the water rights in the newly expanded ESPA ACGWS will be phased-in.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that effective December 8, 2025, ground water users holding water rights bearing priority dates junior to August 15, 1952, within the Eastern Snake Plain Aquifer area of common ground water supply ("ESPA ACGWS") and listed in Attachment A to this order, shall curtail/refrain from diversion and use of ground water pursuant to those water rights unless notified by the Department that the curtailment order has been modified or rescinded as to their water rights.

IT IS FURTHER ORDERED that holders of ground water rights listed in Attachment A to this order, who were not previously listed in Attachment A to the July 25, 2025 Curtailment Order, may seek to participate in an approved mitigation plan through a ground water district and shall have fifteen days from the date of this order to join, solely for mitigation purposes, the ground water district situated nearest the lands to which the water rights are appurtenant. *See* H.B. 737a, 58th Leg., 2d Reg. Sess. (Idaho 2006) (*Act Relating to the Administration of Ground Water Rights Within the Eastern Snake River Plain*); *see also* I.C. § 42-5259. The water rights that have fifteen days to join a ground water district are identified in Attachment A.

IT IS FURTHER ORDERED that watermasters for the water districts within the ESPA ACGWS who regulate ground water are directed to review the water rights listed in Attachment A to this order and begin the curtailment process.

IT IS FURTHER ORDERED that this order applies to consumptive ground water rights, including but not limited to, agricultural, commercial, industrial, and municipal uses. This order excludes ground water rights used for *de minimis* domestic purposes where such domestic use is within the limits of the definition set forth in Idaho Code § 42-111 and ground water rights used for *de minimis* stock watering where such stock watering use is within the limits of the definitions set forth in Idaho Code § 42-1401A(11), pursuant to IDAPA 37.03.11.020.11.

Dated 8th day of December 2025.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 8th day of December 2025, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage ☒ prepaid Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage ☒ prepaid Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage ☒ prepaid Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage ☒ prepaid Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage ☒ prepaid Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage ☒ prepaid Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage ☒ prepaid Email

Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage ☒ prepaid Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage ☒ prepaid Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage ☒ prepaid Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage ☒ prepaid Email
Michael A. Kirkham City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 mkirkham@idahofallsidaho.gov	☒ U.S. Mail, postage ☒ prepaid Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage ☒ prepaid Email
Dylan Anderson Dylan Anderson Law PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage ☒ prepaid Email

COURTESY COPY TO: Craig Chandler IDWR— Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 craig.chandler@idwr.idaho.gov	☒ Email
COURTESY COPY TO: Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS, LOVELAND, SHIRLEY & LINDSTROM, LLP PO Box 910 Burley, ID 83318 wparsons@pmt.org wparsons@magicvalley.law	☒ Email
COURTESY COPY TO: Jerry R. Rigby RIGBY, ANDRUS & RIGBY LAW, PLLC PO Box 250 Rexburg, ID 83440 jrigby@rex-law.com	☒ Email
COURTESY COPY TO: Andrew J. Waldera SAWTOOTH LAW OFFICES, PLLC 1101 W. River Street, Suite 110 Boise, Idaho 83702 andy@sawtoothlaw.com	☒ Email

Megan Jenkins
Executive Assistant

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to August 15, 1952
(Highlighted rights have 15-days to join a Ground Water District)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
1523 LLC	35-14566	Decreed	11/3/1972	IRRIGATION	0.05	2.6	
288S 500W LLC	36-17158	Decreed	2/1/1961	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
2ME FARMS LLC	34-2328B	Decreed	4/29/1955	IRRIGATION	1.64	82.0	
2ME FARMS LLC	34-2284B	Decreed	8/14/1957	IRRIGATION	1.50	65.0	
2ME FARMS LLC	34-2400B	Decreed	3/2/1961	IRRIGATION	2.10	116.0	
3 STRING CATTLE OF IDAHO LLC	37-23203	Decreed	7/24/1973	COMMERCIAL, STOCKWATER	0.16		
3 WEIGHT LLC	34-7081	Decreed	10/10/1974	IRRIGATION	1.30	65.0	
A & B IRRIGATION DISTRICT	36-16749	Decreed	4/1/1956	IRRIGATION	0.45	26.0	
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15127A	Decreed	4/1/1962	IRRIGATION	31.12		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15192	Decreed	4/1/1962	IRRIGATION	0.60		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15193A	Decreed	4/1/1962	IRRIGATION	0.21		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15194A	Decreed	4/1/1962	IRRIGATION	0.23		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15195A	Decreed	4/1/1962	IRRIGATION	0.87		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15196A	Decreed	4/1/1962	IRRIGATION	0.29		
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15193B	Decreed	4/1/1965	IRRIGATION	0.31		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15194B	Decreed	4/1/1968	IRRIGATION	2.51		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15195B	Decreed	4/1/1978	IRRIGATION	2.24		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15196B	Decreed	4/1/1981	IRRIGATION	0.08		Yes
A & B IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	36-15127B	Decreed	4/1/1984	IRRIGATION	28.89		Yes
A W HARDY FAMILY INVESTMENTS LTD	29-14198	Decreed	6/23/1977	IRRIGATION	0.01	0.9	
A W HARDY FAMILY INVESTMENTS LTD	29-14427	Decreed	6/23/1977	IRRIGATION	0.01	0.3	
A W HARDY FAMILY INVESTMENTS LTD	29-14431	Decreed	6/23/1977	IRRIGATION	0.01	1.3	
A W HARDY FAMILY INVESTMENTS LTD	29-14435	Decreed	6/23/1977	IRRIGATION	0.03	3.4	
ADAMS, CHERYL L; ADAMS, H LYLE; ADAMS, RODDY L	37-7078	Decreed	10/12/1970	COMMERCIAL, STOCKWATER	0.06		
ADAMS, MARY J	25-14316	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
AEI CORP	29-8037	License	11/13/1990	DOMESTIC, INDUSTRIAL	0.06		
AGRI-SERVICE LLC	36-8453	License	9/21/1989	COMMERCIAL	0.04		
AIKELE, DON A	34-14179	Decreed	4/20/1961	IRRIGATION	0.02	2.0	
AIKELE, ERIC; AIKELE, JANET	34-7029	Decreed	12/4/1972	IRRIGATION	6.00	325.0	
AIKELE, ERIC; AIKELE, JANET	34-12382	Decreed	5/1/1973	IRRIGATION	0.46	325.0	Yes
AIKELE, ERIC; AIKELE, JANET	34-7060	Decreed	1/22/1974	IRRIGATION	3.00	150.0	
AIKELE, ERIC; AIKELE, JANET	34-7164	Decreed	12/14/1976	IRRIGATION	1.79	179.0	
AIKELE, ERIC; AIKELE, JANET	34-12417	Decreed	5/1/1981	IRRIGATION	0.46	179.0	Yes
AIKELE, JUEL; AIKELE, MARY ANN	34-14692	Decreed	4/20/1961	IRRIGATION	0.01	1.2	
AIKELE, PEGGY; AIKELE, STEVEN J	34-14693	Decreed	4/20/1961	IRRIGATION	0.01	1.2	

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AIRGAS INTERMOUNTAIN INC	25-7515	License	8/24/1989	INDUSTRIAL	0.05		
AKERS, DONNA E; AKERS, SHERMAN L	29-10649	Decreed	8/1/1961	IRRIGATION, STOCKWATER	0.13	6.4	
ALBERT, IVIS; GRANT US PEACE LLC; WHITEHEAD, MARIE	34-7105	Decreed	3/11/1975	DOMESTIC, IRRIGATION	0.23	11.0	
ALLEN FARMS INC	33-7173	Decreed	5/29/1985	IRRIGATION	4.07	315.0	
ALLEN FARMS INC	33-7175	Decreed	5/29/1985	IRRIGATION	5.22	297.0	
ALLEN, BRENT L; ALLEN, N SCOTT	33-7012	Decreed	6/8/1972	IRRIGATION	3.82	288.0	
ALLEN, BRENT L; ALLEN, N SCOTT; ALLEN, NORMAN G	33-2081A	Decreed	10/22/1956	IRRIGATION	1.86	288.0	
ALLEN, BRENT L; ALLEN, N SCOTT; ALLEN, NORMAN G	33-2081B	Decreed	10/22/1956	IRRIGATION	1.55	312.0	
ALLEN, BRENT L; ALLEN, N SCOTT; ALLEN, NORMAN G	33-7017	Decreed	5/25/1972	IRRIGATION, STOCKWATER	3.09	312.0	
ALLEN, NORMAN S	33-2124	Decreed	4/14/1966	IRRIGATION	4.49	305.0	
ALLEN, NORMAN S	33-7088A	Decreed	1/27/1981	IRRIGATION	0.08	4.0	
AMERICAN FALLS RESERVOIR DISTRICT #2	36-11120	Decreed	11/27/1962	DOMESTIC, IRRIGATION	0.07	1.5	
ANDERSEN, BELVA E; ANDERSEN, JOEL S	34-2397A	Decreed	2/20/1961	IRRIGATION	2.40	120.0	
ANDERSEN, BELVA E; ANDERSEN, JOEL S	34-2412C	Decreed	4/13/1961	IRRIGATION	3.52	142.1	
ANDERSEN, BELVA E; ANDERSEN, JOEL S	34-7184	Decreed	4/26/1977	IRRIGATION	0.56	33.0	
ANDERSEN, BELVA E; ANDERSEN, JOEL S	34-7210A	Decreed	11/8/1977	IRRIGATION	1.08	73.0	
ANDERSEN, DEAN	34-2416B	Decreed	5/16/1961	IRRIGATION	1.34	209.5	
ANDERSEN, DEAN; ANDERSEN, KARALEE W	34-2416C	Decreed	5/16/1961	IRRIGATION	0.80	209.5	
ANDERSEN, TRAVIS REX	34-10370A	Decreed	5/31/1960	IRRIGATION	2.29	152.0	
ANDERSEN, TRAVIS REX	34-10370B	Decreed	5/31/1960	IRRIGATION	0.81	54.0	
ANDERSEN, TRAVIS REX	34-10941A	Decreed	5/1/1965	IRRIGATION	0.60	152.0	Yes
ANDERSEN, TRAVIS REX	34-10941B	Decreed	5/1/1965	IRRIGATION	0.21	54.0	Yes
ANDERSON, BARBARA; ANDERSON, TREVOR	34-7237	Decreed	1/24/1980	IRRIGATION, STOCKWATER	0.06	3.0	
ANDERSON, BRENDA; ANDERSON, SHAWN	34-4135	Decreed	7/8/1955	IRRIGATION	3.28	164.0	
ANDERSON, BRIAN M	34-7008	Decreed	6/24/1968	IRRIGATION	0.88	44.0	
ANDERSON, CHAD ALLEN; ANDERSON, JASHELLE HEATHER	45-7650	License	6/21/1989	DOMESTIC, IRRIGATION	0.06	1.0	
ANDERSON, CLARK E; ANDERSON, TRACY	29-14453	Decreed	10/28/1953	IRRIGATION	0.02	2.9	
ANDERSON, CLARK E; ANDERSON, TRACY	29-14433	Decreed	6/23/1977	IRRIGATION	0.03	2.9	
ANDERSON, MARY M; ANDERSON, ROBERT R	34-14679	Decreed	2/11/1955	IRRIGATION	2.04	129.0	
ANDERSON, MAURICE H	34-7183	Decreed	4/25/1977	IRRIGATION	0.74	80.0	
ANDERSON, RENAE; ANDERSON, RICHARD	29-2393A	Decreed	9/25/1957	IRRIGATION	0.04	2.5	
ANDREASON, DAVID S	33-2087A	Decreed	6/12/1959	IRRIGATION	0.68	34.0	
ANDREASON, TYLER JAMES	33-7059	Decreed	9/19/1977	DOMESTIC, IRRIGATION	1.10	77.0	
ANGIELEN LLC	32-13351	Decreed	11/12/1974	STOCKWATER	0.06		
ANGIELEN LLC	32-13353	Decreed	4/1/1987	STOCKWATER	0.01		Yes

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ARCHER, CINDY L	34-2439	Decreed	10/6/1961	IRRIGATION	0.80	39.0	
ARMENTA, JUAN; SANCHEZ, BLANCA	37-23654	Decreed	9/20/1974	IRRIGATION	0.07	5.0	
ARTCO INC	22-7473	License	12/23/1983	INDUSTRIAL, IRRIGATION	0.84	17.0	
ASHLEY, LOIS J	34-14243	Decreed	4/29/1955	IRRIGATION	0.11	5.3	
ATKINSON, ANDREW ; ATKINSON, MARY	29-13736	License	2/21/2006	DOMESTIC	0.08		
B & B FARMS	22-14632	Decreed	1/25/1965	MUNICIPAL	0.61		
B & B FARMS	22-14630	Decreed	3/4/1974	MUNICIPAL	0.28		
BABCOCK, MARJORIE J; BABCOCK, REUBEN H	34-2330A	Decreed	5/5/1955	IRRIGATION	1.75	156.0	
BABCOCK, MARJORIE J; BABCOCK, REUBEN H	34-12377	Decreed	6/1/1961	IRRIGATION	1.25	156.0	
BABEL, PAUL; HAMPTON, WALLACE; PARKS, FRED A	25-7083	License	1/28/1976	DOMESTIC	0.06		
BABEL, PAUL; JEPPESEN, DARWIN J; PARKS, FRED A	25-7363	License	6/24/1983	DOMESTIC	0.04		
BABNEAU, LORI P; BABNEAU, RONALD E	34-2477J	Decreed	6/13/1966	IRRIGATION	0.05	2.5	
BAH REXBURG AC PROPERTY LLC	22-11451	Decreed	8/31/1960	IRRIGATION	0.04	2.0	
BAILEY, ARLENE; HIGGINS, DARLENE	34-7177	Decreed	4/11/1977	IRRIGATION	0.71	36.0	
BAILEY, JULIE A; BAILEY, STEVEN E	35-8619	License	9/24/1985	IRRIGATION, STOCKWATER	0.04	0.5	
BAISCH, ROBERT L	35-7481	License	2/21/1975	DOMESTIC	0.08		
BAKER FARMS INC	22-7761	License	8/20/1993	COMMERCIAL, DOMESTIC	0.04		
BAKER, BONNIE K; BAKER, JASON K	34-14954	Decreed	5/14/1977	IRRIGATION	0.19	10.0	
BAM PROPERTIES LLC	29-2495	Decreed	8/12/1964	IRRIGATION	0.61	28.5	
BANDY, BONNIE; BANDY, BRADLEY W	36-7473	Decreed	5/14/1974	IRRIGATION	0.02	1.0	
BANNOCK COUNTY	29-7329	Decreed	5/12/1976	IRRIGATION	0.82	61.1	
BANNOCK COUNTY	29-7972	License	5/5/1990	DIVERSION TO STORAGE, IRRIGATION, RECREATION STORAGE	0.48	61.1	
BARBEN, GORDON E; SAMPSON, KEN	27-7025	License	4/2/1973	DOMESTIC	0.08		
BARKDULL, CARL; BARKDULL, KATHLEEN	29-7619	Decreed	1/5/1982	DOMESTIC, IRRIGATION	0.02	1.2	
BARTAUSKY, TOM	27-7404	License	4/8/1985	IRRIGATION	1.00	50.0	
BARTAUSKY, TOM	27-7432	License	7/10/1987	IRRIGATION	0.70	35.0	
BARTAUSKY, TOM; BLEAZARD, ELCY	27-12209	License	8/22/1991	IRRIGATION	0.11	5.3	
BARTLETT, CLIFFORD; BARTLETT, SANDRA	25-14259	Decreed	8/10/1966	IRRIGATION	0.03	1.4	
BARTLETT, ERWIN; BARTLETT, JANICE	45-7653	License	6/6/1989	COMMERCIAL	0.04		
BATEMAN, CHRISTOPHER	34-14087	Decreed	5/14/1977	IRRIGATION	0.22	11.4	
BATES, ROBERT W; BATES, SHARON H; WILKINS, ELMA; WILKINS, LLOYD	25-7357	Decreed	6/16/1983	DOMESTIC	0.06		
BATT, ALAN C; BATT, MILLIE	25-7109	Decreed	5/2/1977	IRRIGATION	3.03	229.0	
BEACH, BEVERLY S; BEACH, SHELTON S	34-14591	Decreed	4/28/1977	DOMESTIC, IRRIGATION	0.30	30.0	
BEACH, BEVERLY S; BEACH, SHELTON S	34-14592	Decreed	8/5/1979	IRRIGATION	0.04	30.0	Yes

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BEAL, SETH E; BEAL, SHELLEY	34-2397B	Decreed	2/20/1961	IRRIGATION	2.36	112.0	
BEAL, SETH E; BEAL, SHELLEY	34-2397C	Decreed	2/20/1961	IRRIGATION	1.46	73.0	
BEAR CREST LTD LLC	22-14440	Permit	12/6/2021	COMMERCIAL	1.22		
BEAR ISLAND WATER ASSN INC	35-8672	License	9/6/1988	DOMESTIC	0.20		
BEARD, KAYDON	34-13779	Decreed	5/6/1954	IRRIGATION	0.14	7.0	
BECK, AMBER; BECK, TRAVIS	34-14516	Decreed	12/17/1961	IRRIGATION	0.08	4.1	
BEDY CANYON LLC	34-2424A	Decreed	6/13/1961	IRRIGATION	3.03	177.0	
BEELER, GARY; BEELER, PRISCILLA	34-14844	Decreed	9/29/1966	IRRIGATION	0.16	9.8	
BEELER, GARY; BEELER, PRISCILLA	34-14847	Decreed	5/20/1984	IRRIGATION	0.03	9.8	Yes
BEESLEY, DEAN; BEESLEY, HAZEL L; WRAUGHT, PERCY M	25-7268	Decreed	1/8/1982	DOMESTIC	0.06		
BELANGER, CARRIE A	34-7115	Decreed	12/4/1989	IRRIGATION	0.16	8.0	
BELL SMITH LLC	34-2321	Decreed	2/8/1955	DOMESTIC, IRRIGATION	6.00	738.0	
BELL SMITH LLC	34-2322	Decreed	2/8/1955	IRRIGATION	4.20	319.0	
BELL SMITH LLC	34-2367	Decreed	5/12/1960	IRRIGATION	2.87	221.0	
BELL SMITH LLC	34-2378	Decreed	8/2/1960	IRRIGATION	1.78	319.0	
BELL SMITH LLC	34-7015	Decreed	4/17/1970	DOMESTIC, IRRIGATION	4.67	738.0	
BELL, JAMIE; BELL, TROY	29-14451	Decreed	10/28/1953	IRRIGATION	0.06	6.9	
BELL, JAMIE; BELL, TROY	29-14424	Decreed	6/23/1977	IRRIGATION	0.06	6.9	
BENSON, CLIFFORD; BENSON, LADAWN C	35-8124	Permit	3/25/1983	IRRIGATION	6.40	320.0	
BEORCHIA, MICHAEL; BEORCHIA, REVA	35-14830	Decreed	1/26/1962	IRRIGATION	0.02	2.3	
BETTY JK KEKUNA-TOMISATO REVOCABLE LIVING TRUST; GLENN N TOMISATO REVOCABLE LIVING TRUST; HUFFAKER, LYLE D; HUFFAKER, TERI L	34-13932	Decreed	12/17/1961	IRRIGATION	0.08	5.0	
BETZER, CADEN BO; BETZER, DAKOTA LEE	34-14843	Decreed	9/29/1966	IRRIGATION	0.16	9.8	
BETZER, CADEN BO; BETZER, DAKOTA LEE	34-14846	Decreed	5/20/1984	IRRIGATION	0.03	9.8	Yes
BEVAN, DONNA; BEVAN, THOMAS	35-14773	Decreed	4/27/1964	IRRIGATION	0.08	2.0	
BEVERLY, EDWARD; BEVERLY, TANA	34-14598	Decreed	8/29/1960	IRRIGATION	0.06	6.0	
BEVERLY, EDWARD; BEVERLY, TANA	34-14599	Decreed	12/17/1961	IRRIGATION	0.01	6.0	
BEVERLY, EDWARD; BEVERLY, TANA	34-14600	Decreed	1/3/1975	IRRIGATION	0.01	6.0	
BEYER, PATRICK	25-7313	Decreed	4/11/1983	DOMESTIC, IRRIGATION	0.05	0.7	
BIG FIVE WATER ASSN	25-7199	Decreed	7/24/1980	DOMESTIC	0.11		
BIG J FARMS LLC; JAG FARMS LLC	35-13068	Decreed	12/31/1977	DOMESTIC	0.01		
BIG J FARMS LLC; JAG FARMS LLC	35-13199	Decreed	11/1/1983	DOMESTIC	0.08		
BIG LOST RIVER CEMETERY DISTRICT	34-2337	Decreed	1/25/1957	IRRIGATION	0.10	8.0	
BIG LOST RIVER CEMETERY DISTRICT	34-10452	Decreed	5/15/1967	IRRIGATION	0.04	8.0	Yes

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BIGGS, DONALD; BIGGS, HELEN ; BUSH, ROBERT; EATON, BENJAMIN; EATON, KENDRA; OCKERMAN, JOY	25-7082	Decreed	1/28/1976	DOMESTIC	0.16		
BINGHAM COUNTY	35-14757	License	9/21/1989	COMMERCIAL	0.13		
BINGHAM, BOYD A; BINGHAM, SHERRY R	36-8425	License	6/23/1989	IRRIGATION	0.88	105.0	
BINGHAM, CHERYL J; BINGHAM, MAX J	34-14528	Decreed	9/13/1961	IRRIGATION	0.07	4.0	
BINGHAM, CHERYL J; BINGHAM, MAX J	34-14529	Decreed	4/1/1977	IRRIGATION	0.01	4.0	Yes
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2266	Decreed	10/9/1952	IRRIGATION	3.10	391.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2269G	Decreed	10/23/1952	IRRIGATION	4.35	391.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-12226	Decreed	4/1/1987	IRRIGATION	0.59	285.0	Yes
BINGHAM, LYNN; BINGHAM, MARCINE	33-2074	Decreed	2/25/1955	IRRIGATION	0.64	32.0	
BLACK HAWK HOMEOWNERS ASSN INC	25-14305	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14307	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14308	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14312	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14315	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-7669	License	2/23/1999	DOMESTIC	1.05		
BLACK HAWK HOMEOWNERS ASSN INC	25-14395	License	8/28/2013	DOMESTIC	0.40		
BLAINE COUNTY SCHOOL DISTRICT #61	37-22205	Decreed	7/21/1961	MITIGATION	0.30		
BLAINE COUNTY SCHOOL DISTRICT #61	37-21742	License	4/17/2006	IRRIGATION	0.70	8.7	
BLAINE COUNTY SCHOOL DISTRICT #61	37-23102	Permit	2/20/2018	IRRIGATION	0.38	4.8	
BLAKE, AMANDA	35-14013	License	2/19/2010	RECREATION STORAGE	0.00		
BLEAK, BRUCE; BLEAK, CARMA	34-14129	Decreed	2/12/1974	IRRIGATION	1.13	29.4	
BLEDSOE, HELEN M; HACKMAN, ERNEST A	35-7916	License	9/16/1980	DOMESTIC	0.08		
BLEYL, DAARON; BLEYL, NICOLE	34-14015	Decreed	3/20/1961	IRRIGATION	0.16	8.3	
BLISS LLC	37-7761A	Decreed	5/8/1980	DOMESTIC, STOCKWATER	0.07		
BLUE SPRUCE RANCH LP	34-10579	Decreed	8/2/1961	IRRIGATION	0.92	194.0	
BLUE SPRUCE RANCH LP	34-2433	Decreed	8/2/1961	IRRIGATION	2.34	194.0	
BOHMAN, JON MARC; BOHMAN, REBECCA S	25-14271	Decreed	8/10/1966	IRRIGATION	0.02	1.1	
BOHNE, BLAINE L	34-13880	Decreed	12/17/1961	IRRIGATION	0.10	5.7	
BOISE PACKAGING & NEWSPRINT LLC	45-2568	Decreed	4/1/1958	DOMESTIC, FIRE PROTECTION FROM STORAGE, FIRE PROTECTION STORAGE, FIRE PROTECTION	0.09		
BOLINDER, CATHERINE L	27-7322	License	6/8/1982	DOMESTIC	0.06		
BONAWITZ, DANI; BONAWITZ, DUKE	36-8065	Decreed	2/17/1982	DOMESTIC, IRRIGATION	0.12	5.0	
BONNIE BARTON BANDY IRREVOCABLE TRUST	36-17287	Decreed	5/14/1974	IRRIGATION	0.08	4.0	
BORAH PEAK FARMS LLC	33-2103	Decreed	6/28/1961	IRRIGATION	3.52	1754.0	

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BORAH PEAK FARMS LLC	33-2107	Decreed	10/2/1961	IRRIGATION	3.68	1754.0	
BORAH PEAK FARMS LLC	33-10985	Decreed	4/1/1987	IRRIGATION	1.73	1754.0	Yes
BORAH PEAK FARMS LLC	33-7183	License	4/17/1987	IRRIGATION	3.61	1754.0	
BORAN , MICHAEL J	35-8635B	Decreed	12/17/1986	FISH PROPAGATION	0.72		
BORAN , MICHAEL J	35-8782	License	5/23/1989	FISH PROPAGATION	4.64		
BOWDEN, JOHN ISOM; BOWDEN, SHEENA MARYA	34-4044	Decreed	6/1/1961	IRRIGATION	0.04	2.0	
BOWN, RICHARD F; BOWN, VIRGINIA	34-4076	Decreed	6/10/1959	DOMESTIC, IRRIGATION, STOCKWATER	0.13	6.0	
BRADY, LANCE; BRADY, SHANNON; HAGAN, DANNY D; HAGAN, MARILYNN J ; HOLMES, BILL; HOLMES, LINDA	25-7330	Decreed	6/14/1983	DOMESTIC, IRRIGATION	0.08	0.4	
BRAGA, BRYAN	34-14685	Decreed	12/31/1955	DOMESTIC, IRRIGATION	0.04	2.0	
BRAGG, CANDY LEE; BRAGG, JOHNATHAN KENNETH	34-13975	Decreed	6/22/1961	IRRIGATION	0.65	39.5	
BRANAGAN, DANIEL JAMES; BRANAGAN, KERRY	34-13751	Decreed	1/30/1961	IRRIGATION	0.01	3.0	
BRANAGAN, DANIEL JAMES; BRANAGAN, KERRY	34-13753	Decreed	8/31/1976	IRRIGATION	0.05	3.0	
BRIGGS LAND & LIVESTOCK LLC	32-13404	Decreed	12/2/1976	IRRIGATION	0.73	151.0	
BRIGGS LAND & LIVESTOCK LLC	32-13405	Decreed	12/2/1976	IRRIGATION	0.86	151.0	
BRIGGS LAND & LIVESTOCK LLC	32-13406	Decreed	4/1/1986	IRRIGATION	0.25	151.0	Yes
BROADIE IV, MOJANET JAMES; BROADIE, KELSEY D	34-2413C	Decreed	5/12/1961	IRRIGATION	1.67	210.0	
BROADIE IV, MOJANET JAMES; BROADIE, KELSEY D	34-12361	Decreed	4/1/1976	IRRIGATION	0.84	210.0	Yes
BROADIE, DEBORAH D; BROADIE, MOJANET J	34-2379A	Decreed	8/8/1960	IRRIGATION	1.63	125.0	
BROADIE, DEBORAH D; BROADIE, MOJANET J	34-2379B	Decreed	8/8/1960	IRRIGATION	0.68	125.0	
BROADIE, DEBORAH D; BROADIE, MOJANET J	34-13647	Decreed	4/9/1961	IRRIGATION	2.07	215.0	
BROADIE, DEBORAH D; BROADIE, MOJANET J	34-13648	Decreed	4/9/1961	IRRIGATION	2.07	214.0	
BROADIE, DEBORAH D; BROADIE, MOJANET J	34-13657	Decreed	11/19/1987	IRRIGATION	1.02	215.0	Yes
BROADIE, DEBORAH D; BROADIE, MOJANET J	34-13658	Decreed	11/19/1987	IRRIGATION	1.02	214.0	Yes
BROWER, AMANDA; BROWER, JASON	29-14460	Decreed	10/28/1953	IRRIGATION	0.04	4.6	
BROWER, AMANDA; BROWER, JASON	29-14440	Decreed	6/23/1977	IRRIGATION	0.04	4.6	
BROWN, BERTHA; BROWN, ROBERT L	29-2521	Decreed	5/27/1966	DOMESTIC, IRRIGATION	0.03	1.6	
BROWN, BERTHA; BROWN, ROBERT L	29-7428	Decreed	12/8/1977	DOMESTIC, IRRIGATION	0.29	8.8	
BROWN, GORDON; LAMCZYK, DANNY; LAMCZYK, JANE	27-7342	Decreed	2/16/1983	DOMESTIC, IRRIGATION	0.06	0.5	
BROWN, JAN A; BROWN, SID E; MOMBERGER, JESSE C	31-7510	License	11/14/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.11	2.0	
BRP INC	25-7622	License	9/23/1998	DOMESTIC	0.23		
BRP INC	25-14504	Permit	10/12/2021	DOMESTIC	0.26		
BUCKWALTER, TRAVIS	34-2306	Decreed	7/22/1953	IRRIGATION	2.24	181.0	
BUCKWALTER, TRAVIS	34-7009	Decreed	7/8/1968	IRRIGATION	1.32	181.0	
BUCKWALTER, TRAVIS	34-10066	Decreed	5/1/1976	IRRIGATION	0.16	181.0	Yes

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BUNCE, MICHAEL F	29-7914	License	4/9/1990	DOMESTIC, IRRIGATION	0.09	6.0	
BURCHAM JR, J E; BURCHAM, BURVA J; BURCHAM, WESLEY E	29-7663A	Decreed	10/26/1982	DOMESTIC	0.10		
BURGESS SUBDIVISION WATER ASSN INC	25-7457	License	10/27/1988	DOMESTIC	0.11		
BURLEY HEALTHCARE HOLDING LLC	45-11194	Decreed	6/1/1960	DOMESTIC, IRRIGATION	0.15	5.5	
BURLEY IRRIGATION DISTRICT	45-7720	License	9/27/1993	DOMESTIC	0.09		
BURNETT, BOYD B	34-14167	Decreed	9/16/1960	IRRIGATION	1.10	69.0	
BURNETT, BOYD B	34-14169	Decreed	9/16/1972	IRRIGATION	0.22	69.0	Yes
BURNETT, BOYD B; BURNETT, SANDRA P	34-2328A	Decreed	4/29/1955	IRRIGATION	0.18	9.0	
BURNS CONCRETE INC	25-13982	License	12/18/2002	COMMERCIAL	3.53		
BURNS FAMILY TRUST	34-14845	Decreed	9/29/1966	IRRIGATION	0.16	9.8	
BURNS FAMILY TRUST	34-14848	Decreed	5/20/1984	IRRIGATION	0.03	9.8	Yes
BURNS, KIRK E; SZIMHARDT, LINDA J	25-7426	License	6/6/1988	IRRIGATION	0.08	5.6	
BURRELL, GEORGE W; BURRELL, LURANA J; KEETCH, SHYANN; KEETCH, STETSON	29-13900	License	4/3/2009	DOMESTIC	0.08		
BURRUP, JOHN R; BURRUP, JON R	25-13085	Decreed	7/6/1958	COMMERCIAL, STOCKWATER	0.12		
BUSH, KRISTINE; OETTING, JESSE	34-10324	Decreed	12/31/1962	IRRIGATION, STOCKWATER	0.10	4.0	
BUTTE COUNTY	34-14802	Decreed	2/24/1980	IRRIGATION	0.22	11.0	
BUTTE COUNTY	34-7226C	Decreed	2/24/1980	IRRIGATION	1.04	130.3	
BUTTE COUNTY CEMETERY MAINTENANCE DISTRICT	33-14955	Decreed	2/24/1980	IRRIGATION	0.06	4.0	
BUTTE COUNTY CEMETERY MAINTENANCE DISTRICT	34-14470	Decreed	2/24/1980	IRRIGATION	0.10	4.8	
BUTTE COUNTY CEMETERY MAINTENANCE DISTRICT	34-14485	Decreed	2/24/1980	IRRIGATION	0.10	4.9	
BUTTE COUNTY CEMETERY MAINTENANCE DISTRICT	33-7229	License	10/29/1999	IRRIGATION	0.03	4.0	
BUTTE COUNTY JOINT SCHOOL DISTRICT #111	33-10096	Decreed	4/1/1956	IRRIGATION	0.06	2.0	
BUTTE COUNTY JOINT SCHOOL DISTRICT #111	34-7252	Decreed	8/14/1980	IRRIGATION	0.20	10.0	
BUXTON, JILL D; BUXTON, TROY	34-2427	Decreed	6/15/1961	IRRIGATION	2.94	147.0	
CALDWELL, TED L	27-7117	Decreed	10/21/1977	DOMESTIC, IRRIGATION	0.25	24.0	
CALLISTER, DAVID R; CALLISTER, MAKAYLA R	33-14877	Decreed	4/15/1968	IRRIGATION	2.05	156.0	
CALLISTER, DAVID R; CALLISTER, MAKAYLA R	33-14879	Decreed	4/30/1976	IRRIGATION	0.96	156.0	
CALLISTER, DAVID R; CALLISTER, MAKAYLA R	33-14881	Decreed	7/15/1978	IRRIGATION	0.26	156.0	Yes
CALLISTER, DON O	33-2121	Decreed	7/9/1965	IRRIGATION	2.03	150.0	
CALLISTER, DON O	33-14907	Decreed	10/24/1974	IRRIGATION	0.74	156.0	
CAREY, MICHAEL; CAREY, SHELBI	34-7201B	Decreed	6/28/1977	IRRIGATION	0.02	2.0	
CARLSON, BRENT J	29-14446	Decreed	10/28/1953	IRRIGATION	0.01	1.3	
CARLSON, BRENT J	29-14426	Decreed	6/23/1977	IRRIGATION	0.01	1.3	
CARPENTER, BARBARA; CARPENTER, MAURICE	25-7193B	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	

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CARPENTER, CRYSTAL A; CARPENTER, NATHAN D	34-14168	Decreed	9/16/1960	IRRIGATION	2.90	181.0	
CARPENTER, CRYSTAL A; CARPENTER, NATHAN D	34-14170	Decreed	9/16/1972	IRRIGATION	0.58	181.0	Yes
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-13974	Decreed	1/25/1962	IRRIGATION	0.09	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-2459B	Decreed	1/25/1962	IRRIGATION	0.12	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-13980	Decreed	1/27/1976	IRRIGATION	0.30	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-7386	Decreed	4/7/1977	IRRIGATION	0.21	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-13979	Decreed	10/31/1986	IRRIGATION	0.08	46.7	Yes
CARSTENS, JULIUS M J	25-7481	License	12/22/1988	IRRIGATION	0.04	1.4	
CARTER, HEATHER I; CARTER, VAL C	34-13901	Decreed	10/25/1965	IRRIGATION	4.27	239.0	
CARTER, TIERRA CANDICE; CARTER, WILSON ENGLAND	35-14932	Decreed	2/5/1981	IRRIGATION	0.65	36.0	
CASA DEL NORTE LP	37-7081	Decreed	12/8/1970	IRRIGATION	1.67	840.0	
CASSIA JOINT SCHOOL DISTRICT #151	45-14512	Decreed	3/15/1956	IRRIGATION	0.03	7.6	
CASSIA JOINT SCHOOL DISTRICT #151	45-14510	Decreed	12/19/1974	IRRIGATION	0.05	7.6	
CASSIA JOINT SCHOOL DISTRICT #151	45-14509	Decreed	3/22/1975	IRRIGATION	0.05	7.6	
CASSIA JOINT SCHOOL DISTRICT #151	45-14511	Decreed	4/28/1975	IRRIGATION	0.02	7.6	
CASSIDY, FRANCIS J; HOFFMAN, RICHARD P; MEYER, DAVID DANIEL; MEYER, JENNY CLUFF; TANNER, TOMMY C	25-7638	License	4/25/1995	DOMESTIC	0.10		
CASTRO JR, VICENTE; CASTRO, PATRICIA	36-17297	Decreed	2/4/1976	IRRIGATION	0.06	3.1	
CEYNAR, MARCENE; FANN, LAVEDA A; FANN, R E; FARNSWORTH, BETH; FARNSWORTH, JAY; PICKERING, CRAIG; PICKERING, VICKY	25-7272	Decreed	2/4/1982	DOMESTIC	0.10		
CHALCO LLC	25-14168	Decreed	12/10/1954	IRRIGATION	0.11	1876.1	
CHAMBERS, RALEIGH R	25-7343	License	6/27/1983	DOMESTIC	0.06		
CHAPMAN, GARY RAY; CHAPMAN, REBECCA LYNN	22-14405	Decreed	4/22/1979	IRRIGATION	0.04	2.0	
CHARLYNE KAULUKUKUI MCKNEELY TRUST	34-14656	Decreed	4/19/1960	IRRIGATION	0.05	7.4	
CHERRY, MARY ANN; CHERRY, ROBERT	25-14402	Decreed	7/19/1973	IRRIGATION	0.02	1.2	
CHERYL LYNN BLOUNT & STEVEN GUY HERICKS LIVING TRUST	37-23115	Decreed	9/20/1974	IRRIGATION	0.02	1.7	
CHILDERS, LINDA MARIE; CHILDERS, RODNEY DEAN	37-23116	Decreed	9/20/1974	IRRIGATION	0.03	2.7	
CHILDERS, LINDA MARIE; CHILDERS, RODNEY DEAN	37-23209	Decreed	9/20/1974	IRRIGATION	0.02	1.8	
CHRISTENSEN, ADAM W; NELSON, DIANE K	37-23133	Decreed	9/20/1974	IRRIGATION	0.02	0.8	
CHRISTENSEN, BRAD LEE	29-7706	License	5/21/1983	IRRIGATION	0.10	5.0	
CHRISTENSEN, BRAD LEE; CHRISTENSEN, KRISTI	29-7273	Decreed	7/3/1975	IRRIGATION	0.15	7.3	
CHRISTENSEN, LANCE ISAAC	25-7431	License	7/6/1988	DOMESTIC, IRRIGATION	0.09	1.6	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	45-13877	Decreed	10/1/1952	IRRIGATION	0.04	2.0	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	45-13878	Decreed	10/1/1952	IRRIGATION	0.04	2.0	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	34-13752	Decreed	1/30/1961	IRRIGATION	0.01	2.5	

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CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	34-13754	Decreed	8/31/1976	IRRIGATION	0.04	2.5	
CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	22-7438	Decreed	7/20/1983	DOMESTIC	0.28		
CITY OF ALAMEDA	29-2324	License	10/22/1952	MUNICIPAL	6.00		
CITY OF ARCO	34-10030	Decreed	6/1/1962	MUNICIPAL	2.12		
CITY OF ARCO	34-7454	License	1/27/1984	MUNICIPAL	0.80		
CITY OF ARCO	34-7547	License	10/25/1990	MUNICIPAL	1.81		
CITY OF BUTTE CITY	34-4027	Decreed	6/20/1960	FIRE PROTECTION, MUNICIPAL	0.23		
CITY OF CHUBBUCK	29-14012	Decreed	8/19/1952	MUNICIPAL	1.83		
CITY OF CHUBBUCK	29-14013	Decreed	8/19/1952	MUNICIPAL	2.25		
CITY OF CHUBBUCK	29-14058	Decreed	8/19/1952	MUNICIPAL	0.05		
CITY OF CHUBBUCK	29-14106	Decreed	8/18/1953	MUNICIPAL	0.93		
CITY OF CHUBBUCK	29-2385	Decreed	1/11/1957	MUNICIPAL	0.78		
CITY OF CHUBBUCK	29-2413	Decreed	6/25/1959	MUNICIPAL	1.10		
CITY OF CHUBBUCK	29-14055	Decreed	6/20/1961	MUNICIPAL	0.13		
CITY OF CHUBBUCK	29-14081	Decreed	6/20/1961	MUNICIPAL	0.03		
CITY OF CHUBBUCK	29-2469	Decreed	3/10/1963	MUNICIPAL	1.11		
CITY OF CHUBBUCK	29-14016	Decreed	1/17/1966	MITIGATION, MUNICIPAL	1.89		
CITY OF CHUBBUCK	29-14099	Decreed	5/2/1966	MUNICIPAL	2.52		
CITY OF CHUBBUCK	29-14056	Decreed	10/26/1966	MUNICIPAL	0.09		
CITY OF CHUBBUCK	29-14082	Decreed	10/26/1966	MUNICIPAL	0.02		
CITY OF CHUBBUCK	29-14096	Decreed	11/29/1971	MUNICIPAL	0.21		
CITY OF CHUBBUCK	29-14097	Decreed	11/29/1971	MUNICIPAL	0.02		
CITY OF CHUBBUCK	29-14054	Decreed	12/31/1974	MUNICIPAL	1.47		
CITY OF CHUBBUCK	29-14080	Decreed	12/31/1974	MUNICIPAL	0.27		
CITY OF CHUBBUCK	29-14107	Decreed	12/3/1980	MUNICIPAL	0.61		
CITY OF MACKAY	34-7073	Decreed	6/18/1974	MUNICIPAL	0.88		
CITY OF MACKAY	34-7505	Decreed	3/29/1988	WATER QUALITY IMPROVEMENT	0.18		
CITY OF MACKAY	34-7532	License	1/26/1990	MUNICIPAL	1.12		
CITY OF MACKAY	34-7572	License	8/29/2005	MUNICIPAL	0.94		
CITY OF MOORE	34-14817	Decreed	2/11/1955	IRRIGATION	0.28	208.0	
CLARKEROSA LLC	34-7193	Decreed	6/26/1978	IRRIGATION	2.31	139.3	
CLAYSON, CASEY; CLAYSON, SHANE	45-7496	Decreed	1/27/1982	DOMESTIC, IRRIGATION	0.06	0.7	
CLOSE, ROBERT; CLOSE, SALLY	25-11547	Decreed	1/31/1959	DOMESTIC, IRRIGATION	0.07	1.0	
COBURN, DEAN V	34-7040A	Decreed	7/2/1973	DOMESTIC, IRRIGATION	0.06	1.0	
COBURN, JODY K; COBURN, MARTY T	34-13791	License	3/11/2003	IRRIGATION	0.22	22.0	

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COLLEEN GRACE HOLLOWWA TESTAMENTARY TRUST	34-7195	Decreed	5/18/1977	IRRIGATION	0.40	20.0	
COLLINS JR, FLOYD L; COLLINS, LINDA M	34-7072	Decreed	5/22/1974	IRRIGATION	0.68	34.0	
COLLINS, CRAIG; COLLINS, LERRINA	34-13664	Decreed	4/6/1982	IRRIGATION	0.57	30.0	
COLSON, F SCOTT	34-2352	Decreed	4/15/1959	IRRIGATION	0.74	78.0	
COMORE DEVELOPMENT INC	25-14240	License	6/1/1989	IRRIGATION	2.10	2634.0	
COMORE DEVELOPMENT INC	25-14488	License	8/5/2020	DOMESTIC	0.27		
COMORE LOMA WATER CO INC	25-7040	Decreed	9/17/1973	DOMESTIC	0.20		
COMORE LOMA WATER CO INC	25-7042	Decreed	10/26/1973	DOMESTIC	0.08		
COMORE LOMA WATER CO INC	25-7161	Decreed	9/29/1978	DOMESTIC	0.98		
COMORE LOMA WATER CORP	25-14243	Decreed	5/6/1957	IRRIGATION	0.53	2634.0	
COMORE LOMA WATER CORP	25-12706	Decreed	7/1/1960	DOMESTIC, IRRIGATION	0.13	2634.0	
COMORE LOMA WATER CORP	25-14340	Decreed	3/20/1961	IRRIGATION	0.56	2634.0	
COMORE LOMA WATER CORP	25-14242	Decreed	5/1/1980	IRRIGATION	0.29	2634.0	Yes
COMORE LOMA WATER CORP	25-14487	License	6/1/1989	IRRIGATION	1.31	2634.0	
COMORE LOMA WATER CORP	25-14505	License	6/1/1989	IRRIGATION	0.42	2634.0	
COMORE LOMA WATER CORP	25-7578	Decreed	8/29/1990	DOMESTIC	0.30		
COMORE LOMA WATER CORP	25-7652	Decreed	12/11/1996	DOMESTIC	1.33		
COMORE LOMA WATER CORP	25-14166	License	3/28/2005	DOMESTIC	0.58		
COMORE LOMA WATER CORP	25-14167	License	4/12/2005	DOMESTIC	0.21		
COMORE LOMA WATER CORP	25-14183	License	4/29/2006	DOMESTIC	0.50		
COMORE LOMA WATER CORP	25-14484	License	4/17/2020	DOMESTIC	0.38		
COMORE LOMA WATER CORP	25-14506	License	8/5/2020	DOMESTIC	0.18		
CONSOLIDATED AG PROPERTIES LLC	45-2448B	Decreed	6/1/1953	STOCKWATER	0.17		
COOK, DANNY; COOK, DARRELL L	35-7979	License	5/5/1981	DOMESTIC	0.06		
COOK, DONALD J	35-7362	License	12/27/1973	DOMESTIC, STOCKWATER	0.05		
CORDES, RONALD A	25-7488	License	2/14/1989	DOMESTIC, IRRIGATION	0.10	3.0	
CORDON TRAILER COURT	25-10195	Decreed	3/11/1960	COMMERCIAL	0.13		
COTTRELL, BRYON G; COTTRELL, TIFFANI A	34-14081	Decreed	7/5/1960	IRRIGATION	0.12	11.0	
COTTRELL, BRYON G; COTTRELL, TIFFANI A	34-14083	Decreed	4/10/1961	IRRIGATION	0.10	11.0	
COUNTRY CLUB WATER	25-14447	Decreed	1/27/1976	IRRIGATION	0.03	18.7	
COUNTRY CLUB WATER	25-14448	Decreed	10/31/1986	IRRIGATION	0.01	18.7	Yes
COUNTY OF BANNOCK	29-13466	License	1/14/2003	COMMERCIAL	1.78		
COUNTY OF CUSTER FAIR BOARD	34-7539	Decreed	1/10/1990	COMMERCIAL	0.04		
COUNTY OF JEFFERSON	25-13985	License	5/13/2003	RECREATION STORAGE	0.00		
COX, ED; COX, PATRICIA	29-7903	License	4/17/1990	IRRIGATION	0.04	2.0	

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CRABTREE, DOUGLAS R; CRABTREE, SHAUNA S	25-14289	Decreed	8/10/1966	IRRIGATION	0.04	2.0	
CRAIG, JODI; GARRETT, MIKE; STEVENS, CHERYL	34-14644	Decreed	9/29/1966	IRRIGATION	0.13	8.1	
CRAIG, JODI; GARRETT, MIKE; STEVENS, CHERYL	34-14645	Decreed	5/20/1984	IRRIGATION	0.02	8.1	Yes
CRANDALL, JEFF; CRANDALL, SUSAN	35-8658	License	11/2/1985	DOMESTIC	0.06		
CRANE CROPS LLC	45-7303	Decreed	5/10/1977	IRRIGATION, STOCKWATER	1.28	62.0	
CRANE, KARI L; CRANE, TROY W	45-4067B	Decreed	8/1/1962	IRRIGATION	1.46	73.0	
CRANER, DAVID A; CRANER, HELEN B	45-7442	Decreed	4/4/1980	IRRIGATION	0.12	4.0	
CRANNEY LAND COMPANY LLC	45-2639	Decreed	2/20/1961	IRRIGATION	3.48	196.0	
CRAPO, JUDD; CRAPO, SUSAN	22-14340	License	4/10/2017	IRRIGATION	0.01	2.7	
CRARY INDUSTRIES INC	36-11369	Decreed	8/20/1959	COMMERCIAL	0.03		
CRAWFORD, GAYLE; CRAWFORD, JOHN S	36-17138	Decreed	3/7/1978	IRRIGATION	0.04	2.3	
CRAWFORD, HARRY J	34-2413A	Decreed	5/12/1961	IRRIGATION	1.67	148.0	
CRNICH, CHRIS; CRNICH, MELONIE	34-7288	Decreed	1/12/1981	IRRIGATION	0.11	5.0	
CROMWELL, VERNAL D	25-7446	License	10/21/1988	DOMESTIC	0.06		
CRONQUIST, CAMERON; CRONQUIST, LORI	35-14895	Decreed	8/19/1977	IRRIGATION	0.09	5.0	
CRONQUIST, JAMES; TURPIN, NATALIE	34-4083	Decreed	11/1/1959	IRRIGATION, STOCKWATER	0.11	5.0	
CROP PRODUCTION SERVICES	25-4250	Decreed	3/8/1963	COMMERCIAL	0.10		
CROTTS, RICHARD S; MC CONNELL, FRANCES L	37-23627	Decreed	9/20/1974	IRRIGATION	0.08	6.4	
CRUMP, ROBERT	34-14561	Decreed	6/17/1960	IRRIGATION	1.15	133.0	
CRUMP, ROBERT	34-14562	Decreed	6/17/1960	IRRIGATION	1.13	133.0	
CRUMP, ROBERT	34-14563	Decreed	8/15/1964	IRRIGATION	0.38	133.0	
CRUMP, ROBERT	34-7198	Decreed	6/13/1977	IRRIGATION	3.11	278.0	
CRYSTAL POND ANGLERS ASSN INC	22-7577	License	8/24/1988	RECREATION STORAGE	0.00		
CSJ FARMS LLC	22-14438	Decreed	12/29/1982	IRRIGATION	5.83	588.3	
CUNDICK, LARRY; CUNDICK, ROSALYNN	37-23213	Decreed	9/20/1974	IRRIGATION	0.02	1.6	
CUSHMAN, BRIAN; CUSHMAN, JENNIE JEAN	34-14625	Decreed	12/17/1961	IRRIGATION	0.09	4.7	
D & C PROPERTIES LLC	25-14596	Permit	8/4/2010	INDUSTRIAL	2.00		
D & L PARTNERSHIP; WILLIAMS JR, LOGAN ; WILLIAMS, LINDA C; WILLIAMS, MARCIE L	34-2316A	Decreed	12/24/1954	IRRIGATION	1.20	60.0	
D & M WATER ASSN	29-7281	Decreed	8/4/1975	DOMESTIC	0.26		
D & M WATER ASSN	29-7367	Decreed	2/7/1977	DOMESTIC	0.40		
D & M WATER ASSN	29-7912	License	4/2/1990	DOMESTIC	0.04		
DAINS, CLAUDIA LYNN; DAINS, RANDY MARK	34-14942	Decreed	7/2/1973	IRRIGATION	0.40	20.0	
DAINS, CLAUDIA LYNN; DAINS, RANDY MARK	34-7058	Decreed	1/10/1974	DOMESTIC, IRRIGATION, STOCKWATER	1.08	56.7	
DANIEL, BRENDA	25-7447	License	10/25/1988	IRRIGATION	0.02	1.0	

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DANIEL, BRENDA; DANIEL, DAVID S	25-7261	Decreed	10/8/1981	DOMESTIC, IRRIGATION, STOCKWATER	0.04	2.0	
DANIEL, MELVIN R JR	25-7538	License	9/19/1989	COMMERCIAL	0.07		
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14589	Decreed	9/28/1981	IRRIGATION	0.01	15.0	
DATRICE, JAMES	34-14949	Decreed	3/2/1961	IRRIGATION	0.30	15.0	
DAVID GREENE LIVING TRUST	37-23211	Decreed	9/20/1974	IRRIGATION	0.04	3.4	
DAVIS, BRIAN L	29-14462	Decreed	10/28/1953	IRRIGATION	0.01	1.5	
DAVIS, BRIAN L	29-14442	Decreed	6/23/1977	IRRIGATION	0.01	1.5	
DAVISON, NANCY; DAVISON, RANDY LEE	25-7017A	Decreed	3/20/1972	IRRIGATION	0.42	21.0	
DAW, ADELE S; DAW, TERRELL B	25-14255	Decreed	8/10/1966	IRRIGATION	0.02	1.2	
DE MOSS, GARY A; DE MOSS, HELEN	37-22168	Decreed	9/20/1974	IRRIGATION, STOCKWATER	1.61	802.0	
DEES, ELDON G; DEES, KATHALINE; DEES, RONALD K; DEES, SHIRLEY	25-7351	Decreed	6/24/1983	DOMESTIC, STOCKWATER	0.06		
DERBYHAWK LLC	25-7553	License	9/27/1989	DOMESTIC	0.11		
DIERS, NEDRA; DIERS, ROBERT K	34-10288	Decreed	5/1/1962	DOMESTIC, IRRIGATION	0.07	1.0	
DIRKS, SHANE LEE; DIRKS, TANYA MARIE	34-2379C	Decreed	8/8/1960	IRRIGATION	2.02	111.0	
DIRKS, SHANE LEE; DIRKS, TANYA MARIE	34-14960	Decreed	9/13/1961	IRRIGATION	1.88	109.0	
DIRKS, SHANE LEE; DIRKS, TANYA MARIE	34-2471	Decreed	10/29/1965	IRRIGATION	3.20	155.0	
DIRKS, SHANE LEE; DIRKS, TANYA MARIE	34-14961	Decreed	4/1/1977	IRRIGATION	0.30	109.0	Yes
DIXON, ANNIE; JAHN, ROBERT	35-7823	License	11/22/1978	DOMESTIC, STOCKWATER	0.05		
DOBSON RANCH	31-11429	Decreed	6/21/1957	DIVERSION TO STORAGE, IRRIGATION FROM STORAGE, IRRIGATION STORAGE	13.45	1561.6	
DOMINICK, TERESA	25-7073F	Decreed	8/1/1975	IRRIGATION	0.10	5.0	
DOUBLE EAGLE PROPERTIES LLLP	45-14462	Decreed	6/30/1985	IRRIGATION	0.08	21.8	
DOYLE, DACIA MITCHELL; MITCHELL, DUSTIN A; MITCHELL, HARRY T; MITCHELL, LOUANA LEMMON	34-14458	Decreed	6/1/1953	IRRIGATION	0.06	2.6	
DREW, STAN	29-8237	License	4/17/2000	DOMESTIC	0.11		
EAGLE CREEK NORTHWEST LLC	32-13237	Decreed	4/2/1964	IRRIGATION	1.96	134.0	
EAGLE CREEK NORTHWEST LLC	32-13277	Decreed	7/27/1979	IRRIGATION	2.25	132.0	
EAGLE CREEK NORTHWEST LLC	32-13279	Decreed	7/27/1979	IRRIGATION	2.25	132.0	
EAMES, LINDA J	25-7643	License	12/4/1995	DOMESTIC	0.18		
EAST FAIRVIEW WATER WELL CO	25-12791	Decreed	4/1/1961	DOMESTIC	0.11		
EATON, ISABEL L	34-14242	Decreed	4/29/1955	IRRIGATION	0.28	14.2	
EDEN, GARY; EDEN, GLENNA R	37-8363	License	8/6/1988	COMMERCIAL, DOMESTIC, STOCKWATER	0.05		
EDSTROM CONSTRUCTION PROPERTIES LLP	22-14542	Permit	3/27/2023	INDUSTRIAL STORAGE, INDUSTRIAL, RECREATION STORAGE	4.00		
EDWARDS, LA DONNA; EDWARDS, SAMUEL	35-8793	License	6/13/1989	DOMESTIC	0.04		
EGAN, BROCK; EGAN, KODI	32-13235	Decreed	6/13/1974	IRRIGATION	3.49	450.0	

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EGAN, BROCK; EGAN, KODI	32-7070	Decreed	2/7/1977	IRRIGATION	2.59	450.0	
EGAN, BROCK; EGAN, KODI	32-7085	Decreed	8/4/1977	IRRIGATION	4.98	450.0	
ELK RIDGE RV LLC	36-17282	Decreed	2/2/1954	COMMERCIAL	0.11		
ELK RIDGE RV LLC	36-17283	Decreed	3/1/1975	COMMERCIAL	0.03		Yes
ELK, DELYLA; ELK, DUSTIN	34-7040B	Decreed	7/2/1973	IRRIGATION	0.24	12.0	
ELLIOTT, DAVID S; ELLIOTT, JANICE	25-14314	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
ELLIS, RANDY; HAINES, KENNETH; SIMMONS, LARRY W; SMITH, RICKY; SMITH, ROGER; WHEELER, BLISS	35-8821	License	9/13/1989	DOMESTIC	0.04		
ELLWEIN, MELVIN J; ELLWEIN, VIVIAN J	34-2323F	Decreed	2/11/1955	IRRIGATION	0.23	14.8	
ELLWEIN, MELVIN J; ELLWEIN, VIVIAN J	34-7197B	Decreed	6/10/1977	IRRIGATION	1.34	155.0	
EMPEY, BRUCE; EMPEY, JEANETTE C	25-7098	Decreed	8/5/1976	DOMESTIC, IRRIGATION	0.05	6.0	
ENSZ, MARK; ENSZ, MELANIE	34-2312	Decreed	7/17/1954	IRRIGATION	7.00	588.0	
ENSZ, MARK; ENSZ, MELANIE	34-13876	Decreed	1/30/1961	IRRIGATION	1.96	249.3	
ENSZ, MARK; ENSZ, MELANIE	34-14334	Decreed	1/30/1961	IRRIGATION	0.22	194.5	
ENSZ, MARK; ENSZ, MELANIE	34-10885	Decreed	4/1/1961	IRRIGATION, STOCKWATER	3.20	588.0	
ENSZ, MARK; ENSZ, MELANIE	34-7076	Decreed	10/16/1974	IRRIGATION	1.56	588.0	
ENSZ, MARK; ENSZ, MELANIE	34-14335	Decreed	8/31/1976	IRRIGATION	3.34	194.5	
ESTATE OF KAREN HARNEY	34-14086	Decreed	5/14/1977	IRRIGATION	1.47	76.1	
EVANS, LOIS C; EVANS, MYRON C	31-10061	Decreed	12/31/1976	DOMESTIC	0.04		
F & C TRUCKING LLC	36-17067	Decreed	9/8/1962	COMMERCIAL, STOCKWATER	0.09		
FALCON RIDGE HOA	25-14181	License	1/27/2006	DOMESTIC	0.31		
FALLING TREE WELL CO	35-8815	License	9/20/1989	DOMESTIC	0.04		
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2614	Decreed	2/16/1953	IRRIGATION	1.52		
FARMERS MERCHANT INC	35-7723	Decreed	7/4/1977	DOMESTIC, INDUSTRIAL	0.04		
FEHRINGER, MARTIN	29-14051	Decreed	2/23/1966	IRRIGATION	0.02	1.5	
FELD, TODD	35-13284	Decreed	2/23/1972	COMMERCIAL, STOCKWATER	0.30		
FERRERA, ANGELA; FERRERA, DAVID	29-14459	Decreed	10/28/1953	IRRIGATION	0.01	1.8	
FERRERA, ANGELA; FERRERA, DAVID	29-14439	Decreed	6/23/1977	IRRIGATION	0.02	1.8	
FIELDS, KAREN C; FIELDS, VIRGIL	37-7699	Decreed	2/23/1978	DOMESTIC, STOCKWATER	0.20		
FINK, CONNIE LEE; FINK, DAN ROBERT	25-14260	Decreed	8/10/1966	IRRIGATION	0.03	1.4	
FONNESBECK, BAMBIE; FONNESBECK, EDWIN	34-10551	Decreed	8/28/1962	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.0	
FORBES, TAZARR E	34-14465	Decreed	8/1/1978	IRRIGATION	0.24	13.2	
FOUR SEASONS WATER CO	27-7351	License	4/20/1983	DOMESTIC	0.29		
FOUR SQUARE WATER WELL CORP	25-7327	Decreed	2/4/1985	DOMESTIC, IRRIGATION	0.16	3.0	
FREEMAN, MARK E	25-14306	Decreed	8/10/1966	IRRIGATION	0.02	2.0	

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FREEMAN, MARK E	25-14311	Decreed	8/10/1966	IRRIGATION	0.02	2.0	
FREEMAN, RICHARD T	34-2420	Decreed	6/21/1961	IRRIGATION	1.45	73.0	
FREMONT MADISON IRRIGATION DISTRICT	21-13261	License	4/23/1969	IRRIGATION	18.62		
FREMONT MADISON IRRIGATION DISTRICT	22-13506	License	4/23/1969	IRRIGATION	18.74		
FROMOVER 9 LLC; JUNIPER VIEW LLC; RGC FARMS LLC; UNIT 2 LLC	22-7648	License	4/6/1989	IRRIGATION	2.61	797.2	
FUGER, JASON CHRISTOPHER	33-2079	Decreed	11/16/1955	IRRIGATION	1.70	231.0	
FUGER, JASON CHRISTOPHER	33-2098	Decreed	3/27/1969	IRRIGATION	2.00	231.0	
FUGER, JASON CHRISTOPHER	33-7032	Decreed	4/3/1974	IRRIGATION	1.54	231.0	
FULLMER JR, ALBERT W; FULLMER, ELEANOR	34-2437A	Decreed	9/5/1961	IRRIGATION	0.02	1.5	
FULLMER, APRIL; FULLMER, NICHOLAS	25-4106	Decreed	4/1/1959	IRRIGATION	0.05	1.7	
FULLMER, BARBARA; FULLMER, PAUL	34-10205	Decreed	4/1/1960	IRRIGATION, STOCKWATER	0.06	2.0	
FUNK, BRENT; FUNK, CHALET	36-17181	Decreed	11/28/1977	IRRIGATION, MITIGATION BY NON-USE	2.14	104.7	
FUNK, LEROY; FUNK, RONDA	45-2672	Decreed	10/26/1961	IRRIGATION	1.00	71.0	
G & L METAL FAB INC	29-10882	Decreed	4/15/1961	COMMERCIAL	0.04		
G5 LAND COMPANY LLC	45-2688B	Decreed	10/17/1962	COMMERCIAL	0.04		
GABIOLA, JOSHUA B J FELTON	34-2324	Decreed	2/28/1955	IRRIGATION	2.44	173.0	
GABIOLA, JOSHUA B J FELTON	34-12356	Decreed	4/1/1966	IRRIGATION	0.25	173.0	Yes
GALKA, MAGDALENA B; WAS, ALEKSANDER P; WAS, PIOTR B	34-14622	Decreed	12/17/1961	IRRIGATION	0.03	1.7	
GAMETT, ALICE JUNE; GAMETT, FRANK L	34-14029	Decreed	10/29/1953	IRRIGATION	0.37	16.0	
GAMETT, CHANDOS; GAMETT, WESTON	34-14972	Decreed	12/31/1962	IRRIGATION	0.04	2.0	
GAMETT, KIM; GAMETT, RANDY	34-2432	Decreed	7/5/1961	IRRIGATION	0.12	6.0	
GARY & PAMELA ROGERS FAMILY TRUST	34-7118B	Decreed	11/24/1975	IRRIGATION	8.81	440.0	
GARY & PAMELA ROGERS FAMILY TRUST	34-14147	Decreed	6/2/1978	IRRIGATION	0.08	12.3	
GEHRING, JORDAN	35-12692	Decreed	6/1/1982	DOMESTIC	0.04		
GENERAL MILLS OPERATIONS INC	35-2857B	Decreed	1/16/1967	INDUSTRIAL	0.23		
GERRATT, LARRY	45-11613	Decreed	7/22/1955	IRRIGATION	0.60	151.0	
GERRATT, LARRY; GERRATT, REX	45-11441	Decreed	4/1/1960	COMMERCIAL, DOMESTIC, STOCKWATER	0.07		
GERRISH, AMBER; GERRISH, GALEN	34-2425F	Decreed	12/17/1961	IRRIGATION	0.10	5.2	
GIBBY, REED	45-13990	License	2/10/2006	DOMESTIC	0.09		
GIBEAULT, GERALD; GIBEAULT, GLORIA	34-14484	Decreed	4/2/1980	IRRIGATION	0.07	3.7	
GIESBRECHT, JANA; GIESBRECHT, JAYSON	34-2316B	Decreed	12/24/1954	IRRIGATION	0.40	23.0	
GIESBRECHT, JANA; GIESBRECHT, JAYSON	34-2361A	Decreed	4/19/1960	IRRIGATION	3.20	349.5	
GILBERT, GEORGE A; GILBERT, VERA JEAN	34-14146	Decreed	6/2/1978	IRRIGATION	0.12	18.7	
GILBERT, JUANITA F; GILBERT, ROBERT E	34-2431	Decreed	6/29/1961	IRRIGATION	2.67	156.0	
GILLEN, NORMAN	27-7585	License	4/20/1999	DOMESTIC	0.14		

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GLANBIA FOODS INC	36-16213	Decreed	11/11/1959	MITIGATION	2.60	400.0	
GLANBIA FOODS INC	36-16215	Decreed	11/15/1970	MITIGATION	3.90	410.0	
GLANBIA FOODS INC	36-16219	Decreed	5/26/1971	MITIGATION	0.33	400.0	Yes
GLANBIA FOODS INC	36-16217	Decreed	5/16/1980	MITIGATION	0.96	400.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7238	Decreed	10/31/1974	DOMESTIC, IRRIGATION	0.11	8.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7984	Decreed	4/23/1990	IRRIGATION	0.03	8.0	
GONZALEZ, LAURA; ORTIZ, JULIO	29-14346	Decreed	12/16/1963	IRRIGATION	0.03	2.0	
GOODLIFFE, ARNOLD J; GOODLIFFE, BECKY B	29-8044	License	4/2/1990	IRRIGATION	0.06	2.0	
GOODWIN EXCAVATING LLC; POCATELLO READY MIX	35-14326	Decreed	5/2/1977	INDUSTRIAL	0.10		
GOODY, BRYON; GOODY, RUTH	29-14183	Decreed	2/3/1961	IRRIGATION	0.06	3.0	
GOUGH, JONATHAN; GOUGH, MEMORI DEANN	37-23212	Decreed	9/20/1974	IRRIGATION	0.03	2.7	
GOUGH, SHAUN	37-23373	License	8/22/1988	IRRIGATION	0.03	1.5	
GRAEFE, MICHAEL ROBERT	33-7068	License	8/19/1979	DOMESTIC, IRRIGATION	0.05	2.0	
GRANITE TRUST ORGANIZATION	34-10272	Decreed	5/16/1960	IRRIGATION	3.38	237.5	
GRANITE TRUST ORGANIZATION	34-12433	Decreed	5/16/1960	IRRIGATION	1.25	213.0	
GRANITE TRUST ORGANIZATION	34-10939	Decreed	4/3/1968	IRRIGATION	0.59	211.0	Yes
GRANT US PEACE LLC	34-7139	Decreed	4/1/1976	IRRIGATION	0.13	7.0	
GRAVES, FRANCES M; GRAVES, RICHARD L	37-7371	Permit	7/31/1974	DOMESTIC, IRRIGATION, STOCKWATER	6.49	320.0	
GRAY, F SCOTT; HENRY, JOHN M; RODRIGUEZ, JAVIER P	25-7439	License	8/15/1988	DOMESTIC, IRRIGATION	0.09	1.0	
GRAYBEAL, EMILY; GRAYBEAL, JASON	37-4052	Decreed	4/1/1962	DOMESTIC, IRRIGATION	0.08	1.4	
GREAT WESTERN MALTING CO	29-7504	Decreed	9/20/1979	DOMESTIC, INDUSTRIAL	3.25		
GREGORY, CINDY LOU; GREGORY, JAMES S	34-14212	Decreed	6/29/1959	IRRIGATION	0.10	4.9	
GREGORY, CINDY LOU; GREGORY, JAMES S	34-14172	Decreed	11/18/1974	IRRIGATION	0.25	29.0	
GRIMMETT, GARY D	35-8179	Decreed	8/2/1983	DOMESTIC, IRRIGATION	0.10	3.0	
GRISENTI, CHEYANNA; GRISENTI, TYSON	36-17209	Decreed	6/21/1960	IRRIGATION	0.08	4.0	
GROVER, ALICE MAE; GROVER, MELVIN G	25-7480	License	1/9/1989	DOMESTIC, IRRIGATION, STOCKWATER	0.07	3.0	
GUNDERSON, ADEN	35-14178	Decreed	9/28/1981	IRRIGATION	0.01	20.0	
HALBERT, GILBERT L; HALBERT, KIM M	36-2371B	Decreed	12/31/1958	IRRIGATION	0.08	2.5	
HALE, ANGELA A; HALE, MICHAEL J	34-14101	License	5/21/2009	DOMESTIC, IRRIGATION	0.15	5.6	
HALE, LAUREN; HALE, NIC	29-14445	Decreed	10/28/1953	IRRIGATION	0.01	1.3	
HALE, LAUREN; HALE, NIC	29-14425	Decreed	6/23/1977	IRRIGATION	0.01	1.3	
HALL, BRIANNE; HALL, STEVEN	29-7628	Decreed	1/19/1982	IRRIGATION	0.12	7.6	
HALL, RUSSELL	21-13316	Decreed	4/24/1956	IRRIGATION	0.05	5.0	
HALL, RUSSELL	21-13315	Decreed	4/24/1962	IRRIGATION	0.05	5.0	

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HALLINAN, KAYE; JENSEN, GARY L; JENSEN, GORDON L; JENSEN, J LYLE; JENSEN, M LEROY; JENSEN, TERRY L	29-2419	Decreed	10/26/1959	IRRIGATION	1.32	104.6	
HAMILTON LAND & LIVESTOCK LTD	25-4022	Decreed	2/7/1957	IRRIGATION	0.09	4.5	
HAMMOND, LORNA O; THE SHELTERED TRUST	35-8016	License	1/18/1982	DOMESTIC, STOCKWATER	0.06		
HANCOCK, DEAN	25-14496	Decreed	4/22/1979	IRRIGATION	0.02	1.0	
HANEY FARMS LLC	34-2382B	Decreed	9/18/1960	IRRIGATION	2.07	249.0	
HANEY FARMS LLC	34-14877	Decreed	3/20/1961	IRRIGATION	0.20	249.0	
HANEY FARMS LLC	34-2423	Decreed	6/12/1961	IRRIGATION	2.36	249.0	
HANEY, KODY	34-12367	Decreed	3/20/1961	IRRIGATION	1.14	57.0	
HANSEN, MARC T; HANSEN, TEENA	34-14187	Decreed	4/20/1961	IRRIGATION	0.04	16.0	
HANSEN, MARC T; HANSEN, TEENA	34-14185	Decreed	5/29/1961	IRRIGATION	0.13	16.0	
HANSEN, VIRGINIA E	45-4125	Decreed	3/20/1962	DOMESTIC, IRRIGATION	0.04	0.7	
HANSEN, WILLIAM KORBY	25-7458	License	11/8/1988	DOMESTIC, IRRIGATION	0.09	1.7	
HARDIN, SIMONE	34-13740	Decreed	10/29/1953	IRRIGATION	0.65	28.0	
HARDIN, SIMONE	34-14878	Decreed	7/16/1963	IRRIGATION	0.13	24.0	
HARDIN, SIMONE	34-2447B	Decreed	7/16/1963	IRRIGATION	0.34	27.0	
HARDIN, SIMONE	34-10930B	Decreed	8/6/1987	IRRIGATION	0.19	27.0	Yes
HARDIN, SIMONE	34-14879	Decreed	8/6/1987	IRRIGATION	0.07	24.0	Yes
HARDING, GALE W	22-7568	License	9/1/1988	IRRIGATION, STOCKWATER	0.10	5.0	
HAROLD L RUPP SR TRUST; RUPP, VEDA J	29-13143	Decreed	6/2/1953	IRRIGATION	0.56	365.0	
HAROLD L RUPP SR TRUST; RUPP, VEDA J	29-13144	Decreed	6/9/1953	IRRIGATION	1.26	365.0	
HAROLDSEN, G ERIC; HAROLDSEN, GRANT O	25-7300	Decreed	1/5/1983	DOMESTIC, STOCKWATER	0.06		
HARRELL, BRIAN S; HARRELL, CAROLYN J	33-14888	Decreed	3/2/1961	IRRIGATION	0.60	139.1	
HARRELL, BRIAN S; HARRELL, ILENE	33-2077	Decreed	10/13/1955	IRRIGATION	2.20	262.7	
HARRELL, BRIAN S; HARRELL, ILENE	33-15093	Decreed	11/14/1955	IRRIGATION	0.11	262.7	
HARRELL, BRIAN S; HARRELL, ILENE	33-2078	Decreed	11/14/1955	IRRIGATION	1.55	143.5	
HARRELL, BRIAN S; HARRELL, ILENE	33-14951	Decreed	3/2/1961	IRRIGATION	0.58	143.0	
HARRELL, BRIAN S; HARRELL, ILENE	33-15094	Decreed	4/3/1961	IRRIGATION	0.11	262.7	
HARRELL, BRIAN S; HARRELL, ILENE	33-2100	Decreed	4/3/1961	IRRIGATION	1.44	143.5	
HARRELL, BRIAN S; HARRELL, ILENE	33-14884	Decreed	9/23/1965	IRRIGATION	0.04	139.1	
HARRELL, BRIAN S; HARRELL, ILENE	33-14953	Decreed	9/23/1965	IRRIGATION	0.04	143.0	
HARRELL, SANDRA L	33-14889	Decreed	3/2/1961	IRRIGATION	0.01	3.0	
HARRELL, SANDRA L	33-14885	Decreed	9/23/1965	IRRIGATION	0.00	3.0	
HARRIS, BILL B	25-7489	License	2/23/1989	DOMESTIC, STOCKWATER	0.06		
HARRIS, JON DALE; HARRIS, VANESSA	34-14659	Decreed	12/17/1961	IRRIGATION	0.09	4.6	

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HARRY, KIMBERLY A; HARRY, RICHARD C	34-2435A	Decreed	7/26/1961	IRRIGATION	1.54	71.0	
HART, DAVID J; HART, JAMES W	29-2395	Decreed	2/28/1958	IRRIGATION	2.11	215.2	
HART, ROBERT E	29-14263	Decreed	2/28/1958	IRRIGATION	0.70	71.8	
HARTLEY, CHARDON; HARTLEY, CRYSTAL	34-13911	Decreed	4/29/1955	IRRIGATION	0.14	6.9	
HARWOOD, DOROTHY; HARWOOD, JACQUELINE L; HARWOOD, KENTON L; HARWOOD, LEON W	34-7045B	Decreed	10/2/1973	IRRIGATION	0.68	39.0	
HARWOOD, DOROTHY; HARWOOD, JACQUELINE L; HARWOOD, KENTON L; HARWOOD, LEON W	34-7045C	Decreed	10/2/1973	IRRIGATION	1.56	89.0	
HARWOOD, DOROTHY; HARWOOD, JACQUELINE L; HARWOOD, KENTON L; HARWOOD, LEON W	34-10471B	Decreed	8/13/1974	IRRIGATION	0.06	39.0	Yes
HARWOOD, DOROTHY; HARWOOD, JACQUELINE L; HARWOOD, KENTON L; HARWOOD, LEON W	34-10471C	Decreed	8/13/1974	IRRIGATION	0.12	89.0	Yes
HASLAM, LAVORE	35-8629	License	4/8/1986	DOMESTIC, STOCKWATER	0.06		
HAWKER, KATHERINE	34-4089	Decreed	8/1/1961	IRRIGATION, STOCKWATER	0.32	18.0	
HAWKINS, PENNY R; JONES, PHYLLIS J	34-2409A	Decreed	4/6/1961	IRRIGATION	2.20	132.0	
HAWKINS, PENNY R; JONES, PHYLLIS J	34-12034A	Decreed	6/20/1972	IRRIGATION	0.37	132.0	Yes
HAWLEY, JEFF; HAWLEY, KATIE	33-2101A	Decreed	7/12/1961	IRRIGATION	3.58	862.3	
HAWLEY, JEFF; HAWLEY, KATIE	33-2101B	Decreed	7/12/1961	IRRIGATION	4.68	862.3	
HAYES, AMY; HAYES, DESTRY	35-14639	Decreed	9/28/1981	IRRIGATION	0.02	3.3	
HAYMAKER PARTNERS LLC	34-14894	Decreed	5/4/1960	IRRIGATION	2.29	365.4	
HAYMAKER PARTNERS LLC	34-14891	License	1/22/1980	IRRIGATION	1.80	365.4	
HEISE HOT SPRINGS INC	23-7016	Decreed	2/3/1976	IRRIGATION	0.36	14.5	
HEJTMANEK, WESTON	33-14917	Decreed	2/4/1977	IRRIGATION	0.09	76.0	
HELSLEY HENDRIX, JEANINE P; HELSLEY, BRIAN T	36-16561	Decreed	2/8/1971	IRRIGATION	0.03	3.0	
HENDRICKS, TERRY	22-13913	License	1/20/2009	DOMESTIC	0.17		
HENRIE, JAREM	25-7302	Decreed	1/25/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.05	2.0	
HENSLEY, DEBORAH; HENSLEY, FLOYD EARL; LOCKES, BERNICE; REYNOLDS, LYNN; WESSEL, TERESA	25-7084	Decreed	1/28/1976	DOMESTIC	0.06		
HERITAGE DEVELOPMENT	29-8173	License	7/19/1996	DOMESTIC	0.27		
HERMELIA GONZALEZ FAMILY TRUST	29-14559	Decreed	2/4/1972	IRRIGATION	0.04	2.5	
HERRMANN, MELISSA; VAN DYCK, CAMERON	34-14816	Decreed	8/1/1961	IRRIGATION	0.06	4.6	
HIGBEE, BRIDGET L; HIGBEE, OTTO J	34-13938	Decreed	8/16/1966	IRRIGATION	0.19	9.5	
HIGHWAY ESTATES WATER USERS INC	25-7038	Decreed	9/20/1973	DOMESTIC	0.20		
HIGLEY DEVELOPMENTS LLC	25-14444	Decreed	10/28/1953	IRRIGATION	0.05	2.8	
HIHN, AMBER R; HIHN, THOMAS M	34-14296	Decreed	12/17/1961	IRRIGATION	0.09	4.6	
HILL, BRENT; LLOYD, LINDA; MC GARY, DEBRA; MC GARY, STEPHEN	22-7584	License	8/30/1988	DOMESTIC, IRRIGATION	0.10	2.0	

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HINCKLEY, LA PREAL	25-14005	License	10/12/2003	IRRIGATION	0.06	3.0	
HINTZE FARMS	34-10696	Decreed	4/26/1955	COMMERCIAL	0.04		
HINTZE, LIN F; HINTZE, S K	34-10702	Decreed	7/1/1955	COMMERCIAL	0.04		
HJELM, JAMIE; HJELM, KATHY	34-7019B	Decreed	4/28/1977	IRRIGATION	0.23	23.0	
HJELM, JAMIE; HJELM, KATHY	34-10056B	Decreed	8/5/1979	IRRIGATION	0.03	23.0	Yes
HK CONTRACTORS INC	25-14462	License	3/2/2018	INDUSTRIAL	1.05		
HOLDAWAY, CHAD	31-4069	Decreed	12/31/1961	DOMESTIC, STOCKWATER	0.16		
HOLLADAY, JAYSON C; HOLLADAY, RUTH R	29-2336	Decreed	7/1/1953	DOMESTIC, IRRIGATION	0.04	3.0	
HOLLAND, JOHN H; HOLLAND, JUDITH A	36-7112	Decreed	1/22/1970	IRRIGATION, STOCKWATER	0.84	40.0	
HOLMES, JENNIFER A; HOLMES, MARK E	34-7562	License	11/14/1994	DOMESTIC	0.10		
HOLT, CHRIS; HOLT, TINA	34-2374B	Decreed	7/11/1960	IRRIGATION	0.53	27.5	
HONDO, AKIYE I; HONDO, DANIEL A	45-2664	Decreed	8/30/1961	IRRIGATION	2.00	157.0	
HORSESHOE BEND LLC	25-14296	Decreed	2/7/1957	IRRIGATION	0.37	65.9	
HOWARD, DANIEL	34-14767	Decreed	9/29/1966	IRRIGATION	0.05	2.8	
HOWARD, DANIEL	34-14769	Decreed	5/20/1984	IRRIGATION	0.01	2.8	Yes
HOWE WATER DISTRICT	33-7067	Decreed	3/28/1979	DOMESTIC	0.70		
HUELSMAN, BARBARA; HUELSMAN, LONE JAMES	34-14497	Decreed	8/29/1960	IRRIGATION	0.04	2.0	
HUFFAKER, COLLEEN; HUFFAKER, DALE	34-13894	Decreed	8/1/1961	IRRIGATION	0.12	9.6	
HUFFAKER, COLLEEN; HUFFAKER, DALE	34-14871	Decreed	9/29/1966	IRRIGATION	0.02	1.2	
HUFFAKER, COLLEEN; HUFFAKER, DALE	34-14947	Decreed	9/29/1966	IRRIGATION	0.14	8.5	
HUFFAKER, COLLEEN; HUFFAKER, DALE	34-14872	Decreed	5/20/1984	IRRIGATION	0.01	1.2	Yes
HUFFAKER, COLLEEN; HUFFAKER, DALE	34-14948	Decreed	5/20/1984	IRRIGATION	0.02	8.5	Yes
HUGGINS, CHARLES D	34-13927	Decreed	6/10/1977	IRRIGATION	0.26	30.1	
HUGGINS, CHARLES D; HUGGINS, KAREN	34-2401E	Decreed	3/6/1961	IRRIGATION	0.16	8.0	
HUNSTMANS PROPERTIES	27-7511	License	4/20/1990	COMMERCIAL	0.33		
HUNTING, AUDREY	25-7453	License	10/28/1988	IRRIGATION	0.03	1.0	
HUTCHISON, JA NEAL; HUTCHISON, WINSTON	45-4218	Decreed	7/1/1958	IRRIGATION	0.05	1.5	
HYMAS, KIMBERLY; HYMAS, TORREY ERIC	29-14454	Decreed	10/28/1953	IRRIGATION	0.05	6.4	
HYMAS, KIMBERLY; HYMAS, TORREY ERIC	29-14434	Decreed	6/23/1977	IRRIGATION	0.06	6.4	
ID DEPARTMENT OF FISH AND GAME	29-13997	Decreed	1/21/1964	DIVERSION TO STORAGE, RECREATION STORAGE	0.12		
ID DEPARTMENT OF FISH AND GAME	29-13998	License	2/10/2011	RECREATION STORAGE	0.00		
ID DEPARTMENT OF JUVENILE CORRECTIONS	21-11971	Decreed	1/1/1956	COMMERCIAL	0.68		
ID DEPARTMENT OF PARKS AND RECREATION	36-17147	Decreed	8/7/1973	IRRIGATION	0.06	5.0	
ID DEPARTMENT OF TRANSPORTATION	37-20852	Decreed	9/20/1974	IRRIGATION	0.09		

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ID DEPARTMENT OF TRANSPORTATION	22-7317	Decreed	1/31/1980	COMMERCIAL, DOMESTIC	0.04		
ID DEPARTMENT OF TRANSPORTATION	31-7372	Decreed	1/28/1982	INDUSTRIAL	0.05		
ID FISH & GAME COMMISSION	35-8635A	Decreed	12/17/1986	FISH PROPAGATION	0.72		
ID FISH & GAME COMMISSION	35-8679	License	12/26/1988	COMMERCIAL	1.00		
IDAHO AGRI INVESTMENTS LLC	45-14533	Decreed	9/6/1967	COMMERCIAL, STOCKWATER	3.01		
IDAHO AGRI INVESTMENTS LLC	45-7237	License	5/2/1975	DOMESTIC, STOCKWATER	0.08		
IDAHO FALLS COUNTRY CLUB INC	25-13372	Decreed	12/31/1961	COMMERCIAL, IRRIGATION	0.67	132.0	
IDAHO POWER COMPANY	29-8126	Decreed	1/26/1959	INDUSTRIAL	2.68		
IDAHO POWER COMPANY	45-7669	License	1/9/1990	DOMESTIC	0.06		
IDAHO STATE UNIVERSITY	29-7289	Decreed	9/22/1975	HEATING	1.12		
IDAHO WATER CO LLC	36-16909	Decreed	9/12/1973	IRRIGATION	0.06	485.0	
IDAHO WATER CO LLC	36-16911	Decreed	9/12/1973	IRRIGATION	0.10	485.0	
IDAHO WATER COMPANY LLC	29-14366	Decreed	5/27/1974	IRRIGATION	0.10	20.0	
INTERSTATE MFG	36-8454	License	9/14/1989	COMMERCIAL	0.04		
ISAAK, LAMAR	29-14319	Decreed	2/28/1977	IRRIGATION	0.56	38.0	
ISAEFF, PATRICIA	25-10094	Decreed	10/31/1958	DOMESTIC, IRRIGATION, STOCKWATER	0.06	2.0	
ISHAM FARMS	33-2070A	Decreed	2/14/1953	IRRIGATION	1.68	145.0	
ISHAM FARMS	33-2070B	Decreed	2/14/1953	IRRIGATION	0.14	959.0	
ISHAM FARMS	33-2116	Decreed	5/31/1963	IRRIGATION	3.33	959.0	
ISHAM FARMS	33-7006B	Decreed	8/18/1966	IRRIGATION	0.24	959.0	
ISHAM FARMS	33-7057E	Decreed	7/20/1977	IRRIGATION	0.38	959.0	
J R SIMPLOT CO	33-2076A	Decreed	3/22/1955	IRRIGATION	7.50	3002.0	
J R SIMPLOT CO	33-2076B	Decreed	3/22/1955	IRRIGATION	6.80	3002.0	
J R SIMPLOT CO	33-10092	Decreed	11/1/1961	DOMESTIC, STOCKWATER	0.15		
J R SIMPLOT CO	29-2515	Decreed	1/5/1966	IRRIGATION	2.00	196.0	
J R SIMPLOT CO	29-7036	Decreed	9/10/1969	DOMESTIC, INDUSTRIAL	0.03		
J R SIMPLOT CO	29-7089	Decreed	6/9/1972	IRRIGATION	1.08	196.0	
JACK C BROWN LIVING TRUST; PATRICIA BROWN LIVING TRUST	35-9072	License	12/7/1998	DOMESTIC	0.18		
JACOB, JANET; JACOB, PAUL	34-14814	Decreed	5/14/1977	IRRIGATION	0.21	10.7	
JACOBS, GEORGE J	25-7321	License	5/9/1983	DOMESTIC, STOCKWATER	0.08		
JANSS FARMS	37-7351	Decreed	4/12/1974	STOCKWATER	0.14		
JARVIS, WADE DEE	29-14360	Decreed	2/10/1987	IRRIGATION	0.02	1.5	
JEFFERSON SCHOOL DISTRICT #251	35-8683	License	12/2/1988	INDUSTRIAL	0.02		
JEFFERSON SCHOOL DISTRICT #251	25-7472	License	1/23/1989	DOMESTIC	0.07		
JEFFRIES, DAVID A; JEFFRIES, SARA E	37-23214	Decreed	9/20/1974	IRRIGATION	0.02	2.0	

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JENSEN FAMILY CATTLE LLC	34-2340B	Decreed	1/8/1958	IRRIGATION	1.40	56.0	
JENSEN FAMILY CATTLE LLC	34-14753	Decreed	9/9/1960	IRRIGATION	0.56	95.0	
JENSEN FAMILY CATTLE LLC	34-7233	Decreed	3/6/1986	IRRIGATION	1.34	95.0	
JENSEN, CHRIS L	35-7411B	Decreed	4/3/1974	IRRIGATION	0.01	1.0	
JENSEN, CHRISTY; JENSEN, MARSHALL	34-14426	Decreed	5/14/1977	IRRIGATION	0.15	7.5	
JENSEN, DE ANN N; JENSEN, JAY	34-2357B	Decreed	3/31/1960	IRRIGATION	2.00	82.0	
JENSEN, DE ANN N; JENSEN, JAY	34-7055	Decreed	12/20/1973	IRRIGATION	4.80	307.0	
JENSEN, DE ANN N; JENSEN, JAY	34-10923	Decreed	4/12/1994	IRRIGATION	1.05	307.0	Yes
JENSEN, DREW CLINT; JENSEN, ERIN ELIZABETH	34-13671	Decreed	7/17/1962	IRRIGATION	0.74	37.0	
JENSEN, GARY; JENSEN, LARRY	34-2409B	Decreed	4/6/1961	IRRIGATION	2.20	172.0	
JENSEN, GARY; JENSEN, LARRY	34-12034B	Decreed	6/20/1972	IRRIGATION	0.53	172.0	Yes
JENSON, RONALD; JENSON, SHARON	25-10156	Decreed	10/1/1959	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.5	
JEROME CHEESE CO	35-14253	Decreed	8/19/1952	MITIGATION	0.06		
JEROME CHEESE CO	36-16380	Decreed	9/12/1973	MITIGATION	0.11		
JKC FARMS LLC	22-7649	License	4/10/2017	IRRIGATION	1.75	366.8	
JOHN L POWERS TRUST	34-14917	License	1/22/1980	IRRIGATION	0.03	5.3	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-2350	Decreed	7/13/1959	IRRIGATION	1.60	490.9	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-14808	Decreed	8/29/1960	DIVERSION TO STORAGE, IRRIGATION	0.27	13.5	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-13890	Decreed	4/14/1961	IRRIGATION	2.31	248.1	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-2418	Decreed	5/24/1961	IRRIGATION	1.26	490.9	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-14621	Decreed	12/17/1961	IRRIGATION	0.10	186.0	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-14623	Decreed	12/17/1961	IRRIGATION	0.24	186.0	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-14674	Decreed	12/17/1961	IRRIGATION	0.07	186.0	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-14678	Decreed	12/17/1961	IRRIGATION	0.10	186.0	
JOHNSON, DON A; JOHNSON, LAURIE	25-7493	License	3/8/1989	DOMESTIC	0.06		
JOHNSON, E BUD	25-4227	Decreed	10/31/1956	DOMESTIC, IRRIGATION	0.11	1.2	
JOHNSON, MELISSA	25-7455	License	10/21/1988	DOMESTIC, IRRIGATION	0.07	1.0	
JOHNSON, RODNEY M; JOHNSON, SHERRY L	36-17277	Decreed	11/28/1977	IRRIGATION	0.04	2.0	
JOLLEY, BRYAN D; JOLLEY, TAMERA	35-4227B	Decreed	5/1/1959	IRRIGATION	0.02	1.0	
JONES, HEATHER; JONES, JUSTIN	29-14452	Decreed	10/28/1953	IRRIGATION	0.06	8.0	
JONES, HEATHER; JONES, JUSTIN	29-14432	Decreed	6/23/1977	IRRIGATION	0.07	8.0	
JONES, JACOB; JONES, REBECCA	29-14457	Decreed	10/28/1953	IRRIGATION	0.02	2.0	
JONES, JACOB; JONES, REBECCA	29-14437	Decreed	6/23/1977	IRRIGATION	0.02	2.0	
JONES, ROSA GAY	29-7913	License	4/3/1990	DOMESTIC, IRRIGATION	0.06	5.0	
JORY, GRACE; JORY, GRIFFIN WHEELER	29-14140	Decreed	9/25/1957	DOMESTIC, IRRIGATION	0.02	0.5	

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JOURNEYS END HOMEOWNERS ASSN	35-13612	License	11/24/2003	DOMESTIC	0.40		
JOURNEYS END HOMEOWNERS ASSN	35-13611	License	1/13/2007	COMMERCIAL, DOMESTIC	0.11		
JUNIPER HILLS COUNTRY CLUB INC	29-13827	Decreed	1/29/1960	IRRIGATION	0.30	15.0	
JUNIPER HILLS COUNTRY CLUB INC	29-4433	Decreed	4/1/1960	IRRIGATION	2.27	113.3	
JUNIPER VIEW LLC	22-14339	License	4/10/2017	IRRIGATION	0.12	24.5	
KAREY LANE WELL ASSN	35-7698	Decreed	8/11/1983	DOMESTIC	0.14		
KAREY LANE WELL ASSN	35-8943	License	5/3/1991	DOMESTIC	0.09		
KAY, JUSTINE; KAY, THOMAS F; LEVESQUE, GLENDA R	34-2484	Decreed	8/12/1966	IRRIGATION	0.01	2.0	
KEISTER, ARLIE; KEISTER, VICKI	34-13672	Decreed	7/17/1962	IRRIGATION	0.40	20.0	
KELLER, JEANNE; KELLER, STEVE F	34-13785	Decreed	4/2/1980	IRRIGATION	0.08	4.4	
KELLER, STEVE F	34-13784	Decreed	4/2/1980	IRRIGATION	0.07	3.7	
KELLY, JAMIE; KELLY, MARCUS	34-2447C	Decreed	7/16/1963	IRRIGATION	0.50	40.0	
KELLY, JAMIE; KELLY, MARCUS	34-10930C	Decreed	8/6/1987	IRRIGATION	0.28	40.0	Yes
KENNY AND CHELSIE HILL LIVING TRUST	29-14456	Decreed	10/28/1953	IRRIGATION	0.02	2.1	
KENNY AND CHELSIE HILL LIVING TRUST	29-14436	Decreed	6/23/1977	IRRIGATION	0.02	2.1	
KEYBANK NATIONAL ASSOC	25-7517	License	8/24/1989	COMMERCIAL	0.50		
KING MOUNTAIN GLIDER PARK FOUNDATION INC	34-14672	Decreed	3/6/1961	IRRIGATION	0.36	17.3	
KING MOUNTAIN GLIDER PARK FOUNDATION INC	34-14926	Decreed	3/6/1961	IRRIGATION	0.01	0.4	
KING, ELVA S; KING, STEPHEN B	34-2388A	Decreed	9/16/1960	IRRIGATION	1.60	170.0	
KING, ELVA S; KING, STEPHEN B	34-13947	Decreed	2/21/1961	IRRIGATION	1.64	170.0	
KING, ELVA S; KING, STEPHEN B	34-7067A	Decreed	3/22/1974	IRRIGATION	0.91	170.0	
KING, LORI B; KING, STEPHEN K	34-2388C	Decreed	9/16/1960	IRRIGATION	0.45	25.0	
KING, LORI B; KING, STEPHEN K	34-2449B	Decreed	3/4/1963	IRRIGATION	2.40	187.0	
KING, LORI B; KING, STEPHEN K	34-7067C	Decreed	3/22/1974	IRRIGATION	0.11	25.0	
KING, LORI B; KING, STEPHEN K	34-12393	Decreed	5/1/1983	IRRIGATION	0.91	187.0	Yes
KING, ROBERT J; KING, SAMMI J	34-2406H	Decreed	3/20/1961	IRRIGATION	0.77	37.0	
KINGHORN, KARL	25-14338	Decreed	2/18/1958	IRRIGATION	1.37	47.9	
KIRBY, DORIS F; KIRBY, ELWOOD	35-7860	License	6/20/1979	DOMESTIC	0.08		
KIRKHAM JR, DALE B; KIRKHAM, DALE B	29-7941	License	3/31/1990	COMMERCIAL	0.08		
KNIFE RIVER CORPORATION MOUNTAIN WEST	25-14552	Permit	7/8/2024	DIVERSION TO STORAGE, INDUSTRIAL FROM STORAGE, INDUSTRIAL STORAGE, INDUSTRIAL	0.78		
KOCH MATERIALS CO	35-12087	Decreed	5/1/1962	COMMERCIAL, FIRE PROTECTION, INDUSTRIAL	0.11		
KOCH, DENNIS W; KOCH, DIANA E	45-13621	Decreed	7/14/1983	IRRIGATION	0.04	3.4	
KOON, JACK E	22-7751	License	9/18/1992	DOMESTIC	0.06		
KOPP, GWENDOLYN	25-7522	License	9/1/1989	DOMESTIC	0.04		

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KOYLE, JOHN DENNIS; KOYLE, SHANNA	37-2663	Decreed	5/31/1961	IRRIGATION	2.12	156.0	
KRISHNEK, RONALD	34-2477G	Decreed	6/13/1966	IRRIGATION	0.21	11.0	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14730	Decreed	9/28/1981	IRRIGATION	0.01	2.4	
KUBIAK, VERNON ROBERT	34-2366B	Decreed	5/12/1960	IRRIGATION	0.09	7.0	
KUBS, CHRISTOPHER; KUBS, LIANNE	34-7000	Decreed	6/20/1967	IRRIGATION	0.16	8.0	
KUGLER, DIANE K; KUGLER, JOHN B	35-8359	Permit	11/28/1984	IRRIGATION	6.00	313.0	
KULHANEK, DENNIS; KULHANEK, MAXINE	36-8503	License	2/21/1990	IRRIGATION	0.04	2.0	
L & S LAND HOLDINGS LLC	36-17189	Decreed	11/26/1956	COMMERCIAL, STOCKWATER	0.13		
L & S LAND HOLDINGS LLC	36-17188	Decreed	1/23/1973	COMMERCIAL, STOCKWATER	0.09		
L & S LAND HOLDINGS LLC	36-17242	Decreed	1/23/1973	COMMERCIAL, STOCKWATER	0.08		
L & S LAND HOLDINGS LLC	36-17190	Decreed	10/27/1973	COMMERCIAL, STOCKWATER	0.08		
L & S LAND HOLDINGS LLC	36-17187	License	9/24/1979	COMMERCIAL, STOCKWATER	0.20		
L2 LTD PARTNERSHIP; L3 LTD PARTNERSHIP	32-4058	Decreed	7/1/1953	DOMESTIC, STOCKWATER	0.16		
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-2109	Decreed	1/29/1962	IRRIGATION	2.40	230.0	
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-2118	Decreed	5/13/1964	IRRIGATION	3.49	278.0	
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-2131	Decreed	12/5/1966	IRRIGATION	1.10	230.0	
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-7002A	Decreed	4/19/1968	IRRIGATION	1.60	154.0	
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-10029	Decreed	6/1/1968	IRRIGATION	0.87	230.0	Yes
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-7005	Decreed	8/15/1968	IRRIGATION	5.12	313.0	
LAGOMARSINO, MATTHEW J; LAGOMARSINO, RAMONA; LAGOMARSINO, RICHARD A	33-7020	Decreed	2/1/1973	IRRIGATION	3.40	237.0	
LAMB WESTON INC	35-14786	Permit	4/29/2022	INDUSTRIAL	15.00		
LAMB, CORY W; LAMB, TERI G	29-10645	Decreed	5/15/1960	IRRIGATION	0.03	1.0	
LAMBERT, LYLE; LAMBERT, NADINE	29-7640	Decreed	5/17/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.0	
LAMBSON, GARY G; LAMBSON, KATHLEEN K	34-2336C	Decreed	4/9/1956	IRRIGATION	0.08	4.0	
LAMBSON, GARY G; LAMBSON, KATHLEEN K	34-2336D	Decreed	4/9/1956	IRRIGATION	0.06	3.0	
LAMBSON, GARY G; LAMBSON, KATHLEEN K	34-7030	Decreed	2/9/1973	IRRIGATION	0.25	32.0	
LAMBSON, SHARLEECE; LAMBSON, WILLIAM JARED	34-2336B	Decreed	4/9/1956	IRRIGATION	0.40	20.0	
LAMBSON, SHARLEECE; LAMBSON, WILLIAM JARED	34-7222	Decreed	11/30/1978	IRRIGATION	0.02	1.0	
LANDON, JESSICA; LANDON, PAUL	25-14521	License	1/14/1983	IRRIGATION	0.11	10.0	
LANDON, JULIE; LANDON, KELLY	25-14475	Decreed	8/10/1966	IRRIGATION	0.04	2.0	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
LANE JR, DALLAS R; LANE, CRYSTAL L KANDERIS	29-14450	Decreed	10/28/1953	IRRIGATION	0.02	2.8	
LANE JR, DALLAS R; LANE, CRYSTAL L KANDERIS	29-14430	Decreed	6/23/1977	IRRIGATION	0.03	2.8	
LARSEN, BLAINE L; LARSEN, CONNIE L	31-12200	Decreed	2/17/1969	DOMESTIC	0.04		
LARSEN, HELEN	35-8127	License	4/28/1983	DOMESTIC, STOCKWATER	0.08		
LARSEN, JO ANN B	25-7315	Decreed	4/12/1983	COMMERCIAL, DOMESTIC, IRRIGATION	0.19	1.0	
LARSEN, PEGGY A; LARSEN, RICHARD J	31-7129	License	7/30/1974	DOMESTIC, STOCKWATER	0.08		
LARSON, BECKY J; LARSON, CHARLES W	45-4160	Decreed	3/15/1962	IRRIGATION	1.70	173.0	
LAZY EIGHT ESTATES DIVISION 2 HOMEOWNERS ASSN INC	25-14189	License	10/26/2006	DOMESTIC	0.50		
LAZY P FARMS; PAULS, DEBBRAH; PAULS, EMIL V; PAULS, RONALD	37-8147	License	6/27/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.8	
LEAVELL, ALONZO B	37-11199	Decreed	4/1/1960	DOMESTIC	0.03		
LEAVITT, LANCE H; LEAVITT, STEPHANIE D	34-14433	Decreed	2/11/1955	IRRIGATION	0.07	4.2	
LEAVITT, LANCE H; LEAVITT, STEPHANIE D	34-2323E	Decreed	2/11/1955	IRRIGATION	0.06	4.1	
LEE, CAROLYN C; LEE, LARRY O	31-7166A	Permit	6/27/1975	IRRIGATION	3.20	160.0	
LEHMAN, CLAUDIA; LEHMAN, MORRIS	29-7333	Decreed	6/24/1976	DOMESTIC, IRRIGATION	0.16	4.0	
LEMMON, JOYCE; LEMMON, MELVIN C	34-10836	Decreed	6/1/1953	IRRIGATION	0.04	1.9	
LES SCHWAB TIRE CENTERS OF IDAHO	36-11803	Decreed	11/15/1958	COMMERCIAL	0.38		
LEZAMIZ, SID	37-10363	Decreed	9/1/1959	COMMERCIAL	0.11		
LIMA, GUADALUPE	36-17128	Decreed	9/20/1973	IRRIGATION	0.02	1.2	
LITTLE FARM LLC	34-13984	Decreed	3/6/1961	IRRIGATION	1.36	65.3	
LITTLE LOST DAIRY LLC	33-7013	Decreed	4/26/1972	IRRIGATION	2.74	206.2	
LITTLE LOST DAIRY LLC	33-7026	Decreed	10/30/1973	IRRIGATION	1.08	206.2	
LITTLE LOST RIVER LAND & CATTLE LTD	33-2064	Decreed	9/15/1952	IRRIGATION	2.60	156.0	
LITTLE LOST RIVER LAND & CATTLE LTD	33-7030	Decreed	1/17/1974	IRRIGATION	2.85	134.4	
LITTLE LOST RIVER LAND & CATTLE LTD	33-7072	Decreed	4/24/1980	IRRIGATION	0.60	156.0	
LITTLE LOST RIVER LAND & CATTLE LTD	33-7174	License	5/31/1985	IRRIGATION	2.77	150.0	
LITTLEFIELD, ALISA M; LITTLEFIELD, JED	34-14897	Decreed	9/29/1966	IRRIGATION	0.05	3.0	
LITTLEFIELD, ALISA M; LITTLEFIELD, JED	34-14898	Decreed	5/20/1984	IRRIGATION	0.01	3.0	Yes
LOFTUS, LARRY; LOFTUS, STACEY	34-2398	Decreed	2/20/1961	IRRIGATION	1.40	70.0	
LOGSDON, BRUCE; LOGSDON, TRACY	34-13931	Decreed	12/17/1961	IRRIGATION	0.09	4.6	
LOJA LLC	25-7424	License	4/1/1988	IRRIGATION	0.09	3.0	
LOMBARDI, DEAN; LOMBARDI, WANDAMAE	34-14104	Decreed	4/29/1955	IRRIGATION	0.39	201.6	
LOMBARDI, DEAN; LOMBARDI, WANDAMAE	34-13928	Decreed	6/10/1977	IRRIGATION	0.45	201.6	
LONG, DAVID JESSE; LONG, SYLVIA M	35-14908	Decreed	8/19/1977	IRRIGATION	0.11	6.5	
LOOP, JACQUELINE	25-14486	License	9/19/1989	DOMESTIC, IRRIGATION	0.06	0.7	
LOOSLI, S LYNN	21-13258	Decreed	7/14/1977	IRRIGATION	6.75	1651.5	

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LORD, CHRIS; LORD, TEENA	34-2467	Decreed	9/28/1965	IRRIGATION	1.82	91.0	
LORD, DONALD; LORD, JUDY	34-13719	Decreed	4/19/1960	IRRIGATION	0.10	16.0	
LORD, GRANT; LORD, JULIE	34-13844	Decreed	3/2/1961	IRRIGATION	0.08	4.3	
LORDS, DARRELL M	35-8778	License	5/31/1989	IRRIGATION	0.10	4.5	
LORDS, DUSTON; LORDS, HOLLY	34-4035A	Decreed	8/1/1960	IRRIGATION	0.17	8.5	
LOST RIVER FARMS	34-14346	Decreed	8/12/1966	IRRIGATION	0.38	177.0	
LOST RIVER FARMS	34-7205	Decreed	8/1/1977	IRRIGATION	4.62	177.0	
LOVELAND, ANN; LOVELAND, KEVIN	29-14295	Decreed	10/26/1959	IRRIGATION	1.63	128.4	
LOVELL, HOPE; LOVELL, JAMES R	25-7598	License	9/25/1991	IRRIGATION	0.03	1.9	
LYNCH, LESLIE R	36-7154	Decreed	1/25/1971	INDUSTRIAL	0.02		
M & N LAND LLC	45-14568	Decreed	2/1/1954	IRRIGATION	0.44	101.0	
M & N LAND LLC	45-14567	Decreed	12/10/1956	IRRIGATION	0.92	101.0	
MACKAY LAND CO	34-14042	Decreed	5/11/1960	IRRIGATION	0.71	75.0	
MACKAY LAND CO	34-14469	Decreed	5/11/1960	IRRIGATION	0.78	75.0	
MACKAY RV PARK LLC	34-14649	Decreed	9/29/1966	IRRIGATION	0.52	31.5	
MACKAY RV PARK LLC	34-14650	Decreed	5/20/1984	IRRIGATION	0.09	31.5	Yes
MACKAY SCHOOL DISTRICT #182	34-10942	Decreed	5/7/1954	IRRIGATION	0.28	20.0	
MADARIETA SOD FARM	33-14910	Decreed	5/25/1972	IRRIGATION	0.04	5.0	
MADARIETA SOD FARM	33-14912	Decreed	4/11/1973	IRRIGATION	0.03	5.0	
MADISON SCHOOL DISTRICT #321	22-14474	Permit	5/13/2022	DOMESTIC	0.26		
MAGEE FAMILY TRUST	34-13762	Decreed	11/28/1952	IRRIGATION	0.99	197.4	
MAGEE FAMILY TRUST	34-2399	Decreed	2/24/1961	IRRIGATION	1.52	197.4	
MAGEE FAMILY TRUST	34-14343	Decreed	4/1/1987	IRRIGATION	0.12	197.4	Yes
MAGEE GROUP INC	34-2384	Decreed	8/29/1960	IRRIGATION	1.12	58.0	
MAGEE GROUP INC	34-2464	Decreed	6/28/1965	IRRIGATION	2.13	115.6	
MAGIC VALLEY GROWERS LTD	37-20612	Decreed	6/1/1956	INDUSTRIAL	0.10		
MAGNIFY LAND CONSULTING LLC	36-17208	Decreed	4/13/1976	IRRIGATION	0.20	10.0	
MANGAN, LOUIS; MANGAN, ROBIN	34-14660	Decreed	12/17/1961	IRRIGATION	0.11	5.7	
MARLOWE, MARK; MARLOWE, MICHELLE	25-14319	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
MARSHALL, BYRON GUY; MARSHALL, LORI ANN	29-14138	Decreed	2/10/1987	IRRIGATION	0.11	7.0	
MARSHALL, DON W	25-7462	License	11/10/1988	DOMESTIC, IRRIGATION	0.07	1.0	
MARTIAN, ERICA; MARTIAN, PETER	35-7855	Decreed	5/1/1979	COMMERCIAL, HEATING	0.04		
MARTIN, HAROLD D	35-13621	License	12/27/1989	DOMESTIC, IRRIGATION	0.04	0.8	
MASON, JOHN D; MASON, VALERIE	29-7294	Decreed	11/4/1975	DOMESTIC, IRRIGATION	0.12	8.0	
MAUGHAN, GAYLORD L	31-12220	Decreed	8/22/1955	IRRIGATION	0.07	3.5	

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MAUTHE, RICHARD E; MCCASLIN, NANCY J	34-4070	Decreed	8/1/1961	IRRIGATION, STOCKWATER	1.80	105.1	
MAUTHE, RICHARD E; MCCASLIN, NANCY J	34-7248	Decreed	7/8/1980	IRRIGATION, STOCKWATER	0.97	46.4	
MAXMILLION FARMS; SHRADER, MAXINE R	35-8224	Decreed	6/30/1983	DOMESTIC, IRRIGATION	0.04	1.0	
MAYS, DARRELL DEAN; MAYS, MARCHETA	33-2114	Decreed	2/13/1963	IRRIGATION	4.69	901.0	
MAYS, DARRELL DEAN; MAYS, MARCHETA	33-10057	Decreed	4/1/1963	IRRIGATION	4.69	901.0	
MAYS, DARRELL DEAN; MAYS, MARCHETA	33-7192	Decreed	2/12/1990	IRRIGATION	2.74	782.0	
MAYS, KAYALIN; MAYS, RUSSELL H	33-10081	Decreed	8/24/1962	IRRIGATION	8.40	621.5	
MAYS, KAYALIN; MAYS, RUSSELL H	33-7024	Decreed	10/15/1973	IRRIGATION	9.03	320.0	
MC AFFEE, ANGIE; MC AFFEE, RYE	34-7214	Decreed	5/21/1978	IRRIGATION	0.20	12.0	
MC AFFEE, GAIL; MC AFFEE, SCOTT L	34-2351	Decreed	7/20/1959	IRRIGATION	2.90	171.8	
MC AFFEE, GAIL; MC AFFEE, SCOTT L	34-7227	Decreed	5/3/1979	IRRIGATION	0.71	39.0	
MC AFFEE, PAIGE WOODIE	33-2084	Decreed	11/18/1957	IRRIGATION	1.16	260.0	
MC AFFEE, PAIGE WOODIE	33-2095	Decreed	8/30/1960	IRRIGATION	1.55	151.0	
MC AFFEE, PAIGE WOODIE	33-2136	Decreed	8/10/1966	IRRIGATION	1.83	260.0	
MC AFFEE, PAIGE WOODIE	33-7046	Decreed	7/12/1976	IRRIGATION	0.60	151.0	
MC AFFEE, RUTH G; MC AFFEE, RYAN G	34-10323	Decreed	4/18/1975	IRRIGATION	2.62	148.0	
MC BURNEY, CLORINDA M; MC BURNEY, TED L	34-2382A	Decreed	9/18/1960	DOMESTIC, IRRIGATION, STOCKWATER	0.20	9.0	
MC CALL OIL & CHEMICAL	25-7045	Decreed	2/25/1974	DOMESTIC, INDUSTRIAL	0.08		
MC CLYMONDS II, ROBERT C; MC CLYMONDS, KATHERINE A	34-7210B	Decreed	11/8/1977	IRRIGATION	0.21	14.0	
MC COWIN, BRENDA	25-7544	License	8/16/1989	DOMESTIC	0.07		
MC CRAY, JOHN A; MC CRAY, MATEA H	34-7066	Decreed	3/31/1974	IRRIGATION	1.18	60.0	
MC DANIEL, KELLY; MC DANIEL, KIM	34-14240	Decreed	6/13/1968	IRRIGATION	0.05	3.0	
MC DANIEL, WENDY M	25-14299	Decreed	8/10/1966	IRRIGATION	0.03	1.5	
MC DANIEL, ZEE M	25-14330	Decreed	8/10/1966	IRRIGATION	0.80	39.7	
MC DANIEL, ZEE M	25-14332	Decreed	7/27/1972	IRRIGATION	0.40	26.9	
MC DONALD, CHARLES H	33-14916	Decreed	2/4/1977	IRRIGATION	0.01	2.0	
MC DONALD, JAMES; MC DONALD, JESSICA	34-2438	Decreed	9/13/1961	IRRIGATION	0.57	33.0	
MC DONALD, JAMES; MC DONALD, JESSICA	34-10795	Decreed	4/1/1977	IRRIGATION	0.09	33.0	Yes
MC FAMILY REAL ESTATE LLC	34-10615	Decreed	10/17/1955	IRRIGATION	3.34	504.0	
MC FAMILY REAL ESTATE LLC	34-4136	Decreed	4/1/1956	IRRIGATION	3.02	151.0	
MC FAMILY REAL ESTATE LLC	34-14429	Decreed	4/21/1960	IRRIGATION	5.06	252.8	
MC FAMILY REAL ESTATE LLC	34-10617	Decreed	6/1/1961	IRRIGATION	2.18	504.0	
MC GARRY, BRANDON; MC GARRY, BRITTNI	35-14689	Decreed	4/7/1958	IRRIGATION	0.40	65.0	
MC GARRY, KATHLEEN; MC GARRY, TIM R	35-14688	Decreed	4/7/1958	IRRIGATION	0.77	124.0	
MC GARRY, LOGAN PHILLIPS; MC GARRY, WHITNEY DAWN	21-13309	Decreed	6/25/1960	IRRIGATION	0.03	1.5	

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MC HAN, CRYSTAL	45-14515	Decreed	7/15/1974	IRRIGATION	0.02	1.5	
MC KELVEY, JAMES P	34-2456C	Decreed	11/3/1964	IRRIGATION	0.25	10.0	
MC KELVEY, JOHN Q; MC KELVEY, MARGARET E	34-14862	Decreed	11/28/1952	IRRIGATION	0.01	3.5	
MC KELVEY, JOHN Q; MC KELVEY, MARGARET E	34-14861	Decreed	5/16/1977	IRRIGATION	0.06	3.5	
MC KELVEY, JOHN Q; MC KELVEY, MARGARET E	34-14863	Decreed	4/1/1987	IRRIGATION	0.01	3.5	Yes
MC KINNEY, MONICA; MC KINNEY, WILLIAM	37-23208	Decreed	9/20/1974	IRRIGATION	0.02	1.0	
MC KINNEY, MONICA; MC KINNEY, WILLIAM	37-23210	Decreed	9/20/1974	IRRIGATION	0.03	1.5	
MC KINNEY, MONICA; MC KINNEY, WILLIAM	37-23215	Decreed	9/20/1974	IRRIGATION	0.01	0.8	
MEAD, JOHN D; MEAD, LISA J	34-14813	Decreed	6/28/1977	IRRIGATION	0.39	19.0	
MEMMOTT, JENNIFER; MEMMOTT, JOHN C	25-7556	License	9/18/1989	DOMESTIC, IRRIGATION	0.08	1.2	
MENAN PRODUCE INC	25-12178	Decreed	11/1/1953	DOMESTIC, INDUSTRIAL	0.10		
MERLIN HOLDINGS LLC	25-14265	Decreed	8/10/1966	IRRIGATION	0.03	1.3	
MERRILL, CHRISTOPHER; MERRILL, CINDY	25-13580	Decreed	1/1/1963	DOMESTIC, IRRIGATION	0.14	5.0	
MERRILL, KENT	25-14364	License	2/28/1992	IRRIGATION	0.19	12.2	
MGR FARMS LLC	22-13515	Decreed	5/24/1960	IRRIGATION	0.06	3.6	
MICKELSEN PROPERTIES LLC	31-12553	Decreed	6/20/1969	IRRIGATION	0.11	8.5	
MICKELSEN PROPERTIES LLC	31-12554	Decreed	6/20/1969	IRRIGATION	1.61	121.3	
MIKESELL, ELEANOR	31-10268	Decreed	5/1/1957	COMMERCIAL, DOMESTIC	0.04		
MIKKOLA, ARTHUR; MIKKOLA, MARK	25-7389	Decreed	11/2/1983	DOMESTIC, STOCKWATER	0.06		
MILBERT, TIM	34-14211	Decreed	6/29/1959	IRRIGATION	0.05	2.3	
MILBERT, TIM	34-14171	Decreed	11/18/1974	DOMESTIC, IRRIGATION	0.06	2.0	
MILLER, CHARLES; MILLER, RACHEL	25-7442	License	9/8/1988	DOMESTIC, IRRIGATION	0.05	1.0	
MILLER, LYNETTE R; MILLER, MARVIN G	25-4194	Decreed	11/1/1960	IRRIGATION	0.13	7.0	
MILLERCOORS USA LLC	45-7641	License	6/8/1989	COMMERCIAL	0.04		
MINIDOKA IRRIGATION DISTRICT	36-13480	Decreed	5/31/1962	COMMERCIAL	0.04		
MINOR, JOSEPH W; MINOR, KATHLEEN D	34-14737	Decreed	9/29/1966	IRRIGATION	0.01	0.5	
MINOR, JOSEPH W; MINOR, KATHLEEN D	34-14738	Decreed	5/20/1984	IRRIGATION	0.01	0.5	Yes
MITCHELL, GREG J	34-13654	Decreed	6/13/1966	IRRIGATION	0.11	5.5	
MITCHELL, GREG J	34-2477E	Decreed	6/13/1966	IRRIGATION	0.19	10.0	
MITCHELL, RALPH M	45-7640	License	5/23/1989	DOMESTIC, IRRIGATION	0.07	1.5	
MODEL WATER USERS ASSN INC	35-7986	Decreed	6/1/1981	DOMESTIC	0.10		
MONCUR, DEAN	34-2368B	Decreed	5/16/1960	IRRIGATION	1.37	78.0	
MONCUR, DEAN	34-14241	Decreed	6/13/1968	IRRIGATION	0.56	32.0	
MONCUR, DEAN	34-14368	Decreed	6/13/1968	IRRIGATION	0.36	17.4	
MONCUR, DEAN	34-14779	Decreed	6/13/1968	IRRIGATION	0.02	1.0	

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MONCUR, DEAN	34-7019A	Decreed	4/28/1977	IRRIGATION	0.79	79.0	
MONCUR, DEAN	34-7208	Decreed	10/23/1977	IRRIGATION	1.40	183.0	
MONCUR, DEAN	34-10056A	Decreed	8/5/1979	IRRIGATION	0.08	79.0	Yes
MONCUR, WILLIAM	34-10860	Decreed	12/31/1962	IRRIGATION	0.13	6.5	
MONK, AUBRIE; MONK, STEVEN	35-14754	Decreed	4/23/1961	IRRIGATION	0.04	6.0	
MONTAGUE, FANNYE FLORENCE; MONTAGUE, JACK MICHAEL	29-7483	Decreed	2/10/1987	DOMESTIC, IRRIGATION	0.02	1.0	
MONTIERTH, GARY; MONTIERTH, NETTIE	34-13891	Decreed	4/14/1961	IRRIGATION	0.09	9.9	
MOO VIEW COW PALACE	45-13905	Decreed	11/16/1974	COMMERCIAL, STOCKWATER	0.30		
MOORE WATER & SEWER ASSN	34-14789	Decreed	2/11/1955	MUNICIPAL	0.49		
MOORE WATER & SEWER ASSN	34-7543	License	1/31/1990	MUNICIPAL	0.44		
MOORE, AARON R	37-23132	Decreed	9/23/1977	IRRIGATION	0.10	5.0	
MOORE, MEGAN; MOORE, SEAN	34-14849	Decreed	12/17/1961	IRRIGATION	0.08	4.1	
MORGAN II, RAYMOND R; MORGAN, LESLEY E	34-13720	Decreed	4/19/1960	IRRIGATION	0.05	6.5	
MORGAN, CHASE D; MORGAN, JENNY L	29-14449	Decreed	10/28/1953	IRRIGATION	0.01	1.8	
MORGAN, CHASE D; MORGAN, JENNY L	29-14429	Decreed	6/23/1977	IRRIGATION	0.02	1.8	
MORGAN, CODY G; MORGAN, KATHY	36-17092	Decreed	3/11/1954	COMMERCIAL, STOCKWATER	0.04		
MORGAN, CODY G; MORGAN, KATHY	36-17091	Decreed	2/6/1961	COMMERCIAL, STOCKWATER	0.02		
MORRISS, JUDITH L; MORRISS, VIRGIL R	25-7483	License	12/22/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.04	3.0	
MOSS FARMS INC	34-2379F	Decreed	8/8/1960	IRRIGATION	2.11	112.0	
MOSS, CAROL C; MOSS, ROBERT K	34-2333A	Decreed	7/7/1955	IRRIGATION	0.06	7.0	
MOSS, CAROL C; MOSS, ROBERT K	34-2333B	Decreed	7/7/1955	IRRIGATION	1.86	93.0	
MOSS, DENNIS K	34-14525	Decreed	6/6/1961	IRRIGATION	0.64	32.0	
MOUNT MC CALEB INC	34-7512	Decreed	5/22/1989	DOMESTIC	0.04		
MOUNTAIN RIVER SPORTSMANS RV PARK & CAMP	25-14229	License	9/2/2008	COMMERCIAL	0.20		
MOUNTAIN VIEW COURT LLC	21-7428	License	3/23/1989	COMMERCIAL	0.09		
MOUNTAIN VIEW LAND LLC	36-17319	Decreed	9/24/1976	COMMERCIAL, STOCKWATER	0.20		
MOUNTAIN WEST BARK PRODUCTS INC	22-7573	License	8/8/1988	COMMERCIAL	0.08		
MOWREY, KRISTIE; MOWREY, RICK	29-7009	Decreed	3/22/1968	DOMESTIC, IRRIGATION, STOCKWATER	0.11	4.5	
MOYLE, KEVIN A; MOYLE, TAYLOR N	36-17240	License	3/16/1989	COMMERCIAL, DOMESTIC, STOCKWATER	0.33		
MOZES, BOB	34-2406G	Decreed	3/20/1961	IRRIGATION	0.29	14.0	
MULLENIX, PAUL	34-2331	Decreed	5/4/1955	IRRIGATION	1.48	77.0	
MURPHY, LA VERN A	36-10046	Decreed	3/1/1964	DOMESTIC	0.04		
MURRI BUILDERS LLC	25-14320	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
MURRI BUILDERS LLC	25-14322	Decreed	7/27/1972	IRRIGATION	0.01	0.7	
NAPOLI, MARIA; ULIAN, PETER	34-7211	Decreed	1/6/1978	DOMESTIC, IRRIGATION	0.10	4.0	

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NATION, DUANE; NATION, LEAH	34-13783	Decreed	4/2/1980	IRRIGATION	0.04	2.6	
NATURAL GUARDIAN LLC	31-7419A	Decreed	4/11/1985	STOCKWATER	0.04		
NATURAL GUARDIAN LLC; STATE OF IDAHO	31-7419B	Decreed	4/11/1985	STOCKWATER	0.04		
NAYLOR, AUDREY; NAYLOR, LEIGH	25-7582	License	2/4/1991	DOMESTIC, IRRIGATION	0.09	3.0	
NEIBAUR, RYAN	25-7561	License	3/2/1990	IRRIGATION	4.00	360.5	
NELSEN DAIRY	36-8745	License	11/7/1995	COMMERCIAL, STOCKWATER	0.11		
NELSON MACKAY RANCH LLC	34-2325	Decreed	3/9/1955	IRRIGATION	6.50	482.0	
NELSON, DONALD	34-2481	Decreed	8/1/1966	IRRIGATION	1.87	84.0	
NELSON, G DAVID; NELSON, HEATHER M	34-2415	Decreed	5/15/1961	IRRIGATION	0.36	18.0	
NELSON, LAURENCE	29-7868	License	9/11/1989	DOMESTIC, IRRIGATION	0.17	15.0	
NEW PHASE INVESTMENTS LLC	25-14186	License	9/18/2006	COMMERCIAL	0.05		
NICHOLS LAND LLC; NICHOLS, ANGELA; NICHOLS, DEREK A; NICHOLS, PATRICK J	34-13902	Decreed	8/29/1960	IRRIGATION	2.27	426.6	
NICHOLS LAND LLC; NICHOLS, ANGELA; NICHOLS, DEREK A; NICHOLS, PATRICK J	34-13904	Decreed	12/17/1961	IRRIGATION	0.30	426.6	
NICHOLS LAND LLC; NICHOLS, ANGELA; NICHOLS, DEREK A; NICHOLS, PATRICK J	34-13906	Decreed	1/3/1975	IRRIGATION	1.16	426.6	
NICHOLS, ANGELA; NICHOLS, CHLOE; NICHOLS, DEREK A; NICHOLS, IRMA; NICHOLS, PATRICK J	34-14472	Decreed	7/11/1960	IRRIGATION	0.35	78.0	
NICHOLS, ANGELA; NICHOLS, CHLOE; NICHOLS, DEREK A; NICHOLS, IRMA; NICHOLS, PATRICK J	34-14482	Decreed	7/11/1960	IRRIGATION	0.09	78.0	
NICHOLS, ANGELA; NICHOLS, CHLOE; NICHOLS, DEREK A; NICHOLS, IRMA; NICHOLS, PATRICK J	34-14474	Decreed	2/7/1961	IRRIGATION	0.16	78.0	
NICHOLS, ANGELA; NICHOLS, CHLOE; NICHOLS, DEREK A; NICHOLS, IRMA; NICHOLS, PATRICK J	34-14475	Decreed	6/6/1961	IRRIGATION	0.18	78.0	
NICHOLS, ANGELA; NICHOLS, CHLOE; NICHOLS, DEREK A; NICHOLS, IRMA; NICHOLS, PATRICK J	34-2421	Decreed	6/6/1961	IRRIGATION	0.64	78.0	
NICHOLS, ANGELA; NICHOLS, CHLOE; NICHOLS, DEREK A; NICHOLS, IRMA; NICHOLS, PATRICK J	34-2421A	Decreed	6/6/1961	IRRIGATION	1.34	68.0	
NICHOLS, CHLOE; NICHOLS, DEREK	34-13843	Decreed	3/2/1961	IRRIGATION	1.72	87.7	
NICHOLS, CHLOE; NICHOLS, DEREK	34-2408A	Decreed	4/5/1961	IRRIGATION	2.33	112.0	
NICHOLS, CHLOE; NICHOLS, DEREK	34-2408B	Decreed	4/5/1961	IRRIGATION	1.54	77.0	
NICKELSON, DALENE C	25-7193A	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.9	
NICKERSON, KIRK	33-2039B	Decreed	2/23/1954	IRRIGATION	0.38	551.0	
NICKERSON, KIRK	33-2092	Decreed	5/12/1960	IRRIGATION	0.90	229.0	
NICKERSON, KIRK	33-7009	Decreed	4/1/1970	IRRIGATION	8.00	612.2	
NICKERSON, KIRK	33-7025	Decreed	10/30/1973	IRRIGATION	1.16	612.2	

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NICKERSON, KIRK	33-10837	Decreed	4/1/1976	IRRIGATION	0.12	551.0	Yes
NICKERSON, KIRK	33-2037A	Decreed	4/1/1976	IRRIGATION	1.44	551.0	
NICKERSON, KIRK	33-7062	Decreed	12/2/1977	IRRIGATION	1.64	229.0	
NICKERSON, KIRK	33-7065	Decreed	2/23/1979	IRRIGATION	1.45	612.2	
NICKERSON, KIRK; NICKERSON, YVONNE	33-14893	Decreed	2/4/1977	IRRIGATION	0.18	149.0	
NICKISCH, CRAIG W; NICKISCH, MARJORIE I	29-10731	Decreed	3/23/1959	IRRIGATION, STOCKWATER	0.10	4.1	
NIELSON, ADAM; NIELSON, KENDRA C	34-13983	Decreed	3/6/1961	IRRIGATION	0.31	15.0	
NIELSON, BENITA G; NIELSON, JACK W	29-7885	License	12/27/1989	IRRIGATION	0.11	5.0	
NIGHTENGALE, BRADLEY KEITH; NIGHTENGALE, ROSALYN ANN	34-2390A	Decreed	10/12/1960	IRRIGATION	2.02	429.0	
NIGHTENGALE, BRADLEY KEITH; NIGHTENGALE, ROSALYN ANN	34-2390B	Decreed	10/12/1960	IRRIGATION	0.12	429.0	
NIGHTENGALE, BRADLEY KEITH; NIGHTENGALE, ROSALYN ANN	34-4031	Decreed	8/1/1961	IRRIGATION	2.85	429.0	
NIGHTENGALE, BRADLEY KEITH; NIGHTENGALE, ROSALYN ANN	34-14756	Decreed	3/1/1965	DOMESTIC, STOCKWATER	0.16		
NIGHTENGALE, BRADLEY KEITH; NIGHTENGALE, ROSALYN ANN	34-7175	Decreed	4/4/1977	IRRIGATION	0.48	429.0	
NIGHTENGALE, BRADLEY KEITH; NIGHTENGALE, ROSALYN ANN	34-12364	Decreed	7/9/1979	IRRIGATION	0.71	429.0	Yes
NIGHTINGALE, JANIE R; NIGHTINGALE, KURT A	34-14741	Decreed	10/12/1960	IRRIGATION	1.32	281.0	
NIGHTINGALE, JANIE R; NIGHTINGALE, KURT A	34-14742	Decreed	10/12/1960	IRRIGATION	0.07	281.0	
NIGHTINGALE, JANIE R; NIGHTINGALE, KURT A	34-14745	Decreed	8/1/1961	IRRIGATION	1.87	281.0	
NIGHTINGALE, JANIE R; NIGHTINGALE, KURT A	34-14746	Decreed	4/4/1977	IRRIGATION	0.32	281.0	
NIGHTINGALE, JANIE R; NIGHTINGALE, KURT A	34-14750	Decreed	7/9/1979	IRRIGATION	0.47	281.0	Yes
NO TELLUM CREEK RANCH LLC	34-14043	Decreed	5/11/1960	IRRIGATION	2.58	130.0	
NO VIEW CALF RANCH LLC	36-7460AD	Decreed	3/25/1974	COMMERCIAL, STOCKWATER	0.06		
NO VIEW CALF RANCH LLC	36-8774	License	3/10/1998	DOMESTIC, STOCKWATER	0.13		
NOEL, DE ANN B; NOEL, WRIGHT R	22-7372	License	7/14/1981	DOMESTIC, STOCKWATER	0.07		
NOLAN SAYER FARMING & RANCHING	34-10150	Decreed	3/30/1955	IRRIGATION	5.40	165.0	
NORMAN & MARY SOWARDS LIVING TRUST	34-2302	Decreed	2/28/1953	IRRIGATION	3.14	232.0	
NORMAN & MARY SOWARDS LIVING TRUST	34-14502	Decreed	6/9/1961	IRRIGATION	0.48	232.0	
NORMAN & MARY SOWARDS LIVING TRUST	34-2422	Decreed	6/9/1961	IRRIGATION	1.92	105.0	
NORMAN & MARY SOWARDS LIVING TRUST	34-7228	Decreed	5/3/1979	IRRIGATION	0.98	232.0	
NORMAN & MARY SOWARDS LIVING TRUST	34-10871	Decreed	6/15/1980	IRRIGATION	0.16	105.0	Yes
NORMAN & MARY SOWARDS LIVING TRUST	34-14501	Decreed	6/15/1980	IRRIGATION	0.04	232.0	Yes
NORMAN E NEF & SONS INC	35-7962	Permit	6/1/1981	IRRIGATION	12.20	610.0	
NORMAN E NEF & SONS INC	35-7963	Permit	6/1/1981	IRRIGATION	6.40	320.0	
NORRIS, ROBERT J; NORRIS, SUZANNE W	33-2105	Decreed	7/28/1961	IRRIGATION	3.46	189.0	
NORTH RIM FAIRWAYS OWNERS ASSN INC	36-16406	License	2/24/2006	DOMESTIC	0.23		
NORTHROP, DONALD; NORTHROP, VICKIE	34-2366A	Decreed	5/12/1960	IRRIGATION	0.59	32.0	

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NORTHSIDE RANCH CO LLC	36-2318B	Decreed	2/28/1957	STOCKWATER	0.05		
NORTHWEST FARM CREDIT SERVICES FLCA; ROTH INVESTMENTS LLC	37-23157	License	9/20/1990	COMMERCIAL	0.50		
NORTHWEST PIPELINE CORP	29-2376	Decreed	7/6/1956	COMMERCIAL, IRRIGATION	0.08	4.1	
NORTHWEST PIPELINE CORP	45-2531	Decreed	7/6/1956	DOMESTIC, INDUSTRIAL	0.04		
NOTCH BUTTE FARMS LLC	34-14311	Decreed	8/29/1960	DIVERSION TO STORAGE, IRRIGATION, RECREATION STORAGE	3.90	194.0	
NOTCH BUTTE FARMS LLC	34-14312	Decreed	8/29/1960	IRRIGATION	0.38	490.9	
NUTTALL, ALIESHA DAWN; NUTTALL, JEFFREY DOUGLAS	25-7275	Decreed	2/8/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
OAKLEY VALLEY WATER CO	45-4273	Decreed	2/12/1954	MUNICIPAL	0.45		
OKELBERRY, TODD L	36-17355	Decreed	2/6/1953	IRRIGATION	0.07	10.0	
OKELBERRY, TODD L	36-17356	Decreed	2/6/1953	IRRIGATION	0.06	10.0	
OKELBERRY, TODD L	36-17357	Decreed	5/29/1956	IRRIGATION	0.07	10.0	
OKELBERRY, TODD L	36-17358	Decreed	6/24/1960	IRRIGATION	0.01	10.0	
OLSEN, GARY; OLSEN, PATRICIA	25-12353	Decreed	10/7/1953	COMMERCIAL, DOMESTIC	0.16		
ON TIME FINANCIAL LLC	22-14478	Permit	7/14/2022	COMMERCIAL, DOMESTIC	0.21		
ORTON, DEL; ORTON, SHARON	34-13913	Decreed	12/17/1961	IRRIGATION	0.11	5.7	
ORVILLE AND JENNIE MARIE SMITH FAMILY LIMITED PARTNERSHIP	34-2477A	Decreed	6/13/1966	IRRIGATION	3.41	466.0	
ORVILLE AND JENNIE MARIE SMITH FAMILY LIMITED PARTNERSHIP	34-12363A	Decreed	5/1/1978	IRRIGATION	2.89	466.0	Yes
OSTERHOUT, DANA; OSTERHOUT, GAYLEN; OSTERHOUT, LORRIE; OSTERHOUT, VIRGINIA M	45-10587	Decreed	6/30/1958	COMMERCIAL, DOMESTIC, IRRIGATION	0.08	0.5	
OSWALD, BRITTNEY; OSWALD, MATT	29-14171	Decreed	2/3/1961	IRRIGATION	0.06	3.0	
P U RANCH LTD C/O SCOTT SLOCUM	34-2512	Decreed	5/1/1984	IRRIGATION	4.40	535.0	
P U RANCH LTD C/O SCOTT SLOCUM	34-12396	Decreed	10/15/1984	STOCKWATER	0.36		Yes
PACIFICORP	25-7403	License	6/14/1985	WATER QUALITY IMPROVEMENT	0.45		
PACIFICORP	25-14431	License	2/19/2016	WATER QUALITY IMPROVEMENT	0.47		
PANCHERI BROTHERS LLC	33-15082	Decreed	2/13/1953	IRRIGATION	3.97	549.6	
PANCHERI BROTHERS LLC	33-15084	Decreed	5/1/1954	IRRIGATION	3.27	549.6	
PANCHERI BROTHERS LLC	33-15083	Decreed	5/1/1956	IRRIGATION	3.61	549.6	
PANCHERI BROTHERS LLC	33-15070	Decreed	3/3/1959	IRRIGATION	0.49	72.2	
PANCHERI BROTHERS LLC	33-2087B	Decreed	6/12/1959	IRRIGATION	0.84	268.0	
PANCHERI BROTHERS LLC	33-2104A	Decreed	7/21/1961	IRRIGATION	3.62	268.0	
PANCHERI BROTHERS LLC	33-2115	Decreed	2/20/1963	IRRIGATION	2.20	728.0	
PANCHERI BROTHERS LLC	33-15081	Decreed	5/7/1963	IRRIGATION	3.86	549.6	
PANCHERI BROTHERS LLC	33-14876	Decreed	4/15/1968	IRRIGATION	2.85	217.0	
PANCHERI BROTHERS LLC	33-14928	Decreed	5/25/1972	IRRIGATION	0.04	4.8	

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PANCHERI BROTHERS LLC	33-14929	Decreed	5/25/1972	IRRIGATION	0.56	221.8	
PANCHERI BROTHERS LLC	33-14949	Decreed	5/25/1972	IRRIGATION	0.16	221.8	
PANCHERI BROTHERS LLC	33-14904	Decreed	4/11/1973	IRRIGATION	0.85	221.8	
PANCHERI BROTHERS LLC	33-14930	Decreed	4/11/1973	IRRIGATION	0.03	4.8	
PANCHERI BROTHERS LLC	33-14931	Decreed	4/11/1973	IRRIGATION	0.46	221.8	
PANCHERI BROTHERS LLC	33-14950	Decreed	4/11/1973	IRRIGATION	0.13	221.8	
PANCHERI BROTHERS LLC	33-15068	Decreed	10/16/1975	IRRIGATION	0.83	72.2	
PANCHERI BROTHERS LLC	33-14878	Decreed	4/30/1976	IRRIGATION	1.34	217.0	
PANCHERI BROTHERS LLC	33-14880	Decreed	7/15/1978	IRRIGATION	0.36	217.0	Yes
PANCHERI BROTHERS LLC	33-15069	Decreed	4/2/1985	IRRIGATION	0.13	72.2	
PANCHERI INC	33-2068B	Decreed	1/14/1953	IRRIGATION	2.64	1209.0	
PANCHERI INC	33-2093	Decreed	7/27/1960	IRRIGATION	2.41	1209.0	
PANCHERI INC	33-2094	Decreed	9/11/1960	IRRIGATION	4.11	1209.0	
PANCHERI INC	33-2108A	Decreed	10/25/1961	IRRIGATION	1.60	1655.0	
PANCHERI INC	33-2108B	Decreed	10/25/1961	IRRIGATION	3.09	359.0	
PANCHERI INC	33-2113	Decreed	11/26/1962	IRRIGATION	2.52	1209.0	
PANCHERI INC	33-2126A	Decreed	11/26/1962	IRRIGATION	1.96	1209.0	
PANCHERI INC	33-2117A	Decreed	5/31/1963	IRRIGATION	1.86	1655.0	
PANCHERI INC	33-2117B	Decreed	5/31/1963	IRRIGATION	2.98	359.0	
PANCHERI INC	33-2126B	Decreed	7/22/1966	IRRIGATION	4.04	1209.0	
PANCHERI INC	33-7027	Decreed	11/6/1973	IRRIGATION	6.00	1655.0	
PANCHERI INC	33-7038	Decreed	2/3/1975	IRRIGATION	3.06	1209.0	
PANCHERI INC	33-10109	Decreed	5/1/1980	IRRIGATION	2.84	1655.0	Yes
PARKER, BECKY; PARKER, BRENT; PARKER, KEVIN; PARKER, MILISA	21-13319	License	3/21/1988	IRRIGATION	0.60	33.0	
PARKER, BRENT E; PARKER, KRISTINE	25-7073E	Decreed	8/1/1975	IRRIGATION	0.20	10.0	
PARKINSON FARMS	34-2497	Decreed	9/27/1966	IRRIGATION	0.57	480.0	
PARKINSON FARMS	34-2490	Decreed	10/25/1966	IRRIGATION	2.09	306.0	
PARKINSON FARMS	34-2506	Decreed	3/2/1967	IRRIGATION	1.17	480.0	
PARKINSON FARMS	34-2505	Decreed	3/3/1967	IRRIGATION	1.06	480.0	
PARKINSON FARMS	34-4008	Decreed	4/1/1967	IRRIGATION	2.60	480.0	
PARKINSON FARMS	34-10393	Decreed	5/1/1976	IRRIGATION	0.26	306.0	Yes
PARKINSON FARMS	34-7176	Decreed	5/29/1977	IRRIGATION	7.80	885.0	
PARKINSON FARMS	34-12368	Decreed	8/1/1985	IRRIGATION	3.75	885.0	Yes
PATRICK SEAN POWERS LIVING TRUST; POWERS, JOHN L	34-14914	Decreed	5/4/1960	IRRIGATION	0.03	5.3	
PATTCO LLLP	45-7603	License	7/9/1986	IRRIGATION	1.26	447.0	

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PATTON & LINTON INC	29-10994	Decreed	3/1/1956	INDUSTRIAL	0.13		
PEARSON, CHELSEA	34-2323C	Decreed	2/11/1955	IRRIGATION	0.04	2.0	
PEARSON, JAY F; PEARSON, SUSAN	34-2412A	Decreed	4/13/1961	IRRIGATION	0.04	2.0	
PEHRSON, ASHLEY LENAE; PEHRSON, CHANCE R	34-14776	Decreed	6/13/1966	IRRIGATION	1.18	59.0	
PEHRSON, BYRON; PEHRSON, LANA; PEHRSON, LOY; PEHRSON, TERRI	34-13829	Decreed	9/2/1961	IRRIGATION	3.19	221.1	
PEHRSON, BYRON; PEHRSON, LANA; PEHRSON, LOY; PEHRSON, TERRI	34-14827	Decreed	9/2/1961	IRRIGATION	0.45	59.6	
PEHRSON, BYRON; PEHRSON, LANA; PEHRSON, LOY; PEHRSON, TERRI	34-12378	Decreed	6/9/1966	IRRIGATION	0.90	221.1	Yes
PEHRSON, BYRON; PEHRSON, LANA; PEHRSON, LOY; PEHRSON, TERRI	34-14826	Decreed	6/9/1966	IRRIGATION	0.13	59.6	Yes
PEHRSON, BYRON; PEHRSON, LOY	34-14828	Decreed	8/1/1961	IRRIGATION	0.43	59.6	
PEHRSON, BYRON; PEHRSON, LOY	34-4010	Decreed	8/1/1961	IRRIGATION	2.98	150.0	
PEHRSON, BYRON; PEHRSON, LOY	34-7056	Decreed	1/20/1974	IRRIGATION	3.96	233.0	
PEHRSON, BYRON; PEHRSON, TERRI	34-14824	Decreed	5/18/1953	IRRIGATION	0.12	59.6	
PEHRSON, BYRON; PEHRSON, TERRI	34-2304	Decreed	5/18/1953	IRRIGATION	7.06	351.9	
PEHRSON, BYRON; PEHRSON, TERRI	34-2365	Decreed	5/4/1960	IRRIGATION	0.33	31.0	
PEHRSON, BYRON; PEHRSON, TERRI	34-14825	Decreed	5/5/1972	IRRIGATION	0.10	59.6	
PEHRSON, BYRON; PEHRSON, TERRI	34-7025	Decreed	5/5/1972	IRRIGATION	5.52	408.9	
PEHRSON, BYRON; PEHRSON, TERRI	34-7239A	License	1/22/1980	IRRIGATION	0.29	31.0	
PEHRSON, JOSH	34-2403	Decreed	3/31/1961	IRRIGATION	3.20	190.0	
PEHRSON, JOSH	34-12036	Decreed	4/15/1980	IRRIGATION	0.50	190.0	Yes
PEHRSON, MICHELLE; PEHRSON, TRAVIS	34-14423	Decreed	6/29/1959	IRRIGATION	2.03	101.8	
PEHRSON, MICHELLE; PEHRSON, TRAVIS	34-14422	Decreed	11/18/1974	IRRIGATION	0.06	7.0	
PEHRSON, PEGGY; PEHRSON, RANDY D	34-14391	Decreed	2/11/1955	IRRIGATION	0.63	39.4	
PEHRSON, PEGGY; PEHRSON, RANDY D	34-2380	Decreed	8/23/1960	IRRIGATION	3.89	203.0	
PEHRSON, PEGGY; PEHRSON, RANDY D	34-2407	Decreed	3/27/1961	IRRIGATION	3.33	568.4	
PEHRSON, PEGGY; PEHRSON, RANDY D	34-7182	Decreed	4/18/1977	IRRIGATION	3.68	313.0	
PEHRSON, PEGGY; PEHRSON, RANDY D	34-7160	Decreed	2/21/1981	IRRIGATION	1.92	568.4	
PERFORMIX NUTRITION SYSTEMS LLC	36-17196	Decreed	5/27/1974	COMMERCIAL	0.06		
PERKES, MARSHAL TODD	34-10369	Decreed	5/31/1960	IRRIGATION	2.06	115.0	
PETERSEN, KIMBERLY ANN; PETERSEN, RYAN CLAIR	34-7219	Decreed	7/4/1978	COMMERCIAL, HEATING, IRRIGATION, MITIGATION	0.92	69.8	
PETERSON, CHRISTOPHER; PETERSON, MICHELLE	34-7239B	License	1/22/1980	IRRIGATION	0.06	3.0	
PETTET, TERRY	34-4086	Decreed	6/9/1962	DOMESTIC, IRRIGATION, STOCKWATER	0.06	5.0	
PHINNEY, DAVID; RICHARDS, DEBORA	35-14870	Decreed	6/27/1983	DOMESTIC, IRRIGATION	0.02	0.5	
PILKINTON, C R; PILKINTON, THOMAS R	36-7650B	Decreed	7/30/1976	IRRIGATION	0.08	4.0	
PIONEER FARMS - KING MOUNTAIN RANCH	34-14254	Decreed	7/5/1960	IRRIGATION	2.99	275.0	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
PIONEER FARMS - KING MOUNTAIN RANCH	34-14256	Decreed	4/10/1961	IRRIGATION	2.59	275.0	
PIONEER FARMS - KING MOUNTAIN RANCH	34-14457	Decreed	4/2/1980	IRRIGATION	0.10	5.5	
PIONEER WATER USERS ASSN INC	35-7671	Decreed	2/7/1977	DOMESTIC	0.11		
PITCHER, BRANDT; PITCHER, JONI	34-7246	Decreed	5/14/1980	IRRIGATION	0.24	14.0	
PKD PROPERTIES LC; TLD PROPERTIES LLC	45-10761	Decreed	6/24/1957	COMMERCIAL, COOLING	0.02		
PLATT, AUSTIN; PLATT, MARIE	34-14016	Decreed	3/20/1961	IRRIGATION	0.10	5.0	
POLO CLUB ESTATES WATER ASSN	25-7705	License	6/28/2000	DOMESTIC, FIRE PROTECTION	0.68		
PONY ACRES WATER ASSN	29-7625	Decreed	12/15/1981	DOMESTIC, IRRIGATION	0.16	2.0	
POPE, CAROL C	34-4133	Decreed	5/1/1960	DOMESTIC, IRRIGATION	0.12	6.2	
PORT OF ENTRY TRAVEL CENTER LLC	31-11787	Decreed	9/7/1971	COMMERCIAL	0.12		
POVEY, ANDREW E	36-16625	Decreed	11/11/1959	MITIGATION	0.11		
POVEY, ANDREW E	36-16627	Decreed	11/15/1970	MITIGATION	0.16		
POVEY, ANDREW E	36-16631	Decreed	5/26/1971	MITIGATION	0.01		
POVEY, ANDREW E	36-16629	Decreed	5/16/1980	MITIGATION	0.04		
POWERS, ANDREW; POWERS, KARA	25-14267	Decreed	8/10/1966	IRRIGATION	0.02	1.1	
PREMIERE PARTNERS IV LP	34-2315	Decreed	1/7/1955	IRRIGATION	7.02	1750.7	
PREMIERE PARTNERS IV LP	34-2358A	Decreed	2/1/1961	IRRIGATION	5.60	1750.7	
PREMIERE PARTNERS IV LP	34-14188	Decreed	4/20/1961	IRRIGATION	0.60	213.0	
PREMIERE PARTNERS IV LP	34-14186	Decreed	5/29/1961	IRRIGATION	1.66	213.0	
PREMIERE PARTNERS IV LP	34-2429B	Decreed	6/22/1961	IRRIGATION	2.78	1750.7	
PREMIERE PARTNERS IV LP	34-2472A	Decreed	12/29/1965	IRRIGATION	6.82	1750.7	
PREMIERE PARTNERS IV LP	34-7039	Decreed	6/25/1973	IRRIGATION	9.73	345.0	
PREMIERE PARTNERS IV LP	34-7059C	Decreed	1/15/1974	IRRIGATION	2.64	173.6	
PREMIERE PARTNERS IV LP	34-7080A	Decreed	9/23/1974	IRRIGATION	2.67	160.0	
PREMIERE PARTNERS IV LP	34-7122B	Decreed	1/16/1976	IRRIGATION	4.31	714.6	
PREMIERE PARTNERS IV LP	34-7136	Decreed	3/26/1976	IRRIGATION	5.50	160.0	
PREMIERE PARTNERS IV LP	34-7169	Decreed	1/6/1977	IRRIGATION	4.48	160.0	
PREMIERE PARTNERS IV LP	34-12419	Decreed	5/1/1980	IRRIGATION	9.31	1750.7	Yes
PREMIERE PARTNERS IV LP	34-2417A	Decreed	5/1/1983	IRRIGATION	2.67	1750.7	
PREMIERE PARTNERS IV LP	34-2419A	Decreed	5/1/1984	IRRIGATION	2.01	1750.7	
PRICE, MARJORIE	22-14447	Permit	2/16/2022	COMMERCIAL	0.02		
PRINCE, CARI L; PRINCE, JAMES J	36-16101	License	5/9/1988	DOMESTIC	0.04		
PROBART, LEWIS L	29-7067	Decreed	8/3/1971	DOMESTIC, IRRIGATION, STOCKWATER	0.14	7.0	
PURSER, MICHELLE; PURSER, RANDY R	34-2347	Decreed	1/20/1959	IRRIGATION	2.00	785.0	
PURSER, MICHELLE; PURSER, RANDY R	34-2348A	Decreed	5/8/1959	IRRIGATION	0.46	785.0	

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PURSER, MICHELLE; PURSER, RANDY R	34-2348B	Decreed	5/8/1959	IRRIGATION	1.54	785.0	
PURSER, MICHELLE; PURSER, RANDY R	34-14385	Decreed	8/1/1961	IRRIGATION	2.88	223.4	
PURSER, MICHELLE; PURSER, RANDY R	34-2441A	Decreed	2/14/1962	IRRIGATION	1.60	785.0	
PURSER, MICHELLE; PURSER, RANDY R	34-2441B	Decreed	2/14/1962	IRRIGATION	0.84	785.0	
PURSER, MICHELLE; PURSER, RANDY R	34-7045D	Decreed	10/2/1973	IRRIGATION	2.54	148.0	
PURSER, MICHELLE; PURSER, RANDY R	34-10471D	Decreed	8/13/1974	IRRIGATION	0.22	148.0	Yes
PURSER, MICHELLE; PURSER, RANDY R	34-7098A	Decreed	2/3/1975	IRRIGATION	3.58	785.0	
PURSER, MICHELLE; PURSER, RANDY R	34-7098B	Decreed	2/3/1975	IRRIGATION	2.42	785.0	
PURSER, RANDY R	34-2447A	Decreed	7/16/1963	IRRIGATION	2.67	785.0	
PURSER, RANDY R	34-10930A	Decreed	8/6/1987	IRRIGATION	0.62	785.0	Yes
PUTNAM, JANET D; PUTNAM, LAWRENCE D	27-12280	License	5/31/1989	DOMESTIC, IRRIGATION	0.04	1.0	
QUIST, LARRY	34-7075	Decreed	8/18/1974	IRRIGATION	0.21	11.0	
QUIST, LARRY	34-7181	Decreed	4/19/1977	IRRIGATION	7.07	392.0	
R C WILLEY HOME FURNISHINGS	35-14596	Permit	5/25/2018	COMMERCIAL	0.78		
RABURN, JAYNEE N; RABURN, LENARD H	29-7143B	Decreed	7/2/1973	DOMESTIC, IRRIGATION	0.03	1.0	
RAFTER J LLC	34-14612	Decreed	8/29/1960	IRRIGATION	0.14	40.0	
RAFTER J LLC	34-14613	Decreed	6/28/1965	IRRIGATION	0.15	40.0	
RAFTER J LLC	34-14856	Decreed	6/13/1966	IRRIGATION	2.60	327.0	
RAFTER J LLC	34-13939	Decreed	8/16/1966	IRRIGATION	2.35	117.5	
RAFTER J LLC	34-14618	Decreed	8/16/1966	IRRIGATION	0.50	40.0	
RAMSHORN GRAZING ASSN INC	34-2479	Decreed	7/27/1966	IRRIGATION	4.58	410.0	
RANCHO VIA WELL USERS ASSN	25-7404	License	6/28/1985	DOMESTIC, IRRIGATION	0.31	6.0	
RANSOM, ELLEN; RANSOM, KARL	25-14262	Decreed	8/10/1966	IRRIGATION	0.02	1.1	
RASMUSSEN, JEFFREY R; RASMUSSEN, SHAWNA L	45-14534	Decreed	1/19/1978	IRRIGATION	0.01	1.5	
RASMUSSEN, JEFFREY R; RASMUSSEN, SHAWNA L	45-14535	License	2/12/1996	IRRIGATION	0.02	1.5	
RAYMOND, W CRAIG	25-13401	Decreed	6/28/1954	IRRIGATION, STOCKWATER	0.09	3.5	
READING, DESIREE V; READING, JASON; READING, JEFF; READING, MICHELLE	34-14047	Decreed	4/29/1955	IRRIGATION	0.38	19.0	
REED, CHARLES LE ROY	35-12258	Decreed	6/1/1955	COMMERCIAL, DOMESTIC, STOCKWATER	0.09		
REED, RICKIE	34-7178	Decreed	4/12/1977	IRRIGATION	0.20	10.0	
REES, CARL C; REES, PATRICIA	29-7240	Decreed	11/29/1974	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.3	
REVA W WALKER TRUST	34-2389	Decreed	10/6/1960	IRRIGATION	2.54	119.0	
REYNOLDS, ALISA; REYNOLDS, NICOLAS	34-14928	Decreed	9/30/1966	IRRIGATION	0.04	4.0	
REYNOLDS, CRYSTAL ANN; REYNOLDS, KELLEN JOSHUA	34-2452	Decreed	8/1/1961	IRRIGATION	1.68	67.0	
REYNOLDS, HANNAH; REYNOLDS, VANCE	34-10552	Decreed	6/17/1960	IRRIGATION	0.41	49.0	

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REYNOLDS, HANNAH; REYNOLDS, VANCE	34-2372	Decreed	6/17/1960	IRRIGATION	0.43	49.0	
REYNOLDS, HANNAH; REYNOLDS, VANCE	34-13415	Decreed	8/15/1964	IRRIGATION	0.14	49.0	
REYNOLDS, JACQUELINE; REYNOLDS, RICHARD	34-2496	Decreed	9/30/1966	IRRIGATION	0.10	100.0	
RGC FARMS LLC	22-14338	License	4/10/2017	IRRIGATION	0.18	39.0	
RHODEHOUSE, KEVIN	35-2924	Decreed	7/21/1965	INDUSTRIAL, STOCKWATER	1.11		
RHODEHOUSE, KEVIN	35-8659	License	10/15/1987	COMMERCIAL, STOCKWATER	0.15		
RICHARDS, DENICE	27-7343	Decreed	3/2/1983	DOMESTIC, IRRIGATION	0.08	5.0	
RICKS, CONNIE	25-7183	Decreed	1/14/1980	DOMESTIC, STOCKWATER	0.06		
RIDDLE, CATHERINE; RIDDLE, GLEN	25-14317	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
RIGBY AIR VILLAGE LLC	25-14182	License	3/24/2006	COMMERCIAL	0.20		
RINDFLEISCH, JAMES A	34-7511	Permit	6/12/1989	IRRIGATION	1.85	92.4	
RINGEL, LORI; RINGEL, MERLYN R	35-14630	Decreed	9/28/1981	IRRIGATION	0.01	4.7	
RITCHIE, JOHN M; RITCHIE, KAYE	35-13993	Decreed	7/13/1954	IRRIGATION	0.20	34.4	
RITCHIE, JOHN M; RITCHIE, KAYE	35-13999	Decreed	4/1/1966	IRRIGATION	0.15	48.4	Yes
RITCHIE, JOHN M; RITCHIE, KAYE	35-13995	Decreed	11/12/1975	IRRIGATION	0.42	34.4	
RIVER PARK GOLF COURSE & CAMPGROUND LLC	34-7089	Decreed	1/3/1975	IRRIGATION	0.19	20.5	
RIVERBEND ESTATES	29-8015	License	6/22/1990	DOMESTIC	0.25		
RIVERSIDE DAIRY INC	36-4235	Decreed	1/1/1954	COMMERCIAL, DOMESTIC, STOCKWATER	0.21		
RIVERVIEW ACRES #2 WATER CORP	35-11348	Decreed	6/1/1960	DOMESTIC	0.16		
ROBERTSON, CHARLOTTE; ROBERTSON, KIRK	34-2386	Decreed	9/9/1960	IRRIGATION	1.10	55.0	
ROBERTSON, CHARLOTTE; ROBERTSON, KIRK	34-13559	Decreed	5/1/1962	IRRIGATION	0.16	7.8	
ROBINSON BROS LAND LLC	45-12909B	Decreed	4/1/1961	COMMERCIAL, STOCKWATER	0.04		
ROBINSON, LOGAN D; ROBINSON, RICKY	29-4393	Decreed	3/1/1963	DOMESTIC, IRRIGATION	0.07	3.3	
ROBINSON, PAXTON	45-14566	Decreed	2/1/1954	IRRIGATION	0.14	33.0	
ROBINSON, PAXTON	45-14565	Decreed	12/10/1956	IRRIGATION	0.30	33.0	
ROCKING D ENTERPRISES LLC	34-13915	Decreed	5/20/1958	INDUSTRIAL	0.04		
ROCKY HILLS ENTERPRISES LLC	25-14600	Permit	6/5/2025	DOMESTIC	0.18		
RODRIGUEZ, ALFREDO; RODRIGUEZ, KOURTNEY L	34-14103	Decreed	4/29/1955	IRRIGATION	0.35	17.5	
ROEDER, JAMES L; ROEDER, JOHN	29-7177	License	3/4/1974	DOMESTIC, STOCKWATER	0.08		
ROGERS, DANIEL; ROGERS, SUSAN	34-10378	Decreed	4/1/1956	DOMESTIC, IRRIGATION, STOCKWATER	0.18	7.0	
ROGERS, GARY	34-13738	Decreed	9/5/1961	IRRIGATION	0.08	109.0	
ROGERS, GARY	34-14373	Decreed	9/5/1961	IRRIGATION	0.03	109.0	
ROGERS, GARY	34-14374	Decreed	9/5/1961	IRRIGATION	0.03	109.0	
ROGERS, GARY	34-14375	Decreed	9/5/1961	IRRIGATION	0.07	109.0	
ROGERS, W GARY	34-14394	Decreed	11/24/1975	IRRIGATION	1.80	109.0	

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ROMRELL PROPERTIES LLC	33-2082C	Decreed	2/19/1957	IRRIGATION	1.60	156.0	
ROMRELL PROPERTIES LLC	33-2120	Decreed	7/9/1965	IRRIGATION	3.39	388.0	
ROMRELL PROPERTIES LLC	33-10033	Decreed	8/23/1977	IRRIGATION	0.61	268.0	Yes
ROMRELL PROPERTIES LLC	33-7064	Decreed	7/15/1979	IRRIGATION	0.75	156.0	
ROMRELL PROPERTIES LLC	33-7189	License	7/31/1989	IRRIGATION	0.80	295.0	
ROMRELL PROPERTIES LLC	33-14854	License	1/4/1990	IRRIGATION	1.72	132.0	
ROMRELL, OWEN A	33-10988	Decreed	8/17/1957	IRRIGATION	0.73	268.0	
ROMRELL, OWEN A	33-2137	Decreed	3/3/1958	IRRIGATION	2.10	165.0	
ROMRELL, OWEN A	33-7028	Decreed	12/10/1973	IRRIGATION	2.03	132.0	
ROMRELL, OWEN A	33-14908	Decreed	10/24/1974	IRRIGATION	0.02	153.0	
ROMRELL, OWEN A	33-7071	Decreed	1/8/1980	IRRIGATION	1.52	309.0	
ROMRELL, OWEN A	33-10936	Decreed	12/31/1981	IRRIGATION	0.50	309.0	Yes
ROMRELL, OWEN A; ROMRELL, VELLA JEAN	33-7190	License	12/12/1989	IRRIGATION	0.12	295.0	
ROSE, JUSTIN ALLEN; ROSE, KELSEY BEAL	34-14932	Decreed	2/20/1961	IRRIGATION	0.04	2.0	
ROSENKRANCE, HOWARD; ROSENKRANCE, LAVON	34-4035E	Decreed	8/1/1960	IRRIGATION	0.02	1.0	
ROSENKRANCE, LESTER K; ROSENKRANCE, LOWAYNE K	34-4035B	Decreed	8/1/1960	IRRIGATION	0.28	14.0	
ROSENKRANCE, LESTER K; ROSENKRANCE, LOWAYNE K	34-4035F	Decreed	8/1/1960	IRRIGATION	0.16	8.0	
ROSENKRANCE, MIMI L G; ROSENKRANCE, SHANE D	34-14407	Decreed	1/3/1975	IRRIGATION	0.26	39.5	
ROSENKRANCE, MIMI L G; ROSENKRANCE, SHANE D	34-7090A	Decreed	1/3/1975	IRRIGATION	1.22	112.0	
ROTHWELL, ARVELLA I; ROTHWELL, LYNN O	34-13877	Decreed	1/30/1961	IRRIGATION	0.02	1.7	
ROWE, RANDY; ROWE, SUE-LYNE	34-14820	Decreed	9/29/1966	IRRIGATION	0.16	9.8	
ROWE, RANDY; ROWE, SUE-LYNE	34-14821	Decreed	5/20/1984	IRRIGATION	0.03	9.8	Yes
ROWLAN, BRIAN; ROWLAN, JESSICA	35-14923	Decreed	11/3/1952	IRRIGATION	1.46	138.0	
ROWLAND, ROBERT	29-13892	Decreed	10/28/1953	IRRIGATION, STOCKWATER	2.12	117.6	
ROWLAND, ROBERT	29-14443	Decreed	10/28/1953	IRRIGATION	0.01	0.9	
ROWLAND, ROBERT	29-14444	Decreed	10/28/1953	IRRIGATION	0.01	1.3	
ROWLAND, ROBERT	29-14447	Decreed	10/28/1953	IRRIGATION	0.01	0.3	
ROWLAND, ROBERT	29-14455	Decreed	10/28/1953	IRRIGATION	0.03	3.4	
RTG FARMS LLC	22-14335	Decreed	10/30/1963	IRRIGATION	1.29	95.0	
RUDDELL, DANIEL A; RUDDELL, VICKI L	25-14318	Decreed	8/10/1966	IRRIGATION	0.02	1.2	
RUDY, THOMAS A	45-7278	Decreed	12/6/1976	DOMESTIC	0.24		
RUFF, DOUGLAS L; RUFF, JENNIFER	25-7382	License	6/29/1983	IRRIGATION	0.10	5.0	
RUNHARD LLC	22-7293	Decreed	5/24/1979	COOLING, HEATING	0.15		
RV RICKS FARMS LLC	22-13514	Decreed	5/24/1960	IRRIGATION	1.77	115.8	
SACHER, ANTHONY; SACHER, MARY	34-14108	Decreed	9/5/1961	IRRIGATION	0.06	5.2	

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SADDLE MOUNTAIN RANCH	33-7029	Decreed	1/9/1974	IRRIGATION	1.97	156.0	
SAGE HOLLOW WATER USERS ASSOC	29-2438A	Decreed	2/3/1961	IRRIGATION	2.24	112.0	
SAGE, WILLIAM	34-10004	Decreed	12/31/1952	IRRIGATION	0.03	1.0	
SAND BOX RV LLC	21-13334	Decreed	2/24/1953	COMMERCIAL	0.03		
SAND BOX RV LLC	21-13335	Decreed	6/7/1957	COMMERCIAL	0.02		
SAND BOX RV LLC	21-13333	Decreed	8/4/1979	COMMERCIAL	0.03		
SAND SPRINGS LP	36-17052	License	7/15/2015	DIVERSION TO STORAGE, WILDLIFE STORAGE	2.43		
SANT, CARMA; SANT, WILLIAM L	29-11015	Decreed	3/1/1956	COMMERCIAL, DOMESTIC, STOCKWATER	0.08		
SAYER, BIRGITTA; SAYER, ROGER	34-13778	Decreed	5/6/1954	IRRIGATION	0.15	5.0	
SAYER, EVAN KENT	34-2369B	Decreed	5/11/1960	IRRIGATION	1.34	68.0	
SCC PROPERTIES LLC	37-23469	Decreed	11/25/1962	IRRIGATION	0.38	19.0	
SCENIC FALLS FEDERAL CREDIT UNION	25-14276	Decreed	8/10/1966	IRRIGATION	0.03	1.3	
SCHAAT, BETTY M; SCHAAT, LARRY C	25-14257	Decreed	8/10/1966	IRRIGATION	0.02	1.2	
SCHEUERMANN, KEITH W	25-7547	License	8/25/1989	IRRIGATION	0.15	15.0	
SCHMIDT, CHRISTOPHER; SCHMIDT, STACEY	34-2374A	Decreed	7/11/1960	IRRIGATION	5.03	278.5	
SCHMIDT, CHRISTOPHER; SCHMIDT, STACEY	34-2394	Decreed	2/7/1961	IRRIGATION	3.60	180.0	
SCHMIDT, CHRISTOPHER; SCHMIDT, STACEY	34-2442	Decreed	2/13/1962	IRRIGATION	2.00	179.0	
SCHMIDT, CHRISTOPHER; SCHMIDT, STACEY	34-10736	Decreed	4/1/1978	IRRIGATION	0.65	179.0	Yes
SCHMUCK, CATHY; SCHMUCK, GREG	34-14417	Decreed	4/19/1960	IRRIGATION	0.05	8.1	
SCHOLZ-ALVAREZ, INGRID K	34-7253	Decreed	9/22/1980	DOMESTIC, IRRIGATION	0.15	15.0	
SCHREINER FARMS IDAHO LLC	35-2488	Decreed	1/10/1957	IRRIGATION	0.02	2.0	
SCHREINER FARMS IDAHO LLC	35-2922	Decreed	4/7/1958	IRRIGATION	0.01	2.0	
SCHREINER FARMS IDAHO LLC	35-8951	License	7/29/1991	IRRIGATION	0.88	44.0	
SCHROCK, MICHAEL LANE; SCHROCK, NADA MARIE	34-2376	Decreed	7/20/1960	IRRIGATION	2.30	115.0	
SCHROCK, MICHAEL LANE; SCHROCK, NADA MARIE	34-2430	Decreed	6/23/1961	IRRIGATION	2.00	191.0	
SCHROEDER, MICHELLE; SCHROEDER, NATHAN	29-4104	Decreed	7/28/1955	IRRIGATION	3.00	150.0	
SCOTT, LAMOND; SCOTT, RUTH	35-10855	Decreed	1/4/1954	COMMERCIAL, DOMESTIC	0.04		
SCOTT, STANLEY K	31-7512	License	11/30/1988	DOMESTIC, STOCKWATER	0.19		
SCOTT, STANLEY K	31-7514	License	11/30/1988	DOMESTIC	0.04		
SCOUTEN, JIM L; SCOUTEN, LINDA	34-7201A	Decreed	6/28/1977	IRRIGATION	0.21	10.2	
SCROGGINS, DAVID; SCROGGINS, LOLA	34-14636	Decreed	11/30/1954	IRRIGATION	0.10	13.5	
SCROGGINS, DAVID; SCROGGINS, LOLA	34-14637	Decreed	5/1/1961	IRRIGATION	0.06	13.5	
SCROGGINS, DAVID; SCROGGINS, LOLA	34-14638	Decreed	12/19/1967	IRRIGATION	0.08	13.5	
SCROGGINS, DAVID; SCROGGINS, LOLA	34-14639	Decreed	6/29/1972	IRRIGATION	0.01	13.5	
SCROGGINS, DAVID; SCROGGINS, LOLA	34-14641	Decreed	12/31/1976	IRRIGATION	0.03	13.5	Yes

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13986	Decreed	11/11/1959	COMMERCIAL, STOCKWATER	0.08		
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13987	Decreed	11/15/1970	COMMERCIAL, STOCKWATER	0.13		
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13989	Decreed	5/26/1971	COMMERCIAL, STOCKWATER	0.01		Yes
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13988	Decreed	5/16/1980	COMMERCIAL, STOCKWATER	0.03		
SECRIST, DREW; SECRIST, KAYLA	35-14865	Decreed	9/8/1961	IRRIGATION	0.16	4.0	
SEEFRIED RANCH LLC	34-14832	Decreed	3/24/1960	IRRIGATION	0.22	208.0	
SEEFRIED RANCH LLC	34-2356	Decreed	3/24/1960	IRRIGATION	2.98	149.0	
SEEFRIED RANCH LLC	34-7171	Decreed	3/9/1977	IRRIGATION	3.78	208.0	
SERMON, ROY L	33-14855	License	1/4/1990	IRRIGATION	0.37	28.0	
SERR, DALLAS	36-2730	Decreed	7/30/1954	IRRIGATION	1.00	50.0	
SESSIONS, JUDITH NORTON; SESSIONS, WILLIAM H; WAPITI CROW FARMS LLC	34-2487	Decreed	8/16/1966	IRRIGATION	2.51	294.0	
SHAW, SHELLEE	37-23207	Decreed	9/20/1974	IRRIGATION	0.03	2.2	
SHOSHONE BANNOCK AGRI BUSINESS CORPORTION	29-13940	Decreed	10/3/1977	IRRIGATION	0.13	7.5	
SHOSHONE BANNOCK TRIBES	27-7000	Decreed	7/27/1967	MUNICIPAL	0.50		
SHOSHONE BANNOCK TRIBES	29-7326	Decreed	4/28/1976	IRRIGATION	2.53	160.0	
SHOSHONE BANNOCK TRIBES	29-13941	Decreed	10/3/1977	IRRIGATION	0.18	10.5	
SHURTLIFF, ALICE R; SHURTLIFF, REX S	25-13026	Decreed	12/31/1957	COMMERCIAL	0.04		
SHURTLIFF, MERLENE; SHURTLIFF, RODNEY	35-8855	License	9/7/1989	DOMESTIC, STOCKWATER	0.08		
SIDDOWAY, DEAN; SIDDOWAY, GAYLE	34-2406F	Decreed	3/20/1961	IRRIGATION	0.29	14.0	
SILER, DANIEL; SILER, NATALIE	34-10329	Decreed	12/31/1955	IRRIGATION	0.02	1.0	
SIMPER, HAIZER ONEAL; SIMPER, JENSEN BRYN	35-14901	Decreed	8/19/1977	IRRIGATION	0.11	6.0	
SIMPSON, JEFFREY; SIMPSON, LISA	34-7250	Decreed	8/26/1980	DOMESTIC, IRRIGATION	0.11	10.0	
SINGLE WING RANCH LLC	34-14701	Decreed	11/28/1952	IRRIGATION	0.17	151.6	
SINGLE WING RANCH LLC	34-14700	Decreed	5/16/1977	IRRIGATION	2.81	151.6	
SINGLE WING RANCH LLC	34-14702	Decreed	4/1/1987	IRRIGATION	0.01	151.6	Yes
SIX FLAGS INC	34-13900	Decreed	10/25/1965	IRRIGATION	0.29	16.0	
SMITH, DALE E	34-2404	Decreed	3/1/1961	IRRIGATION, STOCKWATER	1.40	66.0	
SMITH, DANIELLE LYNN; SMITH, DOUGLAS BRANDON	34-14411	Decreed	11/30/1954	IRRIGATION	4.14	541.0	
SMITH, DANIELLE LYNN; SMITH, DOUGLAS BRANDON	34-14412	Decreed	5/1/1961	IRRIGATION	2.58	541.0	
SMITH, DANIELLE LYNN; SMITH, DOUGLAS BRANDON	34-14413	Decreed	12/19/1967	IRRIGATION	3.31	541.0	
SMITH, DANIELLE LYNN; SMITH, DOUGLAS BRANDON	34-14414	Decreed	6/29/1972	IRRIGATION	0.37	541.0	
SMITH, DANIELLE LYNN; SMITH, DOUGLAS BRANDON	34-14408	Decreed	12/31/1976	IRRIGATION	1.31	541.0	Yes
SMITH, JENNIE MARIE; SMITH, ORVILLE E	34-2477B	Decreed	6/13/1966	IRRIGATION	2.00	250.0	
SMITH, JENNIE MARIE; SMITH, ORVILLE E	34-12363B	Decreed	5/1/1978	IRRIGATION	0.76	250.0	Yes

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SMITH, JOAN; SMITH, SCOTT	34-14313	License	7/8/1992	IRRIGATION	0.01	1.0	
SMITH, LESLIE DALE; SMITH, SANDRA LEE	34-14734	Decreed	4/20/1961	IRRIGATION	0.23	22.0	
SMITH, LLOYD L; SMITH, RULLA H	34-13653	Decreed	6/13/1966	IRRIGATION	0.46	23.0	
SMITH, MARY LOU; SMITH, SCOTT	34-14620	Decreed	12/17/1961	IRRIGATION	0.03	1.4	
SMITH, MICHAEL S; SMITH, SANDIE L	34-13614	Decreed	8/1/1961	IRRIGATION	0.50	35.6	
SMITH, NORBERT DARRELL	29-7171	Decreed	2/4/1974	DOMESTIC	0.16		
SMITH, RANDY L; SMITH, SALLY R	29-8004	License	4/13/1990	DOMESTIC, IRRIGATION	0.04	3.0	
SMITH, RICHARD F	22-14612	Decreed	7/5/1973	MUNICIPAL	0.25		
SMITH, STANLEY P	25-14169	Decreed	12/10/1954	IRRIGATION	0.03	1.7	
SMOOT, JASON; SMOOT, STARLA	34-13854	Decreed	12/17/1961	IRRIGATION	0.09	5.7	
SNAKE RIVER BUSINESS PARK BLDG #1 LLC	35-14787	Permit	8/19/2022	COMMERCIAL	0.20		
SNELL, MARK	29-7696	License	3/16/1983	DOMESTIC, IRRIGATION	0.08	2.0	
SOHN, EDNA G; SOHN, HERBERT F; SOHNS INC	35-8333	Decreed	12/12/1983	COMMERCIAL, DOMESTIC	0.08		
SOLLENDER, JERRY B; SOLLENDER, SANDRA	34-14677	Decreed	12/17/1961	IRRIGATION	0.12	6.0	
SORENSEN, ELAINE R	34-2332	Decreed	5/6/1955	IRRIGATION	2.90	2478.0	
SORENSEN, ELAINE R	34-2424B	Decreed	6/13/1961	IRRIGATION	2.27	106.0	
SORENSEN, ELAINE R	34-7052	Decreed	11/13/1973	IRRIGATION	6.00	2478.0	
SORENSEN, ELAINE R	34-13841	Decreed	12/17/1975	IRRIGATION	0.80	2478.0	
SORENSEN, ELAINE R	34-7079	Decreed	9/17/1979	IRRIGATION	2.76	2478.0	
SORENSEN, ELAINE R	34-12416	Decreed	5/1/1982	IRRIGATION	3.85	2478.0	Yes
SORENSEN, ELAINE R; SORENSEN, MITCHELL D	34-14030	Decreed	10/29/1953	IRRIGATION	2.51	108.0	
SORENSEN, ELAINE R; SORENSEN, MITCHELL D	34-14496	Decreed	10/29/1953	IRRIGATION	0.23	10.0	
SORENSEN, MITCHELL D	34-7035B	Decreed	4/12/1973	IRRIGATION	4.98	2478.0	
SORENSEN, MITCHELL D	34-7215A	Decreed	4/14/1978	IRRIGATION	0.14	26.5	
SORENSEN, MITCHELL D	34-2428	Decreed	4/1/1979	IRRIGATION	3.85	2478.0	
SORENSEN, MITCHELL D	34-7236	Permit	9/11/1979	IRRIGATION	6.00	300.0	
SORENSEN, MITCHELL D	34-7247	License	5/30/1980	IRRIGATION	4.38	945.0	
SOUTH INTERCHANGE PROPERTIES LLC	35-14701	Decreed	5/27/1974	IRRIGATION	0.07	23.8	
SOUTH RIDGE LAND LLC	45-14061	Decreed	12/3/1971	COMMERCIAL, DOMESTIC, STOCKWATER	1.01		
SOUTH, BARRY; SOUTH, ELINOR	35-14618	Decreed	9/28/1981	IRRIGATION	0.01	3.3	
SOUTHFIELD LAND & LIVESTOCK LLC	36-7295C	Decreed	12/11/1973	COMMERCIAL, STOCKWATER	0.32		
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-11946	Decreed	6/22/1953	COMMERCIAL, STOCKWATER	0.12		
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-12561	Decreed	6/22/1953	IRRIGATION	0.09	10.0	
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-11942	Decreed	7/25/1955	COMMERCIAL, STOCKWATER	0.03		
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-12559	Decreed	7/25/1955	IRRIGATION	0.02	10.0	

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SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-11944	Decreed	7/26/1961	COMMERCIAL, STOCKWATER	0.02		
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-12560	Decreed	7/26/1961	IRRIGATION	0.01	10.0	
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-12558	Decreed	8/7/1962	IRRIGATION	0.06	10.0	
SPWF HOLDINGS LLC	34-14727	Decreed	12/14/1976	IRRIGATION	2.16	215.7	
SPWF HOLDINGS LLC	34-14728	Decreed	5/1/1981	IRRIGATION	0.56	215.7	Yes
STALEY, RONALD SCOTT; STALEY, TEKLA A	34-2357A	Decreed	4/1/1979	IRRIGATION	2.06	201.0	
STAMOS, CAMERON; STAMOS, CHRIS	34-14853	Decreed	1/8/1958	IRRIGATION	0.10	5.0	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-2509	Decreed	10/5/1960	IRRIGATION	4.68	295.0	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-14180	Decreed	4/20/1961	IRRIGATION	1.89	185.6	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-7028A	Decreed	8/1/1972	IRRIGATION	4.30	224.0	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-7154	Decreed	1/16/1976	IRRIGATION	6.19	714.6	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-7234	Decreed	8/15/1979	IRRIGATION	1.66	82.0	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-7226B	Decreed	2/24/1980	IRRIGATION	1.52	76.0	
STANDLEE FAMILY LIMITED PARTNERSHIP	34-2480A	Decreed	5/1/1986	IRRIGATION	0.79	224.0	
STANDLEY LAND & INVESTMENTS LLC	36-17148	Decreed	4/13/1976	IRRIGATION	0.15	7.7	
STANGER, KARA; STANGER, SPENCER	35-14729	Decreed	9/28/1981	IRRIGATION	0.01	5.2	
STARMARC LLC	36-12462	Decreed	12/31/1958	COMMERCIAL	0.07		
STAV, ANDREW G; STAV, E ELAINE	34-2406E	Decreed	3/20/1961	IRRIGATION	0.73	36.5	
STAVAST, CHATELAINE FMS; STAVAST, LANSON J	34-14710	Decreed	11/28/1952	IRRIGATION	0.01	6.0	
STAVAST, CHATELAINE FMS; STAVAST, LANSON J	34-14708	Decreed	5/16/1977	IRRIGATION	0.11	6.0	
STAVAST, CHATELAINE FMS; STAVAST, LANSON J	34-14711	Decreed	4/1/1987	IRRIGATION	0.01	6.0	Yes
STEELE LAND HOLDINGS LLC	35-14927	Decreed	2/6/1963	IRRIGATION	0.21	12.0	
STEINER, LEONARD; STEINER, RAYANNE	34-2393	Decreed	2/2/1961	IRRIGATION	3.20	160.0	
STEVENSON, JUNE	34-2317	Decreed	11/30/1954	DOMESTIC, IRRIGATION	3.40	169.0	
STEVENSON, JUNE	34-2363	Decreed	4/25/1960	IRRIGATION	2.77	135.0	
STEVENSON, JUNE	34-14519	Decreed	8/29/1960	IRRIGATION	2.28	111.0	
STEVENSON, JUNE	34-2383	Decreed	8/30/1960	IRRIGATION	0.80	134.1	
STEVENSON, JUNE	34-7068	Decreed	3/22/1974	IRRIGATION	1.85	135.0	
STEVENSON, JUNE	34-7118A	Decreed	11/24/1975	IRRIGATION	5.29	264.0	
STEWART, G CRAIG; STEWART, JACKIE	34-2419B	Decreed	6/5/1961	IRRIGATION	1.96	146.0	
STEWART, G CRAIG; STEWART, JACKIE	34-12391	Decreed	5/2/1984	IRRIGATION	0.98	146.0	Yes
STEWART, WILLIAM SETH	34-2309	Decreed	10/2/1953	IRRIGATION	2.00	634.0	
STEWART, WILLIAM SETH	34-2358F	Decreed	4/20/1961	IRRIGATION	1.26	634.0	
STEWART, WILLIAM SETH	34-7059B	Decreed	1/15/1974	IRRIGATION	10.44	634.0	
STEWART, WILLIAM SETH	34-7059D	Decreed	1/15/1974	IRRIGATION	3.50	264.0	

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STEWART, WILLIAM SETH	34-12381	Decreed	5/1/1983	IRRIGATION	1.19	264.0	Yes
STONE, CATHERINE	34-7174	Decreed	3/28/1977	IRRIGATION	0.06	2.0	
SUMMIT TRUSTEES PLLC	25-14310	Decreed	8/10/1966	IRRIGATION	0.02	0.9	
SUNROC CORPORATION	29-13891	Decreed	10/28/1953	IRRIGATION, STOCKWATER	0.90	48.0	
SUNROC CORPORATION	29-7754	License	6/17/1983	COMMERCIAL	0.81		
SUNROC HOLDINGS	34-2318	Decreed	11/30/1954	IRRIGATION	0.26	33.5	
SUNROC HOLDINGS	34-2414	Decreed	5/1/1961	IRRIGATION	0.16	33.5	
SUNROC HOLDINGS	34-2503	Decreed	12/19/1967	IRRIGATION	0.21	33.5	
SUNROC HOLDINGS	34-7027	Decreed	6/29/1972	IRRIGATION	0.02	33.5	
SUNROC HOLDINGS	34-12053	Decreed	12/31/1976	IRRIGATION	0.08	33.5	Yes
SUNSET FARM & RANCH LLC	34-2480B	Decreed	9/11/1966	IRRIGATION	2.00	728.4	
SUNSET FARM & RANCH LLC	34-14772	Decreed	8/18/1974	IRRIGATION	6.86	728.4	
SWANSON, BRIAN RUSSELL; SWANSON, JULIE BELLE	34-14255	Decreed	7/5/1960	IRRIGATION	0.20	18.0	
SWANSON, BRIAN RUSSELL; SWANSON, JULIE BELLE	34-14257	Decreed	4/10/1961	IRRIGATION	0.17	18.0	
TABER, DONALD E	37-10161	Decreed	4/1/1955	COMMERCIAL	0.04		
TABLE ROCK HOLDINGS	35-13320	License	8/7/2001	DOMESTIC	0.10		
TANNER JR, WILLIAM L; TANNER, KIMBERLY	22-14634	Decreed	4/26/1961	IRRIGATION	0.03	2.0	
TANNER JR, WILLIAM L; TANNER, KIMBERLY	22-14636	Decreed	5/1/1968	IRRIGATION	0.01	2.0	Yes
TANNER, JESSICA	22-14635	Decreed	4/26/1961	IRRIGATION	0.03	2.0	
TANNER, JESSICA	22-14637	Decreed	5/1/1968	IRRIGATION	0.01	2.0	Yes
TANNER, KATHY; TANNER, REYNOLD	25-2139	Decreed	10/30/1961	IRRIGATION	1.54	38.0	
TAUSCHER, KATHY; TAUSCHER, LARRY	34-14766	Decreed	9/29/1966	IRRIGATION	0.05	3.0	
TAUSCHER, KATHY; TAUSCHER, LARRY	34-14768	Decreed	5/20/1984	IRRIGATION	0.01	3.0	Yes
TAYLOR, E MARK; TAYLOR, RUBY	34-14038	Decreed	5/14/1977	IRRIGATION	0.16	8.1	
TAYLOR, LOIS; TAYLOR, LYLE D	25-7110	Decreed	5/9/1977	IRRIGATION	1.30	65.0	
TAYLOR, VIVA	34-4128	Decreed	4/1/1955	IRRIGATION, STOCKWATER	0.74	36.0	
TAYLOR, VIVA	34-2375	Decreed	7/13/1960	IRRIGATION	1.40	70.0	
TEA, RANDALL C	34-7054B	Decreed	12/10/1973	IRRIGATION	0.14	9.4	
TELFORD LANDS LLC	34-13946	Decreed	2/21/1961	IRRIGATION	1.56	78.0	
TELFORD LANDS LLC	34-10028	Decreed	4/1/1961	IRRIGATION	4.36	239.0	
TELFORD LANDS LLC	34-2459	Decreed	4/19/1965	IRRIGATION	4.17	2223.8	
TELFORD LANDS LLC	34-2460	Decreed	4/19/1965	IRRIGATION	4.17	2223.8	
TELFORD LANDS LLC	34-2461	Decreed	5/3/1965	IRRIGATION	2.08	2223.8	
TELFORD LANDS LLC	34-2462	Decreed	5/3/1965	IRRIGATION	2.08	2223.8	
TELFORD LANDS LLC	34-7037	Decreed	5/4/1973	IRRIGATION	12.00	2223.8	

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TELFORD LANDS LLC	34-7077	Decreed	9/5/1974	IRRIGATION	8.00	2124.0	
TELFORD LANDS LLC	34-7080B	Decreed	9/23/1974	IRRIGATION	5.33	2124.0	
TELFORD LANDS LLC	34-7092	Decreed	1/14/1975	IRRIGATION	12.00	2124.0	
TELFORD LANDS LLC	34-10246	Decreed	5/1/1975	IRRIGATION	0.17	75.0	Yes
TELFORD LANDS LLC	34-13842	Decreed	12/17/1975	IRRIGATION	0.46	2124.0	
TELFORD LANDS LLC	34-7121A	Decreed	1/9/1976	IRRIGATION	0.46	2124.0	
TELFORD LANDS LLC	34-7121B	Decreed	1/9/1976	IRRIGATION	3.74	2124.0	
TELFORD LANDS LLC	34-12376	Decreed	6/1/1977	IRRIGATION	1.25	2124.0	
TELFORD LANDS LLC	34-2330B	Decreed	6/1/1977	IRRIGATION	1.75	2124.0	
TELFORD LANDS LLC	34-13840	Decreed	4/6/1982	IRRIGATION	1.26	2124.0	
TELFORD LANDS LLC	34-7179	Decreed	4/6/1982	IRRIGATION	2.78	2124.0	
TELFORD LANDS LLC	34-10925	Decreed	5/1/1982	IRRIGATION	7.60	2223.8	Yes
TELFORD LANDS LLC	34-10896	Decreed	4/1/1983	IRRIGATION	0.38	239.0	Yes
TELFORD, AARON; TELFORD, DESAREE	34-7100	Decreed	2/6/1975	IRRIGATION	2.72	136.0	
TELFORD, MARK	34-2486	License	6/7/2002	IRRIGATION	3.76	188.0	
TELFORD, MARK; TELFORD, PAIGE	34-4132	Decreed	6/1/1955	IRRIGATION	2.00	480.0	
TELFORD, MARK; TELFORD, PAIGE	34-10058	Decreed	7/7/1955	IRRIGATION	1.67	480.0	
TELFORD, MARK; TELFORD, PAIGE	34-2340A	Decreed	1/8/1958	IRRIGATION	2.96	147.0	
TELFORD, MARK; TELFORD, PAIGE	34-14759	Decreed	9/16/1960	IRRIGATION	0.80	44.0	
TELFORD, MARK; TELFORD, PAIGE	34-2388D	Decreed	9/16/1960	IRRIGATION	0.45	25.0	
TELFORD, MARK; TELFORD, PAIGE	34-7035A	Decreed	4/12/1973	IRRIGATION	0.64	620.0	
TELFORD, MARK; TELFORD, PAIGE	34-14760	Decreed	3/22/1974	IRRIGATION	0.18	44.0	
TELFORD, MARK; TELFORD, PAIGE	34-7067D	Decreed	3/22/1974	IRRIGATION	0.10	25.0	
TELFORD, MARK; TELFORD, PAIGE	34-7096A	Decreed	1/31/1975	IRRIGATION	1.84	620.0	
TELFORD, MARK; TELFORD, PAIGE	34-7097A	Decreed	1/31/1975	IRRIGATION	1.58	620.0	
TELFORD, MARK; TELFORD, PAIGE	34-7122A	Decreed	1/16/1976	IRRIGATION	4.31	620.0	
TELFORD, MARK; TELFORD, PAIGE	34-7223	Decreed	4/16/1979	IRRIGATION	1.58	620.0	
TELFORD, MICHAEL S; TELFORD, SHANNON J	34-2401A	Decreed	9/1/1961	IRRIGATION	3.70	2223.8	
TELFORD, MICHAEL S; TELFORD, SHANNON J	34-4015	Decreed	9/1/1961	IRRIGATION	1.64	2223.8	
TERNUS, BRENDA; TERNUS, GARY A	35-13858	Decreed	4/27/1964	IRRIGATION	0.32	8.0	
TERRETON TRACTOR INC	31-7346	Decreed	12/2/1980	COMMERCIAL, DOMESTIC	0.04		
TETON NEWDALE CEMETERY DISTRICT	22-2147	Decreed	1/7/1953	IRRIGATION	0.16	8.0	
TETON PIPELINE ASSN INC	22-7188	Decreed	7/6/1976	IRRIGATION	3.37		
TETON PIPELINE ASSN INC	22-7216	Decreed	3/4/1977	IRRIGATION	4.00		
TETON PIPELINE ASSN INC	22-7223	Decreed	4/5/1977	IRRIGATION	7.00		

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
TETON PIPELINE ASSN INC	22-7235	Decreed	6/7/1977	IRRIGATION	6.00		
TETON PIPELINE ASSN INC	22-7360	Decreed	4/14/1981	IRRIGATION	2.00		
TETON PIPELINE ASSN INC	22-7375A	Decreed	8/17/1981	IRRIGATION	6.72		
TETON PIPELINE ASSN INC	22-7375B	Decreed	8/17/1981	IRRIGATION	5.72		
TETON PIPELINE ASSN INC	22-7504	License	7/1/1985	IRRIGATION	6.30		
TEUSCHER, DENNIS	29-7853	License	8/3/1988	IRRIGATION	0.09	3.0	
THE ALEXANDER C CREEK TRUST	34-14039	Decreed	5/14/1977	IRRIGATION	0.29	15.2	
THE DAMIANA REVOCABLE TRUST	34-14250	Decreed	7/5/1960	IRRIGATION	0.09	18.0	
THE DAMIANA REVOCABLE TRUST	34-14252	Decreed	4/10/1961	IRRIGATION	0.08	18.0	
THE DAMIANA REVOCABLE TRUST	34-14328	Decreed	9/5/1961	IRRIGATION	0.11	18.0	
THE G & L KIMBALL FAMILY ESTATE TRUST	34-14866	Decreed	6/28/1965	IRRIGATION	0.08	4.4	
THE G & L KIMBALL FAMILY ESTATE TRUST	34-7207	Decreed	9/19/1977	IRRIGATION	0.27	17.0	
THE LOVELAND FAMILY TRUST	27-7069	Decreed	12/3/1976	IRRIGATION	3.42	171.0	
THOMAS, CATHERINE F; THOMAS, KEVIN E	25-14303	Decreed	8/10/1966	IRRIGATION	0.02	0.9	
THOMAS, TONI L; THOMAS, WILLIAM H	34-14046	Decreed	4/29/1955	IRRIGATION	0.13	6.4	
THOMPSON, BETTY L; THOMPSON, LYNN	29-7075A	Decreed	2/4/1972	IRRIGATION	0.06	3.1	
THOMPSON, HOWARD M	25-7508	License	6/19/1989	DOMESTIC, STOCKWATER	0.11		
THOMPSON, JAMES R	22-7453	License	6/24/1983	DOMESTIC	0.04		
THOMPSON, KRISTEN R	34-14888	Decreed	11/28/1952	IRRIGATION	0.01	2.3	
THOMPSON, KRISTEN R	34-14887	Decreed	5/16/1977	IRRIGATION	0.04	2.3	
THOMPSON, KRISTEN R	34-14889	Decreed	4/1/1987	IRRIGATION	0.01	2.3	Yes
THURBER, NIQUEL M	34-14624	Decreed	12/17/1961	IRRIGATION	0.10	4.8	
TOMLIN, STEPHEN	29-13730	License	6/7/1983	IRRIGATION	0.01	0.5	
TOWN & COUNTRY MOBILE HOME PARK LLC	35-4258	Decreed	6/1/1962	DOMESTIC	0.22		
TRACY, JACOB	34-13761	Decreed	11/28/1952	DIVERSION TO STORAGE, FISH PROPAGATION STORAGE, IRRIGATION, RECREATION STORAGE	0.03	5.2	
TRACY, JACOB	34-7194	Decreed	5/16/1977	IRRIGATION	0.10	5.2	
TRACY, JACOB	34-14342	Decreed	4/1/1987	IRRIGATION	0.01	5.2	Yes
TRAINOR, LISA; TRAINOR, MARK	25-7392A	License	12/16/1983	IRRIGATION	0.14	7.0	
TRAUGHBER, PHILLIP	34-7107	Decreed	4/2/1975	IRRIGATION	0.32	16.0	
TRAUGHBER, SHERLENE	34-7220	Decreed	8/1/1978	IRRIGATION	0.03	1.8	
TRUST FBO MICHAEL SCOTT HICKERSON	34-13914	Decreed	12/17/1961	IRRIGATION	0.09	4.6	
TRUST FBO MICHAEL SCOTT HICKERSON	34-2425D	Decreed	12/17/1961	IRRIGATION	0.21	10.4	
TURNER WELL ASSN	29-7700	License	4/27/1983	IRRIGATION	0.40	19.9	
U62 LLC	34-2485	Decreed	8/10/1966	IRRIGATION, STOCKWATER	0.14	6.0	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
UNION PACIFIC RAILROAD CO	36-4203	Decreed	9/13/1957	COMMERCIAL, DOMESTIC, MUNICIPAL	0.22		
UNITED ALLIANCE & FIDELITY CORP	25-7387	Decreed	12/4/1983	IRRIGATION	0.10	5.0	
US BUREAU OF INDIAN AFFAIRS	29-12560	Decreed	8/23/1954	IRRIGATION	3.75	187.9	
US BUREAU OF INDIAN AFFAIRS	29-12565	Decreed	8/23/1954	COOLING	0.04		
US BUREAU OF LAND MANAGEMENT	34-2373B	Decreed	7/5/1960	IRRIGATION	0.10	5.0	
US BUREAU OF LAND MANAGEMENT	35-7685	Decreed	3/22/1977	IRRIGATION	2.48	124.0	
US BUREAU OF LAND MANAGEMENT	35-7534B	Decreed	8/4/1979	IRRIGATION	1.09	57.0	
US BUREAU OF LAND MANAGEMENT	36-16583	Decreed	3/15/1987	IRRIGATION	0.03	4.0	Yes
US BUREAU OF LAND MANAGEMENT	21-7517	License	2/27/1992	STOCKWATER, WILDLIFE	0.07		
US BUREAU OF LAND MANAGEMENT	36-8726	Permit	4/28/1994	STOCKWATER, WILDLIFE	0.12		
US BUREAU OF LAND MANAGEMENT	21-13032	License	2/24/2006	STOCKWATER, WILDLIFE	0.02		
US BUREAU OF LAND MANAGEMENT	34-14459	Permit	8/26/2014	STOCKWATER, WILDLIFE	0.15		
US BUREAU OF RECLAMATION	25-7201	Decreed	8/11/1980	DOMESTIC, IRRIGATION	0.14	4.0	
US DEPARTMENT OF ENERGY	35-7098	Decreed	8/2/1969	FISH PROPAGATION	20.00		
US DEPARTMENT OF ENERGY	35-7097	Decreed	9/30/1969	DOMESTIC, FISH PROPAGATION	4.00		
VALLEY MOBILE HOME COURT	25-12489	Decreed	3/31/1958	DOMESTIC	0.23		
VALLEY SCHOOL DISTRICT #262	36-15190	Decreed	9/1/1954	DOMESTIC, IRRIGATION	0.15	0.2	
VALLEY SCHOOL DISTRICT #262	36-16299	License	9/22/2004	DOMESTIC, FIRE PROTECTION	1.52		
VALLEY VIEW HEIGHTS SUBDIVISION WATER CO	25-7344	Decreed	7/29/1983	DOMESTIC, STOCKWATER	0.11		
VALLEY VIEW HEIGHTS SUBDIVISION WATER CO	25-13986	License	6/16/2003	DOMESTIC	0.08		
VALLEY VISTA CARE CENTER	34-13830	Decreed	9/2/1961	IRRIGATION	0.28	14.0	
VAN DYKE, VIRGINIA	37-10019	Decreed	2/1/1961	COMMERCIAL, STOCKWATER	0.06		
VAN EPS, KATHY; VAN EPS, LENARD	34-14130	Decreed	2/12/1974	IRRIGATION	1.26	32.6	
VAN ETTEN, CHRIS	34-14448	Decreed	9/30/1953	IRRIGATION	1.56	78.2	
VAN ETTEN, CIRBY	34-14450	Decreed	9/30/1953	IRRIGATION	0.76	38.0	
VAN ETTEN, CLAY	34-14449	Decreed	9/30/1953	IRRIGATION	0.68	34.0	
VAN ETTEN, DEE J; VAN ETTEN, SANDRA	34-2307	Decreed	9/30/1953	IRRIGATION	0.04	1.8	
VAN OVER, MARY; VAN OVER, RAYMOND	25-7650	License	12/29/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.06	1.0	
VEENSTRA, FRANK W	36-17233	Decreed	1/31/1961	STOCKWATER	0.38		
VERBREE LAND HOLDINGS LLC	36-8609	License	10/21/1991	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	
VERDEGAAL LIVING TRUST	37-2676	Decreed	12/11/1961	IRRIGATION	1.85	450.4	
VICK, CHELSEA; VICK, SAMUEL	34-14369	Decreed	6/13/1968	IRRIGATION	0.11	5.6	
W T WILLIAMS INC	33-2069	Decreed	2/13/1953	IRRIGATION	0.03	4.4	
W T WILLIAMS INC	33-4001	Decreed	5/1/1954	IRRIGATION	0.03	4.4	
W T WILLIAMS INC	33-4000	Decreed	5/1/1956	IRRIGATION	0.03	4.4	

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W T WILLIAMS INC	33-2041	Decreed	5/7/1963	IRRIGATION	0.03	4.4	
W T WILLIAMS INC	33-7063	Decreed	3/20/1978	IRRIGATION	7.27	644.0	
WADDOUPS FARMS LLC	34-14794	Decreed	4/13/1961	IRRIGATION	2.22	111.0	
WADDOUPS, D KEITH; WADDOUPS, DEBRA J	34-13976	Decreed	6/22/1961	IRRIGATION	1.20	73.5	
WADDOUPS, LE ANNE; WADDOUPS, WADE	34-2426A	Decreed	12/7/1961	IRRIGATION	0.83	37.0	
WADDOUPS, LE ANNE; WADDOUPS, WADE	34-2426B	Decreed	12/7/1961	IRRIGATION	1.66	68.0	
WADDOUPS, LE ANNE; WADDOUPS, WADE	34-13839	Decreed	4/6/1982	IRRIGATION	0.67	43.0	
WADDOUPS, ROBERT D	34-2416D	Decreed	5/16/1961	IRRIGATION	1.30	64.8	
WADDOUPS, ROBERT DANIEL	34-14791	Decreed	1/24/1980	IRRIGATION, STOCKWATER	2.59	134.0	
WADDOUPS, ROBERT DANIEL	34-14904	Decreed	2/24/1980	IRRIGATION	0.80	40.0	
WADDOUPS, ROBERT DANIEL	34-7226D	Decreed	2/24/1980	IRRIGATION	0.68	34.0	
WADE, NANCY; WADE, RONALD	25-7425	License	6/6/1988	DOMESTIC, IRRIGATION	0.05	1.0	
WAGNER JR, EDWARD P; WAGNER, KRISTIE L	35-8856	Decreed	8/11/1989	DOMESTIC, STOCKWATER	0.10		
WALKER, YOUNG HARVEY	34-2440	Decreed	10/10/1961	IRRIGATION, STOCKWATER	1.55	190.0	
WALKER, YOUNG HARVEY	34-10473	Decreed	8/10/1977	IRRIGATION	0.36	190.0	Yes
WALTERS READY MIX INC	22-14336	License	2/28/1992	INDUSTRIAL	0.10		
WALTERS READY MIX INC	22-14337	Permit	9/26/2011	INDUSTRIAL STORAGE, INDUSTRIAL	4.99		
WALTERS, BRUCE A; WALTERS, MARCEY L	25-7596	License	6/26/1991	DOMESTIC, IRRIGATION	0.15	10.0	
WALTERS, PATRICE; WALTERS, SHAWN J	22-14445	Decreed	4/1/1962	IRRIGATION	2.05	102.8	
WANSTROM, CINDY; WANSTROM, PAUL	34-14654	Decreed	7/26/1961	IRRIGATION	0.43	24.0	
WANSTROM, DAVID E; WANSTROM, NANCY W	34-2435B	Decreed	7/26/1961	IRRIGATION	0.08	4.5	
WANSTROM, JOSEPH SCOTT	34-2339A	Decreed	6/3/1957	IRRIGATION	0.17	18.0	
WANSTROM, JOSEPH SCOTT	34-7172	Decreed	3/13/1977	IRRIGATION	0.94	47.0	
WANSTROM, JOSEPH SCOTT	34-14314	License	7/8/1992	IRRIGATION	0.22	36.0	
WARD, ALLAN	45-14476	Decreed	9/15/1971	COMMERCIAL, IRRIGATION, STOCKWATER	0.30	1.0	
WARD, DANIEL G; WARD, KARLA	45-14422	Decreed	12/11/1953	COMMERCIAL, STOCKWATER	0.06		
WARD, DELORA; WARD, REED I	25-14309	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
WATSON, WESLEY F	34-14505	Decreed	4/2/1980	IRRIGATION	0.04	2.1	
WAYNE PROPERTIES LLC	25-14460	Decreed	2/19/1982	IRRIGATION	0.10	353.9	
WAYNE PROPERTIES LLC	25-14461	Decreed	2/19/1982	IRRIGATION	0.10	353.9	
WAYNE PROPERTIES LLC	25-14463	Decreed	2/19/1982	IRRIGATION	0.10	353.9	
WAYNE PROPERTIES LLC	25-14473	Decreed	2/19/1982	IRRIGATION	0.10	353.9	
WAYNE PROPERTIES LLC	25-14476	Decreed	2/19/1982	IRRIGATION	0.10	353.9	
WAYNE PROPERTIES LLC	25-14489	Decreed	2/19/1982	IRRIGATION	0.10	353.9	
WAYNE PROPERTIES LLC	25-14519	Decreed	2/19/1982	IRRIGATION	0.03	1.3	

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WAYNE PROPERTIES LLC	25-14520	Decreed	2/19/1982	IRRIGATION	0.01	353.9	
WAYNE PROPERTIES LLC	25-14495	License	1/14/1983	IRRIGATION	0.07	285.4	
WAYNE PROPERTIES LLC	25-14503	License	1/14/1983	IRRIGATION	0.07	285.4	
WELLS, DELOS H	35-8220	License	8/4/1983	DOMESTIC, IRRIGATION	0.11	9.5	
WELLS, DELOS H; WELLS, LUELLA	35-10874	Decreed	10/1/1962	DOMESTIC, IRRIGATION	0.20	8.0	
WENDELL & MARJEAN TEW REVOCABLE LIVING TRUST	34-13775	Decreed	5/6/1954	IRRIGATION	0.26	13.0	
WENDLING, JACOB; WENDLING, JAIME	29-14458	Decreed	10/28/1953	IRRIGATION	0.02	3.2	
WENDLING, JACOB; WENDLING, JAIME	29-14438	Decreed	6/23/1977	IRRIGATION	0.03	3.2	
WESTON, CAROL; WESTON, ERVIN P	33-7039	Decreed	3/31/1975	DOMESTIC, IRRIGATION	0.09	3.0	
WHEATLEY, SCHAUNEE; WHEATLEY, SCOTT	29-14461	Decreed	10/28/1953	IRRIGATION	0.02	2.0	
WHEATLEY, SCHAUNEE; WHEATLEY, SCOTT	29-14441	Decreed	6/23/1977	IRRIGATION	0.02	2.0	
WHEELER, G ALVIN; WHEELER, GAY D	34-2353	Decreed	7/31/1959	IRRIGATION	1.87	219.0	
WHEELOCK, MICHAEL T; WHEELOCK, TINA J	29-14448	Decreed	10/28/1953	IRRIGATION	0.02	2.1	
WHEELOCK, MICHAEL T; WHEELOCK, TINA J	29-14428	Decreed	6/23/1977	IRRIGATION	0.02	2.1	
WHITEWATER WATER USERS ASSN	29-2438B	Decreed	2/3/1961	IRRIGATION	0.74	37.0	
WHITEWATER WATER USERS ASSN	29-7819	Decreed	9/20/1979	DOMESTIC	2.00		
WILBURN, DARRELL; WILBURN, KAREN	34-14236	Decreed	9/29/1966	IRRIGATION	0.07	4.0	
WILBURN, DARRELL; WILBURN, KAREN	34-14238	Decreed	5/20/1984	IRRIGATION	0.01	4.0	Yes
WILLIAMS, ANDREA; WILLIAMS, HENRY	34-13732	Decreed	8/1/1961	IRRIGATION	0.54	42.4	
WILLIAMS, BRETT	34-2489	Decreed	8/16/1966	IRRIGATION	2.98	176.0	
WILLIAMS, BRETT; WILLIAMS, TRUDY	34-2377	Decreed	7/22/1960	IRRIGATION	1.60	78.0	
WILLIAMS, BRETT; WILLIAMS, TRUDY	34-14938	Decreed	9/5/1961	IRRIGATION	1.55	151.5	
WILLIAMS, BRETT; WILLIAMS, TRUDY	34-2436	Decreed	9/5/1961	IRRIGATION	2.00	167.0	
WILLIAMS, BRETT; WILLIAMS, TRUDY	34-7054A	Decreed	12/10/1973	IRRIGATION	5.86	390.6	
WILLIAMS, BRETT; WILLIAMS, TRUDY	34-10621	Decreed	6/1/1977	IRRIGATION	0.80	167.0	Yes
WILLIAMS, CLAUDIA; WILLIAMS, JOHN	25-7528	License	9/19/1989	IRRIGATION	0.04	1.3	
WILLIAMS, JANENE; WILLIAMS, WADE	33-2102	Decreed	6/21/1961	IRRIGATION	1.60	77.0	
WILLIAMS, TERRY; WILLIAMS, VICKIE	34-2323B	Decreed	2/11/1955	IRRIGATION	0.16	10.0	
WILLIE, DANIEL L	36-16113	Decreed	11/11/1959	MITIGATION	0.20	30.2	
WILSON, JOHN CHARLES	29-7916	License	3/20/1990	IRRIGATION	0.09	4.5	
WOOD, HEIDI; WOOD, J ADAM	29-8009	License	7/26/1990	IRRIGATION, STOCKWATER	0.04	1.5	
WOOD, HOWARD; WOOD, SHEILA	34-2478	Decreed	6/16/1966	IRRIGATION	0.76	38.0	
WOOD, TIMOTHY	34-13909	Decreed	3/20/1961	IRRIGATION	0.10	5.0	
WOOD, TIMOTHY	34-14464	Decreed	3/20/1961	IRRIGATION	0.24	12.2	
WOODBURY, BRYCE; WOODBURY, STEPHANIE	34-13878	Decreed	1/30/1961	IRRIGATION	0.01	1.0	

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WOODBURY, RANDY	34-13903	Decreed	8/29/1960	IRRIGATION	1.57	150.4	
WOODBURY, RANDY	34-13905	Decreed	12/17/1961	IRRIGATION	0.12	150.4	
WOODBURY, RANDY	34-13907	Decreed	1/3/1975	IRRIGATION	0.30	150.4	
WOODMAN, ERIC; WOODMAN, MICHELLE	34-14237	Decreed	9/29/1966	IRRIGATION	0.04	2.2	
WOODMAN, ERIC; WOODMAN, MICHELLE	34-14239	Decreed	5/20/1984	IRRIGATION	0.01	2.2	Yes
WOODS, JOANNE; WOODS, NICHOLAUS	34-14626	Decreed	12/17/1961	IRRIGATION	0.09	4.7	
WOODS, JOANNE; WOODS, NICHOLAUS	34-14681	Decreed	12/17/1961	IRRIGATION	0.10	4.8	
WRIDE FARMS	35-8949	Permit	8/26/1991	IRRIGATION	3.00	150.0	
WRIGHT, DEE; WRIGHT, RUBY	25-7256	Decreed	5/12/1981	IRRIGATION	0.10	1.4	
WRIGHT, KATHERINE A; WRIGHT, MICHAEL V	34-14627	Decreed	12/17/1961	IRRIGATION	0.09	4.6	
YANCEY, CLEM R	35-7955	License	3/10/1981	DOMESTIC, STOCKWATER	0.06		
YOUNG & YOUNG LIVESTOCK LLC	25-14494	Permit	8/3/2021	DOMESTIC	0.23		
YOUNG, DE VONA; YOUNG, WILLIAM N	25-7437	License	8/26/1988	DOMESTIC, STOCKWATER	0.07		
YOUNG, JUDY D; YOUNG, KENNETH A	25-7436	License	9/14/1988	IRRIGATION	0.03	1.5	
ZIRKELBACH, NANCY; ZIRKELBACH, RICHARD	25-7440	License	8/25/1988	DOMESTIC, IRRIGATION	0.04	1.2	
ZWEIFEL PROPERTIES LLC	32-10031	Decreed	5/1/1968	DOMESTIC, STOCKWATER	0.12		

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

Revised June 28, 2024

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER PHASING IN ADMINISTRATION OF GROUND WATER RIGHTS RECENTLY INCLUDED IN THE ESPA ACGWS**

BACKGROUND

The Eastern Snake Plain Aquifer Area of Common Ground Water Supply ("ESPA ACGWS") is the administrative boundary for the Surface Water Coalition ("SWC") delivery call proceeding (Docket No. CM-DC-2010-001), the proceeding in which this order is being issued.

On November 26, 2025, the Director of the Idaho Department of Water Resources ("Department") expanded the ESPA ACGWS to include the portion of the Little Lost River basin that was not already included within the ESPA ACGWS. *See Order Expanding the Eastern Snake Plain Aquifer Area of Common Ground Water Supply to Include the Little Lost River Tributary Basin* (Nov. 26, 2025).

On December 15, 2025, the Director expanded the ESPA ACGWS to include the Raft River Basin. *See Order Expanding the Eastern Snake Plain Aquifer Area of Common Ground Water Supply to Include the Raft River Tributary Basin* (Dec. 15, 2025).

On January 13, 2026, the Director expanded the ESPA ACGWS to include the portion of the Big Lost River Basin that was not already included within the ESPA ACGWS. *See Order Expanding the Eastern Snake Plain Aquifer Area of Common Ground Water Supply to Include the Big Lost River Tributary Basin* (Jan. 13, 2026).

This order is necessary because the expansion of the ESPA ACGWS subjects previously unadministered ground water rights to administration in the SWC delivery call proceeding. Furthermore, there is currently a curtailment order in effect in the SWC delivery call proceeding, curtailing ground water rights junior to August 15, 1952. *See Final Order Curtailing Ground Water Rights Junior to August 15, 1952* (Dec. 8, 2025).

The Director must decide how to address the inclusion of these ground water rights into the ESPA ACGWS and decide whether the administration of the newly included junior-priority ground water rights should be phased-in pursuant to Rule 40.01.a of the Rules for Conjunctive Management of Surface and Ground Water Resources ("CM Rule") (IDAPA 37.03.11).

ANALYSIS

When the Director issued the orders expanding the ESPA ACGWS, 1,005 ground water rights within the expanded area of administration not previously subject to administration were brought into the SWC delivery call and immediately became subject to administration. These water rights are listed in Attachment A to this order.

As discussed above, there is currently a curtailment order in effect in the SWC delivery call proceeding, curtailing ground water rights junior to August 15, 1952. Many of the previously unadministered ground water rights are not currently participating in a Department-approved mitigation plan. Therefore, the newly included water rights junior to August 15, 1952, not currently participating in an approved mitigation plan are subject to immediate curtailment under the current curtailment order. CM Rule 40.

Pursuant to CM Rule 40.01.a, the Director may, by order, phase-in regulation of junior-priority ground water diversions where material injury is delayed or long range to lessen the economic impact of immediate and complete curtailment.

The Director finds that the material injury caused by the diversion and use of water under these newly included ground water rights is delayed or long range. The Director also finds that the economic impact of immediate and complete curtailment would be severe. The Department has observed that the time required to submit, review, publish, and issue an order regarding a mitigation plan can vary greatly. Approval of an unprotested mitigation plan can occur as quickly as several months. Whereas a protested mitigation plan that is subject to a contested case proceeding and appeal process can take more than a year to resolve.

The Director concludes that priority administration of these newly included ground water rights should be phased-in to provide the affected water users a reasonable time to implement a mitigation plan "to lessen the economic impact of immediate and complete curtailment." CM Rule 40.01.a. Accordingly, the newly included water rights listed in Attachment A will not be subject to administration in the SWC delivery call sooner than April 1, 2027. All water rights that are newly included in the ESPA ACGWS are on notice that they could be subject to a curtailment order in approximately 14 months.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that ground water rights newly included in the ESPA ACGWS and listed in Attachment A to this order will be phased-in to the SWC delivery call proceeding and will not be subject to administration sooner than April 1, 2027.

Dated this 2th day of February 2026.

MATHEW WEAVER
Director

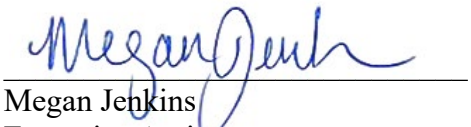
CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 2th day of February 2026, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage ☒ prepaid Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage ☒ prepaid Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage ☒ prepaid Email
Thomas J. Budge RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com	☒ U.S. Mail, postage ☒ prepaid Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage ☒ prepaid Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage ☒ prepaid Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage ☒ prepaid Email

Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage ☒ prepaid Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage ☒ prepaid Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage ☒ prepaid Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage ☒ prepaid Email
Michael A. Kirkham City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 mkirkham@idahofallsidaho.gov	☒ U.S. Mail, postage ☒ prepaid Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage ☒ prepaid Email
Dylan Anderson Dylan Anderson Law PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage ☒ prepaid Email

COURTESY COPY TO: Craig Chandler IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 craig.chandler@idwr.idaho.gov	☒ Email
COURTESY COPY TO: Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS, LOVELAND, SHIRLEY & LINDSTROM, LLP PO Box 910 Burley, ID 83318 wparsons@pmt.org wparsons@magicvalley.law	☒ Email
COURTESY COPY TO: Jerry R. Rigby RIGBY, ANDRUS & RIGBY LAW, PLLC PO Box 250 Rexburg, ID 83440 jrigby@rex-law.com	☒ Email
COURTESY COPY TO: Andrew J. Waldera SAWTOOTH LAW OFFICES, PLLC 1101 W. River Street, Suite 110 Boise, Idaho 83702 andy@sawtoothlaw.com	☒ Email



Megan Jenkins
Executive Assistant

Attachment A - Order Phasing In Administration of Newly Included Ground Water Rights
(Sorted by Tributary Basin, then by Owner)

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Big Lost River	6 X LAND LLC	34-2320	Decreed	2/7/1955	IRRIGATION, RECREATION STORAGE, RECREATION	4.00	219.5
Big Lost River	6 X LAND LLC	34-7155	Decreed	7/29/1976	IRRIGATION	1.64	132.0
Big Lost River	6 X RANCH LLC	34-13763	License	7/29/2002	IRRIGATION	1.50	75.0
Big Lost River	BIG LOST RANCH LLC	34-7106A	Decreed	3/18/1975	IRRIGATION	0.22	18.0
Big Lost River	BIG LOST RANCH LLC	34-13621	Decreed	3/18/1975	IRRIGATION	0.39	31.0
Big Lost River	BORAH BORAH RANCH LLC	34-7595	License	1/11/2000	IRRIGATION	3.12	156.2
Big Lost River	BOWETA LLC	34-7140	Decreed	4/1/1976	IRRIGATION, STOCKWATER	3.03	148.0
Big Lost River	CECIL, JESSE; CECIL, MELINDA	34-4034	Decreed	5/1/1958	IRRIGATION, STOCKWATER	1.03	192.0
Big Lost River	CHERIAN, ALEXANDER	34-2456D	Decreed	11/3/1964		0.30	12.0
Big Lost River	CHURNDASHER RANCH; JOHNSON, SCOTT; JOHNSON, VICTOR A	34-7057	Decreed	1/10/1974	IRRIGATION	4.74	237.0
Big Lost River	DICKEY LIVESTOCK INC	34-7187	Decreed	5/5/1977	IRRIGATION, STOCKWATER	5.81	381.0
Big Lost River	DICKEY LIVESTOCK INC; FULTON, GORDON	34-2288	Decreed	5/16/1949	IRRIGATION	1.20	69.0
Big Lost River	DONAHUE REVOCABLE TRUST	34-7044	Decreed	9/19/1973	IRRIGATION	3.21	255.0
Big Lost River	DONAHUE REVOCABLE TRUST	34-10562	Decreed	5/1/1986	IRRIGATION	0.20	255.0
Big Lost River	DONAHUE REVOCABLE TRUST	34-7585	License	4/23/1998	IRRIGATION	0.79	255.0
Big Lost River	DUNN, VICKI	34-14661	Decreed	5/5/1977	IRRIGATION	0.08	5.0
Big Lost River	EDMONSON, KRISTINA L; HARP, JARED	34-7022	Decreed	9/20/1971	IRRIGATION, STOCKWATER	0.38	18.0
Big Lost River	FILLMORE, NICHOLE D; FILLMORE, TYLER J	34-13895	Decreed	8/1/1961	IRRIGATION	0.10	8.0
Big Lost River	GATES TRUSTEE, ELIZABETH W; GATES TRUSTEE, MARK T; WOODS, PRISCILLA B; WOODS, WARD W	34-10804	Decreed	6/1/1978	DOMESTIC, STOCKWATER	0.19	
Big Lost River	HARDING, LISA LYNNE	34-7245B	Decreed	10/28/1980	IRRIGATION	0.86	57.0
Big Lost River	HARDING, LISA LYNNE	34-13555	Decreed	7/29/1987	IRRIGATION	0.18	57.0
Big Lost River	L & S PARTNERS	34-4035C	Decreed	8/1/1960	IRRIGATION	1.31	65.5
Big Lost River	LAMBSON, GARY G; LAMBSON, KATHLEEN K	34-2336E	Decreed	4/9/1956	IRRIGATION	0.06	3.2
Big Lost River	LENROOT, JEANIE; LENROOT, ROSS W	34-14372	Decreed	9/5/1961	IRRIGATION	0.05	5.0
Big Lost River	MOUNTAIN SPRINGS RANCH LLC	34-10624	Decreed	12/15/1958	IRRIGATION	10.60	639.0
Big Lost River	NO TELLUM CREEK RANCH LLC	34-13622	Decreed	3/18/1975	IRRIGATION	0.20	16.0
Big Lost River	PRITCHETT, STEVE L; PRITCHETT, TERRI L	34-2456B	Decreed	11/3/1964	IRRIGATION	0.24	8.0
Big Lost River	SIMMONS, DWIGHT	34-2310	Decreed	10/24/1953	IRRIGATION	2.00	115.0
Big Lost River	US BUREAU OF LAND MANAGEMENT	34-7146B	Decreed	4/22/1976	IRRIGATION	0.26	19.0
Big Lost River	US BUREAU OF LAND MANAGEMENT	34-12413B	Decreed	4/12/1994	IRRIGATION	0.03	19.0
Big Lost River	US NATIONAL PARK SERVICE	34-12388	Decreed	7/9/1930	COMMERCIAL, DOMESTIC, IRRIGATION	0.00	
Big Lost River	WAKEFIELD, BRYNN; WAKEFIELD, CAMRON	34-14797	Decreed	5/5/1977	IRRIGATION	0.06	4.0
Big Lost River	WARM SPRINGS CREEK RANCH LLC	34-7245A	Decreed	10/28/1980	IRRIGATION	1.74	115.0
Big Lost River	ZOLLINGER, BRET L; ZOLLINGER, JOLENE	34-7146A	Decreed	4/22/1976	IRRIGATION	2.19	161.0
Big Lost River	ZOLLINGER, BRET L; ZOLLINGER, JOLENE	34-12413A	Decreed	4/12/1994	IRRIGATION	0.28	161.0
Little Lost River	ANDREASON, BRENDA; ANDREASON, DARYL	33-2080	Decreed	10/9/1956	IRRIGATION	1.02	124.0
Little Lost River	ANDREASON, DAVID S; ANDREASON, SHERI	33-7014	Decreed	5/10/1972	IRRIGATION	3.73	314.0
Little Lost River	ANDREASON, DAVID S; ANDREASON, SHERI	33-7056	Decreed	7/7/1977	IRRIGATION	1.46	314.0
Little Lost River	ANDREASON, DAVID S; ANDREASON, SHERI L	33-2135A	Decreed	1/29/1949	IRRIGATION	1.60	48.0
Little Lost River	ANDREASON, DAVID S; ANDREASON, SHERI L	33-2072A	Decreed	12/28/1954	IRRIGATION	0.40	48.0
Little Lost River	BIRCH CREEK RANCHES LLC	33-14870	Decreed	1/29/1949	IRRIGATION	1.81	114.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Little Lost River	BIRCH CREEK RANCHES LLC	33-2106	Decreed	8/7/1961	IRRIGATION	3.00	150.0
Little Lost River	BIRCH CREEK RANCHES LLC	33-14872	Decreed	8/7/1961	IRRIGATION	0.47	114.0
Little Lost River	BIRCH CREEK RANCHES LLC	33-11002	Decreed	8/8/1961	IRRIGATION	1.80	150.0
Little Lost River	BIRCH CREEK RANCHES LLC	33-14874	Decreed	8/8/1961	IRRIGATION	0.28	114.0
Little Lost River	PANCHERI BROTHERS LLC	33-14957	Decreed	3/24/1948	IRRIGATION	0.31	24.5
Little Lost River	PANCHERI BROTHERS LLC	33-2138	Decreed	3/3/1959	IRRIGATION	2.36	450.0
Little Lost River	PANCHERI BROTHERS LLC	33-15080	Decreed	3/3/1959	IRRIGATION	0.27	40.0
Little Lost River	PANCHERI BROTHERS LLC	33-14958	Decreed	4/11/1973	IRRIGATION	0.16	24.5
Little Lost River	PANCHERI BROTHERS LLC	33-7040	Decreed	10/16/1975	IRRIGATION	3.97	450.0
Little Lost River	PANCHERI BROTHERS LLC	33-15078	Decreed	10/16/1975	IRRIGATION	0.46	40.0
Little Lost River	PANCHERI BROTHERS LLC	33-7055	Decreed	8/24/1977	IRRIGATION	1.44	106.0
Little Lost River	PANCHERI BROTHERS LLC	33-7172	Decreed	4/2/1985	IRRIGATION	0.60	450.0
Little Lost River	PANCHERI BROTHERS LLC	33-15079	Decreed	4/2/1985	IRRIGATION	0.07	40.0
Little Lost River	PANCHERI BROTHERS LLC; PANCHERI INC	33-2057	Decreed	2/1/1950	IRRIGATION	24.00	1816.0
Little Lost River	PANCHERI BROTHERS LLC; PANCHERI INC	33-2083	Decreed	8/23/1957	IRRIGATION	5.00	1816.0
Little Lost River	PANCHERI BROTHERS LLC; PANCHERI INC	33-2086	Decreed	1/12/1959	IRRIGATION	4.00	1816.0
Little Lost River	PANCHERI BROTHERS LLC; PANCHERI INC	33-2091	Decreed	1/22/1960	IRRIGATION	0.99	1816.0
Little Lost River	PANCHERI BROTHERS LLC; PANCHERI INC	33-7018	Decreed	9/12/1972	IRRIGATION	3.26	1816.0
Little Lost River	PANCHERI INC	33-14871	Decreed	1/29/1949	IRRIGATION	1.39	158.1
Little Lost River	PANCHERI INC	33-2065	Decreed	11/17/1952	IRRIGATION	4.66	1112.0
Little Lost River	PANCHERI INC	33-2066A	Decreed	11/17/1952	IRRIGATION	3.56	1112.0
Little Lost River	PANCHERI INC	33-2066B	Decreed	11/17/1952	IRRIGATION	0.52	1112.0
Little Lost River	PANCHERI INC	33-2068A	Decreed	1/14/1953	IRRIGATION	2.21	188.0
Little Lost River	PANCHERI INC	33-10997	Decreed	4/15/1953	IRRIGATION	0.17	188.0
Little Lost River	PANCHERI INC	33-14873	Decreed	8/7/1961	IRRIGATION	2.53	193.1
Little Lost River	PANCHERI INC	33-14875	Decreed	8/8/1961	IRRIGATION	1.52	193.1
Little Lost River	PANCHERI INC	33-7015	Decreed	5/22/1972	IRRIGATION	1.77	1112.0
Little Lost River	PANCHERI INC	33-7198	License	12/18/1990	IRRIGATION	3.81	272.5
Little Lost River	PANCHERI INC	33-7202	Decreed	11/8/1995	IRRIGATION	3.00	1112.0
Little Lost River	PANCHERI INC	33-14944	Decreed	11/8/1995	IRRIGATION	0.11	188.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R	33-2067	Decreed	11/28/1952	IRRIGATION	2.80	193.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R	33-10937	Decreed	11/28/1952	IRRIGATION	0.58	193.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R	33-2110A	Decreed	6/7/1962	IRRIGATION	3.12	156.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R	33-2110B	Decreed	6/7/1962	IRRIGATION	0.52	193.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-2096	Decreed	9/26/1960	IRRIGATION	2.48	326.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-7023	Decreed	8/30/1973	IRRIGATION	2.02	315.5
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-7066	Decreed	2/23/1979	IRRIGATION	4.13	307.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-7176	License	6/28/1985	IRRIGATION	2.16	315.5
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-7010	Decreed	7/2/1990	IRRIGATION	1.60	326.0
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-7075	Decreed	7/2/1990	IRRIGATION	0.73	315.5
Little Lost River	PHILLIPS, BILLIE; PHILLIPS, DONALD R; ROSS, CAROL; ROSS, ROCKY	33-7191	License	7/2/1990	IRRIGATION	1.34	326.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Little Lost River	SUNNY BAR RANCH LLLP	33-2085	Decreed	7/8/1958	IRRIGATION	2.19	1011.0
Little Lost River	SUNNY BAR RANCH LLLP	33-2123	Decreed	11/16/1965	IRRIGATION	3.96	1011.0
Little Lost River	SUNNY BAR RANCH LLLP	33-2128	Decreed	8/18/1966	IRRIGATION	0.80	281.0
Little Lost River	SUNNY BAR RANCH LLLP	33-7006A	Decreed	8/18/1966	IRRIGATION	4.21	1011.0
Little Lost River	SUNNY BAR RANCH LLLP	33-7057C	Decreed	7/20/1977	IRRIGATION	5.35	1011.0
Little Lost River	WAYMIRE, BECKY JANE; WAYMIRE, TAD	33-15090	Decreed	12/3/1959	IRRIGATION	2.20	181.5
Little Lost River	WAYMIRE, CONNIE A; WAYMIRE, KEITH D	33-2089	Decreed	12/3/1959	IRRIGATION	0.10	8.0
Little Lost River	WAYMIRE, CONNIE; WAYMIRE, KEITH D	33-2135B	Decreed	1/29/1949	IRRIGATION	1.60	218.0
Little Lost River	WAYMIRE, CONNIE; WAYMIRE, KEITH D	33-2072C	Decreed	12/28/1954	IRRIGATION	0.40	218.0
Little Lost River	WAYMIRE, CONNIE; WAYMIRE, KEITH D	33-10028	Decreed	8/7/1957	IRRIGATION	0.43	218.0
Little Lost River	WAYMIRE, CONNIE; WAYMIRE, KEITH D	33-7193	License	1/18/1983	IRRIGATION	4.38	219.0
Raft River	7 SPRINGS RANCH LLC	43-10064	Decreed	5/25/1955	IRRIGATION	5.70	2013.0
Raft River	7 SPRINGS RANCH LLC	43-2535	Decreed	8/31/1961	IRRIGATION	2.04	2013.0
Raft River	7 SPRINGS RANCH LLC	43-10066	Decreed	9/9/1962	IRRIGATION	0.06	2013.0
Raft River	7 SPRINGS RANCH LLC	43-7080	Decreed	7/22/1977	IRRIGATION	0.64	211.0
Raft River	ADT FARMS LLC	43-13671	Decreed	8/15/1951	IRRIGATION	1.54	4038.2
Raft River	ADT FARMS LLC	43-13673	Decreed	3/6/1952	IRRIGATION	2.70	4038.2
Raft River	ADT FARMS LLC	43-13715	Decreed	10/24/1961	IRRIGATION	1.38	1306.0
Raft River	ADT FARMS LLC	43-13675	Decreed	10/30/1962	IRRIGATION	1.98	4038.2
Raft River	ADT FARMS LLC	43-13718	Decreed	6/30/1985	IRRIGATION	0.13	1306.0
Raft River	ADT FARMS LLC; RELAR FARMS LLC	43-13716	Decreed	10/24/1961	IRRIGATION	14.57	1306.0
Raft River	ADT FARMS LLC; RELAR FARMS LLC	43-13719	Decreed	6/30/1985	IRRIGATION	1.39	1306.0
Raft River	ADTD FARMS LLC	43-2328	Decreed	7/22/1948	IRRIGATION	2.20	4038.2
Raft River	ADTD FARMS LLC	43-2338B	Decreed	12/17/1949	IRRIGATION	2.41	4038.2
Raft River	ADTD FARMS LLC	43-12986	Decreed	12/17/1949	IRRIGATION	1.83	4038.2
Raft River	ADTD FARMS LLC	43-12987	Decreed	12/17/1949	IRRIGATION	1.76	4038.2
Raft River	ADTD FARMS LLC	43-2369	Decreed	9/24/1951	IRRIGATION	3.20	4038.2
Raft River	ADTD FARMS LLC	43-13620	Decreed	11/10/1951	IRRIGATION	3.31	4038.2
Raft River	ADTD FARMS LLC	43-13621	Decreed	11/10/1951	IRRIGATION	0.66	4038.2
Raft River	ADTD FARMS LLC	43-2427	Decreed	6/23/1955	IRRIGATION	2.24	4038.2
Raft River	ADTD FARMS LLC	43-13622	Decreed	3/10/1958	IRRIGATION	0.52	4038.2
Raft River	ADTD FARMS LLC	43-13623	Decreed	3/10/1958	IRRIGATION	0.11	4038.2
Raft River	ADTD FARMS LLC	43-13624	Decreed	3/10/1958	IRRIGATION	2.02	4038.2
Raft River	ADTD FARMS LLC	43-13625	Decreed	3/10/1958	IRRIGATION	0.40	4038.2
Raft River	ADTD FARMS LLC	43-2492	Decreed	3/18/1960	IRRIGATION	3.59	4038.2
Raft River	ADTD FARMS LLC	43-13626	Decreed	5/1/1961	IRRIGATION	1.43	4038.2
Raft River	ADTD FARMS LLC	43-13627	Decreed	5/1/1961	IRRIGATION	0.29	4038.2
Raft River	ADTD FARMS LLC	43-4229	Decreed	3/15/1962	IRRIGATION	1.46	4038.2
Raft River	ADTD FARMS LLC	43-2544	Decreed	4/17/1962	IRRIGATION	2.12	4038.2
Raft River	ADTD FARMS LLC	43-13068	Decreed	3/16/1963	IRRIGATION	0.75	4038.2
Raft River	ADTD FARMS LLC	43-13628	Decreed	2/12/1971	IRRIGATION	2.15	4038.2

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	ADTD FARMS LLC	43-13629	Decreed	2/12/1971	IRRIGATION	0.43	4038.2
Raft River	ADTD FARMS LLC	43-13689	Decreed	2/12/1971	IRRIGATION	3.06	4038.2
Raft River	ADTD FARMS LLC	43-13630	Decreed	4/14/1976	IRRIGATION	3.20	4038.2
Raft River	ADTD FARMS LLC	43-13631	Decreed	4/14/1976	IRRIGATION	0.64	4038.2
Raft River	ADTD FARMS LLC	43-13632	License	1/4/1983	IRRIGATION	0.47	4038.2
Raft River	ADTD FARMS LLC	43-13633	License	1/4/1983	IRRIGATION	0.09	4038.2
Raft River	ADTD FARMS LLC	43-4207	Decreed	6/30/1985	IRRIGATION	1.83	4038.2
Raft River	ADTD FARMS LLC	43-11132B	Decreed	6/30/1985	IRRIGATION	0.60	4038.2
Raft River	ADTD FARMS LLC	43-12989	Decreed	6/30/1985	IRRIGATION	0.44	4038.2
Raft River	ADTD FARMS LLC	43-12990	Decreed	6/30/1985	IRRIGATION	2.33	4038.2
Raft River	ADTD FARMS LLC	43-13034	Decreed	6/30/1985	IRRIGATION	0.45	4038.2
Raft River	AGUA CALIENTE LLC	43-2293	Decreed	7/12/1944	DOMESTIC, IRRIGATION	3.46	424.3
Raft River	AGUA CALIENTE LLC	43-4151	Decreed	3/15/1963	IRRIGATION	1.44	424.3
Raft River	AGUA CALIENTE LLC	43-13038	Decreed	6/30/1985	IRRIGATION	1.40	424.3
Raft River	ALMO COMMUNITY PARK	43-10840	Decreed	10/1/1962	DOMESTIC, IRRIGATION	0.10	2.0
Raft River	ANDERSON, BROOKE R; ANDERSON, HAL T	43-4024A	Decreed	3/15/1954	IRRIGATION, STOCKWATER	0.01	6.0
Raft River	ANDERSON, BROOKE R; ANDERSON, HAL T	43-10801	Decreed	3/15/1956	IRRIGATION, STOCKWATER	0.11	6.0
Raft River	ANDERSON, CARLYLE H; ANDERSON, VERLE N	43-7301	License	6/8/1989	DOMESTIC, IRRIGATION	0.08	1.8
Raft River	BAKER, DIANE; BAKER, MARK	43-13067	Decreed	3/16/1963	IRRIGATION	0.07	4.7
Raft River	BARKER, KATHRYN H; BARKER, RUEL	43-4167	Decreed	4/1/1954	IRRIGATION	1.50	187.0
Raft River	BARKER, KATHRYN H; BARKER, RUEL	43-13886	Decreed	9/8/1977	IRRIGATION	1.46	234.1
Raft River	BARNES, JODY	43-2390A	Decreed	4/10/1953	IRRIGATION	0.79	91.9
Raft River	BARNES, JODY	43-2397A	Decreed	7/7/1953	IRRIGATION	1.20	91.9
Raft River	BARNES, MICHEAL LOUISE	43-13865	Decreed	4/10/1953	IRRIGATION	1.36	157.2
Raft River	BARNES, MICHEAL LOUISE	43-13866	Decreed	4/10/1953	IRRIGATION	0.73	84.2
Raft River	BARNES, MICHEAL LOUISE	43-13867	Decreed	7/7/1953	IRRIGATION	2.06	157.2
Raft River	BARNES, MICHEAL LOUISE	43-13868	Decreed	7/7/1953	IRRIGATION	1.10	84.2
Raft River	BENNETT, JAMES L; BENNETT, JEANETTE B	43-4157	Decreed	1/1/1933	COMMERCIAL, IRRIGATION	0.05	1.0
Raft River	BIG SKY DAIRY	43-2276	Decreed	9/20/1935	DOMESTIC, IRRIGATION	2.81	5178.6
Raft River	BIG SKY DAIRY	43-2278	Decreed	4/7/1937	IRRIGATION	2.10	5178.6
Raft River	BIG SKY DAIRY	43-2285B	Decreed	11/10/1939	IRRIGATION	1.80	5178.6
Raft River	BIG SKY DAIRY	43-13102	Decreed	3/15/1949	IRRIGATION, STOCKWATER	0.46	5178.6
Raft River	BIG SKY DAIRY	43-2327	Decreed	7/26/1949	IRRIGATION	0.21	5178.6
Raft River	BIG SKY DAIRY	43-4095	Decreed	7/26/1949	DOMESTIC, HEATING, IRRIGATION	0.04	5178.6
Raft River	BIG SKY DAIRY	43-2341	Decreed	4/7/1950	IRRIGATION	1.34	5178.6
Raft River	BIG SKY DAIRY	43-2363	Decreed	6/19/1951	IRRIGATION	3.10	5178.6
Raft River	BIG SKY DAIRY	43-2299B	Decreed	12/10/1951	DOMESTIC, IRRIGATION	1.86	5178.6
Raft River	BIG SKY DAIRY	43-2381A	Decreed	6/2/1952	IRRIGATION	1.07	5178.6
Raft River	BIG SKY DAIRY	43-13658	Decreed	1/28/1953	IRRIGATION	0.94	5178.6
Raft River	BIG SKY DAIRY	43-13659	Decreed	1/28/1953	IRRIGATION	1.50	5178.6
Raft River	BIG SKY DAIRY	43-2386B	Decreed	1/30/1953	IRRIGATION	0.72	5178.6

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	BIG SKY DAIRY	43-13660	Decreed	1/30/1953	IRRIGATION	1.08	5178.6
Raft River	BIG SKY DAIRY	43-13661	Decreed	1/30/1953	IRRIGATION	1.20	5178.6
Raft River	BIG SKY DAIRY	43-2400	Decreed	11/2/1953	IRRIGATION	2.80	5178.6
Raft River	BIG SKY DAIRY	43-2410	Decreed	6/15/1954	IRRIGATION, STOCKWATER	1.93	141.0
Raft River	BIG SKY DAIRY	43-4065	Decreed	4/1/1956	IRRIGATION, STOCKWATER	5.93	312.0
Raft River	BIG SKY DAIRY	43-2461	Decreed	8/2/1957	IRRIGATION	1.50	5178.6
Raft River	BIG SKY DAIRY	43-4035	Decreed	4/22/1958	IRRIGATION, STOCKWATER	4.32	5178.6
Raft River	BIG SKY DAIRY	43-4003B	Decreed	6/23/1959	IRRIGATION	1.03	5178.6
Raft River	BIG SKY DAIRY	43-2509B	Decreed	1/26/1961	DOMESTIC, IRRIGATION	1.39	5178.6
Raft River	BIG SKY DAIRY	43-10526	Decreed	1/26/1961	IRRIGATION	4.16	5178.6
Raft River	BIG SKY DAIRY	43-2521	Decreed	4/21/1961	IRRIGATION	1.42	5178.6
Raft River	BIG SKY DAIRY	43-2513	Decreed	5/7/1961	IRRIGATION	2.74	5178.6
Raft River	BIG SKY DAIRY	43-13656	Decreed	9/21/1961	IRRIGATION	1.30	5178.6
Raft River	BIG SKY DAIRY	43-13657	Decreed	9/21/1961	IRRIGATION	1.60	5178.6
Raft River	BIG SKY DAIRY	43-4131	Decreed	3/1/1962	IRRIGATION	3.42	5178.6
Raft River	BIG SKY DAIRY	43-10517	Decreed	4/1/1962	IRRIGATION	0.94	5178.6
Raft River	BIG SKY DAIRY	43-2534A	Decreed	7/2/1962	IRRIGATION	1.24	5178.6
Raft River	BIG SKY DAIRY	43-2554A	Decreed	12/6/1962	IRRIGATION	5.56	5178.6
Raft River	BIG SKY DAIRY	43-2554B	Decreed	12/6/1962	IRRIGATION	0.66	5178.6
Raft River	BIG SKY DAIRY	43-4130A	Decreed	3/15/1963	IRRIGATION	1.40	5178.6
Raft River	BIG SKY DAIRY	43-10132	Decreed	6/30/1985	IRRIGATION	0.38	312.0
Raft River	BIG SKY DAIRY	43-10240	Decreed	6/30/1985	IRRIGATION	0.60	5178.6
Raft River	BIG SKY DAIRY	43-10535	Decreed	6/30/1985	IRRIGATION	3.16	5178.6
Raft River	BIG SKY DAIRY	43-10651	Decreed	6/30/1985	IRRIGATION	1.98	5178.6
Raft River	BIG SKY DAIRY	43-11247	Decreed	6/30/1985	IRRIGATION	0.12	141.0
Raft River	BIG SKY DAIRY	43-13077	Decreed	6/30/1985	IRRIGATION	4.84	5178.6
Raft River	BIG SKY DAIRY	43-13103	Decreed	6/30/1985	IRRIGATION	5.69	5178.6
Raft River	BLACK PINE LAND LLC	43-13878	Decreed	4/28/1941	IRRIGATION	0.12	137.6
Raft River	BLACK PINE LAND LLC	43-13875	Decreed	6/1/1953	IRRIGATION, STOCKWATER	0.39	137.6
Raft River	BLACK PINE LAND LLC	43-13877	Decreed	8/1/1954	IRRIGATION	0.27	137.6
Raft River	BLACK PINE LAND LLC	43-13874	Decreed	1/21/1955	IRRIGATION	0.22	137.6
Raft River	BLACK PINE LAND LLC	43-13876	Decreed	8/1/1958	IRRIGATION	0.18	137.6
Raft River	BLACK PINE LAND LLC	43-13882	Decreed	8/1/1958	IRRIGATION	0.06	137.6
Raft River	BLACK PINE LAND LLC	43-13871	Decreed	2/23/1959	IRRIGATION	0.41	137.6
Raft River	BLACK PINE LAND LLC	43-13872	Decreed	6/30/1985	IRRIGATION	0.12	137.6
Raft River	BLACK PINE LAND LLC	43-13879	Decreed	6/30/1985	IRRIGATION	0.15	137.6
Raft River	BLACK, JAY L	43-2279	Decreed	8/28/1965	IRRIGATION	2.11	206.0
Raft River	BLACK, JAY L	43-7144	Decreed	11/8/1979	IRRIGATION	1.58	398.0
Raft River	BODEN, CARL F; BODEN, LORALEE	43-2431	Decreed	8/11/1955	IRRIGATION	0.40	36.7
Raft River	BRANCH FARMS LLC	43-2308A	Decreed	4/11/1948	IRRIGATION	0.52	1289.0
Raft River	BRANCH FARMS LLC	43-13484	Decreed	9/15/1948	IRRIGATION	1.47	292.4

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	BRANCH FARMS LLC	43-2356B	Decreed	9/8/1950	IRRIGATION	0.02	9.3
Raft River	BRANCH FARMS LLC	43-13768	Decreed	9/8/1950	IRRIGATION	0.51	314.1
Raft River	BRANCH FARMS LLC	43-13853	Decreed	9/8/1950	COMMERCIAL, STOCKWATER	0.02	
Raft River	BRANCH FARMS LLC	43-4022B	Decreed	1/1/1953	IRRIGATION	0.04	9.3
Raft River	BRANCH FARMS LLC	43-13770	Decreed	1/1/1953	IRRIGATION	1.23	314.1
Raft River	BRANCH FARMS LLC	43-13855	Decreed	1/1/1953	COMMERCIAL, STOCKWATER	0.04	
Raft River	BRANCH FARMS LLC	43-2388	Decreed	2/23/1953	IRRIGATION, STOCKWATER	2.20	225.0
Raft River	BRANCH FARMS LLC	43-2393	Decreed	4/29/1953	IRRIGATION	1.78	1289.0
Raft River	BRANCH FARMS LLC	43-4023B	Decreed	4/1/1954	IRRIGATION	0.02	9.3
Raft River	BRANCH FARMS LLC	43-4024D	Decreed	4/1/1954	IRRIGATION	0.01	9.3
Raft River	BRANCH FARMS LLC	43-13771	Decreed	4/1/1954	IRRIGATION	0.63	314.1
Raft River	BRANCH FARMS LLC	43-13772	Decreed	4/1/1954	IRRIGATION	0.40	314.1
Raft River	BRANCH FARMS LLC	43-13856	Decreed	4/1/1954	COMMERCIAL, STOCKWATER	0.02	
Raft River	BRANCH FARMS LLC	43-13857	Decreed	4/1/1954	COMMERCIAL, STOCKWATER	0.01	
Raft River	BRANCH FARMS LLC	43-13488	Decreed	4/5/1954	IRRIGATION	3.13	292.4
Raft River	BRANCH FARMS LLC	43-2422	Decreed	2/15/1955	IRRIGATION	3.10	826.0
Raft River	BRANCH FARMS LLC	43-13123	Decreed	4/4/1955	COMMERCIAL, STOCKWATER	0.18	
Raft River	BRANCH FARMS LLC	43-2441C	Decreed	3/5/1956	IRRIGATION	0.09	9.3
Raft River	BRANCH FARMS LLC	43-13769	Decreed	3/5/1956	IRRIGATION	2.93	314.1
Raft River	BRANCH FARMS LLC	43-13854	Decreed	3/5/1956	COMMERCIAL, STOCKWATER	0.09	
Raft River	BRANCH FARMS LLC	43-4130B	Decreed	3/15/1956	IRRIGATION	0.01	9.3
Raft River	BRANCH FARMS LLC	43-13852	Decreed	3/15/1956	COMMERCIAL, STOCKWATER	0.01	
Raft River	BRANCH FARMS LLC	43-2468	Decreed	12/30/1958	IRRIGATION	1.60	1289.0
Raft River	BRANCH FARMS LLC	43-4238A	Decreed	1/22/1960	DOMESTIC, STOCKWATER	0.28	
Raft River	BRANCH FARMS LLC	43-13486	Decreed	10/26/1960	IRRIGATION	1.25	292.4
Raft River	BRANCH FARMS LLC	43-13125	Decreed	5/15/1961	COMMERCIAL, STOCKWATER	0.13	
Raft River	BRANCH FARMS LLC	43-10238	Decreed	9/1/1961	IRRIGATION	3.20	826.0
Raft River	BRANCH FARMS LLC	43-2553	Decreed	11/29/1962	IRRIGATION	0.93	1289.0
Raft River	BRANCH FARMS LLC	43-10151	Decreed	9/30/1971	DOMESTIC	0.04	
Raft River	BRANCH FARMS LLC	43-10190	Decreed	9/15/1981	DOMESTIC, STOCKWATER	0.24	
Raft River	BRANCH FARMS LLC	43-11249	Decreed	6/30/1985	IRRIGATION	0.19	1289.0
Raft River	BRANCH FARMS LLC	43-12960	Decreed	6/30/1985	IRRIGATION	1.44	826.0
Raft River	BRANCH FARMS LLC	43-12993	Decreed	6/30/1985	IRRIGATION	0.60	225.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2284A	Decreed	3/27/1941	IRRIGATION	2.42	1289.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2304A	Decreed	1/30/1948	IRRIGATION	2.63	1289.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2305	Decreed	1/31/1948	IRRIGATION	2.85	1289.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2361	Decreed	2/24/1951	IRRIGATION, STOCKWATER	3.00	826.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2394A	Decreed	4/17/1953	IRRIGATION	1.85	1289.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-4233	Decreed	4/1/1955	IRRIGATION	1.59	361.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2455A	Decreed	2/8/1957	IRRIGATION	4.61	1289.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2455B	Decreed	2/8/1957	IRRIGATION	0.35	1289.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-13764	Decreed	2/8/1957	STOCKWATER	0.01	
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-13767	Decreed	2/8/1957	STOCKWATER	0.06	
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-4238B	Decreed	1/22/1960	DOMESTIC, STOCKWATER	0.06	
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-10123	Decreed	3/15/1962	IRRIGATION	1.30	361.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-4237	Decreed	3/15/1963	IRRIGATION	1.84	1289.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-2573	Decreed	5/22/1963	IRRIGATION	2.70	361.0
Raft River	BRANCH, LUANN S; BRANCH, NOLAN K	43-12995	Decreed	6/30/1985	IRRIGATION	0.88	826.0
Raft River	BRANCH, NOLAN K	43-2284B	Decreed	3/27/1941	IRRIGATION	0.14	1289.0
Raft River	BRANCH, NOLAN K	43-2304B	Decreed	1/30/1948	IRRIGATION	0.23	1289.0
Raft River	BRANCH, NOLAN K	43-2394B	Decreed	4/17/1953	IRRIGATION	0.10	1289.0
Raft River	C BAR CATTLE CO	43-13900	Decreed	9/27/1954	STOCKWATER	0.38	
Raft River	CARPENTER, ALVIN E	43-7084	License	9/5/1977	IRRIGATION	0.87	59.4
Raft River	CARPENTER, ALVIN E	43-11233	Decreed	6/30/1985	IRRIGATION	1.11	471.6
Raft River	CARPENTER, ALVIN E; CARPENTER, TODD	43-13124	Decreed	4/4/1955	IRRIGATION	2.91	471.6
Raft River	CARPENTER, ALVIN E; CARPENTER, TODD	43-13122	Decreed	5/15/1961	IRRIGATION	3.88	471.6
Raft River	CASSIA JOINT SCHOOL DISTRICT #151	43-13184	Decreed	11/27/1957	IRRIGATION	0.07	12.0
Raft River	CASSIA JOINT SCHOOL DISTRICT #151	43-13186	Decreed	11/30/1957	IRRIGATION	0.12	12.0
Raft River	CHRISTIANSEN, TANA; CHRISTIANSEN, TODD	43-13694	Decreed	2/19/1960	IRRIGATION	0.03	2.0
Raft River	CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	43-13137	Decreed	5/29/1950	IRRIGATION	0.07	4.0
Raft River	CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	43-4160	Decreed	3/1/1951	DOMESTIC, IRRIGATION	0.06	0.9
Raft River	CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	43-4161	Decreed	7/1/1953	IRRIGATION	0.06	1.8
Raft River	CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	43-4164	Decreed	5/1/1954	DOMESTIC, IRRIGATION	0.12	1.0
Raft River	CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	43-7176	Decreed	12/31/1981	HEATING	0.35	
Raft River	CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS	43-7194	Decreed	6/10/1983	DOMESTIC, IRRIGATION	0.11	1.0
Raft River	CLEFT OF THE ROCK FARMS	43-2325	Decreed	10/15/1948	IRRIGATION	1.08	154.0
Raft River	CLEFT OF THE ROCK FARMS	43-13133	Decreed	5/29/1950	IRRIGATION	0.84	672.0
Raft River	CLEFT OF THE ROCK FARMS	43-4060E	Decreed	4/1/1954	IRRIGATION	0.08	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-4060G	Decreed	4/1/1954	IRRIGATION	0.25	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-2417E	Decreed	1/31/1955	IRRIGATION	0.24	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-2418E	Decreed	1/31/1955	IRRIGATION	0.24	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-10642	Decreed	1/31/1955	IRRIGATION	1.46	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-4063E	Decreed	5/1/1955	IRRIGATION	0.21	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-4063G	Decreed	5/1/1955	IRRIGATION	0.64	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-4112	Decreed	3/15/1957	IRRIGATION	1.00	154.0
Raft River	CLEFT OF THE ROCK FARMS	43-4061E	Decreed	5/1/1957	IRRIGATION	0.16	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-4062E	Decreed	5/1/1957	IRRIGATION	0.14	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-4064E	Decreed	5/1/1957	IRRIGATION	0.35	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-10643	Decreed	5/1/1957	IRRIGATION	1.94	512.0
Raft River	CLEFT OF THE ROCK FARMS	43-13131	Decreed	11/27/1957	IRRIGATION	0.63	672.0
Raft River	CLEFT OF THE ROCK FARMS	43-13129	Decreed	11/30/1957	IRRIGATION	1.09	672.0
Raft River	CLEFT OF THE ROCK FARMS	43-13513	Decreed	3/8/1961	IRRIGATION	1.15	130.0

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Raft River	CLEFT OF THE ROCK FARMS	43-13515	Decreed	8/3/1976	IRRIGATION	0.70	130.0
Raft River	CLEFT OF THE ROCK FARMS	43-10645	Decreed	6/30/1985	IRRIGATION	0.18	512.0
Raft River	COLLINS, BERTHA L; COLLINS, STANLEY B	43-13285	Decreed	3/5/1956	IRRIGATION	0.17	8.5
Raft River	COLLINS, STANLEY B	43-4038	Decreed	8/1/1958	COMMERCIAL, DOMESTIC	0.22	
Raft River	COTTLE, ROBERT; COTTLE, SHERYL	43-13421	Decreed	10/1/1947	IRRIGATION	0.06	164.3
Raft River	CROSS E LAND LLC	43-2574D	Decreed	7/20/1963	IRRIGATION, STOCKWATER	16.26	1706.5
Raft River	CROSS E LAND LLC	43-2576D	Decreed	3/24/1964	IRRIGATION	10.56	1706.5
Raft River	CROSS E LAND LLC	43-10597A	Decreed	6/30/1985	IRRIGATION	2.96	1706.5
Raft River	DARRINGTON, GEORGE K	43-2295J	Decreed	3/5/1945	IRRIGATION	0.03	4.2
Raft River	DARRINGTON, GEORGE K	43-13058	Decreed	2/13/1963	IRRIGATION	0.09	4.2
Raft River	DURFEE, BRUCE; DURFEE, KAY H	43-13047	Decreed	9/19/1962	IRRIGATION	2.87	332.0
Raft River	DURFEE, BRUCE; DURFEE, KAY H	43-13049	Decreed	1/4/1963	IRRIGATION	3.98	332.0
Raft River	DURFEE, BRUCE; DURFEE, KAY H	43-13051	Decreed	4/1/1963	IRRIGATION	1.20	332.0
Raft River	DURFEE, BRUCE; DURFEE, KAY H	43-13053	Decreed	3/15/1978	IRRIGATION	0.56	332.0
Raft River	DURFEE, JANIS CLARK; DURFEE, KENT ROOKER	43-13048	Decreed	9/19/1962	IRRIGATION	0.73	85.0
Raft River	DURFEE, JANIS CLARK; DURFEE, KENT ROOKER	43-13050	Decreed	1/4/1963	IRRIGATION	1.02	85.0
Raft River	DURFEE, JANIS CLARK; DURFEE, KENT ROOKER	43-13052	Decreed	4/1/1963	IRRIGATION	0.32	85.0
Raft River	DURFEE, JANIS CLARK; DURFEE, KENT ROOKER	43-13054	Decreed	3/15/1978	IRRIGATION	0.14	85.0
Raft River	DURFEE, KENT ROOKER	43-7140	Decreed	7/27/1979	IRRIGATION	2.00	132.0
Raft River	DURFEE, KENT ROOKER	43-7180	Decreed	7/8/1982	COMMERCIAL, STOCKWATER	0.09	
Raft River	DURFEE, LORIN; DURFEE, TERESA L	43-7109	Decreed	10/17/1977	IRRIGATION, STOCKWATER	1.48	112.9
Raft River	DUSTY FARMS LLC	43-13684	Decreed	7/1/1952	IRRIGATION	0.32	3308.9
Raft River	DUSTY FARMS LLC	43-13685	Decreed	6/1/1954	IRRIGATION	0.43	3308.9
Raft River	DUSTY FARMS LLC	43-2432	Decreed	9/21/1955	IRRIGATION	2.50	266.0
Raft River	DUSTY FARMS LLC	43-2486	Decreed	1/22/1960	IRRIGATION	3.36	542.0
Raft River	DUSTY FARMS LLC	43-13683	Decreed	6/15/1963	IRRIGATION	0.19	3308.9
Raft River	DUSTY FARMS LLC	43-13681	Decreed	7/19/1963	IRRIGATION	2.64	3308.9
Raft River	DUSTY FARMS LLC	43-13682	Decreed	3/24/1964	IRRIGATION	1.76	3308.9
Raft River	DUSTY FARMS LLC	43-10334	Decreed	6/30/1985	IRRIGATION	0.98	542.0
Raft River	DUSTY FARMS LLC	43-10826	Decreed	6/30/1985	IRRIGATION	0.88	266.0
Raft River	EAGLE CREEK NORTHWEST LLC	43-2471	Decreed	7/7/1959	IRRIGATION	6.00	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2472	Decreed	7/7/1959	IRRIGATION	7.00	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2475	Decreed	7/7/1959	IRRIGATION	8.50	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-13603	Decreed	7/7/1959	IRRIGATION	3.86	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-13604	Decreed	7/7/1959	IRRIGATION	1.74	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2488	Decreed	2/11/1960	IRRIGATION	5.60	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2489	Decreed	2/11/1960	IRRIGATION	8.90	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2504	Decreed	10/24/1960	IRRIGATION	6.40	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2505	Decreed	10/24/1960	IRRIGATION	6.40	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-10578	Decreed	12/31/1960	COMMERCIAL, DOMESTIC, STOCKWATER	0.15	
Raft River	EAGLE CREEK NORTHWEST LLC	43-2516	Decreed	3/21/1961	IRRIGATION	0.60	5456.5

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	EAGLE CREEK NORTHWEST LLC	43-2517	Decreed	3/21/1961	IRRIGATION	3.00	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2519	Decreed	3/28/1961	IRRIGATION	4.20	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-4199	Decreed	3/15/1962	IRRIGATION	2.16	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-13577	Decreed	9/4/1963	IRRIGATION	4.08	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-13578	Decreed	9/4/1963	IRRIGATION	0.17	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-2575	Decreed	5/20/1964	IRRIGATION	6.08	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-13351	Decreed	3/10/1975	IRRIGATION	0.39	5456.5
Raft River	EAGLE CREEK NORTHWEST LLC	43-13352	Decreed	3/10/1975	IRRIGATION	0.37	5456.5
Raft River	EAST VALLEY CATTLE LLC	43-2313D	Decreed	6/19/1948	IRRIGATION	0.50	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2317C	Decreed	8/14/1948	IRRIGATION	0.99	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2317E	Decreed	8/14/1948	IRRIGATION	0.87	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2317F	Decreed	8/14/1948	IRRIGATION	0.13	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13490	Decreed	8/14/1948	IRRIGATION	0.47	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13491	Decreed	8/14/1948	COMMERCIAL, STOCKWATER	0.02	
Raft River	EAST VALLEY CATTLE LLC	43-2320A	Decreed	9/10/1948	IRRIGATION	3.42	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2320B	Decreed	9/10/1948	IRRIGATION	0.58	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2321B	Decreed	9/24/1948	IRRIGATION	5.66	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2339C	Decreed	2/27/1950	IRRIGATION	2.39	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2339E	Decreed	2/27/1950	IRRIGATION	2.09	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2339F	Decreed	2/27/1950	IRRIGATION	0.32	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13492	Decreed	2/27/1950	IRRIGATION	1.11	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13493	Decreed	2/27/1950	COMMERCIAL, STOCKWATER	0.06	
Raft River	EAST VALLEY CATTLE LLC	43-13448	Decreed	3/2/1950	IRRIGATION	3.93	967.1
Raft River	EAST VALLEY CATTLE LLC	43-13449	Decreed	3/2/1950	COMMERCIAL, STOCKWATER	0.69	
Raft River	EAST VALLEY CATTLE LLC	43-13494	Decreed	3/2/1950	IRRIGATION	7.59	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13495	Decreed	3/2/1950	COMMERCIAL, STOCKWATER	0.27	
Raft River	EAST VALLEY CATTLE LLC	43-2340	Decreed	3/20/1950	IRRIGATION	1.60	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2343	Decreed	4/28/1950	IRRIGATION	2.89	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2345	Decreed	5/2/1950	IRRIGATION	1.60	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13296	Decreed	5/29/1950	STOCKWATER	0.10	
Raft River	EAST VALLEY CATTLE LLC	43-13301	Decreed	5/29/1950	IRRIGATION	0.34	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2364	Decreed	7/9/1951	IRRIGATION	1.30	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2365	Decreed	7/27/1951	IRRIGATION	1.40	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13496	Decreed	2/20/1952	IRRIGATION	2.62	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13497	Decreed	2/20/1952	COMMERCIAL, STOCKWATER	0.10	
Raft River	EAST VALLEY CATTLE LLC	43-4012B	Decreed	7/1/1952	IRRIGATION, STOCKWATER	3.80	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4014A	Decreed	7/1/1952	DOMESTIC, IRRIGATION, STOCKWATER	0.72	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4015B	Decreed	9/26/1953	IRRIGATION, STOCKWATER	0.60	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4060D	Decreed	4/5/1954	IRRIGATION	0.33	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4012D	Decreed	6/1/1954	IRRIGATION, STOCKWATER	1.40	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4014B	Decreed	6/1/1954	IRRIGATION	0.98	9204.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	EAST VALLEY CATTLE LLC	43-10787	Decreed	1/31/1955	IRRIGATION	1.94	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2423C	Decreed	3/1/1955	IRRIGATION	1.63	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2423E	Decreed	3/1/1955	IRRIGATION	1.43	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2423F	Decreed	3/1/1955	IRRIGATION	0.22	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13498	Decreed	3/1/1955	IRRIGATION	0.77	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13499	Decreed	3/1/1955	COMMERCIAL, STOCKWATER	0.02	
Raft River	EAST VALLEY CATTLE LLC	43-4063D	Decreed	5/1/1955	IRRIGATION	0.85	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13460	Decreed	2/24/1956	IRRIGATION	0.74	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13461	Decreed	2/24/1956	COMMERCIAL, STOCKWATER	0.76	
Raft River	EAST VALLEY CATTLE LLC	43-13807	Decreed	2/24/1956	IRRIGATION	3.62	967.1
Raft River	EAST VALLEY CATTLE LLC	43-13450	Decreed	2/27/1957	IRRIGATION	3.66	967.1
Raft River	EAST VALLEY CATTLE LLC	43-13451	Decreed	2/27/1957	COMMERCIAL, STOCKWATER	0.64	
Raft River	EAST VALLEY CATTLE LLC	43-10795	Decreed	5/1/1957	IRRIGATION	2.58	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13452	Decreed	8/26/1957	IRRIGATION	0.97	967.1
Raft River	EAST VALLEY CATTLE LLC	43-13453	Decreed	8/26/1957	COMMERCIAL, STOCKWATER	0.48	
Raft River	EAST VALLEY CATTLE LLC	43-13763	Decreed	8/26/1957	COMMERCIAL, STOCKWATER	1.75	
Raft River	EAST VALLEY CATTLE LLC	43-13298	Decreed	11/27/1957	STOCKWATER	0.08	
Raft River	EAST VALLEY CATTLE LLC	43-13303	Decreed	11/27/1957	IRRIGATION	0.26	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13304	Decreed	11/27/1957	STOCKWATER	0.01	
Raft River	EAST VALLEY CATTLE LLC	43-13300	Decreed	11/30/1957	STOCKWATER	0.14	
Raft River	EAST VALLEY CATTLE LLC	43-13305	Decreed	11/30/1957	IRRIGATION	0.44	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2467C	Decreed	12/23/1958	IRRIGATION	1.77	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2467E	Decreed	12/23/1958	IRRIGATION	1.54	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2467F	Decreed	12/23/1958	IRRIGATION	0.24	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13500	Decreed	12/23/1958	IRRIGATION	0.82	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13501	Decreed	12/23/1958	COMMERCIAL, STOCKWATER	0.04	
Raft River	EAST VALLEY CATTLE LLC	43-13458	Decreed	1/9/1959	IRRIGATION	1.70	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13459	Decreed	1/9/1959	COMMERCIAL, STOCKWATER	0.30	
Raft River	EAST VALLEY CATTLE LLC	43-13454	Decreed	3/30/1959	IRRIGATION	1.11	967.1
Raft River	EAST VALLEY CATTLE LLC	43-13455	Decreed	3/30/1959	COMMERCIAL, STOCKWATER	0.19	
Raft River	EAST VALLEY CATTLE LLC	43-13504	Decreed	1/12/1961	IRRIGATION	3.03	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13505	Decreed	1/12/1961	COMMERCIAL, STOCKWATER	0.10	
Raft River	EAST VALLEY CATTLE LLC	43-13456	Decreed	4/6/1961	IRRIGATION	4.14	967.1
Raft River	EAST VALLEY CATTLE LLC	43-13457	Decreed	4/6/1961	COMMERCIAL, STOCKWATER	0.72	
Raft River	EAST VALLEY CATTLE LLC	43-2510C	Decreed	6/18/1961	IRRIGATION	1.25	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2510E	Decreed	6/18/1961	IRRIGATION	1.10	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2510F	Decreed	6/18/1961	IRRIGATION	0.17	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13506	Decreed	6/18/1961	IRRIGATION	0.59	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13507	Decreed	6/18/1961	COMMERCIAL, STOCKWATER	0.02	
Raft River	EAST VALLEY CATTLE LLC	43-13510	Decreed	3/15/1962	IRRIGATION	2.04	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13511	Decreed	3/15/1962	COMMERCIAL, STOCKWATER	0.11	

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	EAST VALLEY CATTLE LLC	43-4012C	Decreed	6/1/1963	IRRIGATION, STOCKWATER	1.80	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4013B	Decreed	6/15/1963	IRRIGATION, STOCKWATER	8.55	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4002C	Decreed	7/1/1963	IRRIGATION	1.67	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4002E	Decreed	7/1/1963	IRRIGATION	1.47	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-4002F	Decreed	7/1/1963	IRRIGATION	0.22	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13508	Decreed	7/1/1963	IRRIGATION	0.77	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13509	Decreed	7/1/1963	COMMERCIAL, STOCKWATER	0.04	
Raft River	EAST VALLEY CATTLE LLC	43-2574B	Decreed	7/19/1963	IRRIGATION	9.71	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2574E	Decreed	7/19/1963	IRRIGATION	2.00	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2576B	Decreed	3/24/1964	IRRIGATION	6.47	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-2576E	Decreed	3/24/1964	IRRIGATION	1.14	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13462	Decreed	12/14/1965	IRRIGATION	3.01	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13463	Decreed	12/14/1965	COMMERCIAL, STOCKWATER	0.53	
Raft River	EAST VALLEY CATTLE LLC	43-13502	Decreed	12/14/1965	IRRIGATION	2.53	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13503	Decreed	12/14/1965	COMMERCIAL, STOCKWATER	0.08	
Raft River	EAST VALLEY CATTLE LLC	43-10019	Decreed	6/30/1985	IRRIGATION	3.66	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-10365	Decreed	6/30/1985	IRRIGATION	0.47	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-10366	Decreed	6/30/1985	IRRIGATION	0.14	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-12923	Decreed	6/30/1985	IRRIGATION	0.28	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-12933	Decreed	6/30/1985	IRRIGATION	0.02	9204.0
Raft River	EAST VALLEY CATTLE LLC	43-13405	Decreed	6/30/1985	IRRIGATION	2.83	9204.0
Raft River	EVARD LLC	43-13278	Decreed	6/19/1948	IRRIGATION	1.58	1760.0
Raft River	EVARD LLC	43-13279	Decreed	6/19/1948	IRRIGATION	0.27	1760.0
Raft River	EVARD LLC	43-13276	Decreed	7/15/1948	IRRIGATION	4.63	1760.0
Raft River	EVARD LLC	43-13277	Decreed	7/15/1948	IRRIGATION	0.81	1760.0
Raft River	EVARD LLC	43-13384	Decreed	8/14/1948	IRRIGATION	0.01	3276.9
Raft River	EVARD LLC	43-13386	Decreed	2/27/1950	IRRIGATION	0.02	3276.9
Raft River	EVARD LLC	43-13388	Decreed	3/2/1950	IRRIGATION	0.16	3276.9
Raft River	EVARD LLC	43-13390	Decreed	2/20/1952	IRRIGATION	0.06	3276.9
Raft River	EVARD LLC	43-13392	Decreed	3/1/1955	IRRIGATION	0.02	3276.9
Raft River	EVARD LLC	43-13394	Decreed	12/23/1958	IRRIGATION	0.02	3276.9
Raft River	EVARD LLC	43-13274	Decreed	8/8/1960	IRRIGATION	7.66	1760.0
Raft River	EVARD LLC	43-13275	Decreed	8/8/1960	IRRIGATION	1.34	1760.0
Raft River	EVARD LLC	43-2501	Decreed	8/11/1960	STOCKWATER	0.02	
Raft River	EVARD LLC	43-13398	Decreed	1/12/1961	IRRIGATION	0.07	3276.9
Raft River	EVARD LLC	43-13270	Decreed	6/8/1961	IRRIGATION	0.70	1760.0
Raft River	EVARD LLC	43-13271	Decreed	6/8/1961	IRRIGATION	0.12	1760.0
Raft River	EVARD LLC	43-13400	Decreed	6/18/1961	IRRIGATION	0.01	3276.9
Raft River	EVARD LLC	43-13404	Decreed	3/15/1962	IRRIGATION	0.05	3276.9
Raft River	EVARD LLC	43-13466	Decreed	3/15/1963	IRRIGATION	4.59	3276.9
Raft River	EVARD LLC	43-13272	Decreed	5/3/1963	IRRIGATION	4.04	1760.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	EVARD LLC	43-13273	Decreed	5/3/1963	IRRIGATION	0.70	1760.0
Raft River	EVARD LLC	43-13402	Decreed	7/1/1963	IRRIGATION	0.02	3276.9
Raft River	EVARD LLC	43-13396	Decreed	12/14/1965	IRRIGATION	0.05	3276.9
Raft River	EVARD LLC	43-7015	Decreed	1/15/1971	IRRIGATION	1.74	3276.9
Raft River	EVARD LLC	43-13797	Decreed	7/25/1973	IRRIGATION	2.68	3276.9
Raft River	EVARD LLC	43-13468	Decreed	1/27/1978	IRRIGATION	4.65	3276.9
Raft River	EVARD LLC	43-13406	Decreed	6/30/1985	IRRIGATION	0.12	3276.9
Raft River	FEHLMAN, GRANT A	43-10810B	Decreed	3/5/1956	IRRIGATION	0.91	52.8
Raft River	FEHLMAN, GRANT A	43-13284	Decreed	3/5/1956	IRRIGATION	2.57	128.5
Raft River	FIVE RIVERS CATTLE FEEDING LLC	43-4006	Decreed	4/29/1952	COMMERCIAL, DOMESTIC, INDUSTRIAL, IRRIGATION, STOCKWATER	3.00	1063.0
Raft River	FIVE RIVERS CATTLE FEEDING LLC	43-2437	Decreed	3/5/1956	COMMERCIAL, DOMESTIC, INDUSTRIAL, IRRIGATION, STOCKWATER	5.56	1063.0
Raft River	FIVE RIVERS CATTLE FEEDING LLC	43-2442	Decreed	3/5/1956	COMMERCIAL, DOMESTIC, INDUSTRIAL, IRRIGATION, STOCKWATER	7.21	1063.0
Raft River	FIVE RIVERS CATTLE FEEDING LLC	43-2436A	Decreed	1/4/1957	COMMERCIAL, STOCKWATER	2.02	
Raft River	FIVE RIVERS CATTLE FEEDING LLC	43-2438A	Decreed	1/5/1957	COMMERCIAL, STOCKWATER	2.02	
Raft River	FRASER, BROOKLYN; FRASER, JOSH	43-4105C	Decreed	12/31/1927	IRRIGATION	0.02	0.7
Raft River	FRIDAL, S CHAD	43-4033	Decreed	6/1/1945	COMMERCIAL, DOMESTIC, STOCKWATER	0.06	
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-2287	Decreed	5/29/1942	IRRIGATION, STOCKWATER	0.60	120.0
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-13800	Decreed	4/1/1955	IRRIGATION	0.17	106.0
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-13533	Decreed	3/15/1962	IRRIGATION	1.36	106.0
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-13534	Decreed	3/15/1962	IRRIGATION	1.00	50.0
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-13801	Decreed	3/15/1962	IRRIGATION	0.13	106.0
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-13799	Decreed	5/22/1963	IRRIGATION	0.29	106.0
Raft River	GARDINER, MARIE JEANNE; GARDINER, MATTHEW C	43-10477	Decreed	6/30/1985	IRRIGATION	0.45	120.0
Raft River	GARNER CAPITAL INVESTMENTS LLC	43-13827	Decreed	11/10/1951	IRRIGATION	0.23	895.9
Raft River	GARNER CAPITAL INVESTMENTS LLC	43-13599	Decreed	8/13/1956	IRRIGATION	0.35	895.9
Raft River	GARNER CAPITAL INVESTMENTS LLC	43-13721	Decreed	8/13/1956	IRRIGATION	0.01	895.9
Raft River	GARNER CAPITAL INVESTMENTS LLC	43-13895	Decreed	8/13/1956	IRRIGATION	0.34	895.9
Raft River	GARNER CAPITAL INVESTMENTS LLC	43-13828	Decreed	3/10/1958	IRRIGATION	0.05	895.9
Raft River	GARNER CAPITAL INVESTMENTS LLC	43-13829	Decreed	6/11/1960	IRRIGATION	0.26	895.9
Raft River	GARNER LAND LLC	43-13175	Decreed	5/29/1950	IRRIGATION	0.46	895.9
Raft River	GARNER LAND LLC	43-13643	Decreed	6/30/1953	IRRIGATION	0.68	895.9
Raft River	GARNER LAND LLC	43-13177	Decreed	11/27/1957	IRRIGATION	0.35	895.9
Raft River	GARNER LAND LLC	43-13179	Decreed	11/30/1957	IRRIGATION	0.61	895.9
Raft River	GARNER LAND LLC	43-13641	Decreed	3/18/1960	IRRIGATION	0.03	895.9
Raft River	GARNER LAND LLC	43-2511	Decreed	2/8/1961	IRRIGATION	6.39	895.9
Raft River	GARNER LAND LLC	43-4146	Decreed	6/30/1985	IRRIGATION	1.47	895.9
Raft River	GARNER, MICHAEL D; GARNER, TONI L	43-2429	Decreed	8/5/1955	DOMESTIC, IRRIGATION	1.85	153.0
Raft River	GARNER, MICHAEL D; GARNER, TONI L	43-4206	Decreed	6/30/1985	IRRIGATION	0.64	153.0
Raft River	GOODRICH, EDWARD; GOODRICH, PATSY ANN	43-7094	Decreed	7/22/1977	IRRIGATION	0.10	9.7

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	GOODRICH, EDWARD; GOODRICH, PATSY ANN	43-7099A	Decreed	7/22/1977	IRRIGATION	0.08	9.7
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13540	Decreed	8/26/1953	COMMERCIAL, STOCKWATER	0.07	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13727	Decreed	8/26/1953	MUNICIPAL	0.01	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-2580B	Decreed	7/13/1964	COMMERCIAL, STOCKWATER	0.19	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13206	Decreed	7/13/1964	COMMERCIAL, STOCKWATER	0.09	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13209	Decreed	7/13/1964	COMMERCIAL, STOCKWATER	1.28	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13728	Decreed	7/13/1964	MUNICIPAL	0.01	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13729	Decreed	7/13/1964	MUNICIPAL	0.01	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-13730	Decreed	7/13/1964	MUNICIPAL	0.09	
Raft River	GRUSH, PETER J; GRUSH, SYLVIA T	43-7308	License	1/30/1991	COMMERCIAL, HEATING, RECREATION	0.37	
Raft River	GW FINANCE CO LLC	43-13551	Decreed	9/3/1948	IRRIGATION	3.56	792.8
Raft River	GW FINANCE CO LLC	43-2335	Decreed	4/8/1949	IRRIGATION	1.32	792.8
Raft River	GW FINANCE CO LLC	43-13701	Decreed	4/8/1949	IRRIGATION	2.68	4326.1
Raft River	GW FINANCE CO LLC	43-13792	Decreed	5/29/1950	COMMERCIAL, STOCKWATER	0.36	
Raft River	GW FINANCE CO LLC	43-2370A	Decreed	11/10/1951	IRRIGATION	1.06	125.0
Raft River	GW FINANCE CO LLC	43-13830	Decreed	11/10/1951	IRRIGATION	0.04	4326.1
Raft River	GW FINANCE CO LLC	43-13070	Decreed	5/29/1952	COMMERCIAL, STOCKWATER	0.12	
Raft River	GW FINANCE CO LLC	43-13072	Decreed	5/29/1952	COMMERCIAL, STOCKWATER	0.15	
Raft River	GW FINANCE CO LLC	43-13642	Decreed	6/30/1953	IRRIGATION	4.57	244.0
Raft River	GW FINANCE CO LLC	43-13349	Decreed	12/13/1955	IRRIGATION	2.17	4326.1
Raft River	GW FINANCE CO LLC	43-13350	Decreed	12/13/1955	IRRIGATION	3.19	4326.1
Raft River	GW FINANCE CO LLC	43-2464A	Decreed	3/10/1958	IRRIGATION	0.25	125.0
Raft River	GW FINANCE CO LLC	43-13831	Decreed	3/10/1958	IRRIGATION	0.01	4326.1
Raft River	GW FINANCE CO LLC	43-13640	Decreed	3/18/1960	IRRIGATION	0.18	244.0
Raft River	GW FINANCE CO LLC	43-13776	Decreed	4/26/1960	IRRIGATION	0.03	792.8
Raft River	GW FINANCE CO LLC	43-4081	Decreed	6/11/1960	IRRIGATION	1.19	125.0
Raft River	GW FINANCE CO LLC	43-13832	Decreed	6/11/1960	IRRIGATION	0.05	4326.1
Raft River	GW FINANCE CO LLC	43-13563	Decreed	9/17/1973	IRRIGATION	3.60	792.8
Raft River	GW FINANCE CO LLC	43-13777	Decreed	9/17/1973	IRRIGATION	1.46	792.8
Raft River	GW FINANCE CO LLC	43-13778	Decreed	12/26/1976	IRRIGATION	0.50	792.8
Raft River	GW FINANCE CO LLC	43-13573	Decreed	6/15/1977	IRRIGATION	0.50	792.8
Raft River	GW FINANCE CO LLC	43-13779	Decreed	3/15/1978	IRRIGATION	0.69	792.8
Raft River	GW FINANCE CO LLC	43-7122A	License	6/20/1978	IRRIGATION	1.06	792.8
Raft River	GW FINANCE CO LLC	43-7122B	License	6/20/1978	IRRIGATION	1.66	792.8
Raft River	GW FINANCE CO LLC	43-13700	License	6/20/1978	IRRIGATION	2.15	4326.1
Raft River	GW FINANCE CO LLC	43-13565	Decreed	10/23/1978	IRRIGATION	1.05	792.8
Raft River	GW FINANCE CO LLC	43-7311	License	2/20/1991	IRRIGATION	0.52	792.8
Raft River	H BENCH HOLDINGS LLC	43-2447A	Decreed	7/26/1956	IRRIGATION	5.16	500.0
Raft River	H BENCH HOLDINGS LLC	43-2448A	Decreed	7/26/1956	IRRIGATION	5.10	500.0
Raft River	HAHN, DAVID	43-7132	Decreed	10/23/1978	COMMERCIAL, STOCKWATER	0.30	
Raft River	HARPER VALLEY LAND LLC	43-2309	Decreed	5/1/1948	IRRIGATION	2.30	1609.1

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	HARPER VALLEY LAND LLC	43-2312A	Decreed	6/19/1948	IRRIGATION	5.20	1609.1
Raft River	HARPER VALLEY LAND LLC	43-2313A	Decreed	6/19/1948	IRRIGATION	5.20	1958.0
Raft River	HARPER VALLEY LAND LLC	43-2313C	Decreed	6/19/1948	IRRIGATION	2.70	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13108	Decreed	1/3/1949	IRRIGATION	2.38	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13109	Decreed	1/3/1949	IRRIGATION	0.82	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13358	Decreed	8/7/1950	IRRIGATION	2.19	1958.0
Raft River	HARPER VALLEY LAND LLC	43-2356A	Decreed	9/8/1950	IRRIGATION	1.40	256.4
Raft River	HARPER VALLEY LAND LLC	43-2377A	Decreed	3/30/1952	IRRIGATION	1.25	1958.0
Raft River	HARPER VALLEY LAND LLC	43-2377B	Decreed	3/30/1952	IRRIGATION	0.68	1958.0
Raft River	HARPER VALLEY LAND LLC	43-2382	Decreed	7/5/1952	IRRIGATION	0.52	1958.0
Raft River	HARPER VALLEY LAND LLC	43-2383	Decreed	9/15/1952	IRRIGATION	3.12	1958.0
Raft River	HARPER VALLEY LAND LLC	43-4022A	Decreed	1/1/1953	IRRIGATION	0.83	256.4
Raft River	HARPER VALLEY LAND LLC	43-2385	Decreed	1/20/1953	IRRIGATION	3.20	1609.1
Raft River	HARPER VALLEY LAND LLC	43-2391	Decreed	4/18/1953	IRRIGATION	2.80	1609.1
Raft River	HARPER VALLEY LAND LLC	43-4009	Decreed	5/15/1953	IRRIGATION	2.00	1609.1
Raft River	HARPER VALLEY LAND LLC	43-2398	Decreed	8/25/1953	IRRIGATION	2.30	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13110	Decreed	1/14/1954	IRRIGATION	2.23	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13111	Decreed	1/14/1954	IRRIGATION	0.77	1958.0
Raft River	HARPER VALLEY LAND LLC	43-4023A	Decreed	4/1/1954	IRRIGATION	0.43	256.4
Raft River	HARPER VALLEY LAND LLC	43-4024C	Decreed	4/1/1954	IRRIGATION	0.27	256.4
Raft River	HARPER VALLEY LAND LLC	43-4091	Decreed	4/1/1954	IRRIGATION	2.80	1609.1
Raft River	HARPER VALLEY LAND LLC	43-4092	Decreed	4/1/1954	IRRIGATION	0.23	1609.1
Raft River	HARPER VALLEY LAND LLC	43-4141	Decreed	4/3/1954	IRRIGATION	2.67	1609.1
Raft River	HARPER VALLEY LAND LLC	43-4041	Decreed	5/15/1955	IRRIGATION	2.00	321.0
Raft River	HARPER VALLEY LAND LLC	43-2441B	Decreed	3/5/1956	IRRIGATION	1.99	256.4
Raft River	HARPER VALLEY LAND LLC	43-4040	Decreed	5/15/1956	DOMESTIC, IRRIGATION	2.40	321.0
Raft River	HARPER VALLEY LAND LLC	43-13112	Decreed	10/5/1959	IRRIGATION	2.23	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13113	Decreed	10/5/1959	IRRIGATION	0.77	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13316	Decreed	9/28/1960	IRRIGATION	4.58	1958.0
Raft River	HARPER VALLEY LAND LLC	43-4053	Decreed	4/1/1961	IRRIGATION	0.94	321.0
Raft River	HARPER VALLEY LAND LLC	43-4054	Decreed	4/1/1961	IRRIGATION	0.60	321.0
Raft River	HARPER VALLEY LAND LLC	43-13114	Decreed	3/15/1962	IRRIGATION	0.23	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13115	Decreed	3/15/1962	IRRIGATION	0.08	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13360	Decreed	8/24/1962	IRRIGATION	0.35	1958.0
Raft River	HARPER VALLEY LAND LLC	43-2564	Decreed	6/9/1963	IRRIGATION	2.20	1609.1
Raft River	HARPER VALLEY LAND LLC	43-10037	Decreed	6/30/1985	IRRIGATION	1.55	1609.1
Raft River	HARPER VALLEY LAND LLC	43-10632	Decreed	6/30/1985	IRRIGATION	1.43	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13117	Decreed	6/30/1985	IRRIGATION	0.38	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13356	Decreed	6/30/1985	IRRIGATION	1.12	1958.0
Raft River	HARPER VALLEY LAND LLC	43-13362	Decreed	6/30/1985	IRRIGATION	0.35	1958.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2295E	Decreed	3/5/1945	IRRIGATION	1.60	228.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2295G	Decreed	3/5/1945	IRRIGATION	0.83	120.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2295K	Decreed	3/5/1945	IRRIGATION	0.97	177.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-13098	Decreed	3/5/1945	IRRIGATION	0.97	140.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-13099	Decreed	3/5/1945	IRRIGATION	0.03	2.5
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-4000A	Decreed	4/1/1948	IRRIGATION	1.43	170.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2324A	Decreed	9/30/1948	DOMESTIC, IRRIGATION	0.60	30.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2331B	Decreed	12/29/1948	IRRIGATION	0.28	120.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2324B	Decreed	3/31/1950	DOMESTIC, IRRIGATION	0.77	40.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-13100	Decreed	8/1/1956	IRRIGATION	2.89	140.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-13101	Decreed	8/1/1956	IRRIGATION	0.02	2.5
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2454	Decreed	12/31/1956	IRRIGATION	2.40	177.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-4000B	Decreed	6/1/1958	IRRIGATION	1.97	170.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2527	Decreed	6/6/1961	IRRIGATION, STOCKWATER	1.60	80.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2546	Decreed	4/17/1962	IRRIGATION	1.63	148.0
Raft River	HARPER, ALAN J; HARPER, BEVERLY K	43-2562C	Decreed	4/6/1963	IRRIGATION	1.58	79.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-2295H	Decreed	3/5/1945	IRRIGATION	0.42	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-13757	Decreed	3/5/1945	IRRIGATION	0.14	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-13758	Decreed	4/1/1948	IRRIGATION	0.17	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-2330	Decreed	12/29/1948	IRRIGATION	0.80	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-13143	Decreed	5/29/1950	IRRIGATION	0.24	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-13141	Decreed	11/27/1957	IRRIGATION	0.19	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-13139	Decreed	11/30/1957	IRRIGATION	0.33	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-13759	Decreed	6/1/1958	IRRIGATION	0.23	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-4166	Decreed	3/15/1959	IRRIGATION	0.50	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-2528	Decreed	6/6/1961	IRRIGATION	2.20	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-2562B	Decreed	4/6/1963	IRRIGATION	0.60	412.0
Raft River	HARPER, JASON EARL; HARPER, NATALIE	43-11235	Decreed	6/30/1985	IRRIGATION	1.38	412.0
Raft River	HARRIS AG LLC	43-13174	Decreed	5/29/1950	IRRIGATION	0.35	2000.0
Raft River	HARRIS AG LLC	43-2368	Decreed	10/17/1951	IRRIGATION	2.87	2000.0
Raft River	HARRIS AG LLC	43-13422	Decreed	12/4/1951	IRRIGATION	0.17	8.5
Raft River	HARRIS AG LLC	43-13423	Decreed	12/4/1951	COMMERCIAL, STOCKWATER	0.21	
Raft River	HARRIS AG LLC	43-11218	Decreed	1/5/1957	IRRIGATION	3.98	2000.0
Raft River	HARRIS AG LLC	43-13185	Decreed	11/27/1957	IRRIGATION	0.27	2000.0
Raft River	HARRIS AG LLC	43-13187	Decreed	11/30/1957	IRRIGATION	0.46	2000.0
Raft River	HARRIS AG LLC	43-4028A	Decreed	4/1/1960	IRRIGATION	3.42	2000.0
Raft River	HARRIS AG LLC	43-10811	Decreed	4/1/1962	IRRIGATION	3.32	2000.0
Raft River	HARRIS AG LLC	43-10812	Decreed	4/1/1963	IRRIGATION	5.30	2000.0
Raft River	HARRIS AG LLC	43-10490	Decreed	6/30/1985	IRRIGATION	2.42	2000.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13901	Decreed	5/29/1950	IRRIGATION	0.20	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13904	Decreed	10/17/1951	IRRIGATION	1.66	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13906	Decreed	1/5/1957	IRRIGATION	2.31	1160.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13902	Decreed	11/27/1957	IRRIGATION	0.16	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13903	Decreed	11/30/1957	IRRIGATION	0.27	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13908	Decreed	4/1/1960	IRRIGATION	1.98	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13905	Decreed	4/1/1962	IRRIGATION	1.93	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13907	Decreed	4/1/1963	IRRIGATION	3.08	1160.0
Raft River	HARRIS, JACKIE; HARRIS, KURT M	43-13909	Decreed	6/30/1985	IRRIGATION	1.40	1160.0
Raft River	HAWKER, RYAN K	43-7107	Decreed	9/8/1977	IRRIGATION	0.08	8.3
Raft River	HEATON FAMILY LTD PARTNERSHIP	43-13321	Decreed	3/30/1960	IRRIGATION	1.13	109.0
Raft River	HEATON FAMILY LTD PARTNERSHIP	43-13353	Decreed	6/30/1985	IRRIGATION	0.33	109.0
Raft River	HEATON FAMILY LTD PARTNERSHIP	43-13355	Decreed	6/30/1985	IRRIGATION	0.18	109.0
Raft River	HENSON, JACKIE; HENSON, LARRY	43-13743		3/2/2015	RECREATION	0.23	
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-2362	Decreed	2/24/1951	IRRIGATION, STOCKWATER	1.89	97.0
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-13237	Decreed	1/28/1960	IRRIGATION	3.21	249.0
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-13238	Decreed	1/28/1960	IRRIGATION	0.09	249.0
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-13239	Decreed	9/17/1962	DOMESTIC, IRRIGATION	0.46	249.0
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-13240	Decreed	9/17/1962	IRRIGATION	0.01	249.0
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-13241	Decreed	6/30/1985	IRRIGATION	0.96	249.0
Raft River	HICKEN, DORRIS M; HICKEN, ROGER W	43-13242	Decreed	6/30/1985	IRRIGATION	0.03	249.0
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13889	Decreed	9/8/1950	IRRIGATION	0.99	628.6
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13891	Decreed	1/1/1953	IRRIGATION	2.42	628.6
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13892	Decreed	4/1/1954	IRRIGATION	0.79	628.6
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13893	Decreed	4/1/1954	IRRIGATION	1.22	628.6
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13890	Decreed	3/5/1956	IRRIGATION	5.76	628.6
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13773	Decreed	3/15/1956	IRRIGATION	0.17	628.6
Raft River	HIGLEY LAND INVESTMENTS LLC	43-13894	Decreed	3/15/1956	IRRIGATION	0.31	628.6
Raft River	HIGLEY, DAWN; HIGLEY, HEATH	43-2326	Decreed	9/30/1948	IRRIGATION	1.76	195.0
Raft River	HIGLEY, DAWN; HIGLEY, HEATH	43-13041	Decreed	2/19/1960	IRRIGATION	1.91	149.0
Raft River	HIGLEY, DAWN; HIGLEY, HEATH	43-13693	Decreed	2/19/1960	IRRIGATION	0.61	149.0
Raft River	HIGLEY, DAWN; HIGLEY, HEATH	43-2541	Decreed	11/2/1961	IRRIGATION	2.02	195.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13805	Decreed	4/1/1927	IRRIGATION	0.09	4.7
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-2308B	Decreed	4/11/1948	IRRIGATION	0.59	103.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13738	Decreed	4/11/1948	IRRIGATION	0.29	120.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-2310	Decreed	5/10/1948	IRRIGATION	1.92	340.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13785	Decreed	5/10/1948	IRRIGATION	0.40	20.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-2355	Decreed	8/7/1950	IRRIGATION	1.42	340.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-2354A	Decreed	9/17/1954	IRRIGATION	0.15	120.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-2277	Decreed	8/13/1958	IRRIGATION	0.36	33.5
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13746	Decreed	8/13/1958	IRRIGATION	0.23	120.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13784	Decreed	8/13/1958	IRRIGATION	0.21	120.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-2530A	Decreed	7/11/1961	IRRIGATION	3.06	340.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13287	Decreed	7/5/1963	IRRIGATION	0.45	120.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13289	Decreed	7/5/1963	IRRIGATION	0.22	120.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-10237	Decreed	6/30/1985	IRRIGATION	0.10	340.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-10827	Decreed	6/30/1985	IRRIGATION	0.31	103.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13291	Decreed	6/30/1985	IRRIGATION	0.06	120.0
Raft River	HIGLEY, HANK T; HIGLEY, LACEY G	43-13739	Decreed	6/30/1985	IRRIGATION	0.16	120.0
Raft River	HOBSON, BRENT; HOBSON, TERRY	43-4175	Decreed	1/1/1896	COMMERCIAL, DOMESTIC, IRRIGATION	0.07	4.6
Raft River	HOBSON, BRENT; HOBSON, TERRY	43-4177B	Decreed	1/1/1946	COMMERCIAL	0.06	
Raft River	HOLMGREN LAND & LIVESTOCK	43-10534	Decreed	5/29/1961	IRRIGATION	2.42	194.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-2447B	Decreed	7/26/1956	IRRIGATION	1.12	944.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-2448B	Decreed	7/26/1956	IRRIGATION	1.11	944.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-2449	Decreed	7/26/1956	IRRIGATION, STOCKWATER	6.40	944.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-2451	Decreed	7/26/1956	IRRIGATION	6.40	944.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-2450D	Decreed	10/14/1956	IRRIGATION	1.52	944.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-10539	Decreed	6/30/1985	IRRIGATION	0.67	944.0
Raft River	HOLTMAN, BROOK E; HOLTMAN, STACY M	43-10541	Decreed	6/30/1985	IRRIGATION	0.34	944.0
Raft River	HOPKINS DECLO FARMS LLC	43-13600	Decreed	8/13/1956	COMMERCIAL, STOCKWATER	0.34	
Raft River	HOPKINS DECLO FARMS LLC	43-13651	Decreed	8/13/1956	IRRIGATION	0.29	16.0
Raft River	HOPKINS FINANCIAL SERVICES INC	43-13722	Decreed	8/13/1956	IRRIGATION	0.05	3.0
Raft River	ID DEPT OF TRANSPORTATION	43-13697	Decreed	9/27/1954	IRRIGATION	1.98	99.0
Raft River	ID DEPT OF TRANSPORTATION	43-13698	Decreed	9/27/1954	DOMESTIC, IRRIGATION	0.20	27.5
Raft River	ID DEPT OF TRANSPORTATION	43-13163	Decreed	3/16/1963	IRRIGATION	0.52	44.8
Raft River	IDA GOLD FARMS GENERAL PARTNERSHIP	43-13714	Decreed	10/24/1961	IRRIGATION	0.16	12.7
Raft River	IDA GOLD FARMS GENERAL PARTNERSHIP	43-13717	Decreed	6/30/1985	IRRIGATION	0.01	12.7
Raft River	IDA GOLD FARMS LLC	43-2540B	Decreed	10/24/1961	COMMERCIAL, STOCKWATER	0.19	
Raft River	IDA GOLD FARMS LLC	43-13005	Decreed	10/24/1961	COMMERCIAL, STOCKWATER	0.28	
Raft River	J E TRACY INC	43-2532D	Decreed	6/15/1961	IRRIGATION, STOCKWATER	0.08	287.0
Raft River	J E TRACY INC	43-2532E	Decreed	6/15/1961	IRRIGATION, STOCKWATER	3.40	167.0
Raft River	J R SIMPLOT CO	43-2329	Decreed	12/28/1948	IRRIGATION	3.20	280.0
Raft River	J R SIMPLOT CO	43-2378	Decreed	3/22/1952	IRRIGATION	2.40	1411.0
Raft River	J R SIMPLOT CO	43-2483	Decreed	12/23/1959	IRRIGATION	4.74	236.0
Raft River	J R SIMPLOT CO	43-2484	Decreed	12/23/1959	IRRIGATION	6.40	1411.0
Raft River	J R SIMPLOT CO	43-2485	Decreed	12/23/1959	IRRIGATION	4.30	280.0
Raft River	J R SIMPLOT CO	43-2522	Decreed	5/1/1961	IRRIGATION	2.99	1411.0
Raft River	J R SIMPLOT CO	43-10426	Decreed	3/15/1962	IRRIGATION	2.36	1411.0
Raft River	J R SIMPLOT CO	43-2547	Decreed	4/25/1962	IRRIGATION	4.00	1411.0
Raft River	J R SIMPLOT CO	43-2548	Decreed	4/25/1962	IRRIGATION	3.03	1411.0
Raft River	J7 LLC	43-2282	Decreed	4/28/1941	IRRIGATION	0.78	862.0
Raft River	J7 LLC	43-2395	Decreed	6/1/1953	IRRIGATION, STOCKWATER	2.51	862.0
Raft River	J7 LLC	43-4109	Decreed	8/1/1954	IRRIGATION	1.73	862.0
Raft River	J7 LLC	43-2416	Decreed	1/21/1955	IRRIGATION	1.38	862.0
Raft River	J7 LLC	43-4111	Decreed	8/1/1958	IRRIGATION	1.11	862.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	J7 LLC	43-2298E	Decreed	2/23/1959	IRRIGATION	2.59	862.0
Raft River	J7 LLC	43-10500	Decreed	6/30/1985	IRRIGATION	0.94	862.0
Raft River	J7 LLC	43-11200	Decreed	6/30/1985	IRRIGATION	0.80	862.0
Raft River	JAFEK, DOLLY; JAFEK, KENNETH	43-4086	Decreed	8/31/1976	STOCKWATER	0.06	
Raft River	JCK FARMS LLC	43-13286	Decreed	7/5/1963	IRRIGATION	2.75	394.5
Raft River	JCK FARMS LLC	43-13288	Decreed	7/5/1963	IRRIGATION	3.68	394.5
Raft River	JCK FARMS LLC	43-13290	Decreed	6/30/1985	IRRIGATION	1.04	394.5
Raft River	JONES & WIDERBURG FARMS	43-13644	Decreed	10/1/1964	IRRIGATION	4.32	1093.0
Raft River	JONES & WIDERBURG FARMS	43-13645	Decreed	10/1/1964	IRRIGATION	4.16	2744.0
Raft River	JONES & WIDERBURG FARMS	43-7040	Decreed	12/29/1972	IRRIGATION	4.12	2744.0
Raft River	JONES & WIDERBURG FARMS	43-13646	Decreed	9/17/1973	IRRIGATION	0.51	1093.0
Raft River	JONES & WIDERBURG FARMS	43-13647	Decreed	9/17/1973	IRRIGATION	0.49	2744.0
Raft River	JONES & WIDERBURG FARMS	43-13648	Decreed	9/17/1973	IRRIGATION	5.81	1093.0
Raft River	JONES & WIDERBURG FARMS	43-13649	Decreed	9/17/1973	IRRIGATION	5.59	2744.0
Raft River	JONES & WIDERBURG FARMS	43-7062	Decreed	4/9/1976	IRRIGATION	5.51	2744.0
Raft River	JONES & WIDERBURG FARMS	43-13056	Decreed	3/15/1987	IRRIGATION	1.54	2744.0
Raft River	JONES, BETH R; JONES, HAROLD A	43-2550B	Decreed	8/2/1962	DOMESTIC, IRRIGATION	0.20	9.5
Raft River	JONES, DAVID BRENT; JONES, GLEN W	43-2463	Decreed	9/6/1957	IRRIGATION	2.16	151.0
Raft River	JONES, DAVID BRENT; JONES, GLEN W	43-2477	Decreed	8/19/1959	IRRIGATION	2.17	170.0
Raft River	JONES, DAVID BRENT; JONES, GLEN W	43-10167	Decreed	4/1/1976	IRRIGATION	0.62	170.0
Raft River	JONES, DAVID BRENT; JONES, GLEN W	43-10168	Decreed	4/1/1976	IRRIGATION	0.60	151.0
Raft River	JONES, DIANE D; JONES, J MAX	43-13357	Decreed	8/7/1950	IRRIGATION	0.71	75.0
Raft River	JONES, DIANE D; JONES, J MAX	43-13359	Decreed	8/24/1962	IRRIGATION	0.12	75.0
Raft River	JONES, DIANE D; JONES, J MAX	43-13361	Decreed	6/30/1985	IRRIGATION	0.13	75.0
Raft River	JONES, GLENN L; JONES, HAZEL R; JONES, LORIN G	43-2334	Decreed	2/18/1949	IRRIGATION	1.60	211.0
Raft River	JONES, GLENN L; JONES, HAZEL R; JONES, LORIN G	43-2333	Decreed	2/22/1951	IRRIGATION	1.16	211.0
Raft River	JONES, GLENN L; JONES, HAZEL R; JONES, LORIN G	43-2415A	Decreed	1/20/1955	IRRIGATION	0.44	211.0
Raft River	JONES, GLENN L; JONES, HAZEL R; JONES, LORIN G	43-2415B	Decreed	1/20/1955	IRRIGATION	1.40	211.0
Raft River	JONES, WILLIAM D; WILLIAM D JONES & SONS	43-2479	Decreed	10/12/1959	IRRIGATION	2.24	319.0
Raft River	KELLEY, BILL; KELLEY, VIRGINIA	43-2529	Decreed	6/9/1961	IRRIGATION	1.21	225.9
Raft River	KELLEY, BILL; KELLEY, VIRGINIA	43-10504	Decreed	4/1/1968	IRRIGATION	0.62	225.9
Raft River	KELLEY, BILL; KELLEY, VIRGINIA	43-7091	License	7/22/1977	IRRIGATION, STOCKWATER	0.84	41.0
Raft River	KNUDSEN, COLEBEE; KNUDSEN, MONICA	43-2487A	Decreed	11/30/1960	IRRIGATION	1.50	118.0
Raft River	KNUDSEN, COLEBEE; KNUDSEN, MONICA	43-10427	Decreed	6/30/1985	IRRIGATION	0.39	118.0
Raft River	L HANGIN C LAND LLC	43-13378	Decreed	4/1/1960	IRRIGATION	5.83	300.0
Raft River	L HANGIN C LAND LLC	43-13380	Decreed	3/4/1963	IRRIGATION	4.17	300.0
Raft River	LAKESHORE FARMS 2 LLC	43-13516	Decreed	9/11/1961	IRRIGATION	3.13	599.7
Raft River	LAKESHORE FARMS 2 LLC	43-13517	Decreed	9/11/1961	COMMERCIAL, STOCKWATER	0.09	
Raft River	LEON R WALKER FAMILY TRUST; V & R FARMS LLC	43-2359	Decreed	12/1/1950	IRRIGATION	2.90	546.0
Raft River	LEON R WALKER FAMILY TRUST; V & R FARMS LLC	43-2460	Decreed	7/31/1957	IRRIGATION	2.76	546.0
Raft River	LEON R WALKER FAMILY TRUST; V & R FARMS LLC	43-4010	Decreed	7/11/1962	IRRIGATION	2.34	546.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	LEON R WALKER FAMILY TRUST; V & R FARMS LLC	43-7054	Decreed	1/27/1975	IRRIGATION	2.00	546.0
Raft River	LLOYD, ARLO P; LLOYD, BONITA T	43-2532F	Decreed	6/15/1961	IRRIGATION	1.04	52.0
Raft River	LOOCK, ERIC; LOOCK, HAILEY G	43-13037	Decreed	7/30/1935	IRRIGATION, STOCKWATER	0.40	33.0
Raft River	LOUGHMILLER INC	43-13810	Decreed	8/6/1959	IRRIGATION, STOCKWATER	1.02	335.0
Raft River	LOUGHMILLER INC	43-7112	Decreed	12/29/1977	IRRIGATION	1.00	335.0
Raft River	LOUGHMILLER INC	43-13811	Decreed	4/1/1982	IRRIGATION	0.68	335.0
Raft River	MALDONADO, ANGELICA; MALDONADO, GASPAR	43-13782	Decreed	5/10/1956	IRRIGATION	0.04	2.0
Raft River	MC FARLAND, JANET; MC FARLAND, KENNETH A	43-4047	Decreed	9/28/1948	IRRIGATION	4.00	218.0
Raft River	MC FARLAND, JANET; MC FARLAND, KENNETH A	43-4078	Decreed	6/1/1950	IRRIGATION	0.36	218.0
Raft River	MIDWAY DAIRY LLC	43-2366B	Decreed	8/15/1951	COMMERCIAL, STOCKWATER	0.77	
Raft River	MIDWAY DAIRY LLC	43-13672	Decreed	8/15/1951	IRRIGATION	0.29	4038.2
Raft River	MIDWAY DAIRY LLC	43-2375B	Decreed	3/6/1952	COMMERCIAL, DOMESTIC, IRRIGATION, STOCKWATER	1.35	2.0
Raft River	MIDWAY DAIRY LLC	43-13674	Decreed	3/6/1952	IRRIGATION	0.51	4038.2
Raft River	MIDWAY DAIRY LLC	43-2555B	Decreed	10/30/1962	COMMERCIAL, STOCKWATER	0.98	
Raft River	MIDWAY DAIRY LLC	43-13676	Decreed	10/30/1962	IRRIGATION	0.37	4038.2
Raft River	MONTGOMERY, GUY YALE	43-13687	Decreed	5/20/1960	IRRIGATION	1.44	74.0
Raft River	MONTOYA, ALBERTA; MONTOYA, AMPELIO	43-4105B	Decreed	4/1/1927	IRRIGATION	0.09	4.6
Raft River	MOUNTAIN MEADOW DISTRIBUTING LLC	43-10655	Decreed	1/1/1935	AESTHETIC STORAGE, AESTHETIC, RECREATION STORAGE, RECREATION, WILDLIFE STORAGE, WILDLIFE	0.21	
Raft River	MOUNTAIN MEADOW DISTRIBUTING LLC	43-7318	License	5/5/1992	DOMESTIC, HEATING, RECREATION	0.08	
Raft River	NATURE RIDGE HOLDINGS LLC	43-13741	Decreed	7/25/1973	COMMERCIAL, IRRIGATION, STOCKWATER	14.34	1161.4
Raft River	NEWCOMB, LONNA; NEWCOMB, MARK T	43-7002	Decreed	12/21/1969	IRRIGATION	5.44	272.0
Raft River	NEWMAN, JOSEPH J	43-10219	Decreed	6/30/1985	IRRIGATION	1.33	415.5
Raft River	NEWMAN, JOSEPH J; NEWMAN, URSULA J	43-2499	Decreed	8/12/1960	IRRIGATION	4.45	415.5
Raft River	NORTHWEST FARM CREDIT SERVICES FLCA; NORTHWEST FARM CREDIT SERVICES PCA; RED ROCK FARMS LLC; WARM SPRINGS DAIRY LLC	43-13723	License	4/17/2014	HEATING	0.37	
Raft River	OK RENTALS IDAHO LLC	43-2412	Decreed	8/30/1965	IRRIGATION	4.90	331.0
Raft River	OMAN, GUS E; OMAN, RANAE U	43-2392	Decreed	4/22/1953	IRRIGATION	2.20	110.0
Raft River	PARKE, KARLA A; PARKE, ROBERT	43-2428	Decreed	8/5/1955	IRRIGATION	2.00	110.0
Raft River	PARKE, KARLA A; PARKE, ROBERT	43-2550A	Decreed	8/2/1962	IRRIGATION	2.70	244.0
Raft River	PARKE, KARLA A; PARKE, ROBERT	43-11237	Decreed	6/30/1985	IRRIGATION	0.53	244.0
Raft River	PARKE, ROBERT	43-2566	Decreed	6/4/1963	IRRIGATION	0.76	38.0
Raft River	PKD PROPERTIES LC; TLD PROPERTIES LLC	43-2518	Decreed	3/23/1961	IRRIGATION	10.00	1029.0
Raft River	PKD PROPERTIES LC; TLD PROPERTIES LLC	43-10843	Decreed	6/30/1985	IRRIGATION	0.34	1029.0
Raft River	R O JONES & SONS INC	43-2537	Decreed	9/20/1961	IRRIGATION	2.60	318.0
Raft River	RAFT RIVER LAND & LIVESTOCK LLC	43-2342	Decreed	4/24/1950	IRRIGATION	6.10	552.0
Raft River	RAFT RIVER LAND & LIVESTOCK LLC	43-13269	Decreed	12/9/1960	IRRIGATION	0.56	552.0
Raft River	RAFT RIVER LAND & LIVESTOCK LLC	43-2543	Decreed	2/7/1962	IRRIGATION	3.65	552.0
Raft River	RAFT RIVER LAND & LIVESTOCK LLC	43-13023	Decreed	6/30/1985	IRRIGATION	0.29	552.0
Raft River	RAFT RIVER RURAL ELECTRIC COOP INC	43-7323	License	5/5/1997	COOLING, HEATING	0.04	

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2346C	Decreed	3/2/1950	IRRIGATION	2.78	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2346D	Decreed	3/2/1950	IRRIGATION	2.50	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2351	Decreed	6/14/1950	IRRIGATION	2.90	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2349	Decreed	6/21/1950	IRRIGATION	5.12	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2350	Decreed	6/21/1950	IRRIGATION	1.69	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-4014C	Decreed	7/1/1952	IRRIGATION	0.66	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-4014E	Decreed	6/1/1954	IRRIGATION	0.89	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2346H	Decreed	12/26/1958	IRRIGATION	5.57	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2346J	Decreed	12/26/1958	IRRIGATION	2.78	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2346K	Decreed	12/26/1958	IRRIGATION	2.73	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2506	Decreed	11/30/1960	IRRIGATION	3.56	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-13268	Decreed	12/9/1960	IRRIGATION	2.56	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-4013A	Decreed	6/15/1963	IRRIGATION	0.39	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2574C	Decreed	7/19/1963	IRRIGATION	5.39	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-2576C	Decreed	3/24/1964	IRRIGATION	3.60	3308.9
Raft River	RAFT RIVER VALLEY FARMS LLC	43-10478	Decreed	6/30/1985	IRRIGATION	3.80	3308.9
Raft River	RALPH PEAK FAMILY TRUST	43-10036A	Decreed	9/1/1949	IRRIGATION	0.04	2.0
Raft River	RED ROCK FARMS LLC	43-4119	Decreed	4/1/1921	IRRIGATION	2.00	2013.0
Raft River	RED ROCK FARMS LLC	43-4122	Decreed	4/1/1933	IRRIGATION	2.00	2013.0
Raft River	RED ROCK FARMS LLC	43-2281	Decreed	8/7/1940	IRRIGATION	1.60	2013.0
Raft River	RED ROCK FARMS LLC	43-13858	Decreed	3/27/1941	IRRIGATION	0.06	2013.0
Raft River	RED ROCK FARMS LLC	43-4120	Decreed	4/1/1941	IRRIGATION	1.33	2013.0
Raft River	RED ROCK FARMS LLC	43-2296B	Decreed	3/5/1945	IRRIGATION	1.95	2086.4
Raft River	RED ROCK FARMS LLC	43-2306A	Decreed	3/15/1946	IRRIGATION	0.80	2013.0
Raft River	RED ROCK FARMS LLC	43-10636	Decreed	4/1/1946	IRRIGATION	0.80	2013.0
Raft River	RED ROCK FARMS LLC	43-2300A	Decreed	2/24/1947	IRRIGATION	1.82	2013.0
Raft River	RED ROCK FARMS LLC	43-4121	Decreed	4/1/1947	IRRIGATION	0.80	2013.0
Raft River	RED ROCK FARMS LLC	43-13859	Decreed	1/30/1948	IRRIGATION	0.14	2013.0
Raft River	RED ROCK FARMS LLC	43-13860	Decreed	1/31/1948	IRRIGATION	0.15	2013.0
Raft River	RED ROCK FARMS LLC	43-2322	Decreed	9/15/1948	IRRIGATION	1.58	2013.0
Raft River	RED ROCK FARMS LLC	43-2337	Decreed	8/12/1949	IRRIGATION	2.40	2013.0
Raft River	RED ROCK FARMS LLC	43-2367	Decreed	10/23/1951	IRRIGATION	2.18	2086.4
Raft River	RED ROCK FARMS LLC	43-12966	Decreed	12/4/1951	IRRIGATION	3.42	2086.4
Raft River	RED ROCK FARMS LLC	43-2373	Decreed	1/12/1952	IRRIGATION	3.82	2013.0
Raft River	RED ROCK FARMS LLC	43-13863	Decreed	4/17/1953	IRRIGATION	0.05	2013.0
Raft River	RED ROCK FARMS LLC	43-13605	Decreed	8/26/1953	IRRIGATION	7.02	525.5
Raft River	RED ROCK FARMS LLC	43-13606	Decreed	8/26/1953	IRRIGATION	0.50	2086.4
Raft River	RED ROCK FARMS LLC	43-13780	Decreed	3/15/1954	IRRIGATION, STOCKWATER	0.55	2086.4
Raft River	RED ROCK FARMS LLC	43-2409A	Decreed	4/23/1954	IRRIGATION	3.20	2086.4
Raft River	RED ROCK FARMS LLC	43-2414	Decreed	12/8/1954	IRRIGATION	3.10	2086.4
Raft River	RED ROCK FARMS LLC	43-4209	Decreed	3/15/1955	IRRIGATION	3.20	2013.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	RED ROCK FARMS LLC	43-4211	Decreed	3/15/1955	IRRIGATION	1.34	2013.0
Raft River	RED ROCK FARMS LLC	43-2424	Decreed	4/4/1955	IRRIGATION	1.81	2013.0
Raft River	RED ROCK FARMS LLC	43-13781	Decreed	3/15/1956	IRRIGATION, STOCKWATER	6.44	2086.4
Raft River	RED ROCK FARMS LLC	43-2444	Decreed	5/10/1956	IRRIGATION	2.21	2086.4
Raft River	RED ROCK FARMS LLC	43-13783	Decreed	5/10/1956	IRRIGATION	0.94	525.5
Raft River	RED ROCK FARMS LLC	43-13798	Decreed	5/10/1956	IRRIGATION	1.73	525.5
Raft River	RED ROCK FARMS LLC	43-13774	Decreed	7/26/1956	IRRIGATION	0.12	525.5
Raft River	RED ROCK FARMS LLC	43-13775	Decreed	7/26/1956	IRRIGATION	0.11	525.5
Raft River	RED ROCK FARMS LLC	43-13861	Decreed	2/8/1957	IRRIGATION	0.09	2013.0
Raft River	RED ROCK FARMS LLC	43-2456	Decreed	2/18/1957	IRRIGATION	1.60	2086.4
Raft River	RED ROCK FARMS LLC	43-4005	Decreed	4/1/1957	IRRIGATION	2.05	2086.4
Raft River	RED ROCK FARMS LLC	43-13379	Decreed	4/1/1960	IRRIGATION	1.17	2086.4
Raft River	RED ROCK FARMS LLC	43-13381	Decreed	3/4/1963	IRRIGATION	0.83	2086.4
Raft River	RED ROCK FARMS LLC	43-13862	Decreed	3/15/1963	IRRIGATION	0.16	2013.0
Raft River	RED ROCK FARMS LLC	43-13207	Decreed	7/13/1964	IRRIGATION	0.30	2086.4
Raft River	RED ROCK FARMS LLC	43-13208	Decreed	7/13/1964	IRRIGATION	3.51	2086.4
Raft River	RED ROCK FARMS LLC	43-4169	Decreed	6/30/1985	IRRIGATION	1.04	2013.0
Raft River	RED ROCK FARMS LLC	43-10605	Decreed	6/30/1985	IRRIGATION	0.43	2086.4
Raft River	RED ROCK FARMS LLC	43-13543	Decreed	6/30/1985	IRRIGATION	1.71	525.5
Raft River	RED ROCK FARMS LLC	43-13544	Decreed	6/30/1985	IRRIGATION	0.12	2086.4
Raft River	ROSCOE & JOYCE WARD FAMILY TRUST	43-2411	Decreed	8/11/1954	IRRIGATION	5.68	390.0
Raft River	ROSCOE & JOYCE WARD FAMILY TRUST	43-4181	Decreed	3/15/1956	IRRIGATION	2.07	390.0
Raft River	ROUND MOUNTAIN RANCH	43-2401	Decreed	11/30/1953	IRRIGATION	1.74	370.0
Raft River	SCHORZMAN RANCH INC	43-13416	Decreed	10/14/1956	IRRIGATION	2.08	469.0
Raft River	SCHORZMAN RANCH INC	43-13417	Decreed	10/14/1956	IRRIGATION	1.64	232.0
Raft River	SCHORZMAN RANCH INC	43-2470	Decreed	5/11/1959	IRRIGATION	2.08	232.0
Raft River	SCHORZMAN RANCH INC	43-2533	Decreed	8/4/1961	IRRIGATION	1.84	469.0
Raft River	SCHWINN, LYNETTE; TRACY, TRUDY	43-4239	Decreed	9/27/1954	STOCKWATER	0.13	
Raft River	SEARS, JADE O; SEARS, MALIESA B	43-2562A	Decreed	4/6/1963	IRRIGATION	0.16	8.0
Raft River	SEARS, JAXSON L; SEARS, KAYCI A	43-10152	Decreed	1/1/1913	DOMESTIC, IRRIGATION, STOCKWATER	0.06	1.5
Raft River	SHERIDAN, CORDELL J; SHERIDAN, PATRICIA HARPER	43-7085	Decreed	7/22/1977	IRRIGATION	1.09	79.0
Raft River	SMITH FAMILY LAND & LIVESTOCK LLC	43-13655	Decreed	9/21/1961	STOCKWATER	0.13	
Raft River	SMITH, LUKE R; SMITH, VIRGINIA K	43-10191	Decreed	6/20/1960	DOMESTIC, STOCKWATER	0.13	
Raft River	SMITH, RYAN W	43-13485	Decreed	9/15/1948	IRRIGATION	0.03	6.6
Raft River	SMITH, RYAN W	43-13489	Decreed	4/5/1954	IRRIGATION	0.07	6.6
Raft River	SMITH, RYAN W	43-13487	Decreed	10/26/1960	IRRIGATION	0.03	6.6
Raft River	SOUTHERN, SHERRY	43-4235C	Decreed	1/1/1924	DOMESTIC, STOCKWATER	0.31	
Raft River	SPENCER BROTHERS	43-4089	Decreed	4/1/1948	IRRIGATION	2.60	318.2
Raft River	SPENCER BROTHERS	43-4090	Decreed	4/1/1958	IRRIGATION	2.28	318.2
Raft River	SPENCER BROTHERS	43-2556	Decreed	11/2/1962	IRRIGATION	2.50	318.2
Raft River	SPENCER BROTHERS	43-7130	Decreed	10/6/1978	IRRIGATION	0.16	318.2

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	SPENCER, DALLAN; SPENCER, JENNIFER	43-12974	Decreed	10/31/1926	IRRIGATION	0.11	5.0
Raft River	SPENCER, DALLAN; SPENCER, JENNIFER	43-12975	Decreed	10/31/1926	IRRIGATION	0.33	16.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-4060A	Decreed	4/1/1954	IRRIGATION	0.17	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-10282	Decreed	1/31/1955	IRRIGATION	0.96	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-4063A	Decreed	5/1/1955	IRRIGATION	0.42	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-12937	Decreed	8/13/1956	IRRIGATION	1.39	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-10283	Decreed	5/1/1957	IRRIGATION	1.30	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-13317	Decreed	9/28/1960	IRRIGATION	0.80	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-2512C	Decreed	2/14/1961	IRRIGATION	4.32	1210.0
Raft River	SPRATLING, CATHY LUCAS; SPRATLING, JOHN B	43-2512	Decreed	4/1/1961	IRRIGATION	10.88	1210.0
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13552	Decreed	9/3/1948	IRRIGATION	1.60	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13440	Decreed	4/26/1960	IRRIGATION	0.06	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-2567A	Decreed	8/26/1963	IRRIGATION	1.00	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-2567B	Decreed	8/26/1963	IRRIGATION	5.00	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-2568	Decreed	8/26/1963	IRRIGATION	6.00	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-2579	Decreed	10/1/1964	IRRIGATION	2.37	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-2481	Decreed	5/10/1966	IRRIGATION	3.54	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-7052	Decreed	7/2/1973	IRRIGATION	5.37	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-7046	Decreed	9/17/1973	IRRIGATION	3.80	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-7047	Decreed	9/17/1973	IRRIGATION	3.20	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13442	Decreed	9/17/1973	IRRIGATION	3.27	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13564	Decreed	9/17/1973	IRRIGATION	1.62	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13444	Decreed	12/26/1976	IRRIGATION	0.68	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-7088A	Decreed	6/15/1977	IRRIGATION	1.32	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13574	Decreed	6/15/1977	IRRIGATION	0.13	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13446	Decreed	3/15/1978	IRRIGATION	0.31	2584.8
Raft River	SPRING FARMS GENERAL PARTNERSHIP	43-13566	Decreed	10/23/1978	IRRIGATION	0.47	2584.8
Raft River	STEADMAN, LYNN; STEADMAN, SUSAN	43-13439	Decreed	4/26/1960	IRRIGATION	0.01	11.9
Raft River	STEADMAN, LYNN; STEADMAN, SUSAN	43-13441	Decreed	9/17/1973	IRRIGATION	0.11	11.9
Raft River	STEADMAN, LYNN; STEADMAN, SUSAN	43-13443	Decreed	12/26/1976	IRRIGATION	0.04	11.9
Raft River	STEADMAN, LYNN; STEADMAN, SUSAN	43-13445	Decreed	3/15/1978	IRRIGATION	0.05	11.9
Raft River	TAMEZ, LACY	43-10552	Decreed	5/1/1960	DOMESTIC, IRRIGATION	0.06	2.0
Raft River	TAYLOR, CEDRIC	43-4050	Decreed	3/15/1959	IRRIGATION	1.20	448.0
Raft River	TAYLOR, CEDRIC	43-4051	Decreed	3/15/1962	IRRIGATION	2.90	448.0
Raft River	TAYLOR, ROBERT E; TAYLOR, WALLACE C	43-11290	Decreed	7/1/1960	IRRIGATION	0.15	7.3
Raft River	TEETER, CLAIR	43-2531	Decreed	7/21/1961	IRRIGATION	1.14	170.0
Raft River	TEETER, CLAIR; TEETER, JUDY	43-13745	License	7/29/2015	DOMESTIC, HEATING, RECREATION, STOCKWATER	0.09	
Raft River	THORNTON, JAY R; THORNTON, RONDA KIM	43-10036B	Decreed	9/1/1949	IRRIGATION, STOCKWATER	1.21	58.0
Raft River	THORNTON, JED; THORNTON, JENNIFER	43-7300	License	6/7/1989	DOMESTIC, IRRIGATION	0.10	2.8
Raft River	TRACY, KEVIN W; TRACY, TRUDY	43-2445	Decreed	5/31/1956	IRRIGATION	1.44	72.0
Raft River	TRACY, KEVIN W; TRACY, TRUDY	43-4004	Decreed	4/10/1960	IRRIGATION	0.51	104.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	TRACY, KEVIN W; TRACY, TRUDY	43-2502	Decreed	8/12/1960	IRRIGATION	4.38	209.0
Raft River	TRACY, SHARYL L; TRACY, VERNON L (BUD)	43-2446	Decreed	7/13/1956	IRRIGATION	0.69	78.0
Raft River	TRACY, SHARYL L; TRACY, VERNON L (BUD)	43-2549	Decreed	6/18/1962	IRRIGATION	0.76	38.0
Raft River	UDY, KRISTINE; UDY, LANCE	43-7093D	License	8/17/1977	IRRIGATION	0.21	20.0
Raft River	US BUREAU OF LAND MANAGEMENT	43-2409B	Decreed	4/23/1954	IRRIGATION	3.20	160.0
Raft River	US BUREAU OF LAND MANAGEMENT	43-2408	Decreed	7/14/1954	IRRIGATION	2.45	200.0
Raft River	US BUREAU OF LAND MANAGEMENT	43-13281	Decreed	3/10/1961	IRRIGATION	0.02	1.7
Raft River	US BUREAU OF LAND MANAGEMENT	43-13283	Decreed	4/1/1961	IRRIGATION	0.02	1.7
Raft River	US GEOTHERMAL INC	43-2347	Decreed	9/7/1950	IRRIGATION, STOCKWATER	2.00	137.0
Raft River	US GEOTHERMAL INC	43-2381	Decreed	6/2/1952	COOLING	1.67	
Raft River	US GEOTHERMAL INC	43-2413	Decreed	9/21/1954	IRRIGATION	1.80	90.0
Raft River	US GEOTHERMAL INC	43-2534B	Decreed	7/2/1962	COOLING	3.96	
Raft River	US GEOTHERMAL INC	43-10069	Decreed	6/30/1985	COOLING	5.63	
Raft River	VALLEY VU CEMETERY	43-4140	Decreed	5/1/1958	IRRIGATION	0.12	5.9
Raft River	WARD HERITAGE RANCH LLC	43-2507	Decreed	1/9/1961	IRRIGATION	2.26	187.0
Raft River	WARD HERITAGE RANCH LLC	43-7138	Decreed	3/2/1979	IRRIGATION	1.60	101.4
Raft River	WARD, BARBARA PYLE; WARD, THOMAS C	43-2452	Decreed	9/27/1956	IRRIGATION	2.00	230.0
Raft River	WARD, BARBARA PYLE; WARD, THOMAS C	43-2459	Decreed	7/2/1957	IRRIGATION	0.37	230.0
Raft River	WARD, CLARK W; WARD, SARA JANE	43-4110	Decreed	8/6/1959	IRRIGATION, STOCKWATER	0.18	58.0
Raft River	WARD, CLARK W; WARD, SARA JANE	43-13029	Decreed	4/1/1982	IRRIGATION	0.12	58.0
Raft River	WARD, DOUGLAS	43-2532A	Decreed	6/15/1961	IRRIGATION, STOCKWATER	0.04	318.0
Raft River	WARD, DOUGLAS	43-2542	Decreed	1/15/1962	IRRIGATION	1.85	318.0
Raft River	WARD, NANCY; WARD, ROBERT W	43-2474	Decreed	6/3/1959	IRRIGATION	1.63	110.2
Raft River	WARD, STEVEN R; WARD, TONYA M	43-4008	Decreed	4/1/1955	IRRIGATION	2.20	172.0
Raft River	WARD, STEVEN R; WARD, TONYA M	43-7152	Decreed	5/13/1980	IRRIGATION	1.50	172.0
Raft River	WARD, VIRGINIA C; WARD, WALLACE P	43-2558	Decreed	1/7/1963	IRRIGATION	1.54	187.0
Raft River	WARR, JASON; WARR, WENDEE	43-2289	Decreed	4/13/1943	IRRIGATION	0.26	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2294E	Decreed	3/5/1945	IRRIGATION	3.25	588.0
Raft River	WARR, JASON; WARR, WENDEE	43-13833	Decreed	3/5/1945	IRRIGATION	0.18	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2301	Decreed	6/4/1947	IRRIGATION	0.84	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2302	Decreed	10/12/1947	IRRIGATION	2.34	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-4034	Decreed	8/7/1948	IRRIGATION	1.38	588.0
Raft River	WARR, JASON; WARR, WENDEE	43-13834	Decreed	8/7/1948	IRRIGATION	0.07	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2389	Decreed	3/3/1953	IRRIGATION	1.01	588.0
Raft River	WARR, JASON; WARR, WENDEE	43-13838	Decreed	3/3/1953	IRRIGATION	0.05	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2405	Decreed	3/19/1954	IRRIGATION	2.73	588.0
Raft River	WARR, JASON; WARR, WENDEE	43-13837	Decreed	3/19/1954	IRRIGATION	0.15	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2419	Decreed	1/25/1955	IRRIGATION	1.35	588.0
Raft River	WARR, JASON; WARR, WENDEE	43-13835	Decreed	1/25/1955	IRRIGATION	0.07	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-2420B	Decreed	2/3/1955	IRRIGATION	1.44	588.0
Raft River	WARR, JASON; WARR, WENDEE	43-13836	Decreed	2/3/1955	IRRIGATION	0.08	223.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	WARR, JASON; WARR, WENDEE	43-4003D	Decreed	6/23/1959	IRRIGATION	0.01	223.0
Raft River	WARR, JASON; WARR, WENDEE	43-10633	Decreed	6/30/1985	IRRIGATION	0.49	223.0
Raft River	WASTE SOLUTIONS INC	43-2420A	Decreed	2/3/1955	IRRIGATION	0.05	3.0
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13149	Decreed	5/29/1950	IRRIGATION	0.03	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13157	Decreed	5/29/1950	IRRIGATION	0.26	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13897	Decreed	5/29/1950	COMMERCIAL, DOMESTIC, STOCKWATER	0.28	
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13071	Decreed	5/29/1952	IRRIGATION	2.98	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13073	Decreed	5/29/1952	IRRIGATION	3.63	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13635	Decreed	6/30/1953	IRRIGATION	0.75	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-4060F	Decreed	4/1/1954	IRRIGATION, STOCKWATER	0.88	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-2354B	Decreed	9/17/1954	IRRIGATION	2.57	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-2417F	Decreed	1/31/1955	IRRIGATION	2.58	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-2418F	Decreed	1/31/1955	IRRIGATION	2.58	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-4063F	Decreed	5/1/1955	IRRIGATION, STOCKWATER	2.25	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-4061F	Decreed	5/1/1957	IRRIGATION, STOCKWATER	1.64	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-4062F	Decreed	5/1/1957	IRRIGATION, STOCKWATER	1.51	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-4064F	Decreed	5/1/1957	IRRIGATION, STOCKWATER	3.70	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13151	Decreed	11/27/1957	IRRIGATION	0.02	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13159	Decreed	11/27/1957	IRRIGATION	0.68	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13153	Decreed	11/30/1957	IRRIGATION	0.03	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13161	Decreed	11/30/1957	IRRIGATION	1.18	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13639	Decreed	3/18/1960	IRRIGATION	0.03	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13411	Decreed	3/10/1961	IRRIGATION	3.32	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13412	Decreed	3/10/1961	COMMERCIAL, STOCKWATER	0.06	
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13413	Decreed	4/1/1961	IRRIGATION	3.62	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13414	Decreed	4/1/1961	COMMERCIAL, STOCKWATER	0.06	
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13063	Decreed	3/15/1962	IRRIGATION	1.62	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-10089	Decreed	12/31/1983	DOMESTIC, STOCKWATER	0.23	
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-10087	Decreed	6/30/1985	IRRIGATION	2.98	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13064	Decreed	6/30/1985	IRRIGATION	0.84	4326.1
Raft River	WEBB BROTHERS LAND & LIVESTOCK LLC	43-13118	Decreed	5/1/2001	DOMESTIC	0.08	
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-13688	Decreed	5/20/1960	IRRIGATION	0.35	205.2
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-2515	Decreed	4/9/1961	IRRIGATION	16.06	984.6
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-7020D	Decreed	2/12/1971	IRRIGATION	2.22	287.5
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-13690	Decreed	2/12/1971	IRRIGATION	0.05	205.2
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-7129	Decreed	9/13/1978	IRRIGATION	2.80	205.2
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-7192	License	5/16/1983	IRRIGATION	0.82	205.2
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-10624	Decreed	6/30/1985	IRRIGATION	0.83	984.6
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-10041	Decreed	3/15/1987	IRRIGATION	0.15	287.5
Raft River	WHEELER, DIANA M; WHEELER, MICHAEL P	43-7319	License	1/9/1992	IRRIGATION	1.79	287.5
Raft River	WHITAKER, ANDREW W; WHITAKER, TIA K	43-2530B	Decreed	7/11/1961	IRRIGATION	1.60	86.0

Tributary Basin	Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres
Raft River	WHITAKER, ANDREW W; WHITAKER, TIA K	43-10236	Decreed	6/30/1985	IRRIGATION	0.08	86.0
Raft River	WHITAKER, CLETA; WHITAKER, DENTON	43-2294D	Decreed	3/5/1945	IRRIGATION	0.51	329.3
Raft River	WHITAKER, CLETA; WHITAKER, DENTON	43-2294G	Decreed	3/5/1945	IRRIGATION	2.05	329.3
Raft River	WHITAKER, CLETA; WHITAKER, DENTON	43-10289	Decreed	4/1/1959	IRRIGATION	0.56	329.3
Raft River	WHITAKER, CLETA; WHITAKER, DENTON	43-10425	Decreed	4/1/1959	IRRIGATION	3.55	329.3
Raft River	WHITAKER, JENNIFER L; WHITAKER, TRAVIS L	43-2421	Decreed	2/5/1955	IRRIGATION	1.60	147.0
Raft River	WHITAKER, JENNIFER L; WHITAKER, TRAVIS L	43-4096	Decreed	7/9/1958	IRRIGATION	0.34	147.0
Raft River	WICKEL, ARDEN EUGENE; WICKEL, WYNELL F	43-4213	Decreed	4/15/1959	IRRIGATION	1.08	133.0
Raft River	WICKEL, ARDEN EUGENE; WICKEL, WYNELL F	43-13039	Decreed	6/30/1985	IRRIGATION	0.64	133.0
Raft River	WICKEL, DOROTHY J; WICKEL, WILLIAM K	43-7103	Decreed	7/22/1977	IRRIGATION	0.80	292.0
Raft River	WIGHT, JOHN H	43-13036	Decreed	7/30/1935	IRRIGATION, STOCKWATER	0.80	40.0
Raft River	WILLIAM D JONES & SONS	43-2538	Decreed	10/9/1961	IRRIGATION	2.20	319.0
Raft River	WILLOW CREEK ENTERPRISES LLC	43-13332	Decreed	3/15/1963	COMMERCIAL, STOCKWATER	0.11	
Raft River	WILLOW CREEK ENTERPRISES LLC	43-13336	Decreed	3/15/1963	COMMERCIAL, STOCKWATER	0.12	
Raft River	WILLOW CREEK ENTERPRISES LLC	43-13467	Decreed	3/15/1963	COMMERCIAL, STOCKWATER	0.18	
Raft River	WILLOW CREEK ENTERPRISES LLC	43-13334	Decreed	1/27/1978	COMMERCIAL, STOCKWATER	0.10	
Raft River	WILLOW CREEK ENTERPRISES LLC	43-13338	Decreed	1/27/1978	COMMERCIAL, STOCKWATER	0.10	
Raft River	WILLOW CREEK ENTERPRISES LLC	43-13469	Decreed	1/27/1978	COMMERCIAL, STOCKWATER	0.15	
Raft River	WOODWORTH, CINDA S; WOODWORTH, KENNETH D	43-13512	Decreed	3/8/1961	IRRIGATION	2.31	261.0
Raft River	WOODWORTH, CINDA S; WOODWORTH, KENNETH D	43-13514	Decreed	8/3/1976	IRRIGATION	1.41	261.0
Raft River	WOODWORTH, CINDA S; WOODWORTH, KENNETH D	43-7073	License	7/16/1977	IRRIGATION	0.18	15.0
Raft River	WYNN DEWSNUP FAMILY REVOCABLE TRUST	43-2557	Decreed	2/21/1963	IRRIGATION	7.30	954.0
Raft River	WYNN DEWSNUP FAMILY REVOCABLE TRUST	43-7086	Decreed	7/22/1977	IRRIGATION	6.23	954.0
Raft River	WYNN DEWSNUP FAMILY REVOCABLE TRUST	43-7087	Decreed	7/22/1977	IRRIGATION	4.32	954.0
Raft River	YATES, JANET; YATES, KIRTLAND	43-2307	Decreed	3/31/1948	IRRIGATION	2.90	235.0
Raft River	YATES, JANET; YATES, KIRTLAND	43-10593	Decreed	6/30/1985	IRRIGATION	0.84	235.0

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

Revised June 28, 2024

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER REGARDING APRIL 2026 FORECAST SUPPLY** **(METHODOLOGY STEPS 1–3)**

FINDINGS OF FACT

1. On July 19, 2023, the Idaho Department of Water Resources ("Department") issued its *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies steps 1, 2, and 3 of the *Methodology Order*.[1]

A. Step 1

2. By April 1 of each year, Step 1 requires members of the SWC to submit to the Department electronic shapefiles delineating the total anticipated irrigated acres for the upcoming year "or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent." *Methodology Order* ¶ 1, at 41.

3. On February 17, 2026, Minidoka Irrigation District ("Minidoka") submitted its electronic shapefile delineating its total irrigated acres to the Department.

4. On March 27, 2026, the Department received a letter from A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), Milner Irrigation District ("Milner"), North Side Canal Company ("NSCC"), and Twin Falls Canal Company ("TFCC"). In the letter, A&B, BID, Milner, and NSCC confirmed that their total number of irrigated acres for 2026 will not vary by more than five percent from the electronic shapefiles submitted in prior years. With the letter, TFCC submitted an electronic shapefile delineating its total irrigated acres.

[1] Shortly after the *Methodology Order* was issued, the City of Pocatello, the City of Idaho Falls, and the Coalition of Cities (collectively "Cities") and the Idaho Ground Water Appropriators, Inc. ("IGWA") filed petitions for judicial review in Ada County (Nos. CV01-23-13238 and CV01-23-13173). IGWA's petition for judicial review is stayed until December 31, 2027. The Idaho Supreme Court dismissed the Cities' petition for lack of jurisdiction, but the matter is still pending on a petition for rehearing. The filing of a petition for judicial review does not stay the effectiveness of an order. I.C. § 67-5274. No party to the judicial review proceedings has requested a stay of the *Methodology Order*. Accordingly, the Director will apply the *Methodology Order* in this order.

5. On April 8th, 2026, the Department received a letter from American Falls Reservoir District #2 ("AFRD2"), stating that its total number of irrigated acres has not varied by more than five percent.

6. Based on the information submitted by the SWC, the Department will use the following total irrigated acres:

	Total Irrigated Acres[2]	Data Source
A&B	14,749[3]	SRBA Partial Decree
AFRD2	62,361	SRBA Partial Decree
BID	46,035	2013 shapefile submitted by BID, reduced by the Department for overlapping acres and acres outside of service area.
Milner	13,264	2010 service area shapefile, reduced by the Department for overlapping acres and acres outside of service area.
Minidoka	73,825	2026 shapefile submitted by Minidoka, reduced by the Department for overlapping acres and acres outside of the service area.
NSCC	154,067	SRBA Partial Decree
TFCC	193,638	2026 shapefile submitted by TFCC, reduced by the Department for overlapping acres and acres outside of service area.[4]

B. Step 2

7. Step 2 states that, within fourteen days of the issuance of the joint forecast prepared by the United States Bureau of Reclamation ("USBR") and the United States Army Corps of Engineers ("USACE"), the Director "will issue a final order predicting the April [Forecast Supply] for the water year for each SWC entity. The Director will compare the April [Forecast Supply] for each SWC entity to the [Baseline Demand] for each SWC entity to determine if an in-season demand shortfall ("IDS") is anticipated for the upcoming irrigation season." *Methodology Order* ¶ 3, at 42.

[2] "The number of irrigated acres used in this methodology order is the number of reported acres unless that number is larger than the decreed irrigated acres, and if so, then the decreed acres are used." *Methodology Order* ¶ 22, at 11.

[3] The Department has modified the total A&B irrigated acreage count to 14,749 acres. Based on Judge Wildman's district court decision, the new acreage count removes A&B's enlargement acres. *Mem. Decision & Order*, at 8, *City of Idaho Falls v. Idaho Dep't of Water Res.*, No. CV01-23-13238 (Ada Cnty. Dist. Ct. Idaho May 31, 2024).

[4] On April 10, 2026, the Cities filed *Cities' Motion to Consider Information When Determining Surface Water Coalition's Irrigated Acres Under Methodology Step 1* ("*Motion*"). In that motion, they ask the Director to consider the information contained in a technical memorandum prepared by the Cities' consultants when determining TFCC's total irrigated acres in this order. *Motion*, at 2. The motion was filed only days before the deadline for this order, leaving the Department insufficient time to evaluate its merits. The Director may revisit, and if appropriate, modify TFCC's total irrigated acres in orders issued later this irrigation season.

8. On April 2, 2026, the USBR and USACE issued their joint forecast ("Joint Forecast"), predicting an unregulated inflow of 2,300,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 70% percent of the average.[5] The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Id.* ¶ 49, at 19 (citation omitted).

9. The April–July Heise natural flow data from the years 1990–2025 were data inputs for the development of regression equations for A&B and Milner to predict the natural flow supply.[6] Data greater or less than two standard deviations from the average were excluded from the regression development.

10. The April–July Heise natural flow data from the years 1990–2025 and Box Canyon November–March total discharge data for the period 1989–2025, were data inputs for the development of multiple linear regression equations to predict the natural flow supplies for AFRD2, BID, Minidoka, NSCC, and TFCC. *Methodology Order* ¶ 49, at 19. The U.S. Geological Survey measures and monitors the flow at the Box Canyon stream flow measurement gage. The Box Canyon November–March total discharge used by the Director in the 2026 regression models totaled 93,824 acre-feet.

11. The storage allocations were predicted for each SWC member. As of April 6, 2026, Water District No. 1's preliminary water right accounting indicates water rights for Jackson Lake 1906, Lake Walcott, Jackson Lake 1910, Palisades Winter Water Savings, Island Park 1921, American Falls Winter Water Savings, and Henrys Lake 1965 are satisfied. The remaining reservoir rights are 838,546 acre-feet short of satisfaction. Based on a comparison of the current Heise natural flow forecast to the analog years of 2002, 2004, 2013, and 2021, the Director anticipates the remaining reservoir water rights for Jackson Lake and Palisades will be 48-87% satisfied, and each SWC member will receive 90-100% of their allocation. The storage allocations are based on the anticipated allocations minus evaporation charges.

[5] The average is based on the years 1991–2020. The Joint Forecast relies on a "30-Year Climate Normal" to calculate an average April through July runoff volume.

[6] Attached hereto, as Attachment A, are the regression analyses for each SWC entity used to predict natural flow supply.

12. Based on the above, the Director projects the following shortfalls:

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Forecast Supply	Baseline Demand (BLY 2018)	In-Season Demand Shortfall
A&B	1,693	120,313		122,006	64,192	0
AFRD2	31,003	383,024	1,000	415,027	458,890	43,900
BID	72,555	217,257	5,130	294,942	262,211	0
Milner	4,568	79,513		84,081	58,417	0
Minidoka	98,553	341,646	8,370	448,569	354,851	0
NSCC	279,289	821,048	-7,750	1,092,587	1,026,661	0
TFCC	757,715	233,029	-6,750	983,994	1,121,717	137,700
				Total Predicted April In-Season Demand Shortfall (AF)		181,600

C. Step 3

13. Step 3 requires the following:

> Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April [Forecast Supply], whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April IDS unless the April IDS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

Methodology Order ¶ 4, at 42.

14. The predicted April IDS for AFRD2 is 43,900 acre-feet and TFCC is 137,700 acre-feet. The total predicted April IDS is 181,600 acre-feet.

15. The Eastern Snake Plain Aquifer Model ("ESPAM") is used to predict the junior priority water rights that must be curtailed to produce the volume of water equal to the predicted April IDS in the near Blackfoot to Minidoka reach. The ESPAM is updated periodically as new field measurements and advancements in modeling technology become available. ESPAM Version 2.2 ("ESPAM2.2") is the latest model version.[7]

[7] The Department finalized ESPAM2.2 model documentation reports (including a model calibration report, a predictive uncertainty analysis, a superposition model scenario, and a curtailment scenario) on May 27, 2021. *See* Idaho Dep't of Water Res., *ESPAM2.2 Reports* (2021), https:// research.idwr.idaho.gov/files/projects/espam/browse/ESPAM22_Reports/.

16. The Department ran ESPAM2.2 to predict the junior priority water rights within the area of common ground water supply ("ACGWS") that must be curtailed to produce the volume of water equal to the predicted April IDS between May 1 and September 30 of this irrigation season pursuant to the *Methodology Order*. The ESPAM2.2 simulation calculated the curtailment of ground water rights bearing priority dates junior to October 11, 1900, will produce a volume of water of 94,000 acre-feet in the near Blackfoot to Minidoka reach between May 1 and September 30 of this irrigation season. The predicted benefit of the curtailment is less than the April IDS of 181,600 acre-feet. Curtailing ground water rights bearing priority dates junior to October 11, 1900, will offset as much of the April IDS as possible.

CONCLUSIONS OF LAW

1. The Fifth Judicial District Court, in and for the County of Minidoka, held that the evidentiary standard of proof to apply in conjunctive administration of hydraulically connected water rights is clear and convincing. *See Mem. Decision & Order on Pets. for Jud. Rev.*, *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho May 4, 2010); *Mem. Decision & Order on Pets. for Reh'g*, *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho Nov. 2, 2010).

2. "Clear and convincing evidence refers to a degree of proof greater than a mere preponderance." *Idaho State Bar v. Topp*, 129 Idaho 414, 416, 925 P.2d 1113, 1115 (1996) (internal quotations omitted). "Clear and convincing evidence is generally understood to be '[e]vidence indicating that the thing to be proved is highly probable or reasonably certain.'" *State v. Kimball*, 145 Idaho 542, 546, 181 P.3d 468, 472 (2008) (citing *In re Adoption of Doe*, 143 Idaho 188, 191, 141 P.3d 1057, 1060 (2006)); *see also Idaho Dep't of Health & Welfare v. Doe*, 150 Idaho 36, 41, 244 P.3d 180, 185 (2010).

3. The Director must utilize the best available technology for determining the impact of junior ground water diversions. *See Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 814, 252 P.3d 71, 95 (2011). ESPAM 1.1 and 2.1 are the model versions utilized previously in the SWC delivery call proceedings. Previously, the Director determined that ESPAM 2.1 was the best available scientific tool for predicting the effects of ground water pumping. *See Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 124, 369 P.3d 897, 902 (2016). ESPAM 2.2 is the latest version of the ESPAM model. The improvements incorporated into ESPAM 2.2, as discussed in Finding of Fact 15, make it the best available scientific tool for predicting the effects of ground water pumping in this proceeding.

4. In 2026, the Director has sufficient information to quantify the irrigated areas for each of the SWC members as required by Step 1.

5. The USBR-USACE April Joint Forecast predicts an unregulated inflow of 2,300,000 acre-feet at the Snake River near Heise gage from April to July. The forecasted volume equates to 70% of the average.

6. The predicted April IDS is 181,600 acre-feet. Junior ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer ACGWS must mitigate for their proportionate share of the predicted April IDS in accordance with an approved mitigation plan.[8] Junior ground water users mitigating for their proportionate share of the predicted April IDS with a secured volume of water pursuant to an approved mitigation plan must, to the satisfaction of the Director, secure their proportionate share for delivery to the injured members of the SWC on or before May 1, 2026. There was a reasonable carryover shortfall of 86,756 acre-feet in the fall of 2025. However, because junior ground water users did not secure any mitigation water for a carryover shortfall, there is no adjustment to the mitigation obligation.

7. If, on or before May 1, 2026, ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer ACGWS[9] fail to establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS of 181,600 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user. Junior ground water users who are mitigating with a secured volume of water are not required to assign the secured volume of water until after the Director issues a subsequent order requiring the assignment of the water.

8. If, at any time prior to the Director's final determination of the April Forecast Supply, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, predicted IDS determination.

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[8] There are five approved mitigation plans responding to the SWC delivery call, each is stipulated to by the SWC: (1) No. CM-MP-2015-003 for the benefit of A&B; (2) No. CM-MP-2010-001 for the benefit of Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID"); (3) No. CM-MP-2024-003 for the benefit of the Ground Water Districts; (4) No. CM-MP-2019-001 for the benefit of the Coalition of Cities; and (5) No. CM-MP-2007-001 for the benefit of the Water Mitigation Coalition. Given the nature of certain plans, the Department must calculate the proportionate share of the predicted IDS. With regard to A&B's mitigation plan, A&B's proportionate share of the predicted April IDS of 181,600 acre-feet is 10,800 acre-feet. Due to the nature of the mitigation plans for SWID, the Ground Water Districts, the Coalition of Cities, and the Water Mitigation Coalition, these entities do not need to establish that they can mitigate for their proportionate share of the predicted IDS.

[9] On June 28, 2024, the Director issued an order declaring that ground water rights that were to be newly included in the ESPA ACGWS starting July 1, 2024, due to the passage of Senate Bill 1341, would not be subject to administration until November 1, 2025. *Order Re. Mid-Season Change to Area of Common Ground Water Supply for E. Snake Plain Aquifer; 3d Order Am. Curtailment List*, at 4; *see* S.B. 1341, 67th Leg., 2d Reg. Sess. (Idaho 2024) (enacted as I.C. § 42-233c). Accordingly, ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, that were included in the ESPA ACGWS due to the passage of Senate Bill 1341 are subject to administration at this time continuing indefinitely into the future and are required to establish that they can mitigate for their proportionate share of the predicted April IDS. In late 2025 and early 2026, the Director expanded the ESPA ACGWS to include the Raft River tributary basin and the remainder of the Little Lost River and Big Lost River tributary basins not already included in the ACGWS. On February 2, 2026, the Director issued an order declaring that ground water users included in the ESPA ACGWS in late 2025 and early 2026 would not be subject to administration before April 1, 2027. *Order Phasing in Administration of Ground Water Rights Recently Included in the ESPA ACGWS*, at 2. Accordingly, at this time, ground water users in the Raft River tributary basin and the remainder of the Little Lost River and Big Lost River tributary basins who were newly included into the ESPA ACGWS and hold consumptive water rights bearing priority dates junior to October 11, 1900, are not subject to administration.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED as follows:

The Director predicts an April IDS of 181,600 acre-feet. On or before May 1, 2026, ground water users holding consumptive water rights bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer ACGWS shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS of 181,600 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

Dated this 16th day of April 2026.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 16th day of April 2026, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email

Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Zachary H. Jones City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 zjones@idahofalls.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

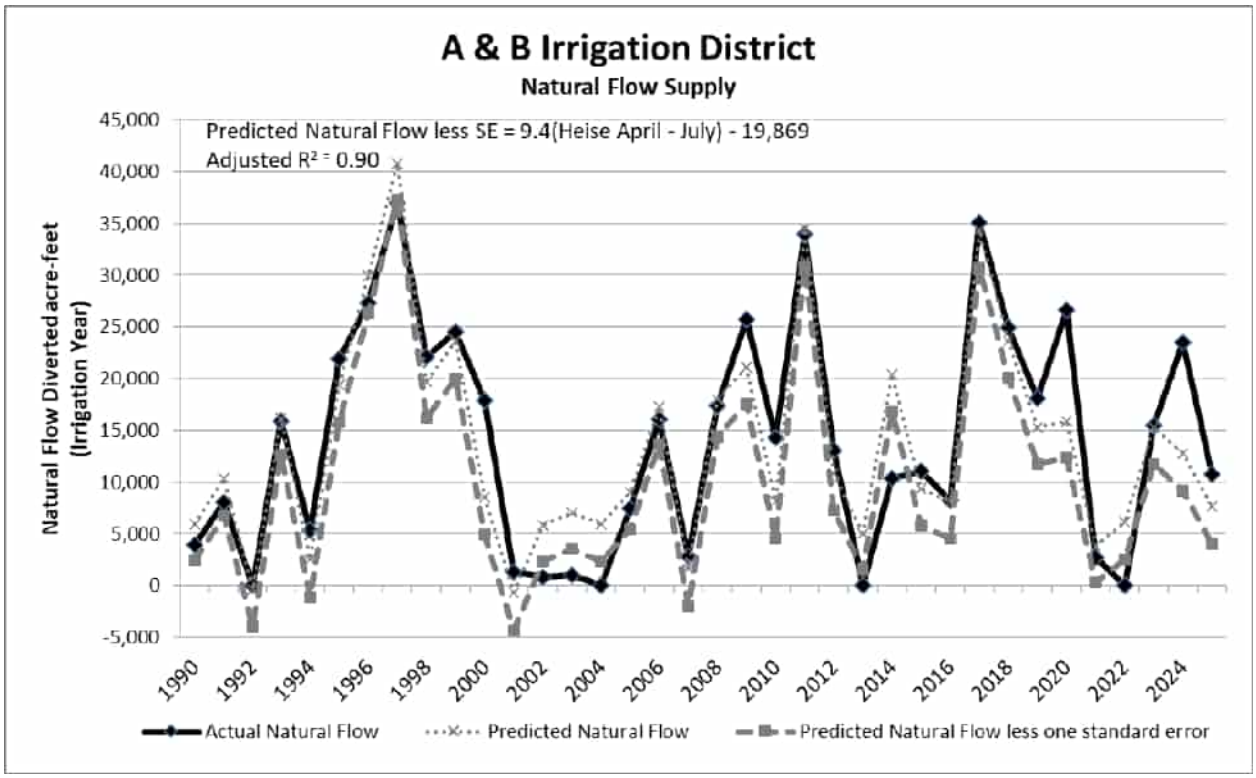
William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

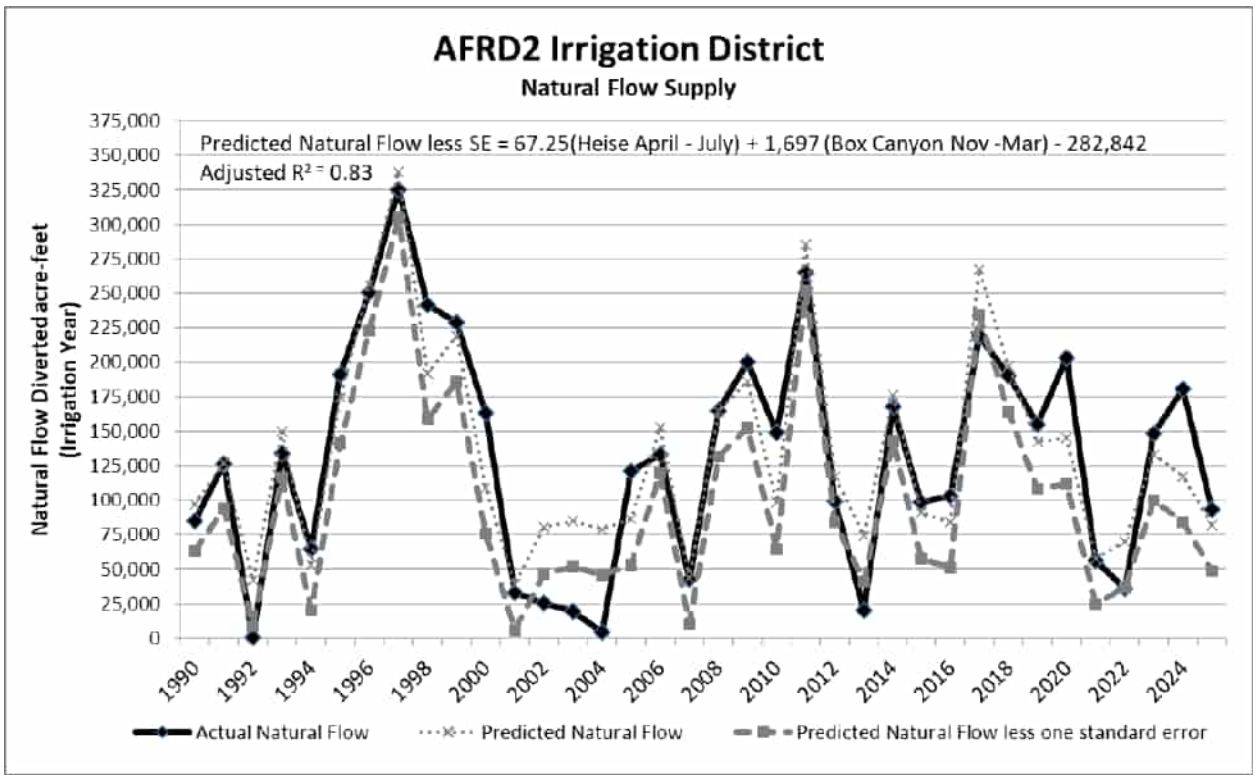
Jerry R. Rigby
Michelle Mortimer
RIGBY, ANDRUS & RIGBY LAW, PLLC
PO Box 250
Rexburg, ID 83440
jrigby@rex-law.com
mmortimer@rex-law.com

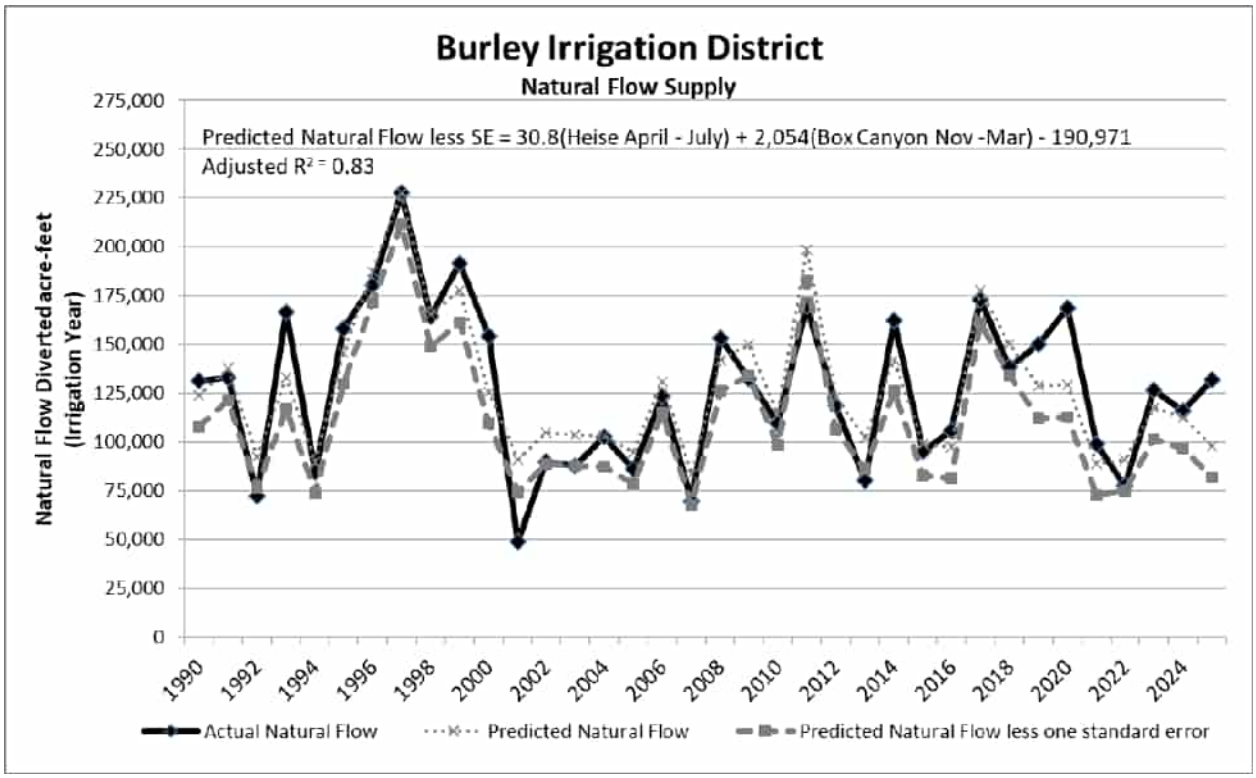
Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
1101 W. River Street, Suite 110
Boise, Idaho 83702
andy@sawtoothlaw.com

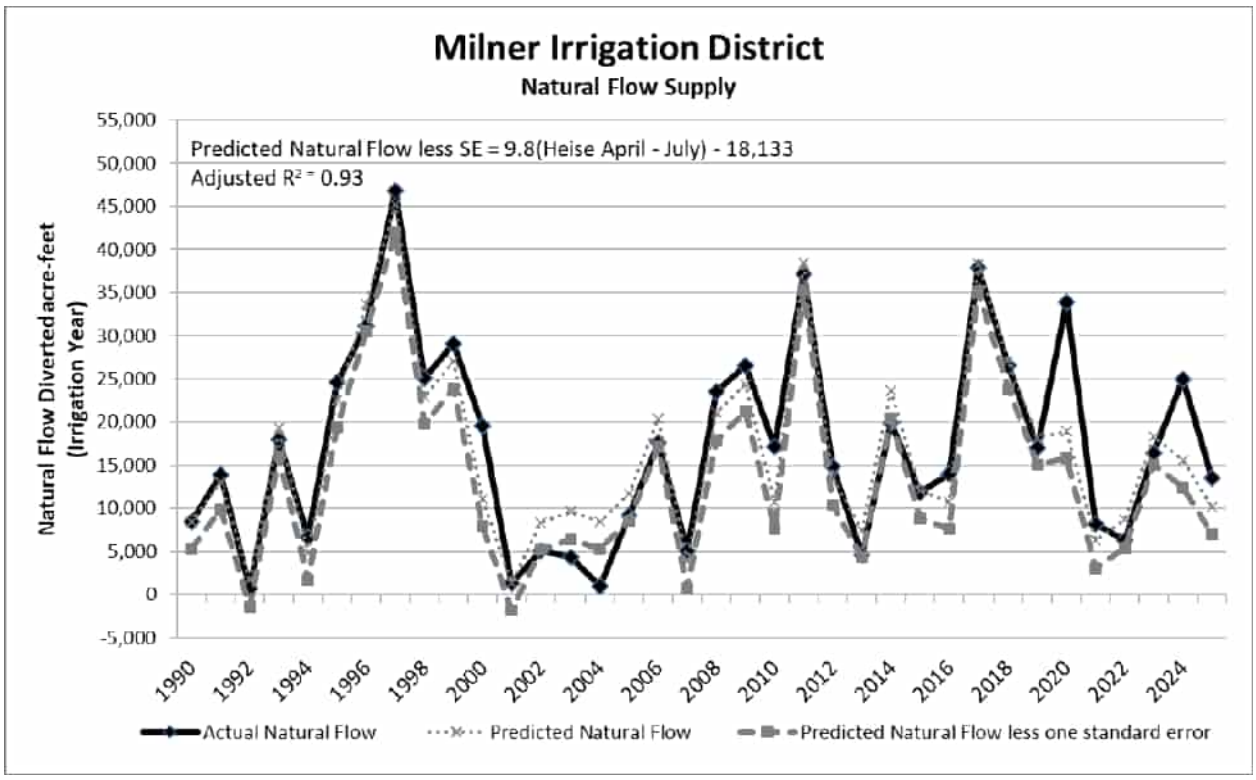
Sarah Tschohl
Paralegal

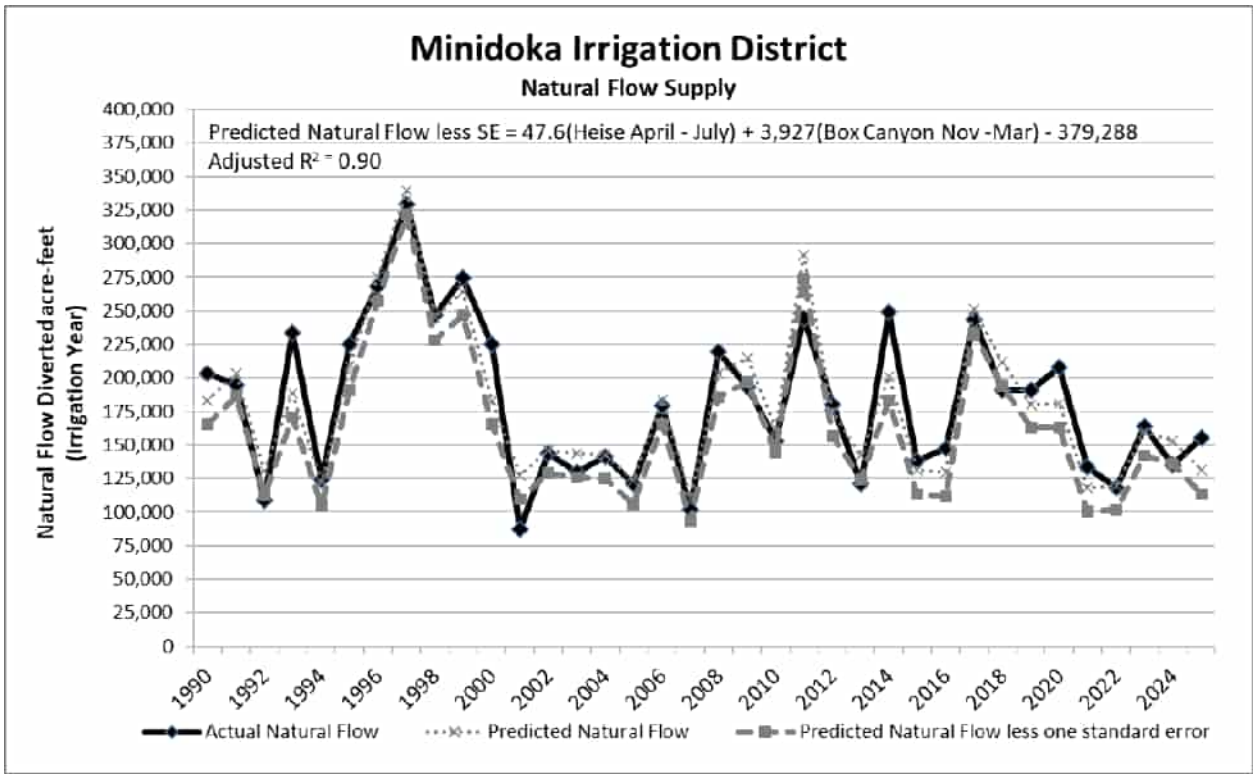
ATTACHMENT A

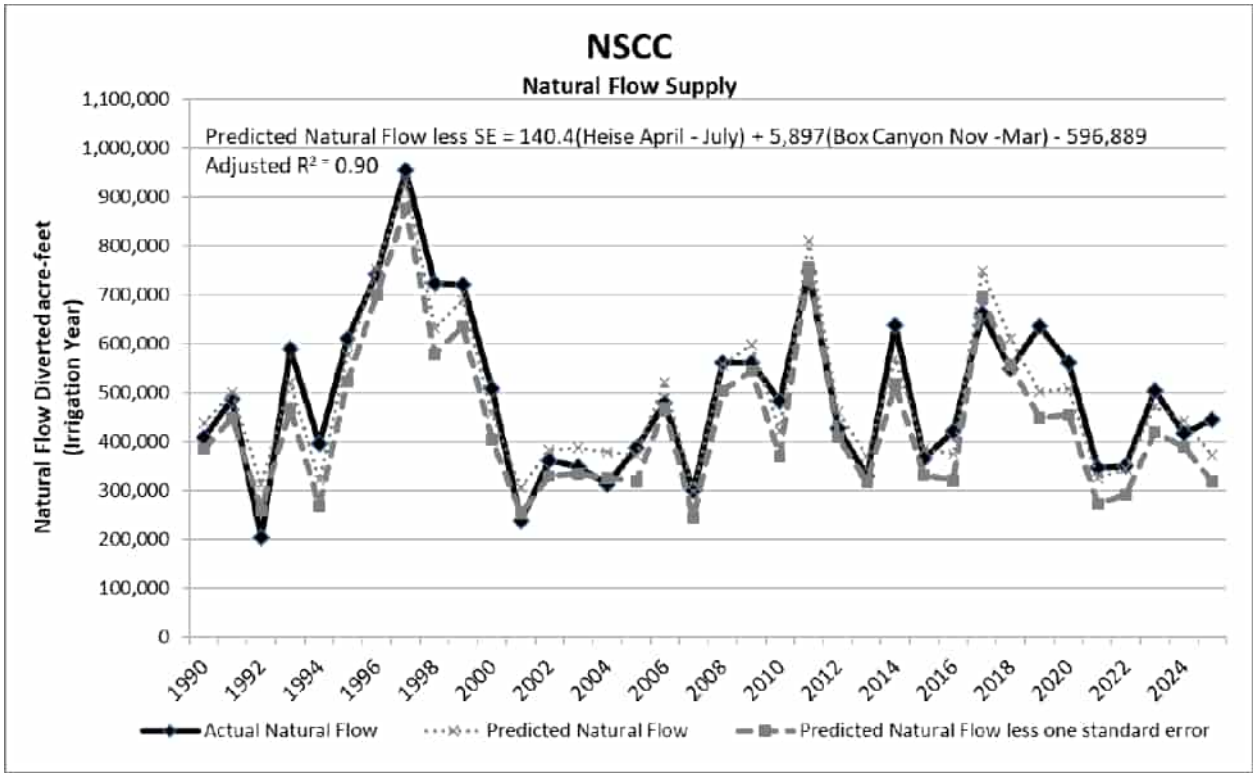


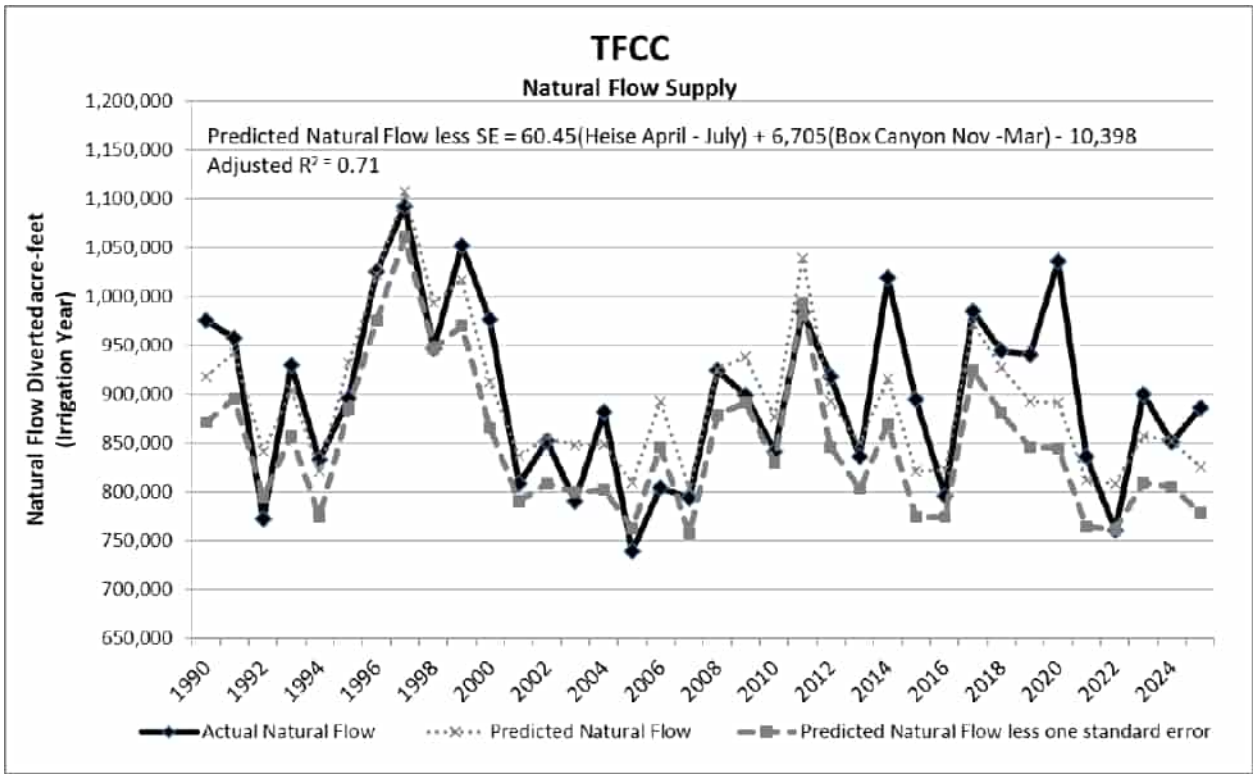



Burley Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 30.8(Heise April - July) + 2,054(Box Canyon Nov -Mar) - 190,971
Adjusted R² = 0.83
Natural Flow Diverted acre-feet (Irrigation Year)
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Milner Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 9.8(Heise April - July) - 18,133
Adjusted R² = 0.93
Natural Flow Diverted acre-feet (Irrigation Year)
55,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Minidoka Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 47.6(Heise April - July) + 3,927(Box Canyon Nov -Mar) - 379,288
Adjusted R² = 0.90
Natural Flow Diverted acre-feet (Irrigation Year)
400,000
375,000
350,000
325,000
300,000
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


NSCC
Natural Flow Supply
Predicted Natural Flow less SE = 140.4(Heise April - July) + 5,897(Box Canyon Nov -Mar) - 596,889
Adjusted R² = 0.90
Natural Flow Diverted acre-feet (Irrigation Year)
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


TFCC
Natural Flow Supply
Predicted Natural Flow less SE = 60.45(Heise April - July) + 6,705(Box Canyon Nov -Mar) - 10,398
Adjusted R² = 0.71
Natural Flow Diverted acre-feet (Irrigation Year)
1,200,000
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
750,000
700,000
650,000
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

The accompanying document is a "**Final Order"** issued by the Idaho Department of Water Resources ("Department") pursuant to Idaho Code § 67-5246. The following statements describe the procedures and time limits for seeking reconsideration or other administrative relief as required by Idaho Code § 67-5248.

PETITION FOR RECONSIDERATION

(*See* Idaho Code § 67-5246(4))

Any party may file a petition for reconsideration of this final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The presiding officer will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law.

REQUEST FOR HEARING

(*See* Idaho Code § 42-1701A(3))

Unless the right to a hearing before the Director or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order, or action of the Director of the Department and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the Director to contest the action. The person shall file with the Director, within fifteen (15) days after receipt of written notice of the action issued by the Director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the Director and requesting a hearing. **Note: The request must be received by the Department within this fifteen (15) day period.**

CERTIFICATE OF SERVICE

(*See* IDAPA 37.01.01.053, 37.01.01.202)

All documents filed with the Department in connection with a petition for reconsideration or a request for hearing of this final order shall be served on all other parties to the proceeding in accordance with Rules 53 and 202 of the Department's Rules of Procedure.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER CURTAILING GROUND WATER RIGHTS JUNIOR TO OCTOBER 11, 1900**

The Director of the Idaho Department of Water Resources ("Department") finds, concludes, and orders as follows:

FINDINGS OF FACT

1. On July 19, 2023, the Director issued the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*").[1] The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC").[2]

2. On April 16, 2026, the Director issued the *Final Order Regarding April 2026 Forecast Supply (Methodology Steps 1–3)* ("*As-Applied Order*"), which applied steps 1, 2, and 3 of the *Methodology Order*. The Director predicted an April in-season demand shortfall ("IDS") of 181,600 acre-feet. *As-Applied Order*, at 4. The Director ordered that, by May 1, 2026, ground water users with consumptive water rights "bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer area of common ground water supply [("ESPA ACGWS")] shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS of 181,600 acre-feet in accordance with an approved mitigation plan." *Id.* at 6. The Director also ordered that, if such a junior ground water user cannot establish that they can mitigate for their proportionate share of the predicted IDS "in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user." *Id.*

[1] Shortly after the *Methodology Order* was issued, the City of Pocatello, the City of Idaho Falls, and the Coalition of Cities (collectively "Cities") and the Idaho Ground Water Appropriators, Inc. ("IGWA") filed petitions for judicial review in Ada County (Nos. CV01-23-13238 and CV01-23-13173). IGWA's petition for judicial review is stayed until December 31, 2027. The Idaho Supreme Court dismissed the Cities' petition for lack of jurisdiction. The filing of a petition for judicial review does not stay the effectiveness of an order. I.C. § 67-5274. No party to the judicial review proceedings has requested a stay of the *Methodology Order*. Accordingly, the Director will apply the *Methodology Order* in this order.

[2] The SWC is comprised of A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

3. Prior to May 1, 2026, there were five approved mitigation plans in place responding to the SWC delivery call, each is stipulated to by the SWC:

(1) Docket No. CM-MP-2010-001 for the benefit of the Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID");

(2) Docket No. CM-MP-2019-001 for the benefit of certain cities commonly referred to as the "Coalition of Cities";

(3) Docket No. CM-MP-2015-003 for the benefit of the A&B Irrigation District ("A&B");

(4) Docket No. CM-MP-2007-001 for the benefit of certain entities commonly referred to as the "Water Mitigation Coalition"; and

(5) Docket No. CM-MP-2024-003 for the benefit of certain ground water districts commonly referred to as the "Ground Water Districts."

4. In the 2026 *As-Applied Order*, the Director found that due to the nature of the approved mitigation plans for SWID, the Coalition of Cities, the Water Mitigation Coalition and the Ground Water Districts, these entities do not need to establish they can mitigate for their proportionate share of the predicted April IDS. *As-Applied Order*, at 6 n.8. However, the Director found that A&B must mitigate for its proportionate share of the predicted IDS of 181,600 acre-feet and determined that A&B's proportionate share is 10,800 acre-feet. *Id*.

5. On May 1, 2026, A&B, the other members of the SWC, IGWA, and American Falls-Aberdeen Ground Water District filed a *Joint Motion for Order Approving Amended 2026-2027 Interim Stipulation* ("*Amended Joint Motion*") requesting approval of A&B's previously filed *Interim Stipulation* with an amendment to the storage volume of water to be delivered. *Amended Joint Motion*, at 3, No. CM-MP-2026-003. On May 14, 2026, the Director issued an *Order Approving A&B Irrigation District's Interim Stipulated Plan for 2026 & 2027*. Due to the nature of A&B's new mitigation plan, it does not need to mitigate for its full proportional share of the predicted IDS.

6. Also on May 1, 2026, the SWC, the Ground Water Districts, the Big Lost River Ground Water District, the Upper Big Lost River Ground Water District, and the Little Lost River Ground Water District filed a *Joint Motion for Approval of First Addendum to 2024 Stipulated Mitigation Plan and for Related Relief* ("*Motion to Approve First Addendum*"). The *Motion to Approve First Addendum* requested the Director approve the First Addendum, which allows the Big Lost River Ground Water District, Upper Big Lost River Ground Water District, and Little Lost River Ground Water District to join the *2024 Stipulated Mitigation Plan* in No. CM-MP-2024-003. On May 7, 2026, the Director issued an *Order Approving First Addendum and Granting Related Relief*.

7. Also on May 1, 2026, Hearing Officer Gerald Schroeder issued a *Preliminary Order Approving Falls Water's Stipulated Mitigation Plan* in Department Docket No. CM-MP-2026-

002. A petition for reconsideration is pending so the order has not become final yet pursuant to Idaho Code § 67-5245 and IDAPA 37.01.01.730.

CONCLUSIONS OF LAW

1. Idaho Code § 42-602 authorizes the Director to supervise water distribution within water districts:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director. The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

2. As explained above, by May 1, 2026, ground water users with consumptive water rights "junior to October 11, 1900, within the [ESPA ACGWS]" are required to "establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS of 181,600 acre-feet in accordance with an approved mitigation plan." *As-Applied Order*, at 7. If a junior ground water user does not establish that they can mitigate for their proportionate share of the predicted April IDS "in accordance with an approved mitigation plan" the ground water user will be subject to this "order curtailing the junior-priority ground water user." *Id.*

3. Due to the nature of the approved mitigation plans for SWID, the Coalition of Cities, the Water Mitigation Coalition, A&B, and the Ground Water Districts, these entities do not need to establish that they can mitigate for their proportionate share of the predicted April IDS. Junior ground water users entitled to the protection of SWID, the Coalition of Cities, the Water Mitigation Coalition, A&B, and the Ground Water Districts mitigation plans will not be subject to curtailment during the 2026 irrigation season.

4. Consistent with the *As-Applied Orde*r, Idaho Code § 42-602, and decisions of the courts, the Director must order curtailment of junior-priority ground water users that have not established they can mitigate in accordance with an approved mitigation plan. Junior-priority ground water users subject to curtailment are listed in Attachments A to this order.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that effective May 14, 2026, ground water users holding water rights bearing priority dates junior to October 11, 1900, within the ESPA ACGWS, and listed in Attachment A to this order, shall curtail/refrain from diversion and use of ground water pursuant to those water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

IT IS FURTHER ORDERED that holders of ground water rights identified by the highlighted rows in Attachment A to this order may seek to participate in an approved mitigation plan through a ground water district and shall have fifteen days from the date of this order to join, solely for mitigation purposes, the ground water district situated nearest the lands to which the water rights are appurtenant. *See* H.B. 737a, 58th Leg., 2d Reg. Sess. (Idaho 2006) (*Act Relating to the Administration of Ground Water Rights Within the Eastern Snake River Plain*); *see also* I.C. § 42-5259.

IT IS FURTHER ORDERED that watermasters for the water districts within the ESPA ACGWS who regulate ground water are directed to review the water rights listed in Attachment A to this order and begin the curtailment process.

IT IS FURTHER ORDERED that this order shall apply to consumptive ground water rights, including but not limited to, agricultural, commercial, industrial, and municipal uses. This order excludes ground water rights used for *de minimis* domestic purposes where such domestic use is within the limits of the definition set forth in Idaho Code § 42-111 and ground water rights used for *de minimis* stock watering where such stock watering use is within the limits of the definitions set forth in Idaho Code § 42-1401A(11), pursuant to IDAPA 37.03.11.020.11.

Dated this 14th day of May 2026.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 14th day of May 2026, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email

Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Zachary H. Jones City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 zjones@idahofalls.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

Jerry R. Rigby
Michelle Mortimer
RIGBY, ANDRUS & RIGBY LAW, PLLC
jrigby@rex-law.com
mmortimer@rex-law.com

Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
andy@sawtoothlaw.com

Sarah Tschohl
Paralegal

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to October 11, 1900
(highlighted rights have 15-days to join a ground water district)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
1523 LLC	35-14566	Decreed	11/3/1972	IRRIGATION	0.05	2.6	
288S 500W LLC	36-17158	Decreed	2/1/1961	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
3 STRING CATTLE OF IDAHO LLC	37-23203	Decreed	7/24/1973	COMMERCIAL, STOCKWATER	0.16	0.0	
A W HARDY FAMILY INVESTMENTS LTD	29-14198	Decreed	6/23/1977	IRRIGATION	0.01	0.9	
A W HARDY FAMILY INVESTMENTS LTD	29-14427	Decreed	6/23/1977	IRRIGATION	0.01	0.3	
A W HARDY FAMILY INVESTMENTS LTD	29-14435	Decreed	6/23/1977	IRRIGATION	0.03	3.4	
ADAMS, CHERYL L; ADAMS, H LYLE; ADAMS, RODDY L	37-7078	Decreed	10/12/1970	COMMERCIAL, STOCKWATER	0.06	0.0	
ADAMS, MARY J	25-14316	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
AEI CORP	29-8037	License	11/13/1990	DOMESTIC, INDUSTRIAL	0.06	0.0	
AIKELE, DON A	34-14179	Decreed	4/20/1961	IRRIGATION	0.02	2.0	
AIKELE, PEGGY; AIKELE, STEVEN J	34-14693	Decreed	4/20/1961	IRRIGATION	0.01	1.2	
AKERS, DONNA E; AKERS, SHERMAN L	29-10649	Decreed	8/1/1961	IRRIGATION, STOCKWATER	0.13	6.4	
AMERICAN FALLS RESERVOIR DISTRICT #2	36-11120	Decreed	11/27/1962	DOMESTIC, IRRIGATION	0.07	1.5	
ANDERSON, CHAD ALLEN; ANDERSON, JASHELLE HEATHER	45-7650	License	6/21/1989	DOMESTIC, IRRIGATION	0.06	1.0	
ANDERSON, CLARK E; ANDERSON, TRACY	29-14453	Decreed	10/28/1953	IRRIGATION	0.02	2.9	
ANDERSON, CLARK E; ANDERSON, TRACY	29-14433	Decreed	6/23/1977	IRRIGATION	0.03	2.9	
ANDERSON, RENAE; ANDERSON, RICHARD	29-2393A	Decreed	9/25/1957	IRRIGATION	0.04	2.5	
ANGIELEN LLC	32-13403	Decreed	11/12/1974	STOCKWATER	0.22	0.0	
AQUA PURA INC	35-7907	License	2/7/1980	DOMESTIC	0.04	0.0	
ARMENTA, JUAN; SANCHEZ, BLANCA	37-23654	Decreed	9/20/1974	IRRIGATION	0.07	5.0	
ATKINSON, ANDREW ; ATKINSON, MARY	29-13736	License	2/21/2006	DOMESTIC	0.08	0.0	
BABEL, PAUL; HAMPTON, WALLACE; PARKS, FRED A	25-7083	License	1/28/1976	DOMESTIC	0.06	0.0	
BAGBY, JESSICA; BAGBY, NASH	45-14561	Decreed	6/1/1939	IRRIGATION	0.09	7.0	
BAH REXBURG AC PROPERTY LLC	22-11451	Decreed	8/31/1960	IRRIGATION	0.04	2.0	
BAILEY, JULIE A; BAILEY, STEVEN E	35-8619	License	9/24/1985	IRRIGATION, STOCKWATER	0.04	0.5	
BAISCH, ROBERT L	35-7481	License	2/21/1975	DOMESTIC	0.08	0.0	
BAM PROPERTIES LLC	29-2495	Decreed	8/12/1964	IRRIGATION	0.61	28.5	
BANDY, BONNIE; BANDY, BRADLEY W	36-7473	Decreed	5/14/1974	IRRIGATION	0.02	1.0	
BANNOCK COUNTY	29-7329	Decreed	5/12/1976	IRRIGATION	0.82	61.1	
BANNOCK COUNTY	29-7972	License	5/5/1990	DIVERSION TO STORAGE, IRRIGATION, RECREATION STORAGE	0.48	61.1	
BARBEN, GORDON E; SAMPSON, KEN	27-7025	License	4/2/1973	DOMESTIC	0.08	0.0	
BARKDULL, CARL; BARKDULL, KATHLEEN	29-7619	Decreed	1/5/1982	DOMESTIC, IRRIGATION	0.02	1.2	
BARNA, BASIL; SNARR, DELMAR; SNARR, MARGARET; SNARR, MERLAND E; SNARR, ROBERT B; SUMMERS, RON	35-12291	Decreed	6/1/1945	DOMESTIC	0.11	0.0	
BARRUS, KEITH; MINKS, ROY; PLOCK, STEPHEN R; SCHNEIDER, SCOT L	25-7080	Decreed	1/28/1976	DOMESTIC	0.11	0.0	
BARTAUSKY, TOM	27-7404	License	4/8/1985	IRRIGATION	1	50.0	
BARTAUSKY, TOM	27-7432	License	7/10/1987	IRRIGATION	0.7	35.0	
BARTAUSKY, TOM; BLEAZARD, ELCY	27-12209	License	8/22/1991	IRRIGATION	0.11	5.3	
BARTLETT, ERWIN; BARTLETT, JANICE	45-7653	License	6/6/1989	COMMERCIAL	0.04	0.0	
BASIC AMERICAN INC	22-13806	Decreed	6/30/1945	COMMERCIAL, DOMESTIC, STOCKWATER	0.38	0.0	
BATES, ROBERT W; BATES, SHARON H; WILKINS, ELMA; WILKINS, LLOYD	25-7357	Decreed	6/16/1983	DOMESTIC	0.06	0.0	
BATT, ALAN C; BATT, MILLIE	25-7109	Decreed	5/2/1977	IRRIGATION	3.03	229.0	
BEAN, BRENT	45-14562	Decreed	6/1/1939	IRRIGATION	0.03	2.0	
BEAR ISLAND WATER ASSN INC	35-8672	License	9/6/1988	DOMESTIC	0.2	0.0	
BELL, JAMIE; BELL, TROY	29-14451	Decreed	10/28/1953	IRRIGATION	0.06	6.9	

Attachment A -Sorted by Owner
List of Ground Water Rights Junior to October 11, 1900
(highlighted rights have 15-days to join a ground water district)

Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
BELL, JAMIE; BELL, TROY	29-14424	Decreed	6/23/1977	IRRIGATION	0.06	6.9	
BENSON, CLIFFORD; BENSON, LADAWN C	35-8124	Permit	3/25/1983	IRRIGATION	6.4	320.0	
BEORCHIA, MICHAEL; BEORCHIA, REVA	35-14830	Decreed	1/26/1962	IRRIGATION	0.02	2.3	
BEVAN, DONNA; BEVAN, THOMAS	35-14773	Decreed	4/27/1964	IRRIGATION	0.08	2.0	
BEVAN, JOHN; BEVAN, LOU; BEVAN, STEVE; COSSABOOM, JUDY; WALTERS, DEANNA	29-4325	Decreed	5/30/1939	IRRIGATION	0.13	5.0	
BEVAN, JOHN; BEVAN, LOU; BEVAN, STEVE; COSSABOOM, JUDY; WALTERS, DEANNA	29-4326	Decreed	4/20/1952	IRRIGATION	1.78	150.0	
BEYER, PATRICK	25-7313	Decreed	4/11/1983	DOMESTIC, IRRIGATION	0.05	0.7	
BIG FIVE WATER ASSN	25-7199	Decreed	7/24/1980	DOMESTIC	0.11	0.0	
BIG J FARMS LLC; JAG FARMS LLC	35-14950	Decreed	9/12/1955	IRRIGATION	0.56	345.6	
BIG J FARMS LLC; JAG FARMS LLC	35-14951	Decreed	5/26/1958	IRRIGATION	0.59	345.6	
BIG J FARMS LLC; JAG FARMS LLC	35-14945	Decreed	12/1/1969	IRRIGATION	1.88	345.6	
BIG J FARMS LLC; JAG FARMS LLC	35-14946	License	11/30/1982	IRRIGATION	1.28	345.6	
BIG J FARMS LLC; JAG FARMS LLC	35-14948	License	11/30/1982	IRRIGATION	0.27	345.6	
BIG J FARMS LLC; JAG FARMS LLC	35-14947	License	6/1/1989	IRRIGATION	0.08	345.6	
BIG J FARMS LLC; JAG FARMS LLC	35-14949	License	6/1/1989	IRRIGATION	0.21	345.6	
BIGGS, DONALD; BIGGS, HELEN ; BUSH, ROBERT; EATON, BENJAMIN; EATON, KENDRA; OCKERMAN, JOY	25-7082	Decreed	1/28/1976	DOMESTIC	0.16	0.0	
BINGHAM COUNTY	35-14757	License	9/21/1989	COMMERCIAL	0.13	0.0	
BINGHAM, BOYD A; BINGHAM, SHERRY R	36-8425	License	6/23/1989	IRRIGATION	0.88	105.0	
BINGHAM, CHERYL J; BINGHAM, MAX J	34-14528	Decreed	9/13/1961	IRRIGATION	0.07	4.0	
BINGHAM, CHERYL J; BINGHAM, MAX J	34-14529	Decreed	4/1/1977	IRRIGATION	0.01	4.0	Yes
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2183D	Decreed	9/5/1950	IRRIGATION	1.728	156.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2202B	Decreed	8/9/1951	DOMESTIC, IRRIGATION	4.8	285.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2266	Decreed	10/9/1952	IRRIGATION	3.1	391.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-2269G	Decreed	10/23/1952	IRRIGATION	4.35	391.0	
BINGHAM, JERRY D; BINGHAM, VALERIE H	35-12226	Decreed	4/1/1987	IRRIGATION	0.59	285.0	Yes
BINGHAM, LARRY	35-2205E	Decreed	11/9/1951	IRRIGATION	2.44	207.0	
BLACK HAWK HOMEOWNERS ASSN INC	25-14305	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14307	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14308	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14312	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-14315	Decreed	8/10/1966	IRRIGATION	0.02	353.9	
BLACK HAWK HOMEOWNERS ASSN INC	25-7669	License	2/23/1999	DOMESTIC	1.05	0.0	
BLACK HAWK HOMEOWNERS ASSN INC	25-14395	License	8/28/2013	DOMESTIC	0.4	0.0	
BLAINE COUNTY SCHOOL DISTRICT #61	37-22205	Decreed	7/21/1961	MITIGATION	0.3	0.0	
BLAINE COUNTY SCHOOL DISTRICT #61	37-21742	License	4/17/2006	IRRIGATION	0.7	8.7	
BLAINE COUNTY SCHOOL DISTRICT #61	37-23102	Permit	2/20/2018	IRRIGATION	0.38	4.8	
BLAKE, AMANDA	35-14013	License	2/19/2010	RECREATION STORAGE	0	0.0	
BLEDSOE, HELEN M; HACKMAN, ERNEST A	35-7916	License	9/16/1980	DOMESTIC	0.08	0.0	
BLISS LLC	37-7761A	Decreed	5/8/1980	DOMESTIC, STOCKWATER	0.07	0.0	
BLUE SPRUCE RANCH LP	34-13941	Decreed	12/19/1950	IRRIGATION	0.83	41.4	
BLUE SPRUCE RANCH LP	34-10579	Decreed	8/2/1961	IRRIGATION	0.92	194.0	
BLUE SPRUCE RANCH LP	34-2433	Decreed	8/2/1961	IRRIGATION	2.34	194.0	
BOHMAN, JON MARC; BOHMAN, REBECCA S	25-14271	Decreed	8/10/1966	IRRIGATION	0.02	1.1	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
BOISE PACKAGING & NEWSPRINT LLC	45-2568	Decreed	4/1/1958	DOMESTIC, FIRE PROTECTION FROM STORAGE, FIRE PROTECTION STORAGE, FIRE PROTECTION	0.09	0.0	
BOLINDER, CATHERINE L	27-7322	License	6/8/1982	DOMESTIC	0.06	0.0	
BONAWITZ, DANI; BONAWITZ, DUKE	36-8065	Decreed	2/17/1982	DOMESTIC, IRRIGATION	0.12	5.0	
BONNIE BARTON BANDY IRREVOCABLE TRUST	36-17287	Decreed	5/14/1974	IRRIGATION	0.08	4.0	
BORAH PEAK FARMS LLC	33-10080	Decreed	12/31/1927	DOMESTIC, STOCKWATER	0.14	0.0	
BORAN , MICHAEL J	35-11390	Decreed	6/1/1941	FISH PROPAGATION	20	0.0	
BORAN , MICHAEL J	35-4271B	Decreed	6/1/1945	FISH PROPAGATION	50	0.0	
BORAN , MICHAEL J	35-8635B	Decreed	12/17/1986	FISH PROPAGATION	0.72	0.0	
BORAN , MICHAEL J	35-8782	License	5/23/1989	FISH PROPAGATION	4.64	0.0	
BOWEN, BRAD	25-12253	Decreed	12/17/1951	DOMESTIC, IRRIGATION	0.07	1.0	
BRADY, LANCE; BRADY, SHANNON; HAGAN, DANNY D; HAGAN, MARILYNN J	25-7330	Decreed	6/14/1983	DOMESTIC, IRRIGATION	0.08	0.4	
BRAY, CLAUDETTE; CAREY, JUNE G	45-11902	Decreed	3/15/1934	IRRIGATION	0.08	2.7	
BROWER, AMANDA; BROWER, JASON	29-14460	Decreed	10/28/1953	IRRIGATION	0.04	4.6	
BROWER, AMANDA; BROWER, JASON	29-14440	Decreed	6/23/1977	IRRIGATION	0.04	4.6	
BROWN ADELAIDE IV LLC	36-17362	Decreed	10/15/1968	IRRIGATION	3.9	240.0	
BROWN, BERTHA; BROWN, ROBERT L	29-2521	Decreed	5/27/1966	DOMESTIC, IRRIGATION	0.033	1.6	
BROWN, BERTHA; BROWN, ROBERT L	29-7428	Decreed	12/8/1977	DOMESTIC, IRRIGATION	0.29	8.8	
BROWN, GORDON; LAMCZYK, DANNY; LAMCZYK, JANE	27-7342	Decreed	2/16/1983	DOMESTIC, IRRIGATION	0.06	0.5	
BROWN, JAN A; BROWN, SID E; MOMBERGER, JESSE C	31-7510	License	11/14/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.11	2.0	
BROWN, MELANIE E; BROWN, TOMMY H	29-12246	Decreed	1/31/1948	DOMESTIC	0.04	0.0	
BRP INC	25-7622	License	9/23/1998	DOMESTIC	0.23	0.0	
BRP INC	25-14504	Permit	10/12/2021	DOMESTIC	0.26	0.0	
BUNCE, MICHAEL F	29-7914	License	4/9/1990	DOMESTIC, IRRIGATION	0.09	6.0	
BURCHAM JR, J E; BURCHAM, BURVA J; BURCHAM, WESLEY E	29-7663A	Decreed	10/26/1982	DOMESTIC	0.1	0.0	
BURGESS SUBDIVISION WATER ASSN INC	25-7457	License	10/27/1988	DOMESTIC	0.11	0.0	
BURLEY HEALTHCARE HOLDING LLC	45-11194	Decreed	6/1/1960	DOMESTIC, IRRIGATION	0.15	5.5	
BURLEY IRRIGATION DISTRICT	45-10390	Decreed	6/19/1909	DOMESTIC	0.05	0.0	
BURLEY IRRIGATION DISTRICT	45-7720	License	9/27/1993	DOMESTIC	0.09	0.0	
BURNS CONCRETE INC	25-13982	License	12/18/2002	COMMERCIAL	3.53	0.0	
BURNS, KIRK E; SZIMHARDT, LINDA J	25-7426	License	6/6/1988	IRRIGATION	0.08	5.6	
BURRELL, GEORGE W; BURRELL, LURANA J; KEETCH, SHYANN; KEETCH, STETSON	29-13900	License	4/3/2009	DOMESTIC	0.08	0.0	
BURRUP, JOHN R; BURRUP, JON R	25-13085	Decreed	7/6/1958	COMMERCIAL, STOCKWATER	0.12	0.0	
CALDWELL, TED L	27-7117	Decreed	10/21/1977	IRRIGATION	0.21	20.0	
CALLEN JR, JERRY R; CALLEN, PATRICIA	36-14326	Decreed	7/15/1919	DOMESTIC, STOCKWATER	0.04	0.0	
CALLEN JR, JERRY R; CALLEN, PATRICIA	36-15514	Decreed	9/30/1919	STOCKWATER	0.03	0.0	
CARLSON, BRENT J	29-14446	Decreed	10/28/1953	IRRIGATION	0.01	1.3	
CARLSON, BRENT J	29-14426	Decreed	6/23/1977	IRRIGATION	0.01	1.3	
CARPENTER, BARBARA; CARPENTER, MAURICE	25-7193B	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-13974	Decreed	1/25/1962	IRRIGATION	0.09	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-2459B	Decreed	1/25/1962	IRRIGATION	0.12	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-13980	Decreed	1/27/1976	IRRIGATION	0.3	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-7386	Decreed	4/7/1977	IRRIGATION	0.21	46.7	
CARROZZA, JACQUELYN; MATKIN, JEFFERY L	29-13979	Decreed	10/31/1986	IRRIGATION	0.08	46.7	Yes
CARSTENS, JULIUS M J	25-7481	License	12/22/1988	IRRIGATION	0.04	1.4	

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CARTER, A LADD; CARTER, JANE M	35-13284	Decreed	2/23/1972	COMMERCIAL, STOCKWATER	0.3	0.0	
CARTER, HEATHER I; CARTER, VAL C	34-13901	Decreed	10/25/1965	IRRIGATION	4.27	239.0	
CARTER, TIERRA CANDICE; CARTER, WILSON ENGLAND	35-14932	Decreed	2/5/1981	IRRIGATION	0.65	36.0	
CASA DEL NORTE LP	37-7081	Decreed	12/8/1970	IRRIGATION	1.67	840.0	
CASSIA JOINT SCHOOL DISTRICT #151	45-14512	Decreed	3/15/1956	IRRIGATION	0.03	7.6	
CASSIA JOINT SCHOOL DISTRICT #151	45-14510	Decreed	12/19/1974	IRRIGATION	0.05	7.6	
CASSIA JOINT SCHOOL DISTRICT #151	45-14509	Decreed	3/22/1975	IRRIGATION	0.05	7.6	
CASSIA JOINT SCHOOL DISTRICT #151	45-14511	Decreed	4/28/1975	IRRIGATION	0.02	7.6	
CASSIDY, FRANCIS J; HANSEN, BARRY A; HANSEN, MARIAN; LINDLEY, ASHLEY M; LINDLEY, KEVIN L; RJHJ INVESTMENTS LLC	25-7638	License	4/25/1995	DOMESTIC	0.1	0.0	
CASTRO JR, VICENTE; CASTRO, PATRICIA	36-17297	Decreed	2/4/1976	IRRIGATION	0.06	3.1	
CEYNAR, MARCENE; FANN, LAVEDA A; FANN, R E; FARNSWORTH, BETH; FARNSWORTH, JAY; PICKERING, CRAIG; PICKERING, VICKY	25-7272	Decreed	2/4/1982	DOMESTIC	0.1	0.0	
CHALCO LLC	25-14168	Decreed	12/10/1954	IRRIGATION	0.11	1876.1	
CHAMBERS, BOYD; HARRIS, JAMES; HARRIS, MARI; LOREN, RICHAN; STUEVE, KENNETH; SWEARINGER, ALDON; WADE, BILL	25-4210	Decreed	3/21/1960	DOMESTIC, IRRIGATION	0.19	2.4	
CHAMBERS, RALEIGH R	25-7343	License	6/27/1983	DOMESTIC	0.06	0.0	
CHAPMAN, GARY RAY; CHAPMAN, REBECCA LYNN	22-14405	Decreed	4/22/1979	IRRIGATION	0.04	2.0	
CHERRY, GLEN; CHERRY, ILA	29-12075	Decreed	4/20/1937	DOMESTIC	0.04	0.0	
CHERRY, MARY ANN; CHERRY, ROBERT	25-14402	Decreed	7/19/1973	IRRIGATION	0.02	1.2	
CHERYL LYNN BLOUNT & STEVEN GUY HERICKS LIVING TRUST	37-23115	Decreed	9/20/1974	IRRIGATION	0.02	1.7	
CHILDERS, LINDA MARIE; CHILDERS, RODNEY DEAN	37-23116	Decreed	9/20/1974	IRRIGATION	0.03	2.7	
CHILDERS, LINDA MARIE; CHILDERS, RODNEY DEAN	37-23209	Decreed	9/20/1974	IRRIGATION	0.02	1.8	
CHRISTENSEN, ADAM W; NELSON, DIANE K	37-23133	Decreed	9/20/1974	IRRIGATION	0.02	0.8	
CHRISTENSEN, BRAD LEE	29-7706	License	5/21/1983	IRRIGATION	0.1	5.0	
CHRISTENSEN, BRAD LEE; CHRISTENSEN, KRISTI	29-14568	Decreed	8/3/1971	DOMESTIC, IRRIGATION, STOCKWATER	0.08	3.8	
CHRISTENSEN, BRAD LEE; CHRISTENSEN, KRISTI	29-7273	Decreed	7/3/1975	IRRIGATION	0.15	7.3	
CHRISTENSEN, LANCE ISAAC	25-7431	License	7/6/1988	DOMESTIC, IRRIGATION	0.09	1.6	
CIRCLE C LAND & CATTLE LLC	25-14621	Decreed	5/9/1977	IRRIGATION	0.98	49.0	
CITY OF CHUBBUCK	29-14012	Decreed	8/19/1952	MUNICIPAL	1.83	0.0	
CITY OF CHUBBUCK	29-14013	Decreed	8/19/1952	MUNICIPAL	2.25	0.0	
CITY OF CHUBBUCK	29-14058	Decreed	8/19/1952	MUNICIPAL	0.05	0.0	
CITY OF CHUBBUCK	29-14106	Decreed	8/18/1953	MUNICIPAL	0.93	0.0	
CITY OF CHUBBUCK	29-2385	Decreed	1/11/1957	MUNICIPAL	0.78	0.0	
CITY OF CHUBBUCK	29-2413	Decreed	6/25/1959	MUNICIPAL	1.1	0.0	
CITY OF CHUBBUCK	29-14055	Decreed	6/20/1961	MUNICIPAL	0.13	0.0	
CITY OF CHUBBUCK	29-14081	Decreed	6/20/1961	MUNICIPAL	0.025	0.0	
CITY OF CHUBBUCK	29-2469	Decreed	3/10/1963	MUNICIPAL	1.11	0.0	
CITY OF CHUBBUCK	29-14016	Decreed	1/17/1966	MITIGATION, MUNICIPAL	1.89	0.0	
CITY OF CHUBBUCK	29-14099	Decreed	5/2/1966	MUNICIPAL	2.52	0.0	
CITY OF CHUBBUCK	29-14056	Decreed	10/26/1966	MUNICIPAL	0.09	0.0	
CITY OF CHUBBUCK	29-14082	Decreed	10/26/1966	MUNICIPAL	0.018	0.0	
CITY OF CHUBBUCK	29-14096	Decreed	11/29/1971	MUNICIPAL	0.21	0.0	
CITY OF CHUBBUCK	29-14097	Decreed	11/29/1971	MUNICIPAL	0.02	0.0	
CITY OF CHUBBUCK	29-14054	Decreed	12/31/1974	MUNICIPAL	1.47	0.0	
CITY OF CHUBBUCK	29-14080	Decreed	12/31/1974	MUNICIPAL	0.266	0.0	

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CITY OF CHUBBUCK	29-14107	Decreed	12/3/1980	MUNICIPAL	0.61	0.0	
CITY OF OAKLEY	45-10803	Decreed	1/1/1930	MUNICIPAL	0.45	0.0	
CITY OF OAKLEY	45-2323B	Decreed	2/19/1950	DOMESTIC, STOCKWATER	0.5	0.0	
CLAYSON, CASEY; CLAYSON, SHANE	45-7496	Decreed	1/27/1982	DOMESTIC, IRRIGATION	0.06	0.7	
CLINGER, ILA; CLINGER, LELAND	29-2267A	Decreed	10/16/1949	DOMESTIC	0.08	0.0	
CLOSE, ROBERT; CLOSE, SALLY	25-11547	Decreed	1/31/1959	DOMESTIC, IRRIGATION	0.07	1.0	
COLLINS JR, FLOYD L; COLLINS, LINDA M	34-7072	Decreed	5/22/1974	IRRIGATION	0.68	34.0	
COMORE DEVELOPMENT INC	25-14240	License	6/1/1989	IRRIGATION	1.95	2634.0	
COMORE DEVELOPMENT INC	25-14488	License	8/5/2020	DOMESTIC	0.27	0.0	
COMORE LOMA WATER CO INC	25-7040	Decreed	9/17/1973	DOMESTIC	0.2	0.0	
COMORE LOMA WATER CO INC	25-7042	Decreed	10/26/1973	DOMESTIC	0.08	0.0	
COMORE LOMA WATER CO INC	25-7161	Decreed	9/29/1978	DOMESTIC	0.98	0.0	
COMORE LOMA WATER CORP	25-14243	Decreed	5/6/1957	IRRIGATION	0.53	2634.0	
COMORE LOMA WATER CORP	25-12706	Decreed	7/1/1960	DOMESTIC, IRRIGATION	0.13	2634.0	
COMORE LOMA WATER CORP	25-14340	Decreed	3/20/1961	IRRIGATION	0.56	2634.0	
COMORE LOMA WATER CORP	25-14242	Decreed	5/1/1980	IRRIGATION	0.29	2634.0	Yes
COMORE LOMA WATER CORP	25-14487	License	6/1/1989	IRRIGATION	1.31	2634.0	
COMORE LOMA WATER CORP	25-14505	License	6/1/1989	IRRIGATION	0.57	2634.0	
COMORE LOMA WATER CORP	25-7578	Decreed	8/29/1990	DOMESTIC	0.3	0.0	
COMORE LOMA WATER CORP	25-7652	Decreed	12/11/1996	DOMESTIC	1.33	0.0	
COMORE LOMA WATER CORP	25-14166	License	3/28/2005	DOMESTIC	0.58	0.0	
COMORE LOMA WATER CORP	25-14167	License	4/12/2005	DOMESTIC	0.21	0.0	
COMORE LOMA WATER CORP	25-14183	License	4/29/2006	DOMESTIC	0.5	0.0	
COMORE LOMA WATER CORP	25-14484	License	4/17/2020	DOMESTIC	0.38	0.0	
COMORE LOMA WATER CORP	25-14506	License	8/5/2020	DOMESTIC	0.18	0.0	
CONSOLIDATED AG PROPERTIES LLC	45-2448B	Decreed	6/1/1953	STOCKWATER	0.17	0.0	
COOK, CHARLES S; COOK, JUDITH; SORENSEN, BARRY	35-10512	Decreed	6/15/1952	COMMERCIAL, DOMESTIC, STOCKWATER	0.11	0.0	
COOK, DANNY; COOK, DARRELL L	35-7979	License	5/5/1981	DOMESTIC	0.06	0.0	
COOK, DONALD J	35-7362	License	12/27/1973	DOMESTIC, STOCKWATER	0.05	0.0	
COOK, JESSICA; COOK, STEVEN MATTHEW	45-14570	Decreed	6/1/1939	IRRIGATION	0.09	7.5	
COOK, KARL T; COOK, MOLLY M	35-14944	Decreed	2/13/1956	IRRIGATION	1.29	161.8	
COOK, KARL T; COOK, MOLLY M	35-14942	Decreed	4/1/1962	IRRIGATION	0.77	161.8	
COOK, KARL T; COOK, MOLLY M	35-14943	Decreed	1/24/1978	IRRIGATION	1.96	161.8	
COOK, STEVEN MATTHEW; COOK, TRISTA	45-14571	Decreed	6/1/1939	IRRIGATION	0.06	4.5	
CORDES, RONALD A	25-7488	License	2/14/1989	DOMESTIC, IRRIGATION	0.1	3.0	
CORDON TRAILER COURT	25-10195	Decreed	3/11/1960	COMMERCIAL	0.13	0.0	
CORP OF THE PRESIDING BISHOP	31-10340	Decreed	5/1/1932	DOMESTIC	0.04	0.0	
CORP OF THE PRESIDING BISHOP	25-4237	Decreed	5/8/1935	DOMESTIC	0.16	0.0	
CORP OF THE PRESIDING BISHOP	45-13877	Decreed	10/1/1952	IRRIGATION	0.04	2.0	
CORP OF THE PRESIDING BISHOP	45-13878	Decreed	10/1/1952	IRRIGATION	0.04	2.0	
CORP OF THE PRESIDING BISHOP	22-7438	Decreed	7/20/1983	DOMESTIC	0.28	0.0	
COUNTRY CLUB WATER	25-14447	Decreed	1/27/1976	IRRIGATION	0.03	18.7	
COUNTRY CLUB WATER	25-14448	Decreed	10/31/1986	IRRIGATION	0.01	18.7	Yes
COUNTY OF BANNOCK	29-13466	License	1/14/2003	COMMERCIAL	1.78	0.0	
COUNTY OF JEFFERSON	25-13985	License	5/13/2003	RECREATION STORAGE	0	0.0	

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COX, ED; COX, PATRICIA	29-7903	License	4/17/1990	IRRIGATION	0.04	2.0	
CRANDALL, JEFF; CRANDALL, SUSAN	35-8658	License	11/2/1985	DOMESTIC	0.06	0.0	
CRANE CROPS LLC	45-7303	Decreed	5/10/1977	IRRIGATION, STOCKWATER	1.28	62.0	
CRANE, KARI L; CRANE, TROY W	45-4067B	Decreed	8/1/1962	IRRIGATION	1.46	73.0	
CRANER, DAVID A; CRANER, HELEN B	45-7442	Decreed	4/4/1980	IRRIGATION	0.12	4.0	
CRANNEY LAND COMPANY LLC	45-2639	Decreed	2/20/1961	IRRIGATION	3.48	196.0	
CRARY INDUSTRIES INC	36-11369	Decreed	8/20/1959	COMMERCIAL	0.03	0.0	
CRAWFORD, GAYLE; CRAWFORD, JOHN S	36-17138	Decreed	3/7/1978	IRRIGATION	0.04	2.3	
CROMWELL, VERNAL D	25-7446	License	10/21/1988	DOMESTIC	0.06	0.0	
CROP PRODUCTION SERVICES	25-4250	Decreed	3/8/1963	COMMERCIAL	0.1	0.0	
CROTTS, RICHARD S; MC CONNELL, FRANCES L	37-23627	Decreed	9/20/1974	IRRIGATION	0.08	6.4	
CRYSTAL POND ANGLERS ASSN INC	22-7577	License	8/24/1988	RECREATION STORAGE	0	0.0	
CUNDICK, LARRY; CUNDICK, ROSALYNN	37-23213	Decreed	9/20/1974	IRRIGATION	0.02	1.6	
D & C PROPERTIES LLC	25-14596	Permit	8/4/2010	INDUSTRIAL	2	0.0	
D & M WATER ASSN	29-7281	Decreed	8/4/1975	DOMESTIC	0.26	0.0	
D & M WATER ASSN	29-7367	Decreed	2/7/1977	DOMESTIC	0.4	0.0	
D & M WATER ASSN	29-7912	License	4/2/1990	DOMESTIC	0.04	0.0	
DANCING DRAGONFLY LLC	25-4165	Decreed	6/19/1959	DOMESTIC, IRRIGATION	0.16	2.0	
DANIEL, BRENDA	25-7447	License	10/25/1988	IRRIGATION	0.02	1.0	
DANIEL, BRENDA; DANIEL, DAVID S	25-7261	Decreed	10/8/1981	DOMESTIC, IRRIGATION, STOCKWATER	0.04	2.0	
DANIEL, MELVIN R JR	25-7538	License	9/19/1989	COMMERCIAL	0.07	0.0	
DARCEL L HULSE TRUST	25-14185	Decreed	4/1/1903	IRRIGATION	0.06	2.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14588	Decreed	12/31/1940	IRRIGATION	0.16	15.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14587	Decreed	3/5/1948	IRRIGATION	0.11	15.0	
DASCANIO, ELIZABETH; DASCANIO, JUSTIN	35-14589	Decreed	9/28/1981	IRRIGATION	0.01	15.0	
DAVENPORT, KENDALL E; DAVENPORT, YOLANDA L	22-10395	Decreed	4/1/1947	DOMESTIC, IRRIGATION	0.06	1.1	
DAVID GREENE LIVING TRUST	37-23211	Decreed	9/20/1974	IRRIGATION	0.04	3.4	
DAVIS, BRIAN L	29-14462	Decreed	10/28/1953	IRRIGATION	0.01	1.5	
DAVIS, BRIAN L	29-14442	Decreed	6/23/1977	IRRIGATION	0.01	1.5	
DAVISON, NANCY; DAVISON, RANDY LEE	25-7017A	Decreed	3/20/1972	IRRIGATION	0.42	21.0	
DAW, ADELE S; DAW, TERRELL B	25-14255	Decreed	8/10/1966	IRRIGATION	0.02	1.2	
DE GIULIO RANCHES INC	35-10346	Decreed	6/1/1901	DOMESTIC, STOCKWATER	0.09	0.0	
DE MOSS, GARY A; DE MOSS, HELEN	37-22168	Decreed	9/20/1974	IRRIGATION, STOCKWATER	1.61	802.0	
DEES, ELDON G; DEES, KATHALINE; DEES, RONALD K; DEES, SHIRLEY	25-7351	Decreed	6/24/1983	DOMESTIC, STOCKWATER	0.06	0.0	
DERBYHAWK LLC	25-7553	License	9/27/1989	DOMESTIC	0.11	0.0	
DIETRICH SCHOOL DISTRICT #314	37-4317	Decreed	8/1/1935	DOMESTIC	0.09	0.0	
DIRKS, SHANE LEE; DIRKS, TANYA MARIE	34-14960	Decreed	9/13/1961	IRRIGATION	1.88	109.0	
DIRKS, SHANE LEE; DIRKS, TANYA MARIE	34-14961	Decreed	4/1/1977	IRRIGATION	0.3	109.0	Yes
DIXON, ANNIE; JAHN, ROBERT	35-7823	License	11/22/1978	DOMESTIC, STOCKWATER	0.05	0.0	
DOBSON RANCH	31-11429	Decreed	6/21/1957	DIVERSION TO STORAGE, IRRIGATION FROM STORAGE, IRRIGATION STORAGE	13.45	1561.6	
DOUBLE EAGLE PROPERTIES LLLP	45-14459	Decreed	10/11/1929	IRRIGATION	0.1	21.8	
DOUBLE EAGLE PROPERTIES LLLP	45-14460	Decreed	5/10/1946	IRRIGATION	0.12	21.8	
DOUBLE EAGLE PROPERTIES LLLP	45-14461	Decreed	2/20/1952	IRRIGATION	0.08	21.8	
DOUBLE EAGLE PROPERTIES LLLP	45-14462	Decreed	6/30/1985	IRRIGATION	0.08	21.8	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
DOUG ANDRUS DISTRIBUTING INC	35-12529	Decreed	1/1/1950	COMMERCIAL	0.18	0.0	
DREW, STAN	29-8237	License	4/17/2000	DOMESTIC	0.11	0.0	
DUNCAN, PATRICIA MCCARDELL; MC CARDELL, PETER D; MC CARDELL, RICHARD KEITH	29-10844	Decreed	1/4/1943	DOMESTIC, IRRIGATION, STOCKWATER	0.06	4.0	
EAMES, LINDA J	25-7643	License	12/4/1995	DOMESTIC	0.18	0.0	
EAST FAIRVIEW WATER WELL CO	25-12791	Decreed	4/1/1961	DOMESTIC	0.11	0.0	
EDEN, GARY T; EDEN, GLENNA R	37-8363	License	8/6/1988	COMMERCIAL, DOMESTIC, STOCKWATER	0.05	0.0	
EDSTROM CONSTRUCTION PROPERTIES LLP	22-14542	Permit	3/27/2023	INDUSTRIAL STORAGE, INDUSTRIAL, RECREATION STORAGE	4	0.0	
EDWARDS, LA DONNA; EDWARDS, SAMUEL	35-8793	License	6/13/1989	DOMESTIC	0.04	0.0	
ELDER, GLEN O; ELDER, JUNE R	29-4000	Decreed	6/1/1947	DOMESTIC, IRRIGATION, STOCKWATER	0.08	4.0	
ELDREDGE, DALE C; ELDREDGE, RENEE J	37-10142	Decreed	5/1/1951	COMMERCIAL, DOMESTIC, STOCKWATER	0.08	0.0	
ELK RIDGE RV LLC	36-17282	Decreed	2/2/1954	COMMERCIAL	0.11	0.0	
ELK RIDGE RV LLC	36-17283	Decreed	3/1/1975	COMMERCIAL	0.03	0.0	Yes
ELLIOTT, DAVID S; ELLIOTT, JANICE	25-14314	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
ELLIS, RANDY; HAINES, KENNETH; SIMMONS, LARRY W; SMITH, RICKY; SMITH, ROGER; WHEELER, BLISS	35-8821	License	9/13/1989	DOMESTIC	0.04	0.0	
EMPEY, BRUCE; EMPEY, JEANETTE C	25-7098	Decreed	8/5/1976	DOMESTIC, IRRIGATION	0.05	6.0	
EVANS, LOIS C; EVANS, MYRON C	31-10061	Decreed	12/31/1976	DOMESTIC	0.04	0.0	
F & C TRUCKING LLC	36-17067	Decreed	9/8/1962	COMMERCIAL, STOCKWATER	0.09	0.0	
FALCON RIDGE HOA	25-14181	License	1/27/2006	DOMESTIC	0.31	0.0	
FALLING TREE WELL CO	35-8815	License	9/20/1989	DOMESTIC	0.04	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2267	Decreed	10/16/1949	IRRIGATION	0.44	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2288	Decreed	5/19/1950	IRRIGATION	2	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13388	Decreed	6/18/1950	IRRIGATION	2.3	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13389	Decreed	6/18/1950	IRRIGATION	0.21	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2306	Decreed	7/2/1951	IRRIGATION	2.8	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2307	Decreed	7/2/1951	IRRIGATION	2	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2310	Decreed	12/22/1951	IRRIGATION	1.6	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13426	Decreed	1/15/1952	IRRIGATION	2.02	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-13427	Decreed	1/15/1952	IRRIGATION	0.73	0.0	
FALLS IRRIGATION DISTRICT / US BUREAU OF RECLAMATION	29-2614	Decreed	2/16/1953	IRRIGATION	1.52	0.0	
FARMS LLC	29-14051	Decreed	2/23/1966	IRRIGATION	0.02	1.5	
FAULKNER LAND & LIVESTOCK CO INC	37-10597	Decreed	12/31/1949	DOMESTIC, STOCKWATER	0.17	0.0	
FEATHERSTON, SHIRLEY K	35-10999	Decreed	12/31/1927	DOMESTIC, IRRIGATION, STOCKWATER	0.1	1.3	
FERGUSON, JEANINE; FERGUSON, LARRY G	25-10022	Decreed	12/31/1937	DOMESTIC, IRRIGATION, STOCKWATER	0.14	1.0	
FERRERA, ANGELA; FERRERA, DAVID	29-14459	Decreed	10/28/1953	IRRIGATION	0.01	1.8	
FERRERA, ANGELA; FERRERA, DAVID	29-14439	Decreed	6/23/1977	IRRIGATION	0.02	1.8	
FIELDS, KAREN C; FIELDS, VIRGIL	37-7699	Decreed	2/23/1978	DOMESTIC, STOCKWATER	0.2	0.0	
FINK, CONNIE LEE; FINK, DAN ROBERT	25-14260	Decreed	8/10/1966	IRRIGATION	0.03	1.4	
FOSTER COMPANY	25-14292	Decreed	2/15/1951	IRRIGATION	0.51	65.9	
FOSTER LAND AND CATTLE	22-14749	Decreed	2/24/1953	IRRIGATION	0.01	16.0	
FOSTER LAND AND CATTLE	22-14750	Decreed	6/7/1957	IRRIGATION	0.01	16.0	
FOSTER LAND AND CATTLE	22-14748	Decreed	8/4/1979	IRRIGATION	0.02	16.0	
FOUR SEASONS WATER CO	27-7351	License	4/20/1983	DOMESTIC	0.29	0.0	
FOUR SQUARE WATER WELL CORP	25-7327	Decreed	2/4/1985	DOMESTIC, IRRIGATION	0.16	3.0	
FRANKLIN DON WIXOM & ZOE FAR WIXOM FAMILY TRUST	45-10575	Decreed	3/15/1939	IRRIGATION, STOCKWATER	0.1	5.0	

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FREEMAN, DIANE WALKER; FREEMAN, DONALD WALTER	35-14952	Decreed	1/26/1962	IRRIGATION	0.04	3.3	
FREEMAN, MARK E	25-14306	Decreed	8/10/1966	IRRIGATION	0.02	2.0	
FREEMAN, MARK E	25-14311	Decreed	8/10/1966	IRRIGATION	0.02	2.0	
FULLMER JR, ALBERT W; FULLMER, ELEANOR	34-2437A	Decreed	9/5/1961	IRRIGATION	0.02	1.5	
FULLMER, APRIL; FULLMER, NICHOLAS	25-4106	Decreed	4/1/1959	IRRIGATION	0.05	1.7	
FUNK, BRENT; FUNK, CHALET	36-17181	Decreed	11/28/1977	IRRIGATION, MITIGATION BY NON-USE	2.14	104.7	
FUNK, LEROY; FUNK, RONDA	45-2672	Decreed	10/26/1961	IRRIGATION	1	71.0	
G5 LAND COMPANY LLC	45-2688B	Decreed	10/17/1962	COMMERCIAL	0.04	0.0	
GAIL E TOLMAN & J THOMAS PARKER TRUST	29-4440	Decreed	5/1/1933	DOMESTIC, IRRIGATION	0.04	1.0	
GALKA, MAGDALENA B; WAS, ALEKSANDER P; WAS, PIOTR B	34-14622	Decreed	12/17/1961	IRRIGATION	0.03	1.7	
GAMETT, CHANDOS; GAMETT, WESTON	34-14972	Decreed	12/31/1962	IRRIGATION	0.04	2.0	
GENERAL MILLS OPERATIONS INC	35-2857B	Decreed	1/16/1967	INDUSTRIAL	0.23	0.0	
GERRATT, LARRY	45-2180	Decreed	10/13/1934	IRRIGATION	2	151.0	
GERRATT, LARRY	45-11613	Decreed	7/22/1955	IRRIGATION	0.6	151.0	
GERRATT, LARRY; GERRATT, REX	45-11441	Decreed	4/1/1960	COMMERCIAL, DOMESTIC, STOCKWATER	0.07	0.0	
GIBBY, REED	45-13990	License	2/10/2006	DOMESTIC	0.09	0.0	
GILLEN, NORMAN	27-7585	License	4/20/1999	DOMESTIC	0.14	0.0	
GLANBIA FOODS INC	36-16213	Decreed	11/11/1959	MITIGATION	2.6	400.0	
GLANBIA FOODS INC	36-16215	Decreed	11/15/1970	MITIGATION	3.9	410.0	
GLANBIA FOODS INC	36-16219	Decreed	5/26/1971	MITIGATION	0.33	400.0	Yes
GLANBIA FOODS INC	36-16217	Decreed	5/16/1980	MITIGATION	0.96	400.0	
GO LLC	27-12180	Decreed	9/30/1905	COMMERCIAL, INDUSTRIAL	0.76	0.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7238	Decreed	10/31/1974	DOMESTIC, IRRIGATION	0.11	8.0	
GONZALES, FERNANDO B; GONZALES, IRENE H	29-7984	Decreed	4/23/1990	IRRIGATION	0.03	8.0	
GONZALEZ, LAURA; ORTIZ, JULIO	29-14346	Decreed	12/16/1963	IRRIGATION	0.03	2.0	
GOODLIFFE, ARNOLD J; GOODLIFFE, BECKY B	29-8044	License	4/2/1990	IRRIGATION	0.06	2.0	
GOODWIN EXCAVATING LLC; POCATELLO READY MIX	35-14326	Decreed	5/2/1977	INDUSTRIAL	0.1	0.0	
GOUGH, JONATHAN; GOUGH, MEMORI DEANN	37-23212	Decreed	9/20/1974	IRRIGATION	0.03	2.7	
GOUGH, SHAUN	37-23373	License	8/22/1988	IRRIGATION	0.03	1.5	
GRAFF, MICHAEL R	36-4206	Decreed	1/1/1952	DOMESTIC, IRRIGATION	0.04	2.0	
GRAVES, FRANCES M; GRAVES, RICHARD L	37-7371	Permit	7/31/1974	DOMESTIC, IRRIGATION, STOCKWATER	6.49	320.0	
GRAY, F SCOTT; HENRY, JOHN M; RODRIGUEZ, JAVIER P	25-7439	License	8/15/1988	DOMESTIC, IRRIGATION	0.09	1.0	
GRAYBEAL, EMILY; GRAYBEAL, JASON	37-4052	Decreed	4/1/1962	DOMESTIC, IRRIGATION	0.08	1.4	
GRIMMETT, GARY D	35-8179	Decreed	8/2/1983	DOMESTIC, IRRIGATION	0.1	3.0	
GRISENTI, CHEYANNA; GRISENTI, TYSON	36-17209	Decreed	6/21/1960	IRRIGATION	0.08	4.0	
GROVER, ALICE MAE; GROVER, MELVIN G	25-7480	License	1/9/1989	DOMESTIC, IRRIGATION, STOCKWATER	0.07	3.0	
GROVER, JACK H; GROVER, ROBERTA CAROL	35-10496	Decreed	4/1/1948	COMMERCIAL	0.02	0.0	
GUMMERSON, CHARLES E; GUMMERSON, REBECCA M	45-4033A	Decreed	8/1/1935	DOMESTIC, IRRIGATION, STOCKWATER	0.08	1.8	
GUNDERSON, ADEN	35-14176	Decreed	12/31/1940	IRRIGATION	0.21	20.0	
GUNDERSON, ADEN	35-14174	Decreed	3/5/1948	IRRIGATION	0.15	20.0	
GUNDERSON, ADEN	35-14178	Decreed	9/28/1981	IRRIGATION	0.01	20.0	
HALBERT, GILBERT L; HALBERT, KIM M	36-2371B	Decreed	12/31/1958	IRRIGATION	0.08	2.5	
HALE, LAUREN; HALE, NIC	29-14445	Decreed	10/28/1953	IRRIGATION	0.01	1.3	
HALE, LAUREN; HALE, NIC	29-14425	Decreed	6/23/1977	IRRIGATION	0.01	1.3	
HALL, BRIANNE; HALL, STEVEN	29-7628	Decreed	1/19/1982	IRRIGATION	0.12	7.6	

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HALL, DOUG; HALL, TAMARA	25-14289	Decreed	8/10/1966	IRRIGATION	0.04	2.0	
HALLINAN, KAYE; JENSEN, GARY L; JENSEN, GORDON L; JENSEN, J LYLE; JENSEN, M LEROY; JENSEN, TERRY L	29-2419	Decreed	10/26/1959	IRRIGATION	1.32	104.6	
HAMILTON LAND & LIVESTOCK LTD	25-4022	Decreed	2/7/1957	IRRIGATION	0.09	4.5	
HAMMOND, LORNA O; THE SHELTERED TRUST	35-8016	License	1/18/1982	DOMESTIC, STOCKWATER	0.06	0.0	
HANCOCK, DEAN	25-14496	Decreed	4/22/1979	IRRIGATION	0.02	1.0	
HANSEN, VIRGINIA E	45-4125	Decreed	3/20/1962	DOMESTIC, IRRIGATION	0.04	0.7	
HANSEN, WILLIAM KORBY	25-7458	License	11/8/1988	DOMESTIC, IRRIGATION	0.09	1.7	
HAROLDSEN, G ERIC; HAROLDSEN, GRANT O	25-7300	Decreed	1/5/1983	DOMESTIC, STOCKWATER	0.06	0.0	
HARRIS, BILL B	25-7489	License	2/23/1989	DOMESTIC, STOCKWATER	0.06	0.0	
HARRY, KIMBERLY A; HARRY, RICHARD C	34-2435A	Decreed	7/26/1961	IRRIGATION	1.54	71.0	
HART, DAVID J; HART, JAMES W	29-2395	Decreed	2/28/1958	IRRIGATION	2.11	215.2	
HART, ROBERT E	29-14263	Decreed	2/28/1958	IRRIGATION	0.7	71.8	
HASLAM, LAVORE	35-8629	License	4/8/1986	DOMESTIC, STOCKWATER	0.06	0.0	
HAWKINS, PENNY R; JONES, PHYLLIS J	34-2409A	Decreed	4/6/1961	IRRIGATION	2.2	132.0	
HAWKINS, PENNY R; JONES, PHYLLIS J	34-12034A	Decreed	6/20/1972	IRRIGATION	0.37	132.0	Yes
HAYES, AMY; HAYES, DESTRY	35-14638	Decreed	6/1/1938	IRRIGATION	0.04	3.3	
HAYES, AMY; HAYES, DESTRY	35-14639	Decreed	9/28/1981	IRRIGATION	0.02	3.3	
HEISE HOT SPRINGS INC	23-7016	Decreed	2/3/1976	IRRIGATION	0.36	14.5	
HELSLEY HENDRIX, JEANINE P; HELSLEY, BRIAN T	36-16561	Decreed	2/8/1971	IRRIGATION	0.03	3.0	
HENRIE, JAREM	25-7302	Decreed	1/25/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.05	2.0	
HENSLEY, DEBORAH; HENSLEY, FLOYD EARL; LOCKES, BERNICE; REYNOLDS, LYNN; WESSEL, TERESA	25-7084	Decreed	1/28/1976	DOMESTIC	0.06	0.0	
HERITAGE DEVELOPMENT	29-8173	License	7/19/1996	DOMESTIC	0.27	0.0	
HERMELIA GONZALEZ FAMILY TRUST	29-14559	Decreed	2/4/1972	IRRIGATION	0.04	2.5	
HIGHWAY ESTATES WATER USERS INC	25-7038	Decreed	9/20/1973	DOMESTIC	0.2	0.0	
HIGLEY DEVELOPMENTS LLC	25-14444	Decreed	10/28/1953	IRRIGATION	0.05	2.8	
HILL, BARBARA; WRIGHT, LE ROY C; WRIGHT, MARILYN	25-14615	Decreed	5/12/1981	IRRIGATION	0.05	0.7	
HILL, BRENT; LLOYD, LINDA; MC GARY, DEBRA; MC GARY, STEPHEN	22-7584	License	8/30/1988	DOMESTIC, IRRIGATION	0.1	2.0	
HINCKLEY, LA PREAL	25-14005	License	10/12/2003	IRRIGATION	0.06	3.0	
HINTZE FARMS	34-10696	Decreed	4/26/1955	COMMERCIAL	0.04	0.0	
HINTZE, LIN F; HINTZE, S K	34-10702	Decreed	7/1/1955	COMMERCIAL	0.04	0.0	
HOFFBUHR INVESTMENT CO LLC	45-13668	Decreed	4/28/1951	IRRIGATION	0.02	1.0	
HOLDAWAY, CHAD	31-4069	Decreed	12/31/1961	DOMESTIC, STOCKWATER	0.16	0.0	
HOLLADAY, JAYSON C; HOLLADAY, RUTH R	29-2336	Decreed	7/1/1953	DOMESTIC, IRRIGATION	0.04	3.0	
HOLLAND, JOHN H; HOLLAND, JUDITH A	36-7112	Decreed	1/22/1970	IRRIGATION, STOCKWATER	0.84	40.0	
HOLMES, JENNIFER A; HOLMES, MARK E	34-7562	License	11/14/1994	DOMESTIC	0.1	0.0	
HOME ACRES WATER ASSN	29-4269	Decreed	9/1/1945	DOMESTIC, STOCKWATER	0.1	0.0	
HONDO, AKIYE I; HONDO, DANIEL A	45-2664	Decreed	8/30/1961	IRRIGATION	2	157.0	
HUETTIG, BRIAN J; HUETTIG, LARRY; HUETTIG, NANCY	36-16866	Decreed	1/8/1951	COMMERCIAL	0.03	0.0	
HUNSTMANS PROPERTIES	27-7511	License	4/20/1990	COMMERCIAL	0.33	0.0	
HUNTING, AUDREY	25-7453	License	10/28/1988	IRRIGATION	0.03	1.0	
HUTCHISON, JA NEAL; HUTCHISON, WINSTON	45-4218	Decreed	7/1/1958	IRRIGATION	0.05	1.5	
HYMAS, KIMBERLY; HYMAS, TORREY ERIC	29-14454	Decreed	10/28/1953	IRRIGATION	0.05	6.4	
HYMAS, KIMBERLY; HYMAS, TORREY ERIC	29-14434	Decreed	6/23/1977	IRRIGATION	0.06	6.4	

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ID DEPT OF FISH & GAME	29-13997	Decreed	1/21/1964	DIVERSION TO STORAGE, RECREATION STORAGE	0.12	0.0	
ID DEPT OF FISH & GAME	29-13998	License	2/10/2011	RECREATION STORAGE	0	0.0	
ID DEPT OF PARKS & RECREATION	36-17147	Decreed	8/7/1973	IRRIGATION	0.06	5.0	
ID DEPT OF TRANSPORTATION	37-20852	Decreed	9/20/1974	IRRIGATION	0.09	0.0	
ID DEPT OF TRANSPORTATION	22-7317	Decreed	1/31/1980	COMMERCIAL, DOMESTIC	0.04	0.0	
ID DEPT OF TRANSPORTATION	31-7372	Decreed	1/28/1982	INDUSTRIAL	0.05	0.0	
ID FISH & GAME COMMISSION	35-4271A	Decreed	6/1/1945	FISH PROPAGATION	50	0.0	
ID FISH & GAME COMMISSION	35-8635A	Decreed	12/17/1986	FISH PROPAGATION	0.72	0.0	
ID FISH & GAME COMMISSION	35-8679	License	12/26/1988	COMMERCIAL	1	0.0	
IDAHO AG CREDIT FLCA; SCHWENDIMAN, VAL E	22-13293	License	1/5/1992	IRRIGATION	7.11	528.0	
IDAHO AGRI INVESTMENTS LLC	45-14533	Decreed	9/6/1967	COMMERCIAL, STOCKWATER	3.01	0.0	
IDAHO AGRI INVESTMENTS LLC	45-7237	License	5/2/1975	DOMESTIC, STOCKWATER	0.08	0.0	
IDAHO DAIRY HOLDINGS LLC	45-14463	Decreed	6/17/1929	COMMERCIAL, STOCKWATER	0.3	0.0	
IDAHO FALLS COUNTRY CLUB INC	25-13372	Decreed	12/31/1961	COMMERCIAL, IRRIGATION	0.67	132.0	
IDAHO POWER COMPANY	29-8126	Decreed	1/26/1959	INDUSTRIAL	2.68	0.0	
IDAHO POWER COMPANY	45-7669	License	1/9/1990	DOMESTIC	0.06	0.0	
IDAHO RAIL INVESTMENT LLC	29-11027	Decreed	12/14/1917	INDUSTRIAL, IRRIGATION	0.11	1.4	
IDAHO STATE UNIVERSITY	29-7289	Decreed	9/22/1975	HEATING	1.12	0.0	
IDAHO WATER CO LLC	36-16909	Decreed	9/12/1973	IRRIGATION	0.06	485.0	
IDAHO WATER CO LLC	36-16911	Decreed	9/12/1973	IRRIGATION	0.1	485.0	
IDAHO WATER COMPANY LLC	29-14365	Decreed	12/24/1948	IRRIGATION	0.19	20.0	
IDAHO WATER COMPANY LLC	29-14366	Decreed	5/27/1974	IRRIGATION	0.1	20.0	
INFANGER, DEBRA A; INFANGER, JOHN N	37-23224	License	3/17/2020	DOMESTIC	0.15	0.0	
ISAAK, LAMAR	29-14319	Decreed	2/28/1977	IRRIGATION	0.56	38.0	
J R SIMPLOT CO	33-10092	Decreed	11/1/1961	DOMESTIC, STOCKWATER	0.15	0.0	
J R SIMPLOT CO	29-2515	Decreed	1/5/1966	IRRIGATION	2	196.0	
J R SIMPLOT CO	29-7036	Decreed	9/10/1969	DOMESTIC, INDUSTRIAL	0.03	0.0	
J R SIMPLOT CO	29-7089	Decreed	6/9/1972	IRRIGATION	1.08	196.0	
JACK C BROWN LIVING TRUST; PATRICIA BROWN LIVING TRUST	35-9072	License	12/7/1998	DOMESTIC	0.18	0.0	
JACOB, JANET; JACOB, PAUL	34-14814	Decreed	5/14/1977	IRRIGATION	0.21	10.7	
JACOBS, GEORGE J	25-7321	License	5/9/1983	DOMESTIC, STOCKWATER	0.08	0.0	
JANSS FARMS	37-7351	Decreed	4/12/1974	STOCKWATER	0.14	0.0	
JARVIS, WADE DEE	29-14360	Decreed	2/10/1987	IRRIGATION	0.02	1.5	
JEFFERSON SCHOOL DISTRICT #251	35-8683	License	12/2/1988	INDUSTRIAL	0.02	0.0	
JEFFERSON SCHOOL DISTRICT #251	25-7472	License	1/23/1989	DOMESTIC	0.07	0.0	
JEFFRIES, DAVID A; JEFFRIES, SARA E	37-23214	Decreed	9/20/1974	IRRIGATION	0.02	2.0	
JENSEN, CHRIS L	35-2092B	Decreed	3/30/1948	IRRIGATION	0.01	1.0	
JENSEN, CHRIS L	35-7411B	Decreed	4/3/1974	IRRIGATION	0.01	1.0	
JENSEN, GARY; JENSEN, LARRY	34-2409B	Decreed	4/6/1961	IRRIGATION	2.2	172.0	
JENSEN, GARY; JENSEN, LARRY	34-12034B	Decreed	6/20/1972	IRRIGATION	0.53	172.0	Yes
JENSON, RONALD; JENSON, SHARON	25-10156	Decreed	10/1/1959	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.5	
JEROME CHEESE CO	35-14253	Decreed	8/19/1952	MITIGATION	0.06	0.0	
JEROME CHEESE CO	36-16380	Decreed	9/12/1973	MITIGATION	0.11	0.0	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-14808	Decreed	8/29/1960	DIVERSION TO STORAGE, IRRIGATION	0.27	13.5	
JOHN LEZAMIZ FAMILY LTD PARTNERSHIP	34-13890	Decreed	4/14/1961	IRRIGATION	2.31	248.1	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
JOHNSON, DON A; JOHNSON, LAURIE	25-7493	License	3/8/1989	DOMESTIC	0.06	0.0	
JOHNSON, E BUD	25-4227	Decreed	10/31/1956	DOMESTIC, IRRIGATION	0.11	1.2	
JOHNSON, MELISSA	25-7455	License	10/21/1988	DOMESTIC, IRRIGATION	0.07	1.0	
JOHNSON, RODNEY M; JOHNSON, SHERRY L	36-17277	Decreed	11/28/1977	IRRIGATION	0.04	2.0	
JOLLEY, BRYAN D; JOLLEY, TAMERA	35-4227B	Decreed	5/1/1959	IRRIGATION	0.02	1.0	
JONES, CLYDE R; JONES, HELEN	25-12037	Decreed	12/31/1948	IRRIGATION	0.108	5.4	
JONES, HEATHER; JONES, JUSTIN	29-14452	Decreed	10/28/1953	IRRIGATION	0.06	8.0	
JONES, HEATHER; JONES, JUSTIN	29-14432	Decreed	6/23/1977	IRRIGATION	0.07	8.0	
JONES, JACOB; JONES, REBECCA	29-14457	Decreed	10/28/1953	IRRIGATION	0.02	2.0	
JONES, JACOB; JONES, REBECCA	29-14437	Decreed	6/23/1977	IRRIGATION	0.02	2.0	
JONES, ROSA GAY	29-7913	License	4/3/1990	DOMESTIC, IRRIGATION	0.06	5.0	
JORY, GRACE; JORY, GRIFFIN WHEELER	29-14140	Decreed	9/25/1957	DOMESTIC, IRRIGATION	0.02	0.5	
JOURNEYS END HOMEOWNERS ASSN	35-13612	License	11/24/2003	DOMESTIC	0.4	0.0	
JOURNEYS END HOMEOWNERS ASSN	35-13611	License	1/13/2007	COMMERCIAL, DOMESTIC	0.11	0.0	
JUNIPER HILLS COUNTRY CLUB INC	29-13827	Decreed	1/29/1960	IRRIGATION	0.3	15.0	
JUNIPER HILLS COUNTRY CLUB INC	29-4433	Decreed	4/1/1960	IRRIGATION	2.27	113.3	
JUNIPER VIEW LLC	22-14339	License	4/10/2017	IRRIGATION	0.12	24.5	
K & J HOLDING LLC	31-10737	Decreed	12/12/1948	COMMERCIAL, DOMESTIC, STOCKWATER	0.04	0.0	
KAREY LANE WELL ASSN	35-7698	Decreed	8/11/1983	DOMESTIC	0.14	0.0	
KAREY LANE WELL ASSN	35-8943	License	5/3/1991	DOMESTIC	0.09	0.0	
KENNY AND CHELSIE HILL LIVING TRUST	29-14456	Decreed	10/28/1953	IRRIGATION	0.02	2.1	
KENNY AND CHELSIE HILL LIVING TRUST	29-14436	Decreed	6/23/1977	IRRIGATION	0.02	2.1	
KEYBANK NATIONAL ASSOC	25-7517	License	8/24/1989	COMMERCIAL	0.5	0.0	
KINGHORN, KARL	25-14338	Decreed	2/18/1958	IRRIGATION	1.37	47.9	
KIRBY, DORIS F; KIRBY, ELWOOD	35-7860	License	6/20/1979	DOMESTIC	0.08	0.0	
KIRKHAM JR, DALE B; KIRKHAM, DALE B	29-7941	License	3/31/1990	COMMERCIAL	0.08	0.0	
KLOEPFER INC	45-13665	Decreed	4/28/1951	IRRIGATION	0.42	24.0	
KNIFE RIVER CORPORATION MOUNTAIN WEST	25-14552	Permit	7/8/2024	DIVERSION TO STORAGE, INDUSTRIAL FROM STORAGE, INDUSTRIAL STORAGE, INDUSTRIAL	0.78	0.0	
KNOWLES, CHARLOTTE LUANN	45-14589	Decreed	9/27/1972	IRRIGATION	0.03	4.5	
KOCH MATERIALS CO	35-12087	Decreed	5/1/1962	COMMERCIAL, FIRE PROTECTION, INDUSTRIAL	0.11	0.0	
KOCH, DENNIS W; KOCH, DIANA E	45-13621	Decreed	7/14/1983	IRRIGATION	0.04	3.4	
KOON, JACK E	22-7751	License	9/18/1992	DOMESTIC	0.06	0.0	
KOPP, GWENDOLYN	25-7522	License	9/1/1989	DOMESTIC	0.04	0.0	
KROGSTAD, RYAN	25-11545	Decreed	4/1/1927	DOMESTIC, IRRIGATION, STOCKWATER	0.06	0.7	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14727	Decreed	12/31/1940	IRRIGATION	0.02	2.4	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14724	Decreed	3/5/1948	IRRIGATION	0.02	2.4	
KRUCKEBERG, ALEISHA; KRUCKEBERG, MATTHEW	35-14730	Decreed	9/28/1981	IRRIGATION	0.01	2.4	
KUBIAK, VERNON ROBERT	34-2366B	Decreed	5/12/1960	IRRIGATION	0.09	7.0	
KUGLER, DIANE K; KUGLER, JOHN B	35-8359	Permit	11/28/1984	IRRIGATION	6	313.0	
KULHANEK, DENNIS; KULHANEK, MAXINE	36-8503	License	2/21/1990	IRRIGATION	0.04	2.0	
KUNZLER, KAREN; KUNZLER, WILLIAM JUNIOR	45-2375E	Decreed	4/28/1951	IRRIGATION	0.03	1.5	
KURPJUWEIT, ALBERT J; KURPJUWEIT, NINA	29-12132	Decreed	5/1/1965	DOMESTIC, STOCKWATER	0.06	0.0	
L & S LAND HOLDINGS LLC	36-10098	Decreed	1/1/1935	DOMESTIC, STOCKWATER	0.05	0.0	
L & S LAND HOLDINGS LLC	36-17189	Decreed	11/26/1956	COMMERCIAL, STOCKWATER	0.13	0.0	

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L & S LAND HOLDINGS LLC	36-17188	Decreed	1/23/1973	COMMERCIAL, STOCKWATER	0.09	0.0	
L & S LAND HOLDINGS LLC	36-17242	Decreed	1/23/1973	COMMERCIAL, STOCKWATER	0.08	0.0	
L & S LAND HOLDINGS LLC	36-17190	Decreed	10/27/1973	COMMERCIAL, STOCKWATER	0.08	0.0	
L & S LAND HOLDINGS LLC	36-17187	License	9/24/1979	COMMERCIAL, STOCKWATER	0.2	0.0	
L2 LTD PARTNERSHIP; L3 LTD PARTNERSHIP	32-4058	Decreed	7/1/1953	DOMESTIC, STOCKWATER	0.16	0.0	
LACEY, AKILAH; LACEY, HOLLY	29-14444	Decreed	10/28/1953	IRRIGATION	0.01	1.3	
LACEY, AKILAH; LACEY, HOLLY	29-14431	Decreed	6/23/1977	IRRIGATION	0.01	1.3	
LAIRD, WILLIAM G	36-15071	Decreed	12/31/1947	COMMERCIAL, DOMESTIC	0.11	0.0	
LAMB WESTON INC	35-14786	Permit	4/29/2022	INDUSTRIAL	15	0.0	
LAMB, CORY W; LAMB, TERI G	29-10645	Decreed	5/15/1960	IRRIGATION	0.03	1.0	
LAMBERT, LYLE; LAMBERT, NADINE	29-7640	Decreed	5/17/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.0	
LANDON, JESSICA; LANDON, PAUL	25-14521	License	1/14/1983	IRRIGATION	0.11	10.0	
LANDON, JULIE; LANDON, KELLY	25-14475	Decreed	8/10/1966	IRRIGATION	0.04	2.0	
LANE JR, DALLAS R; LANE, CRYSTAL L KANDERIS	29-14450	Decreed	10/28/1953	IRRIGATION	0.02	2.8	
LANE JR, DALLAS R; LANE, CRYSTAL L KANDERIS	29-14430	Decreed	6/23/1977	IRRIGATION	0.03	2.8	
LARSEN, BLAINE L; LARSEN, CONNIE L	31-12200	Decreed	2/17/1969	DOMESTIC	0.04	0.0	
LARSEN, HELEN	35-8127	License	4/28/1983	DOMESTIC, STOCKWATER	0.08	0.0	
LARSEN, JO ANN B	25-7315	Decreed	4/12/1983	COMMERCIAL, DOMESTIC, IRRIGATION	0.19	1.0	
LARSEN, PEGGY A; LARSEN, RICHARD J	31-7129	License	7/30/1974	DOMESTIC, STOCKWATER	0.08	0.0	
LARSON, BECKY J; LARSON, CHARLES W	45-4160	Decreed	3/15/1962	IRRIGATION	1.7	173.0	
LAZY EIGHT ESTATES DIVISION 2 HOMEOWNERS ASSN INC	25-14189	License	10/26/2006	DOMESTIC	0.5	0.0	
LAZY P FARMS; PAULS, DEBBRAH; PAULS, EMIL V; PAULS, RONALD	37-8147	License	6/27/1983	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.8	
LCSC ENTERPRISES LLC	36-17359	Decreed	6/21/1955	COMMERCIAL	0.07	0.0	
LEAVELL, ALONZO B	37-11199	Decreed	4/1/1960	DOMESTIC	0.03	0.0	
LEE, CAROLYN C; LEE, LARRY O	31-7166A	Permit	6/27/1975	IRRIGATION	3.2	160.0	
LEHMAN, CLAUDIA; LEHMAN, MORRIS	29-7333	Decreed	6/24/1976	DOMESTIC, IRRIGATION	0.16	4.0	
LEMMON, JOYCE; LEMMON, MELVIN C	34-10836	Decreed	6/1/1953	IRRIGATION	0.04	1.9	
LES SCHWAB TIRE CENTERS OF IDAHO	36-11803	Decreed	11/15/1958	COMMERCIAL	0.38	0.0	
LEZAMIZ, ROBIN J; TABER, LYNDA LU LEZAMIZ	37-10363	Decreed	9/1/1959	COMMERCIAL	0.11	0.0	
LIGHTHOUSE PROPERTIES LLC	25-7547	License	8/25/1989	IRRIGATION	0.15	15.0	
LIMA, GUADALUPE	36-17128	Decreed	9/20/1973	IRRIGATION	0.02	1.2	
LINCOLN LAND CO LLC	25-2119	Decreed	6/10/1955	DOMESTIC	5.56	0.0	
LINTON, ROSE M; LINTON, WILLIAM D	29-12031	Decreed	4/20/1937	DOMESTIC, STOCKWATER	0.04	0.0	
LITTLE SKY FARMS LLLP	37-2526A	Decreed	11/28/1951	IRRIGATION	3.59	208.0	
LOFT 745 LLC C/O JOSH FOSTER	25-14545	License	5/15/2024	COMMERCIAL	0.04	0.0	
LOJA LLC	25-13579	Decreed	9/1/1945	COMMERCIAL, DOMESTIC	0.27	0.0	
LOJA LLC	25-7424	License	4/1/1988	IRRIGATION	0.09	3.0	
LONE STAR WATER USERS COOP ASSN INC	37-4344	Decreed	4/1/1940	COMMERCIAL, DOMESTIC, STOCKWATER	0.07	0.0	
LONG, DAVID JESSE; LONG, SYLVIA M	35-14908	Decreed	8/19/1977	IRRIGATION	0.11	6.5	
LOOP, JACQUELINE	25-14486	License	9/19/1989	DOMESTIC, IRRIGATION	0.06	0.7	
LORD, DONALD; LORD, JUDY	34-13723	Decreed	6/18/1948	IRRIGATION	0.21	16.0	
LORD, DONALD; LORD, JUDY	34-13719	Decreed	4/19/1960	IRRIGATION	0.1	16.0	
LORDS, DARRELL M	35-8778	License	5/31/1989	IRRIGATION	0.1	4.5	
LOVELAND, ANN; LOVELAND, KEVIN	29-14295	Decreed	10/26/1959	IRRIGATION	1.63	128.4	
LOVELL, HOPE; LOVELL, JAMES R	25-7598	License	9/25/1991	IRRIGATION	0.03	1.9	

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LYNCH, LESLIE R	36-7154	Decreed	1/25/1971	INDUSTRIAL	0.02	0.0	
M & N LAND LLC	45-14568	Decreed	2/1/1954	IRRIGATION	0.44	101.0	
M & N LAND LLC	45-14567	Decreed	12/10/1956	IRRIGATION	0.92	101.0	
MACY, CHANTELLE L; MACY, SEAN C	27-12363	Decreed	10/21/1977	DOMESTIC, IRRIGATION	0.04	4.0	
MADISON SCHOOL DISTRICT #321	22-14474	Permit	5/13/2022	DOMESTIC	0.26	0.0	
MAEBE, RICHARD	36-10527	Decreed	5/1/1948	DOMESTIC, IRRIGATION	0.08	2.6	
MAGEE FAMILY TRUST	34-2294	Decreed	6/24/1950	IRRIGATION	0.12	197.4	
MAGEE FAMILY TRUST	34-13762	Decreed	11/28/1952	IRRIGATION	0.99	197.4	
MAGEE FAMILY TRUST	34-2399	Decreed	2/24/1961	IRRIGATION	1.52	197.4	
MAGEE FAMILY TRUST	34-14343	Decreed	4/1/1987	IRRIGATION	0.12	197.4	Yes
MAGIC VALLEY GROWERS LTD	37-20612	Decreed	6/1/1956	INDUSTRIAL	0.1	0.0	
MAGNIFY LAND CONSULTING LLC	36-17208	Decreed	4/13/1976	IRRIGATION	0.2	10.0	
MARLOWE, MARK; MARLOWE, MICHELLE	25-14319	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
MARSHALL, BYRON GUY; MARSHALL, LORI ANN	29-14138	Decreed	2/10/1987	IRRIGATION	0.11	7.0	
MARSHALL, DON W	25-7462	License	11/10/1988	DOMESTIC, IRRIGATION	0.07	1.0	
MARTIAN, ERICA; MARTIAN, PETER	35-7855	Decreed	5/1/1979	COMMERCIAL, HEATING	0.04	0.0	
MARTIN, HAROLD D	35-13621	License	12/27/1989	DOMESTIC, IRRIGATION	0.04	0.8	
MATHESON, KATHLEEN; MATHESON, RICHARD F	27-12362	License	5/31/1983	COMMERCIAL, DOMESTIC, IRRIGATION	0.17	11.8	
MAXMILLION FARMS; SHRADER, MAXINE R	35-8224	Decreed	6/30/1983	DOMESTIC, IRRIGATION	0.04	1.0	
MC ALISTER, G P; MC ALISTER, JEN	36-11921	Decreed	4/23/1947	DOMESTIC	0.14	0.0	
MC CALL OIL & CHEMICAL	25-7045	Decreed	2/25/1974	DOMESTIC, INDUSTRIAL	0.08	0.0	
MC DANIEL, KELLY; MC DANIEL, KIM	34-14240	Decreed	6/13/1968	IRRIGATION	0.05	3.0	
MC DANIEL, WENDY M	25-14299	Decreed	8/10/1966	IRRIGATION	0.03	1.5	
MC DANIEL, ZEE M	25-14330	Decreed	8/10/1966	IRRIGATION	0.8	39.7	
MC DANIEL, ZEE M	25-14332	Decreed	7/27/1972	IRRIGATION	0.4	26.9	
MC GARRY, THERON R; MC GARRY, TIM R	22-4150	Decreed	9/1/1948	DOMESTIC, STOCKWATER	0.23	0.0	
MC HAN, CRYSTAL	45-14515	Decreed	7/15/1974	IRRIGATION	0.02	1.5	
MC KELVEY, JOHN Q; MC KELVEY, MARGARET E	34-14861	Decreed	5/16/1977	IRRIGATION	0.06	3.5	
MC KELVEY, JOHN Q; MC KELVEY, MARGARET E	34-14863	Decreed	4/1/1987	IRRIGATION	0.01	3.5	Yes
MC KINNEY, MONICA; MC KINNEY, WILLIAM	37-23208	Decreed	9/20/1974	IRRIGATION	0.02	1.0	
MC KINNEY, MONICA; MC KINNEY, WILLIAM	37-23210	Decreed	9/20/1974	IRRIGATION	0.03	1.5	
MC KINNEY, MONICA; MC KINNEY, WILLIAM	37-23215	Decreed	9/20/1974	IRRIGATION	0.01	0.8	
MCINTOSH, JOSHUA	25-12184	Decreed	6/1/1950	DOMESTIC, IRRIGATION, STOCKWATER	0.09	1.9	
MEMMOTT, JENNIFER; MEMMOTT, JOHN C	25-7556	License	9/18/1989	DOMESTIC, IRRIGATION	0.08	1.2	
MENAN PRODUCE INC	25-12178	Decreed	11/1/1953	DOMESTIC, INDUSTRIAL	0.1	0.0	
MERLIN HOLDINGS LLC	25-14265	Decreed	8/10/1966	IRRIGATION	0.03	1.3	
MERRILL, CINDY	25-13580	Decreed	1/1/1963	DOMESTIC, IRRIGATION	0.14	5.0	
MERRILL, KENT	25-14364	License	2/28/1992	IRRIGATION	0.19	12.2	
MEYER LAND COMPANY LLC	25-11617	Decreed	12/31/1950	COMMERCIAL	0.166	0.0	
MIKESELL, ELEANOR	31-10268	Decreed	5/1/1957	COMMERCIAL, DOMESTIC	0.04	0.0	
MIKKOLA, ARTHUR; MIKKOLA, MARK	25-7389	Decreed	11/2/1983	DOMESTIC, STOCKWATER	0.06	0.0	
MILES, MICHAEL D	45-14587	Decreed	6/1/1939	IRRIGATION	0.02	1.8	
MILLER, LYNETTE R; MILLER, MARVIN G	25-4194	Decreed	11/1/1960	IRRIGATION	0.13	7.0	
MILLERCOORS USA LLC	45-7641	License	6/8/1989	COMMERCIAL	0.04	0.0	
MILNER IRRIGATION DISTRICT	45-4171	Decreed	1/1/1941	COMMERCIAL, DOMESTIC	0.06	0.0	

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MILNER IRRIGATION DISTRICT	45-463	Decreed	7/12/1952	IRRIGATION	2.5	0.0	
MINIDOKA IRRIGATION DISTRICT	36-13480	Decreed	5/31/1962	COMMERCIAL	0.04	0.0	
MINOR, JOSEPH W; MINOR, KATHLEEN D	34-14737	Decreed	9/29/1966	IRRIGATION	0.01	0.5	
MINOR, JOSEPH W; MINOR, KATHLEEN D	34-14738	Decreed	5/20/1984	IRRIGATION	0.01	0.5	Yes
MITCHELL, RALPH M	45-7640	License	5/23/1989	DOMESTIC, IRRIGATION	0.07	1.5	
MIX, GUY; MIX, MARGARET	29-12076	Decreed	4/20/1937	DOMESTIC	0.04	0.0	
MODEL WATER USERS ASSN INC	35-7986	Decreed	6/1/1981	DOMESTIC	0.1	0.0	
MONK, AUBRIE; MONK, STEVEN	35-14753	Decreed	2/2/1952	IRRIGATION	0.06	6.0	
MONK, AUBRIE; MONK, STEVEN	35-14754	Decreed	4/23/1961	IRRIGATION	0.04	6.0	
MONTAGUE, FANNYE FLORENCE; MONTAGUE, JACK MICHAEL	29-7483	Decreed	2/10/1987	DOMESTIC, IRRIGATION	0.02	1.0	
MONTIERTH, GARY; MONTIERTH, NETTIE	34-13891	Decreed	4/14/1961	IRRIGATION	0.09	9.9	
MOO VIEW COW PALACE	45-13905	Decreed	11/16/1974	COMMERCIAL, STOCKWATER	0.3	0.0	
MOORE, AARON R	37-23132	Decreed	9/23/1977	IRRIGATION	0.1	5.0	
MORE LAND PROPERTIES LLC	35-14940	Decreed	10/1/1962	IRRIGATION	0.1	5.0	
MORE LAND PROPERTIES LLC	35-14941	License	8/4/1983	IRRIGATION	0.06	5.0	
MORGAN, CHASE D; MORGAN, JENNY L	29-14449	Decreed	10/28/1953	IRRIGATION	0.01	1.8	
MORGAN, CHASE D; MORGAN, JENNY L	29-14429	Decreed	6/23/1977	IRRIGATION	0.02	1.8	
MORGAN, CODY G; MORGAN, KATHY	36-17092	Decreed	3/11/1954	COMMERCIAL, STOCKWATER	0.04	0.0	
MORGAN, CODY G; MORGAN, KATHY	36-17091	Decreed	2/6/1961	COMMERCIAL, STOCKWATER	0.02	0.0	
MORRISS, JUDITH L; MORRISS, VIRGIL R	25-7483	License	12/22/1988	DOMESTIC, IRRIGATION, STOCKWATER	0.04	3.0	
MOSS FARMS INC	34-2379F	Decreed	8/8/1960	IRRIGATION	2.11	112.0	
MOSS, DENNIS K	34-14525	Decreed	6/6/1961	IRRIGATION	0.64	32.0	
MOUNT MC CALEB INC	34-7512	Decreed	5/22/1989	DOMESTIC	0.04	0.0	
MOUNTAIN RIVER SPORTSMANS RV PARK & CAMP	25-14229	License	9/2/2008	COMMERCIAL	0.2	0.0	
MOUNTAIN VIEW LAND LLC	36-17319	Decreed	9/24/1976	COMMERCIAL, STOCKWATER	0.2	0.0	
MOUNTAIN WEST BARK PRODUCTS INC	22-7573	License	8/8/1988	COMMERCIAL	0.08	0.0	
MOWREY, KRISTIE; MOWREY, RICK	29-7009	Decreed	3/22/1968	DOMESTIC, IRRIGATION, STOCKWATER	0.11	4.5	
MOYLE, KEVIN A; MOYLE, TAYLOR N	36-17240	License	3/16/1989	COMMERCIAL, DOMESTIC, STOCKWATER	0.33	0.0	
MULLINS, CODY; MULLINS, KRISTY TADDONIO	45-14569	Decreed	6/1/1939	IRRIGATION	0.06	4.5	
MURRI BUILDERS LLC	25-14320	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
MURRI BUILDERS LLC	25-14322	Decreed	7/27/1972	IRRIGATION	0.01	0.7	
NATION, DUANE; NATION, LEAH	34-13783	Decreed	4/2/1980	IRRIGATION	0.04	2.6	
NAYLOR, AUDREY; NAYLOR, LEIGH	25-7582	License	2/4/1991	DOMESTIC, IRRIGATION	0.09	3.0	
NEIBAUR, RYAN	25-7561	License	3/2/1990	IRRIGATION	0.27	24.0	
NELSEN DAIRY	36-8745	License	11/7/1995	COMMERCIAL, STOCKWATER	0.11	0.0	
NELSON, ERIC B; NELSON, SUAZANNE Y	25-7363	License	6/24/1983	DOMESTIC	0.04	0.0	
NELSON, LAURENCE	29-7868	License	9/11/1989	DOMESTIC, IRRIGATION	0.17	15.0	
NEW PHASE INVESTMENTS LLC	25-14186	License	9/18/2006	COMMERCIAL	0.05	0.0	
NICHOLS LAND LLC; NICHOLS, ANGELA; NICHOLS, DEREK A; NICHOLS, PATRICK J	34-13904	Decreed	12/17/1961	IRRIGATION	0.3	426.6	
NICKELSON, DALENE C	25-7193A	Decreed	4/30/1980	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.9	
NICKISCH, CRAIG W; NICKISCH, MARJORIE I	29-10731	Decreed	3/23/1959	IRRIGATION, STOCKWATER	0.1	4.1	
NIELSON, BENITA G; NIELSON, JACK W	29-7885	License	12/27/1989	IRRIGATION	0.11	5.0	
NO VIEW CALF RANCH LLC	36-7460AD	Decreed	3/25/1974	COMMERCIAL, STOCKWATER	0.06	0.0	
NO VIEW CALF RANCH LLC	36-8774	License	3/10/1998	DOMESTIC, STOCKWATER	0.13	0.0	
NOEL, DE ANN B; NOEL, WRIGHT R	22-7372	License	7/14/1981	DOMESTIC, STOCKWATER	0.07	0.0	

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NORMAN E NEF & SONS INC	35-7962	Permit	6/1/1981	IRRIGATION	12.2	610.0	
NORMAN E NEF & SONS INC	35-7963	Permit	6/1/1981	IRRIGATION	6.4	320.0	
NORTH FORTY FOUR LLC	25-13026	Decreed	12/31/1957	COMMERCIAL	0.04	0.0	
NORTH RIM FAIRWAYS OWNERS ASSN INC	36-16406	License	2/24/2006	DOMESTIC	0.23	0.0	
NORTHSIDE RANCH CO LLC	36-2318B	Decreed	2/28/1957	STOCKWATER	0.05	0.0	
NORTHWEST FARM CREDIT SERVICES FLCA; ROTH INVESTMENTS LLC	37-23157	License	9/20/1990	COMMERCIAL	0.5	0.0	
NORTHWEST PIPELINE CORP	29-2376	Decreed	7/6/1956	COMMERCIAL, IRRIGATION	0.08	4.1	
NORTHWEST PIPELINE CORP	45-2531	Decreed	7/6/1956	DOMESTIC, INDUSTRIAL	0.04	0.0	
NUTTALL, ALIESHA DAWN; NUTTALL, JEFFREY DOUGLAS	25-7275	Decreed	2/8/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.03	1.0	
OAKLEY VALLEY WATER CO	45-4273	Decreed	2/12/1954	MUNICIPAL	0.45	0.0	
OKELBERRY, TODD L	36-17355	Decreed	2/6/1953	IRRIGATION	0.07	10.0	
OKELBERRY, TODD L	36-17356	Decreed	2/6/1953	IRRIGATION	0.06	10.0	
OKELBERRY, TODD L	36-17357	Decreed	5/29/1956	IRRIGATION	0.07	10.0	
OKELBERRY, TODD L	36-17358	Decreed	6/24/1960	IRRIGATION	0.01	10.0	
OLSEN, GARY; OLSEN, PATRICIA	25-12353	Decreed	10/7/1953	COMMERCIAL, DOMESTIC	0.16	0.0	
ON TIME FINANCIAL LLC	22-14478	Permit	7/14/2022	COMMERCIAL, DOMESTIC	0.21	0.0	
OSTERHOUT, DANA; OSTERHOUT, GAYLEN; OSTERHOUT, LORRIE; OSTERHOUT, VIRGINIA M	45-10587	Decreed	6/30/1958	COMMERCIAL, DOMESTIC, IRRIGATION	0.08	0.5	
OSWALD, BRITTNEY; OSWALD, MATT	29-14171	Decreed	2/3/1961	IRRIGATION	0.06	3.0	
P U RANCH LTD C/O SCOTT SLOCUM	34-12396	Decreed	10/15/1984	STOCKWATER	0.36	0.0	Yes
PACIFICORP	25-7403	License	6/14/1985	WATER QUALITY IMPROVEMENT	0.45	0.0	
PACIFICORP	25-14431	License	2/19/2016	WATER QUALITY IMPROVEMENT	0.47	0.0	
PALACIO, WILLIAM M	37-19847	Decreed	3/15/1952	IRRIGATION	0.44	22.0	
PARKER, BRENT E; PARKER, KRISTINE	25-7073E	Decreed	8/1/1975	IRRIGATION	0.2	10.0	
PARKINSON FARMS	34-10393	Decreed	5/1/1976	IRRIGATION	0.26	306.0	Yes
PATTCO LLLP	45-7603	License	7/9/1986	IRRIGATION	1.26	447.0	
PAUL, LILAH; PAUL, WALTER T	45-2259	Decreed	5/24/1948	IRRIGATION	0.12	4.1	
PAULS, DEBBRAH; PAULS, RONALD	37-4390	Decreed	7/1/1916	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.2	
PAULS, DEBBRAH; PAULS, RONALD	37-4391	Decreed	7/1/1941	DOMESTIC, IRRIGATION, STOCKWATER	0.04	1.2	
PEARSON, CHELSEA	34-2323C	Decreed	2/11/1955	IRRIGATION	0.04	2.0	
PEARSON, JAY F; PEARSON, SUSAN	34-2412A	Decreed	4/13/1961	IRRIGATION	0.04	2.0	
PEHRSON, BYRON; PEHRSON, LOY G	34-10581	Decreed	5/1/1920	DOMESTIC, STOCKWATER	0.65	0.0	
PEHRSON, JOSH	34-2403	Decreed	3/31/1961	IRRIGATION	3.2	190.0	
PERFORMIX NUTRITION SYSTEMS LLC	36-17195	Decreed	12/24/1948	COMMERCIAL	0.09	0.0	
PERFORMIX NUTRITION SYSTEMS LLC	36-17196	Decreed	5/27/1974	COMMERCIAL	0.06	0.0	
PETTET, TERRY	34-4086	Decreed	6/9/1962	DOMESTIC, IRRIGATION, STOCKWATER	0.06	5.0	
PHILLIPS BROTHERS FARM & LIVESTOCK	25-14610	Decreed	10/15/1974	INDUSTRIAL	0.09	0.0	
PHINNEY, DAVID; RICHARDS, DEBORA	35-14870	Decreed	6/27/1983	DOMESTIC, IRRIGATION	0.02	0.5	
PILKINTON, C R; PILKINTON, THOMAS R	36-7650B	Decreed	7/30/1976	IRRIGATION	0.08	4.0	
PKD PROPERTIES LC; TLD PROPERTIES LLC	45-10761	Decreed	6/24/1957	COMMERCIAL, COOLING	0.02	0.0	
POCATELLO CHUBBUCK SCHOOL DISTRICT #25	29-11688	Decreed	8/10/1914	DOMESTIC, IRRIGATION	0.12	5.7	
POCATELLO READY MIX INC	27-10010	Decreed	6/20/1952	INDUSTRIAL	0.08	0.0	
POLO CLUB ESTATES WATER ASSN	25-7705	License	6/28/2000	DOMESTIC, FIRE PROTECTION	0.68	0.0	
PONY ACRES WATER ASSN	29-7625	Decreed	12/15/1981	DOMESTIC, IRRIGATION	0.16	2.0	
PORT OF ENTRY TRAVEL CENTER LLC	31-11787	Decreed	9/7/1971	COMMERCIAL	0.12	0.0	

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POVEY, ANDREW E	36-16625	Decreed	11/11/1959	MITIGATION	0.11	0.0	
POVEY, ANDREW E	36-16627	Decreed	11/15/1970	MITIGATION	0.16	0.0	
POVEY, ANDREW E	36-16631	Decreed	5/26/1971	MITIGATION	0.01	0.0	
POVEY, ANDREW E	36-16629	Decreed	5/16/1980	MITIGATION	0.04	0.0	
POWERS, ANDREW; POWERS, KARA	25-14267	Decreed	8/10/1966	IRRIGATION	0.02	1.1	
PRICE, MARJORIE	22-14447	Permit	2/16/2022	COMMERCIAL	0.02	0.0	
PRINCE, CARI L; PRINCE, JAMES J	36-16101	License	5/9/1988	DOMESTIC	0.04	0.0	
PROBART, LEWIS L	29-7067	Decreed	8/3/1971	DOMESTIC, IRRIGATION, STOCKWATER	0.06	3.2	
PUTNAM, JANET D; PUTNAM, LAWRENCE D	27-12280	License	5/31/1989	DOMESTIC, IRRIGATION	0.04	1.0	
R C WILLEY HOME FURNISHINGS	35-14596	Permit	5/25/2018	COMMERCIAL	0.78	0.0	
RABURN, JAYNEE N; RABURN, LENARD H	29-7143B	Decreed	7/2/1973	DOMESTIC, IRRIGATION	0.03	1.0	
RANCH PROPERTIES LLC	45-11969	Decreed	6/1/1939	IRRIGATION	0.84	63.5	
RANCHO VIA WELL USERS ASSN	25-7404	License	6/28/1985	DOMESTIC, IRRIGATION	0.31	6.0	
RANDALL, JULIA; RANDALL, SCOTT	25-10298	Decreed	12/31/1949	DOMESTIC	0.08	0.0	
RANSOM, ELLEN; RANSOM, KARL	25-14262	Decreed	8/10/1966	IRRIGATION	0.02	1.1	
RANSTROM, GENE M	45-13667	Decreed	4/28/1951	IRRIGATION	0.21	13.0	
RASMUSSEN, JEFFREY R; RASMUSSEN, SHAWNA L	45-14534	Decreed	1/19/1978	IRRIGATION	0.01	1.5	
RASMUSSEN, JEFFREY R; RASMUSSEN, SHAWNA L	45-14535	License	2/12/1996	IRRIGATION	0.02	1.5	
RAYMOND, W CRAIG	25-13401	Decreed	6/28/1954	IRRIGATION, STOCKWATER	0.09	3.5	
REED, CHARLES LE ROY	35-12258	Decreed	6/1/1955	COMMERCIAL, DOMESTIC, STOCKWATER	0.09	0.0	
REES, CARL C; REES, PATRICIA	29-7240	Decreed	11/29/1974	DOMESTIC, IRRIGATION, STOCKWATER	0.085	1.3	
REYNOLDS, ALISA; REYNOLDS, NICOLAS	34-14928	Decreed	9/30/1966	IRRIGATION	0.04	4.0	
RHODEHOUSE, KEVIN	35-2924	Decreed	7/21/1965	INDUSTRIAL, STOCKWATER	1.11	0.0	
RHODEHOUSE, KEVIN	35-8659	License	10/15/1987	COMMERCIAL, STOCKWATER	0.15	0.0	
RICHARDS, DENICE	27-7343	Decreed	3/2/1983	DOMESTIC, IRRIGATION	0.08	5.0	
RICKS, CONNIE	25-7183	Decreed	1/14/1980	DOMESTIC, STOCKWATER	0.06	0.0	
RIDDLE, CATHERINE; RIDDLE, GLEN	25-14317	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
RIGBY AIR VILLAGE LLC	25-14182	License	3/24/2006	COMMERCIAL	0.2	0.0	
RINDFLEISCH, JAMES A	34-7511	Permit	6/12/1989	IRRIGATION	1.85	92.4	
RINGEL, LORI; RINGEL, MERLYN R	35-14629	Decreed	12/31/1940	IRRIGATION	0.05	4.7	
RINGEL, LORI; RINGEL, MERLYN R	35-14628	Decreed	3/5/1948	IRRIGATION	0.03	4.7	
RINGEL, LORI; RINGEL, MERLYN R	35-14630	Decreed	9/28/1981	IRRIGATION	0.01	4.7	
RITCHIE, JOHN M	35-13657	Decreed	3/13/1948	IRRIGATION	0.08	4.0	
RITCHIE, JOHN M; RITCHIE, KAYE	35-13997	Decreed	5/11/1949	IRRIGATION	0.55	48.4	
RITCHIE, JOHN M; RITCHIE, KAYE	35-13993	Decreed	7/13/1954	IRRIGATION	0.2	34.4	
RITCHIE, JOHN M; RITCHIE, KAYE	35-13999	Decreed	4/1/1966	IRRIGATION	0.15	48.4	Yes
RITCHIE, JOHN M; RITCHIE, KAYE	35-13995	Decreed	11/12/1975	IRRIGATION	0.42	34.4	
RIVERBEND ESTATES	29-8015	License	6/22/1990	DOMESTIC	0.25	0.0	
RIVERSIDE DAIRY INC	36-4235	Decreed	1/1/1954	COMMERCIAL, DOMESTIC, STOCKWATER	0.21	0.0	
ROBCO LLC	31-10665	Decreed	12/31/1925	DOMESTIC	0.1	0.0	
ROBCO LLC	31-12562	Decreed	12/27/1977	IRRIGATION	1.17	127.0	
ROBCO LLC	31-12563	Decreed	2/28/1979	IRRIGATION	1.36	127.0	
ROBINSON BROS LAND LLC	45-12909B	Decreed	4/1/1961	COMMERCIAL, STOCKWATER	0.04	0.0	
ROBINSON WATER ASSN INC	25-4064	Decreed	6/1/1942	DOMESTIC	0.1	0.0	
ROBINSON, LOGAN D; ROBINSON, RICKY	29-4393	Decreed	3/1/1963	DOMESTIC, IRRIGATION	0.07	3.3	

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ROBINSON, PAXTON	45-14566	Decreed	2/1/1954	IRRIGATION	0.14	33.0	
ROBINSON, PAXTON	45-14591	Decreed	2/1/1954	IRRIGATION	0.02	37.0	
ROBINSON, PAXTON	45-14565	Decreed	12/10/1956	IRRIGATION	0.3	33.0	
ROBINSON, PAXTON	45-14590	Decreed	12/10/1956	IRRIGATION	0.04	37.0	
ROCKY HILLS ENTERPRISES LLC	25-14600	Permit	6/5/2025	DOMESTIC	0.18	0.0	
ROEDER, JAMES L; ROEDER, JOHN	29-7177	License	3/4/1974	DOMESTIC, STOCKWATER	0.08	0.0	
ROMRIELL, ELMER; ROMRIELL, LOUISE	29-12074	Decreed	4/20/1937	DOMESTIC	0.04	0.0	
ROSE, JUSTIN ALLEN; ROSE, KELSEY BEAL	34-14932	Decreed	2/20/1961	IRRIGATION	0.04	2.0	
ROSENBERG RANCH & FARMS LLC	25-11823	Decreed	7/16/1927	DOMESTIC, STOCKWATER	0.74	0.0	
ROSENKRANCE, LESTER K; ROSENKRANCE, LOWAYNE K	34-4035F	Decreed	8/1/1960	IRRIGATION	0.16	8.0	
ROWLAN, BRIAN; ROWLAN, JESSICA	25-14608	Decreed	11/3/1952	MUNICIPAL	0.05	0.0	
ROWLAN, BRIAN; ROWLAN, JESSICA	35-14923	Decreed	11/3/1952	IRRIGATION	1.36	128.1	
ROWLAND, ROBERT	29-13892	Decreed	10/28/1953	IRRIGATION, STOCKWATER	2.12	117.6	
ROWLAND, ROBERT	29-14443	Decreed	10/28/1953	IRRIGATION	0.01	0.9	
ROWLAND, ROBERT	29-14447	Decreed	10/28/1953	IRRIGATION	0.01	0.3	
ROWLAND, ROBERT	29-14455	Decreed	10/28/1953	IRRIGATION	0.03	3.4	
RR WOMENS REAL ESTATE LLC	36-17360	Decreed	1/21/1957	IRRIGATION	0.07	58.9	
RUDDELL, DANIEL A; RUDDELL, VICKI L	25-14318	Decreed	8/10/1966	IRRIGATION	0.02	1.2	
RUDY, THOMAS A; TREVINO, KRISTIN; TREVINO, LUKE	45-7278	Decreed	12/6/1976	DOMESTIC	0.24	0.0	
RUFF, DOUGLAS L; RUFF, JENNIFER	25-7382	License	6/29/1983	IRRIGATION	0.1	5.0	
RUNHARD LLC	22-7293	Decreed	5/24/1979	COOLING, HEATING	0.15	0.0	
SAGE HOLLOW WATER USERS ASSOC	29-2438A	Decreed	2/3/1961	IRRIGATION	2.24	112.0	
SAND BOX RV LLC	21-13334	Decreed	2/24/1953	COMMERCIAL	0.03	0.0	
SAND BOX RV LLC	21-13335	Decreed	6/7/1957	COMMERCIAL	0.02	0.0	
SAND BOX RV LLC	21-13333	Decreed	8/4/1979	COMMERCIAL	0.03	0.0	
SAND SPRINGS LP	36-17052	License	7/15/2015	DIVERSION TO STORAGE, WILDLIFE STORAGE	2.43	0.0	
SANT, CARMA; SANT, WILLIAM L	29-11015	Decreed	3/1/1956	COMMERCIAL, DOMESTIC, STOCKWATER	0.08	0.0	
SCC PROPERTIES LLC	37-23469	Decreed	11/25/1962	IRRIGATION	0.38	19.0	
SCENIC FALLS FEDERAL CREDIT UNION	25-14276	Decreed	8/10/1966	IRRIGATION	0.03	1.3	
SCHNEIDER, ARLYNN; SCHNEIDER, FRED	35-11852	Decreed	4/1/1934	COMMERCIAL, DOMESTIC	0.08	0.0	
SCHOLZ-ALVAREZ, INGRID K	34-7253	Decreed	9/22/1980	DOMESTIC, IRRIGATION	0.15	15.0	
SCHREINER FARMS IDAHO LLC	35-2488	Decreed	1/10/1957	IRRIGATION	0.02	2.0	
SCHREINER FARMS IDAHO LLC	35-2922	Decreed	4/7/1958	IRRIGATION	0.01	2.0	
SCHREINER FARMS IDAHO LLC	35-8951	License	7/29/1991	IRRIGATION	0.88	44.0	
SCHROEDER, MICHELLE; SCHROEDER, NATHAN	29-4104	Decreed	7/28/1955	IRRIGATION	3	150.0	
SCHULTZ, ROBYN	29-14183	Decreed	2/3/1961	IRRIGATION	0.06	3.0	
SCHWENDIMAN, DAVID; SCHWENDIMAN, DIANE P; SCHWENDIMAN, VAL E	22-14746	License	3/25/1991	IRRIGATION	0.38	471.0	
SCHWENDIMAN, DAVID; SCHWENDIMAN, DIANE P; SCHWENDIMAN, VAL E	22-14747	License	3/25/1991	IRRIGATION	0.02	471.0	
SCHWENDIMAN, DAVID; SCHWENDIMAN, DIANE P; SCHWENDIMAN, VAL E	22-7703	License	3/25/1991	IRRIGATION	6.77	2050.5	
SCHWENDIMAN, DAVID; SCHWENDIMAN, DIANE P; SCHWENDIMAN, VAL E	22-7704	License	3/25/1991	IRRIGATION	7.3	608.0	
SCHWENDIMAN, DAVID; SCHWENDIMAN, VAL E	22-13292	License	1/5/1992	IRRIGATION	4.41	471.0	
SCOTT, LAMOND; SCOTT, RUTH	35-10855	Decreed	1/4/1954	COMMERCIAL, DOMESTIC	0.04	0.0	
SCOTT, STANLEY K	31-7512	License	11/30/1988	DOMESTIC, STOCKWATER	0.19	0.0	
SCOTT, STANLEY K	31-7514	License	11/30/1988	DOMESTIC	0.04	0.0	
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13986	Decreed	11/11/1959	COMMERCIAL, STOCKWATER	0.08	0.0	

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SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13987	Decreed	11/15/1970	COMMERCIAL, STOCKWATER	0.13	0.0	
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13989	Decreed	5/26/1971	COMMERCIAL, STOCKWATER	0.01	0.0	Yes
SEARLE BROTHERS LAND & LIVESTOCK LLC	45-13988	Decreed	5/16/1980	COMMERCIAL, STOCKWATER	0.03	0.0	
SEATON, RICHARD	29-12073	Decreed	4/20/1937	DOMESTIC	0.04	0.0	
SECRIST, DREW; SECRIST, KAYLA	35-14865	Decreed	9/8/1961	IRRIGATION	0.16	4.0	
SERR, DALLAS	36-2730	Decreed	7/30/1954	IRRIGATION	1	50.0	
SHAW, SHELLEE	37-23207	Decreed	9/20/1974	IRRIGATION	0.03	2.2	
SHOSHONE BANNOCK AGRI BUSINESS CORPORTION	29-13940	Decreed	10/3/1977	IRRIGATION	0.13	7.5	
SHOSHONE BANNOCK TRIBES	29-13779	Decreed	11/22/1919	IRRIGATION, STOCKWATER	0.58	29.2	
SHOSHONE BANNOCK TRIBES	27-7000	Decreed	7/27/1967	MUNICIPAL	0.5	0.0	
SHOSHONE BANNOCK TRIBES	29-7326	Decreed	4/28/1976	IRRIGATION	2.53	160.0	
SHOSHONE BANNOCK TRIBES	29-13941	Decreed	10/3/1977	IRRIGATION	0.18	10.5	
SHURTLIFF, MERLENE; SHURTLIFF, RODNEY	35-8855	License	9/7/1989	DOMESTIC, STOCKWATER	0.08	0.0	
SIEVERS, GERALD J; SIEVERS, WANDA L	45-2216A	Decreed	1/5/1946	IRRIGATION	3	160.0	
SIMPER, HAIZER ONEAL; SIMPER, JENSEN BRYN	35-14901	Decreed	8/19/1977	IRRIGATION	0.11	6.0	
SIX FLAGS INC	34-13900	Decreed	10/25/1965	IRRIGATION	0.29	16.0	
SLAGOWSKI, JOE; SLAGOWSKI, NICOLE	31-12232	Decreed	12/31/1943	STOCKWATER	0.12	0.0	
SMITH, DALE E	34-2404	Decreed	3/1/1961	IRRIGATION, STOCKWATER	1.4	66.0	
SMITH, NORBERT DARRELL	29-7171	Decreed	2/4/1974	DOMESTIC	0.16	0.0	
SMITH, RANDY L; SMITH, SALLY R	29-8004	License	4/13/1990	DOMESTIC, IRRIGATION	0.04	3.0	
SMITH, RICHARD F	22-14612	Decreed	7/5/1973	MUNICIPAL	0.25	0.0	
SMITH, STANLEY P	25-14169	Decreed	12/10/1954	IRRIGATION	0.03	1.7	
SNAKE RIVER BUSINESS PARK BLDG #1 LLC	35-14787	Permit	8/19/2022	COMMERCIAL	0.2	0.0	
SNELL, MARK	29-7696	License	3/16/1983	DOMESTIC, IRRIGATION	0.08	2.0	
SOHN, EDNA G; SOHN, HERBERT F; SOHNS INC	35-8333	Decreed	12/12/1983	COMMERCIAL, DOMESTIC	0.08	0.0	
SORENSEN, MITCHELL D	34-2428	Decreed	4/1/1979	IRRIGATION	3.85	2478.0	
SOUTH INTERCHANGE PROPERTIES LLC	35-14700	Decreed	12/24/1948	IRRIGATION	0.13	23.8	
SOUTH INTERCHANGE PROPERTIES LLC	35-14701	Decreed	5/27/1974	IRRIGATION	0.07	23.8	
SOUTH RIDGE LAND LLC	45-14061	Decreed	12/3/1971	COMMERCIAL, DOMESTIC, STOCKWATER	1.01	0.0	
SOUTH, BARRY; SOUTH, ELINOR	35-14616	Decreed	12/31/1940	IRRIGATION	0.04	3.3	
SOUTH, BARRY; SOUTH, ELINOR	35-14614	Decreed	3/5/1948	IRRIGATION	0.02	3.3	
SOUTH, BARRY; SOUTH, ELINOR	35-14618	Decreed	9/28/1981	IRRIGATION	0.01	3.3	
SOUTHFIELD LAND & LIVESTOCK LLC	36-7295C	Decreed	12/11/1973	COMMERCIAL, STOCKWATER	0.32	0.0	
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-11946	Decreed	6/22/1953	COMMERCIAL, STOCKWATER	0.12	0.0	
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-11942	Decreed	7/25/1955	COMMERCIAL, STOCKWATER	0.03	0.0	
SPENCER, DAVID RANDY; SPENCER, MICHELLE	31-11944	Decreed	7/26/1961	COMMERCIAL, STOCKWATER	0.02	0.0	
STANDLEY LAND & INVESTMENTS LLC	36-17148	Decreed	4/13/1976	IRRIGATION	0.15	7.7	
STANGER, KARA; STANGER, SPENCER	35-14726	Decreed	12/31/1940	IRRIGATION	0.06	5.2	
STANGER, KARA; STANGER, SPENCER	35-14723	Decreed	3/5/1948	IRRIGATION	0.04	5.2	
STANGER, KARA; STANGER, SPENCER	35-14729	Decreed	9/28/1981	IRRIGATION	0.01	5.2	
STARMARC LLC	36-12462	Decreed	12/31/1958	COMMERCIAL	0.07	0.0	
STAVAST, CHATELAINE FMS; STAVAST, LANSON J	34-14710	Decreed	11/28/1952	IRRIGATION	0.01	6.0	
STAVAST, CHATELAINE FMS; STAVAST, LANSON J	34-14708	Decreed	5/16/1977	IRRIGATION	0.11	6.0	
STAVAST, CHATELAINE FMS; STAVAST, LANSON J	34-14711	Decreed	4/1/1987	IRRIGATION	0.01	6.0	Yes
STEELE LAND HOLDINGS LLC	35-14927	Decreed	2/6/1963	IRRIGATION	0.21	12.0	

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Owner	Water Right No.	Basis	Priority Date	Water Use List	Diversion Rate (cfs)	Total Acres	Enlargement
SUMMIT TRUSTEES PLLC	25-14310	Decreed	8/10/1966	IRRIGATION	0.02	0.9	
SUNDOWN CORP INC	35-10256	Decreed	5/1/1920	COMMERCIAL, STOCKWATER	0.07	0.0	
SUNROC CORPORATION	29-13891	Decreed	10/28/1953	IRRIGATION, STOCKWATER	0.9	48.0	
SUNROC CORPORATION	29-7754	License	6/17/1983	COMMERCIAL	0.81	0.0	
TABER, DONALD E	37-10161	Decreed	4/1/1955	COMMERCIAL	0.04	0.0	
TABLE ROCK HOLDINGS	35-13320	License	8/7/2001	DOMESTIC	0.1	0.0	
TANNER, KATHY; TANNER, REYNOLD	25-2139	Decreed	10/30/1961	IRRIGATION	1.54	38.0	
TAYLOR, LOIS; TAYLOR, LYLE D	25-7110	Decreed	5/9/1977	IRRIGATION	0.32	16.0	
TAYLOR, RODNEY R; TAYLOR, STEPHANIE A	37-2526B	Decreed	11/28/1951	IRRIGATION	0.06	3.0	
TERNUS, BRENDA; TERNUS, GARY A	35-13858	Decreed	4/27/1964	IRRIGATION	0.32	8.0	
TERRETON TRACTOR INC	31-7346	Decreed	12/2/1980	COMMERCIAL, DOMESTIC	0.04	0.0	
TEUSCHER, DENNIS	29-7853	License	8/3/1988	IRRIGATION	0.09	3.0	
THE LAVRADOR BOERSIG TRUST	25-14617	License	3/2/1990	IRRIGATION	0.12	11.0	
THE LOVELAND FAMILY TRUST	27-11205	Decreed	1/31/1939	DOMESTIC, STOCKWATER	0.44	0.0	
THE LOVELAND FAMILY TRUST	27-7069	Decreed	12/3/1976	IRRIGATION	3.42	171.0	
THOMAS, CATHERINE F; THOMAS, KEVIN E	25-14303	Decreed	8/10/1966	IRRIGATION	0.02	0.9	
THOMPSON, BETTY L; THOMPSON, LYNN	29-7075A	Decreed	2/4/1972	IRRIGATION	0.06	3.1	
THOMPSON, HOWARD M	25-7508	License	6/19/1989	DOMESTIC, STOCKWATER	0.11	0.0	
THOMPSON, JAMES R	22-7453	License	6/24/1983	DOMESTIC	0.04	0.0	
THOMPSON, KRISTEN R	34-14887	Decreed	5/16/1977	IRRIGATION	0.04	2.3	
THOMPSON, KRISTEN R	34-14889	Decreed	4/1/1987	IRRIGATION	0.01	2.3	Yes
TOMLIN, STEPHEN	29-13730	License	6/7/1983	IRRIGATION	0.01	0.5	
TOWN & COUNTRY MOBILE HOME PARK LLC	35-4258	Decreed	6/1/1962	DOMESTIC	0.22	0.0	
TRACY, JACOB	34-13761	Decreed	11/28/1952	DIVERSION TO STORAGE, FISH PROPAGATION STORAGE, IRRIGATION, RECREATION STORAGE	0.03	5.2	
TRACY, JACOB	34-7194	Decreed	5/16/1977	IRRIGATION	0.1	5.2	
TRACY, JACOB	34-14342	Decreed	4/1/1987	IRRIGATION	0.01	5.2	Yes
TRAINOR, LISA; TRAINOR, MARK	25-7392A	License	12/16/1983	IRRIGATION	0.14	7.0	
TURNER LAND & LIVESTOCK LLC	45-4033	Decreed	8/1/1935	IRRIGATION	1.67	80.0	
TURNER WELL ASSN	29-7700	License	4/27/1983	IRRIGATION	0.4	19.9	
UNION PACIFIC RAILROAD CO	36-4204	Decreed	8/18/1903	COMMERCIAL, DOMESTIC, MUNICIPAL	0.33	0.0	
UNION PACIFIC RAILROAD CO	36-4201	Decreed	3/24/1913	INDUSTRIAL, STOCKWATER	0.22	0.0	
UNION PACIFIC RAILROAD CO	36-4205	Decreed	5/4/1918	STOCKWATER	0.06	0.0	
UNION PACIFIC RAILROAD CO	36-4202	Decreed	6/5/1925	INDUSTRIAL	0.04	0.0	
UNION PACIFIC RAILROAD CO	36-4203	Decreed	9/13/1957	COMMERCIAL, DOMESTIC, MUNICIPAL	0.22	0.0	
UNITED ALLIANCE & FIDELITY CORP	25-7387	Decreed	12/4/1983	IRRIGATION	0.1	5.0	
US BUREAU OF INDIAN AFFAIRS	29-12560	Decreed	8/23/1954	IRRIGATION	3.75	187.9	
US BUREAU OF INDIAN AFFAIRS	29-12565	Decreed	8/23/1954	COOLING	0.04	0.0	
US BUREAU OF LAND MANAGEMENT	34-2373B	Decreed	7/5/1960	IRRIGATION	0.1	5.0	
US BUREAU OF LAND MANAGEMENT	35-7685	Decreed	3/22/1977	IRRIGATION	2.48	124.0	
US BUREAU OF LAND MANAGEMENT	35-7534B	Decreed	8/4/1979	IRRIGATION	1.09	57.0	
US BUREAU OF LAND MANAGEMENT	36-16583	Decreed	3/15/1987	IRRIGATION	0.03	4.0	Yes
US BUREAU OF LAND MANAGEMENT	36-8726	Permit	4/28/1994	STOCKWATER, WILDLIFE	0.12	0.0	
US BUREAU OF LAND MANAGEMENT	21-13032	License	2/24/2006	STOCKWATER, WILDLIFE	0.02	0.0	
US BUREAU OF LAND MANAGEMENT	34-14459	Permit	8/26/2014	STOCKWATER, WILDLIFE	0.15	0.0	

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US BUREAU OF RECLAMATION	25-7201	Decreed	8/11/1980	DOMESTIC, IRRIGATION	0.14	4.0	
US DEPT OF ENERGY	34-10901	Decreed	4/7/1950	SEE REMARKS	80	0.0	
US DEPT OF ENERGY	35-7098	Decreed	8/2/1969	FISH PROPAGATION	20	0.0	
US DEPT OF ENERGY	35-7097	Decreed	9/30/1969	DOMESTIC, FISH PROPAGATION	4	0.0	
US DEPT OF INTERIOR	21-7517	License	2/27/1992	STOCKWATER, WILDLIFE	0.07	0.0	
US FISH & WILDLIFE SERVICE	31-4066	Decreed	11/12/1936	DOMESTIC, IRRIGATION	0.06	1.0	
US NATIONAL PARK SERVICE	34-12383	Decreed	5/2/1924	COMMERCIAL, DOMESTIC, IRRIGATION	0	0.0	
US NATIONAL PARK SERVICE	34-12385	Decreed	7/23/1928	COMMERCIAL, DOMESTIC, IRRIGATION	0	0.0	
USDA ARS SHEEP EXPERIMENT STATION	31-11201	Decreed	10/30/1915	ADMINISTRATIVE	0.27	0.0	
USDA ARS SHEEP EXPERIMENT STATION	31-11200	Decreed	11/21/1916	ADMINISTRATIVE	0.231	0.0	
V L NEIBAUR FARMS LLC	25-14616	License	3/2/1990	IRRIGATION	3.61	325.5	
VALLEY MOBILE HOME COURT	25-12489	Decreed	3/31/1958	DOMESTIC	0.23	0.0	
VALLEY SCHOOL DISTRICT #262	36-15190	Decreed	9/1/1954	DOMESTIC, IRRIGATION	0.15	0.2	
VALLEY SCHOOL DISTRICT #262	36-16299	License	9/22/2004	DOMESTIC, FIRE PROTECTION	1.52	0.0	
VALLEY VIEW HEIGHTS SUBDIVISION WATER CO	25-7344	Decreed	7/29/1983	DOMESTIC, STOCKWATER	0.11	0.0	
VALLEY VIEW HEIGHTS SUBDIVISION WATER CO	25-13986	License	6/16/2003	DOMESTIC	0.08	0.0	
VAN DYKE, VIRGINIA	37-10019	Decreed	2/1/1961	COMMERCIAL, STOCKWATER	0.06	0.0	
VAN OVER, MARY; VAN OVER, RAYMOND	25-7650	License	12/29/1982	DOMESTIC, IRRIGATION, STOCKWATER	0.06	1.0	
VEENSTRA, FRANK W	36-17233	Decreed	1/31/1961	STOCKWATER	0.38	0.0	
VERBREE LAND HOLDINGS LLC	36-8609	License	10/21/1991	DOMESTIC, IRRIGATION, STOCKWATER	0.02	2.5	
VERDEGAAL LIVING TRUST	37-2676	Decreed	12/11/1961	IRRIGATION	1.85	450.4	
VH PROPERTIES LLC	25-14595	Decreed	10/9/1961	COMMERCIAL, STOCKWATER	0.84	0.0	
WADDOUPS, LE ANNE; WADDOUPS, WADE	34-2426A	Decreed	12/7/1961	IRRIGATION	0.833	37.0	
WADE, NANCY; WADE, RONALD	25-7425	License	6/6/1988	DOMESTIC, IRRIGATION	0.05	1.0	
WAGNER JR, EDWARD P; WAGNER, KRISTIE L	35-8856	Decreed	8/11/1989	DOMESTIC, STOCKWATER	0.1	0.0	
WAITMAN, DAVID B; WAITMAN, MARGARET	29-11435	Decreed	4/20/1945	IRRIGATION	0.05	1.8	
WALKER, ROLAND L	25-11822	Decreed	5/15/1935	DOMESTIC, STOCKWATER	0.7	0.0	
WALKER, ROLAND L	25-11821	Decreed	6/19/1962	DOMESTIC, STOCKWATER	1.32	0.0	
WALTERS PRODUCE INC	22-12520	Decreed	12/31/1951	COMMERCIAL	0.23	0.0	
WALTERS READY MIX INC	22-11666	Decreed	6/1/1947	INDUSTRIAL, RECREATION	0.04	0.0	
WALTERS, BRUCE A; WALTERS, MARCEY L	25-7596	License	6/26/1991	DOMESTIC, IRRIGATION	0.15	10.0	
WANSTROM, DAVID E; WANSTROM, NANCY W	34-2435B	Decreed	7/26/1961	IRRIGATION	0.08	4.5	
WARD, ALLAN	45-14476	Decreed	9/15/1971	COMMERCIAL, IRRIGATION, STOCKWATER	0.3	1.0	
WARD, BRADLEY; WARD, BRITTANY	35-14934	Decreed	2/24/1953	IRRIGATION	3.2	441.7	
WARD, BRADLEY; WARD, BRITTANY	35-14935	Decreed	6/7/1957	IRRIGATION	1.57	441.7	
WARD, BRADLEY; WARD, BRITTANY	35-14933	Decreed	8/4/1979	IRRIGATION	3.69	441.7	
WARD, DANIEL G; WARD, KARLA	45-14422	Decreed	12/11/1953	COMMERCIAL, STOCKWATER	0.06	0.0	
WARD, DELORA; WARD, REED I	25-14309	Decreed	8/10/1966	IRRIGATION	0.02	1.0	
WARNER, KAREN; WARNER, VAN H	25-14072	Decreed	10/31/1938	IRRIGATION, STOCKWATER	0.11	3.0	
WASSERLEIN, WILLIAM	45-14563	Decreed	6/1/1939	IRRIGATION	0.02	1.8	
WAYNE PROPERTIES LLC	25-14460	Decreed	2/19/1982	IRRIGATION	0.1	353.9	
WAYNE PROPERTIES LLC	25-14461	Decreed	2/19/1982	IRRIGATION	0.1	353.9	
WAYNE PROPERTIES LLC	25-14463	Decreed	2/19/1982	IRRIGATION	0.1	353.9	
WAYNE PROPERTIES LLC	25-14473	Decreed	2/19/1982	IRRIGATION	0.1	353.9	
WAYNE PROPERTIES LLC	25-14476	Decreed	2/19/1982	IRRIGATION	0.1	353.9	

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WAYNE PROPERTIES LLC	25-14489	Decreed	2/19/1982	IRRIGATION	0.1	353.9	
WAYNE PROPERTIES LLC	25-14519	Decreed	2/19/1982	IRRIGATION	0.03	1.3	
WAYNE PROPERTIES LLC	25-14520	Decreed	2/19/1982	IRRIGATION	0.01	353.9	
WAYNE PROPERTIES LLC	25-14495	License	1/14/1983	IRRIGATION	0.07	285.4	
WAYNE PROPERTIES LLC	25-14503	License	1/14/1983	IRRIGATION	0.07	285.4	
WELLS, DELOS H	35-8220	License	8/4/1983	DOMESTIC, IRRIGATION	0.05	4.5	
WELLS, DELOS H; WELLS, LUELLA	35-10874	Decreed	10/1/1962	DOMESTIC, IRRIGATION	0.1	3.0	
WENDLING, JACOB; WENDLING, JAIME	29-14458	Decreed	10/28/1953	IRRIGATION	0.02	3.2	
WENDLING, JACOB; WENDLING, JAIME	29-14438	Decreed	6/23/1977	IRRIGATION	0.03	3.2	
WESTERN AG PRODUCTS LLC	45-10305	Decreed	6/15/1949	DOMESTIC, INDUSTRIAL	0.04	0.0	
WHEATLEY, SCHAUNEE; WHEATLEY, SCOTT	29-14461	Decreed	10/28/1953	IRRIGATION	0.02	2.0	
WHEATLEY, SCHAUNEE; WHEATLEY, SCOTT	29-14441	Decreed	6/23/1977	IRRIGATION	0.02	2.0	
WHEELOCK, MICHAEL T; WHEELOCK, TINA J	29-14448	Decreed	10/28/1953	IRRIGATION	0.02	2.1	
WHEELOCK, MICHAEL T; WHEELOCK, TINA J	29-14428	Decreed	6/23/1977	IRRIGATION	0.02	2.1	
WHITEWATER WATER USERS ASSN	29-2438B	Decreed	2/3/1961	IRRIGATION	0.74	37.0	
WHITEWATER WATER USERS ASSN	29-7819	Decreed	9/20/1979	DOMESTIC	2	0.0	
WILDE, CECIL; WILDE, NANCY JO	25-11653	Decreed	5/1/1942	IRRIGATION	0.09	4.5	
WILKINSON, LAUREL; WILKINSON, LORENZO H	29-12077	Decreed	4/20/1937	DOMESTIC	0.04	0.0	
WILLIAMS, CLAUDIA; WILLIAMS, JOHN	25-7528	License	9/19/1989	IRRIGATION	0.04	1.3	
WILLIAMS, LYNETTE D; WILLIAMS, ROBERT E	35-12733	Decreed	4/1/1945	DOMESTIC	0.17	0.0	
WILLIE, DANIEL L	36-16113	Decreed	11/11/1959	MITIGATION	0.2	30.2	
WILSON, HARLEM E; WILSON, SONDRA L	29-13474	Decreed	10/26/1948	COMMERCIAL	0.04	0.0	
WILSON, JOHN CHARLES	29-7916	License	3/20/1990	IRRIGATION	0.09	4.5	
WILSON, KINDEE	29-7294	Decreed	11/4/1975	DOMESTIC, IRRIGATION	0.12	8.0	
WOOD, HEIDI; WOOD, J ADAM	29-8009	License	7/26/1990	IRRIGATION, STOCKWATER	0.04	1.5	
WOODBURY, BRYCE; WOODBURY, STEPHANIE	34-13878	Decreed	1/30/1961	IRRIGATION	0.01	1.0	
WOODMAN, ERIC; WOODMAN, MICHELLE	34-14237	Decreed	9/29/1966	IRRIGATION	0.04	2.2	
WOODMAN, ERIC; WOODMAN, MICHELLE	34-14239	Decreed	5/20/1984	IRRIGATION	0.01	2.2	Yes
WOODVILLE WATER & SEWER DISTRICT	35-11318	Decreed	5/1/1939	COMMERCIAL, DOMESTIC	0.35	0.0	
WRIDE FARMS	35-8949	Permit	8/26/1991	IRRIGATION	3	150.0	
WRIGHT, LE ROY C; WRIGHT, MARILYN	25-7256	Decreed	5/12/1981	IRRIGATION	0.05	0.7	
YANCEY, CLEM R	35-7955	License	3/10/1981	DOMESTIC, STOCKWATER	0.06	0.0	
YOUNG & YOUNG LIVESTOCK LLC	25-14494	Permit	8/3/2021	DOMESTIC	0.23	0.0	
YOUNG, DE VONA; YOUNG, WILLIAM N	25-7437	License	8/26/1988	DOMESTIC, STOCKWATER	0.07	0.0	
YOUNG, JUDY D; YOUNG, KENNETH A	25-7436	License	9/14/1988	IRRIGATION	0.03	1.5	
ZIRKELBACH, NANCY; ZIRKELBACH, RICHARD	25-7440	License	8/25/1988	DOMESTIC, IRRIGATION	0.04	1.2	
ZWEIFEL PROPERTIES LLC	32-10031	Decreed	5/1/1968	DOMESTIC, STOCKWATER	0.12	0.0	

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

The accompanying document is a "**Final Order"** issued by the Idaho Department of Water Resources ("Department") pursuant to Idaho Code § 67-5246. The following statements describe the procedures and time limits for seeking reconsideration or other administrative relief as required by Idaho Code § 67-5248.

PETITION FOR RECONSIDERATION

(*See* Idaho Code § 67-5246(4))

Any party may file a petition for reconsideration of this final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The presiding officer will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law.

REQUEST FOR HEARING

(*See* Idaho Code § 42-1701A(3))

Unless the right to a hearing before the Director or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order, or action of the Director of the Department and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the Director to contest the action. The person shall file with the Director, within fifteen (15) days after receipt of written notice of the action issued by the Director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the Director and requesting a hearing. **Note: The request must be received by the Department within this fifteen (15) day period.**

CERTIFICATE OF SERVICE

(*See* IDAPA 37.01.01.053, 37.01.01.202)

All documents filed with the Department in connection with a petition for reconsideration or a request for hearing of this final order shall be served on all other parties to the proceeding in accordance with Rules 53 and 202 of the Department's Rules of Procedure.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER AMENDING CURTAILMENT LIST TO INCLUDE UNMITIGATED GROUND WATER RIGHTS**

BACKGROUND

On April 16, 2026, the Director issued the *Final Order Regarding April 2026 Forecast Supply (Methodology Steps 1–3)* ("*As-Applied Order*"), which applied steps 1, 2, and 3 of the *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The Director predicted an April in-season demand shortfall ("IDS") of 181,600 acre-feet. *As-Applied Order*, at 4. The Director ordered that, by May 1, 2026, ground water users with consumptive water rights "bearing priority dates junior to October 11, 1900, within the Eastern Snake Plain Aquifer area of common ground water supply [("ESPA ACGWS")] shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS of 181,600 acre-feet in accordance with an approved mitigation plan." *Id.* at 6. The Director also ordered that, if such a junior ground water user cannot establish that they can mitigate for their proportionate share of the predicted IDS "in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user." *Id.*

On May 14, 2026, the Director issued a *Final Order Curtailing Ground Water Rights Junior to October 11, 1900* ("*May Curtailment Order*"). The *May Curtailment Order* required holders of ground water rights within the ESPA ACGWS bearing priority dates junior to October 11, 1900, and listed in Attachment A, to "curtail/refrain from diversion and use of ground water pursuant to those water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights." *May Curtailment Order*, at 3.

Attachment A excluded certain junior-priority ground water rights bearing a priority date junior to October 11, 1900, that the Department understood to be protected by an approved mitigation plan. Following issuance of the *May Curtailment Order*, the Director became aware of several ground water rights bearing priority dates junior to October 11, 1900, that were not in fact covered by an approved mitigation plan and were incorrectly omitted from on Attachment A to the *May Curtailment Order*.

ANALYSIS

Idaho Code § 42-602 authorizes the Director to supervise water distribution within water districts:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director. The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

"[W]hen it is found that junior-priority ground water pumping is causing a senior right holder material injury, the Director must either: (1) curtail junior-priority ground water pumping to satisfy the senior's right, or (2) '[a]llow out-of-priority diversion of water by junior-priority ground water users pursuant to a mitigation plan that has been approved by the Director.'" *Rangen, Inc. v. Idaho Dep't of Water Res.*, 160 Idaho 251, 256, 371 P.3d 305, 310 (2016), *abrogated in part on other ground by 3G AG LLC v. IDWR*, 170 Idaho 251, 509 P.3d 1180 (2022) (quoting IDAPA 37.03.040.01).

Consistent with the *As-Applied Orde*r, Idaho Code § 42-602, IDAPA 37.03.040.01, and decisions of the courts, the Director must order curtailment of junior-priority ground water users that have not established they can mitigate in accordance with an approved mitigation plan. Thus, the curtailment list must be supplemented to include those unmitigated junior-priority ground water rights that were not included in Attachment A to the *May Curtailment Order*.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED that effective June 17, 2026, the curtailment list is amended to include the following ground water rights:

Water Right No. 25-7540, Laura Lee Hobbs, Licensed, Priority Date 08/18/1989, 0.10 cfs.

Water Right No. 25-4103, Bill Vaughn, Decreed, Priority Date 12/31/1958, 0.11 cfs.

Water Right No. 35-14613, Western Slope LLC., Decreed, Priority Date 03/05/1948, 0.61 cfs.

Water Right No. 35-14615, Western Slope LLC., Decreed, Priority Date 12/31/1940, 0.88 cfs.

Water Right No. 35-14617, Western Slope LLC., Decreed, Priority Date 09/28/1981, 0.05 cfs.

Water Right No. 35-7576, Woodland Heights Water Users Association., Decreed, 01/28/1976, 0.38 cfs.

IT IS FURTHER ORDERED that holders of these ground water rights shall immediately curtail/refrain from diversion and use of ground water pursuant to these water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights. All other ground water rights listed in the Attachment A continue to be curtailed consistent with the *Final Order Curtailing Ground Water Rights Junior to October 11, 1900.*

Dated this 17th day of June 2026



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 17th day of June 2026, the above and foregoing, was served by the method indicated below, and addressed to the following:

Laura Lee Hobbs 611 Amy Lane Idaho Falls, ID 83406	☒ U.S. Mail, postage prepaid
Bill Vaughn 7362 N 5 E Idaho Falls, ID 83401	☒ U.S. Mail, postage prepaid
Western Slope LLC 910 Twin Butte Road Menan, ID 83434-5116	☒ U.S. Mail, postage prepaid
Woodland Heights Water Users Association 2144 S Bellin Road Idaho Falls, ID 83402-5603	☒ U.S. Mail, postage prepaid
John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email

David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email

Zachary H. Jones City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 zjones@idahofalls.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
andy@sawtoothlaw.com

William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

Jerry R. Rigby
Michelle Mortimer
RIGBY, ANDRUS & RIGBY LAW, PLLC
jrigby@rex-law.com
mmortimer@rex-law.com

Megan Jenkins
Executive Assistant

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER REVISING APRIL 2026 FORECAST SUPPLY AND CONTINUING MAY 14, 2026 CURTAILMENT ORDER** ***(METHODOLOGY STEPS 5 & 6)***

The Director of the Idaho Department of Water Resources ("Department") finds, concludes, and orders as follows:

FINDINGS OF FACT

A. Background

1. On July 19, 2023, the Department issued its *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies Steps 5 and 6 of the *Methodology Order*.

2. Step 5 of the *Methodology Order* addresses the final injury determination to reasonable carryover for members of the SWC. Step 5 states:

> If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall. If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report . . . the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC.

Methodology Order, at 43. On November 21, 2025, the Director issued the *Final Order Establishing 2025 Reasonable Carryover* (*Methodology Step 9*) ("*2025 Step 9 Order*") establishing a reasonable carryover shortfall of 86,756 acre-feet. Junior ground water users were given 14 days to provide a volume of water to fulfill the carryover shortfall. No water users secured water. While the SWC's storage allocation did not fill this year, because no water users secured water in 2025 to fulfill the carryover shortfall, there is no volume of water to be made available to the SWC under Step 5.

3. Step 6 of the *Methodology Order* states:

> Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC: (1) recalculate RISD [Reasonable In-Season Demand]; (2) issue a revised FS [Forecast Supply]; and (3) estimate the Time of Need date.

Methodology Order, at 43 (footnote omitted).

4. On April 16, 2026, the Director issued his *Final Order Regarding April 2026 Forecast Supply (Methodology Steps 1 – 3)* ("*April Forecast Supply Order*"). The *April Forecast Supply Order* predicted a demand shortfall to the SWC of 181,600 acre-feet for the 2026 irrigation season. *April Forecast Supply Order*, at 4. At that time, the members of the SWC predicted to experience material injury during the 2026 irrigation season were Twin Falls Canal Company ("TFCC") and American Falls Reservoir District #2 (AFRD2). *Id.* The Director ordered that, on or before May 1, 2026, ground water users with consumptive water rights "junior to October 11, 1900, within the Eastern Snake Plain Aquifer ACGWS [area of common ground water supply] shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted April IDS [in-season demand shortfall] of 181,600 acre-feet in accordance with an approved mitigation plan." *Id.* at 7. The Director also ordered that, "[i]f a junior ground water user cannot establish . . . that they can mitigate for their proportionate share of the predicted April IDS in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user." *Id.*

5. On May 14, 2026, the Director issued a *Final Order Curtailing Ground Water Rights Junior to October 11, 1900* ("*Curtailment Order*"). The Director ordered that:

> [E]ffective May 14, 2026, ground water users holding water rights bearing priority dates junior to October 11, 1900, within the ESPA ACGWS, and listed in Attachment A to this order, shall curtail/refrain from diversion and use of ground water pursuant to those water rights unless notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

Curtailment Order, at 3.

6. On June 17, 2026, the Director issued an *Order Amending Curtailment List to Include Unmitigated Ground Water Rights*, adding six water rights to the list of water rights subject to the *Curtailment Order*.

B. April through June Water Supply Conditions and Climate

7. The April 2026 Joint Forecast prepared by the United States Army Corps of Engineers ("USACE") and the United States Bureau of Reclamation ("BOR") predicted 2,300,000 acre-feet of unregulated inflow at the Snake River near Heise gage for the period April–July 2025, which equates to 70% of the 1991–2020 average. *April Forecast Supply Order*,

at 2. The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Methodology Order*, at 19.

8. The June 2026 Joint Forecast prepared by the USACE and the BOR predicted 900,000 acre-feet of unregulated inflow at the Snake River near Heise gage for the period June–July 2025, which equates to 50% of the 1991–2020 average.

9. Over much of the Eastern Snake Plain and its tributary basins, precipitation was above average in April but below average in May and June. For example, according to data measured at all the Natural Resources Conservation Service's SNOTEL sites in the Upper Snake River Basin, the basin received 110%, 55%, and 63% of average precipitation in April, May, and June, respectively. Similarly, the National Weather Service's Twin Falls weather station reported 123%, 4%, and 53% of normal precipitation in April, May, and June, respectively. During the same time, temperatures were above average April through June. For example, the average daily temperatures reported by the National Weather Service's Twin Falls weather station were 1.7, 4.4, and 1.6 degrees above normal for April, May, and June, respectively.

C. Reasonable In-Season Demand

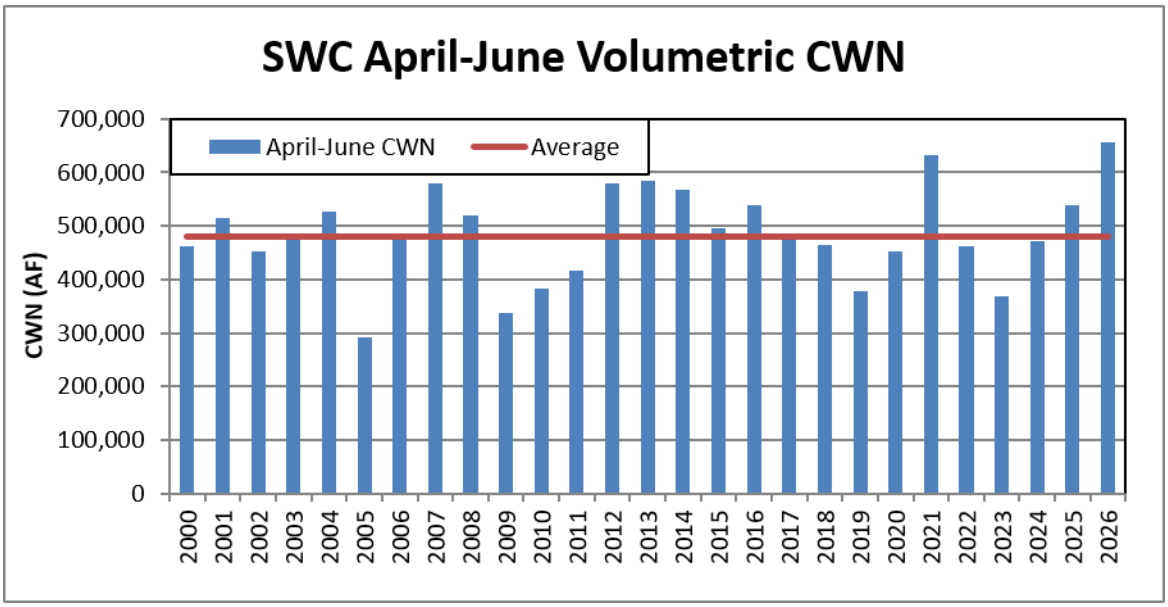
10. RISD "is the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the projected beneficial use of growing crops within the service area of the entity." *Methodology Order*, at 13. In April, the demand from the 2018 baseline year ("BLY") defines the RISD. *Id.* at 17. During the irrigation season, the RISD for the completed portion of the irrigation season is recalculated by dividing the actual crop water need ("CWN") for each entity by the project efficiency for that entity. *Id.* at 17, 43. For the remainder of the irrigation season, the RISD is the demand defined by the July–October 2018 BLY. RISD is calculated on a monthly time step.

i. Crop Water Need

11. "CWN is the volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability." *Methodology Order*, at 15. " CWN is the difference between the fully realizable consumptive use associated with crop growth, or ET [evapotranspiration], and effective precipitation . . . ." *Id.*

12. CWN is an input variable for calculating RISD for the completed portion of the irrigation season. *Id.* at 17. Actual RISD for the completed portion of the irrigation season is combined with monthly predicted baseline demands for the remaining months of the irrigation season to calculate a season-total RISD volume. *Id.* at 17–18. In-season demand shortfall is then calculated as the difference between the adjusted FS and the RISD. *Id.* at 23.

13. As calculated from the beginning of the irrigation season (April 1), the SWC's volumetric CWN for the current water year through June 30, 2026, is 657,039 acre-feet. This volume is 137% of the 2000–2025 average CWN for April 1–June 30 and 142% of the CWN for the 2018 BLY. The following graphs summarize monthly volumetric CWN values:


SWC April-June Volumetric CWN
April-June CWN
Average
CWN (AF)
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
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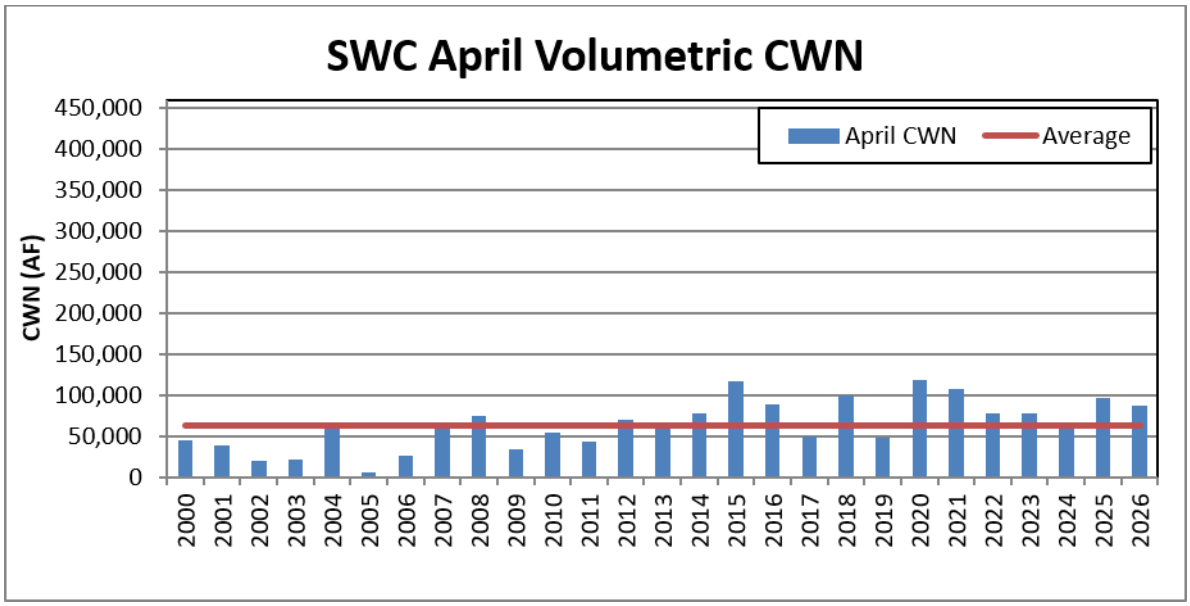
SWC April Volumetric CWN
April CWN
Average
CWN (AF)
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2000
2001
2002
2003
2004
2005
2006
2007
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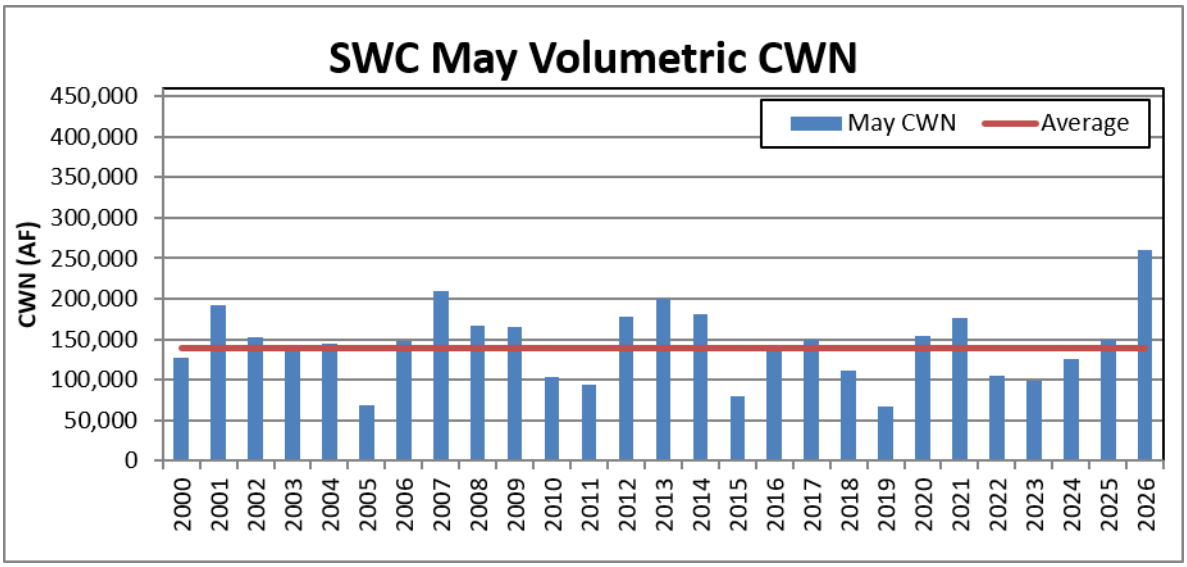
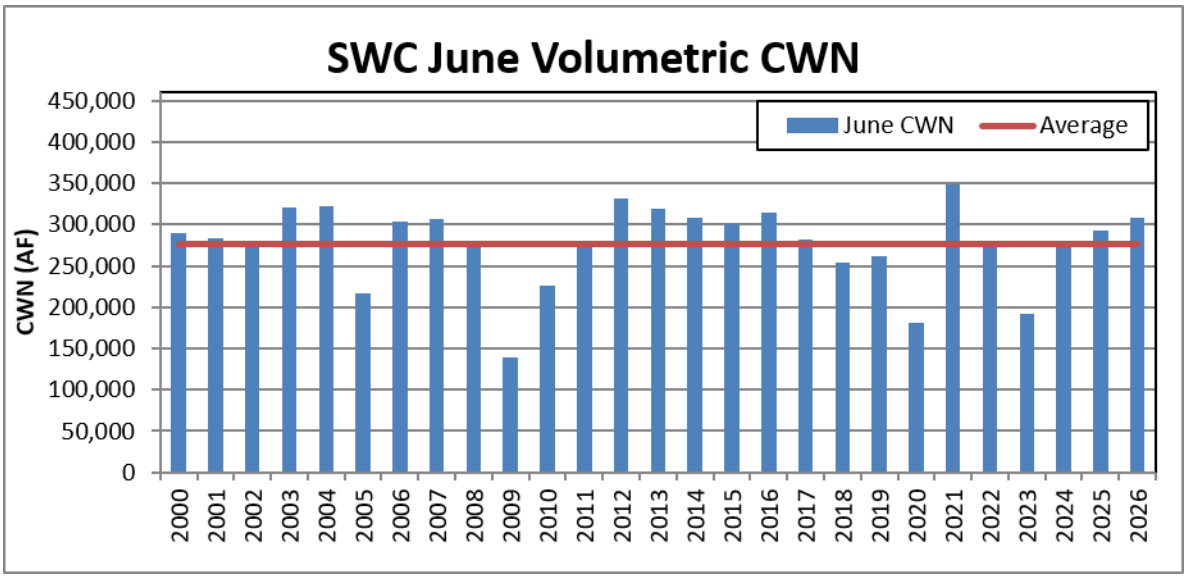




ii. Extension of BLY

14. The RISD for the remaining portion of the irrigation season (July–October) is the July–October demand for the 2018 BLY. The numeric July–October demand values are shown in the table in Finding of Fact 15 below.

iii. Calculation of RISD

15. As calculated from the beginning of the irrigation season (April 1), the SWC's volumetric RISD for 2026 through June is 1,907,341 acre-feet. This volume is 142% of the 2000–2025 average demand from April 1–June 30 and 136% of the demand for the 2018 BLY. The recalculated RISD for each entity at this time is:

	April–June CWN (AF)	E_p (April–June)	April–June RISD (AF)	July–October Demand for 2018 BLY (AF)	Recalculated RISD (AF)
A&B	20,016	0.41-0.90	37,219	38,528	75,747[1]
AFRD2	71,135	0.20-0.38	252,302	274,485	526,787
BID	60,537	0.30-0.46	159,472	145,546	305,019
Milner	15,961	0.35-0.66	34,414	36,432	70,846
Minidoka	103,782	0.37-0.56	223,925	196,968	420,893
NSCC	161,932	0.21-0.40	583,376	594,099	1,177,475
TFCC	223,676	0.28-0.51	616,634	653,473	1,270,107

D. Forecast Supply

16. When calculated during the irrigation season, the FS is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. *Methodology Order*, at 43. For this order, the FS is the sum of the actual natural flow supply from April through June, the predicted natural flow supply from July through October, and the actual storage allocations. Actual natural flow diversions for the completed portion of the irrigation season are extracted from the Department's water rights accounting program. The natural flow diversions for the remainder of the irrigation season are estimated by regression analysis. *Id.* at 20–21, 43. Storage allocations are determined by Water District 01 after the Day of Allocation. *Id.* at 43.

i. Sum of Actual Natural Flow Diverted

17. Actual natural flow diverted for the period April through June for each SWC member are summarized in the table contained within the Summary of Forecast Supply section in Finding of Fact 25.

ii. Regression Models to Predict Natural Flow (July–October)

18. Natural flow diversions were predicted for the remainder of the irrigation season by regression analysis. The *Methodology Order* established the following predictor variables for the regression models: natural flow in the Snake River near Heise as reported by the BOR, snow water equivalent ("SWE") data from the Two Ocean Plateau SNOTEL site, Spring Creek discharge, and ground water levels near American Falls Reservoir. *Methodology Order*, at 20.

[1]The Department has modified the total A&B irrigated acreage count to 14,749 acres. Based on the decision in CV01-23-13238, the new acreage count removes A&B Irrigation District's enlargement acres.

Unique regression models with unique predictor variable groups are established in the *Methodology Order* for each SWC member. *Id.* at 20–21.

19. Either June 15 or July 1 SWE values for the Two Ocean Plateau SNOTEL site are used as input variables in each of the regression models developed in the *Methodology Order*. *Id.* Two Ocean Plateau SWE data was selected as a predictor variable in the *Methodology Order* based upon stepwise statistical analysis carried out in the development of each regression model. *Id.* The Two Ocean Plateau SWE data is an optimum predictor variable for several reasons, including: its elevation (the site is located above 9,000 ft and typically still has snow late in the runoff season (June 15 and July 1); its location (the site is in the headwaters of the Snake River above Jackson Reservoir); and its period of record, which is sufficiently long enough to support model development.

20. On July 1, 2026, the Two Ocean Plateau SNOTEL station reported 0.0 inches of SWE. When the snow water equivalent is zero on July 1, the predicted natural flow supplies for the period July 1–October 31 for A&B, AFRD2, and Milner are zero acre-feet. *Methodology Order*, at 20.

21. The input variables used to predict July–October natural flow volumes for BID, Minidoka, and NSCC in 2026 include: (1) 5.3 inches of SWE reported by the Two Ocean Plateau SNOTEL site on June 15, 2026; (2) 1,904,721 acre-feet of natural flow runoff at the Snake River near Heise (April–June) as reported by the BOR; and (3) 27.47 feet depth to water at well 05S 31E 27ABA1 as measured by the Department on March 23, 2026.

22. The variables used to predict the July–October natural flow volume for TFCC in 2026 include: (1) 5.3 inches of the SWE reported by the Two Ocean Plateau SNOTEL Site on June 15; (2) 1,904,721 acre-feet of natural flow runoff at the Snake River near Heise (April–June) as reported by the BOR; and (3) 66,070 acre-feet of discharge (January–May) as measured and reported by the United States Geologic Survey for its Spring Creek at Sheepskin Rd Nr Fort Hall ID Gage (Gage No. 13075983).

iii. Storage Allocations

23. Preliminary storage allocation values for each member of the SWC are summarized in the table in Finding of Fact 25 below. These values are established based on reported storage for each SWC entity in Water District 01's initial storage report published on July 9, 2026. These values include each entity's contribution to the Water District 01 Rental Pool flow augmentation program.

iv. Adjustments to Total Supply

24. Natural flow and storage water supplies were both adjusted, as shown in the table in Finding of Fact 25 below. The adjustments to natural flow depicted in the summary table were for water wheeled by BID and Milner for the Southwest Irrigation District. The adjustments to the stored water supply depicted in the summary table were for the Minidoka Credit.

v. Summary of Forecast Supply

25. The following table summarizes the calculated FS and its individual components for each of the SWC members.

	Natural Flow Diverted through 6/30 (AF)	Predicted Natural Flow 7/1 to 10/31 (AF)	Natural Flow Adjustment (AF)	Preliminary Storage Allocation (AF)	Minidoka Credit Adjustment (AF)	Forecast Supply (AF)
A&B	936	0	0	106,223	0	107,159
AFRD2	7,749	0	0	363,260	1,000	372,009
BID	59,430	0	(3,714)	197,196	5,130	258,042
Milner	4,976	0	(3,011)	71,870	0	73,835
Minidoka	74,482	0	0	273,676	8,370	356,528
NSCC	163,687	42,317	0	793,715	(7,750)	991,969
TFCC	393,054	367,366	0	227,002	(6,750)	980,672

E. Revised Shortfall Prediction

26. In-season demand shortfall ("IDS") is calculated as the difference between RISD and the FS.

27. Based on the established values above, and as summarized in the following table, the Director predicts that AFRD2, BID, Minidoka, NSCC, and TFCC will be materially injured by junior ground water pumping.

	Forecast Supply (AF)	RISD (AF)	Shortfall (AF)
A&B	107,159	75,747	0
AFRD2	372,009	526,787	154,800
BID	258,042	305,019	47,000
Milner	73,835	70,846	0
Minidoka	356,528	420,893	64,400
NSCC	991,969	1,177,475	185,500
TFCC	980,672	1,270,107	289,400
		Total	741,100

28. The current predicted shortfall to the SWC's RISD is 741,100 acre-feet.

29. The Time of Need is used to determine when, during the water year, junior ground water users mitigating for their proportionate share using storage water must deliver that storage water to the SWC. No junior ground water users are mitigating for their proportionate share using storage water this year.

F. Step 6

30. Step 6 requires the following:

> Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water or to conduct other approved activities pursuant to an approved mitigation plan that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users. A transient ESPAM simulation will be run to determine the priority date to produce the necessary additional mitigation obligation volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

Methodology Order, at 44 (footnote omitted).

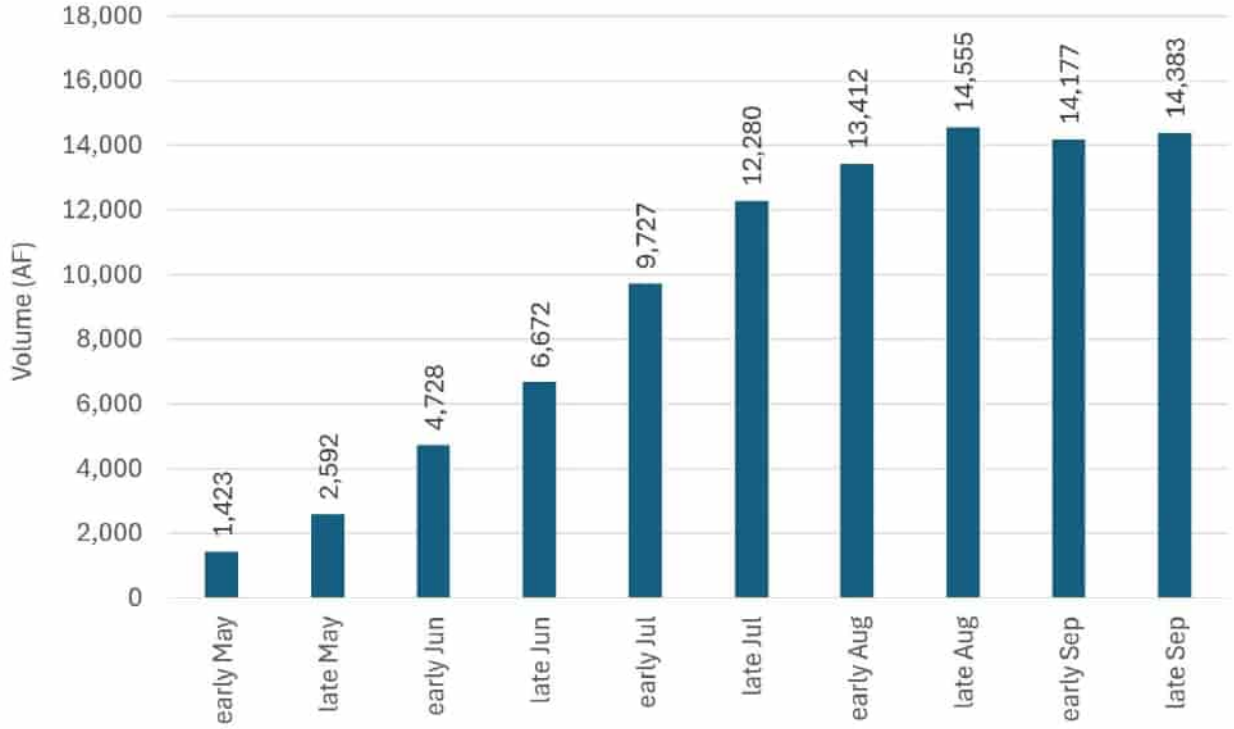
31. The total predicted July IDS for AFRD2, BID, Minidoka, NSCC, and TFCC is 741,100 acre-feet.

32. In April 2026, pursuant to the *Methodology Order*, the Department ran the Eastern Snake Plain Aquifer Model version 2.2 ("ESPAM2.2") to calculate the priority curtailment date, such that the curtailment of all water rights junior to the date within the ACGWS, would produce a volume of water equal to the April IDS in the Snake River between May 1 and September 30.[2] The ESPAM2.2 simulation predicted curtailment of ground water rights bearing priority dates junior to October 11, 1900, would produce a volume of water of 94,000 AF in the near Blackfoot to Minidoka reach between May 1 and September 30 of this irrigation season. The predicted benefit was less than the April IDS of 181,600 acre-feet. The Director concluded that curtailing ground water rights bearing priority dates junior to October 11, 1900, would offset as much of the April IDS as possible. *April Forecast Supply Order*, at 5.

33. In July 2026, the Department evaluated the effect of the simulated curtailment of ground water rights bearing priority dates junior to October 11, 1900, on near Blackfoot to Minidoka reach gains during July through September. The ESPAM2.2 simulation calculated that curtailment of ground water rights junior to October 11, 1900, would produce a volume of water

[2] Effective July 1, 2024, Senate Bill 1341 added a new section to Idaho Code, Idaho Code § 42-233c, which modified the description of the ESPA ACGWS. S.B. 1341, 67th Leg., 2d Reg. Sess. (Idaho 2024). In accordance with S.B. 1341, the Director subsequently expanded the ESPA ACGWS. In late 2025 and early 2026, the Director expanded the ESPA ACGWS to include the Raft River tributary basin and the remainder of the Little Lost River and Big Lost River tributary basins not already included in the ACGWS. On February 2, 2026, the Director issued an order declaring that ground water users included in the ESPA ACGWS in late 2025 and early 2026 would not be subject to administration before April 1, 2027. *Order Phasing in Administration of Ground Water Rights Recently Included in the ESPA ACGWS*, at 2. Accordingly, at this time, ground water users in the Raft River tributary basin and the remainder of the Little Lost River and Big Lost River tributary basins who were newly included into the ESPA ACGWS and hold consumptive water rights bearing priority dates junior to October 11, 1900, are not subject to administration.

of 78,500 AF in the near Blackfoot to Minidoka reach between July 1 and September 30 of this irrigation season. The following figure summarizes the results of the ESPAM2.2 simulation:



Modeled increase in ESPA discharge to near Blackfoot to Minidoka reach from curtailment of ground water junior to October 11, 1900

34. The predicted July through September benefits to the near Blackfoot to Minidoka reach from curtailment of ground water rights bearing priority dates junior to October 11, 1900, are less than the July IDS of 741,100 acre-feet. Continuing the curtailment of ground water rights junior to October 11, 1900, will offset as much of the July IDS as possible.

CONCLUSIONS OF LAW

1. Idaho Code § 42-602 authorizes the Director to supervise water distribution within water districts:

> The director of the department of water resources shall have direction and control of the distribution of water from all natural water sources within a water district to the canals, ditches, pumps and other facilities diverting therefrom. Distribution of water within water districts created pursuant to section 42-604, Idaho Code, shall be accomplished by watermasters as provided in this chapter and supervised by the director. The director of the department of water resources shall distribute water in water districts in accordance with the prior appropriation doctrine. The provisions of chapter 6, title 42, Idaho Code, shall apply only to distribution of water within a water district.

2. Idaho Code § 42-607 states the watermaster, under the direction of the Idaho Department of Water Resources, shall regulate diversions "during times of water scarcity, in order to supply the prior rights of others from such stream or water supply . . . ."

3. This year, no water is required to be allocated to the SWC pursuant to Step 5 related to a reasonable carryover shortfall because no junior water users secured water in 2025 to fulfill the carryover shortfall.

4. This year, because no junior ground water users are mitigating for their proportionate share using storage water, the Time of Need as described in Step 6 is not applicable.

5. Based on the Findings of Fact 6 through 27 above, it is reasonably certain AFRD2, BID, Minidoka, NSCC, and TFCC will be materially injured. The calculated shortfall to AFRD2, BID, Minidoka, NSCC, and TFCC is 741,100 acre-feet.

6. The May 14, 2026 *Curtailment Order* curtailed ground water users holding water rights bearing priority dates junior to October 11, 1900, which is the priority date equal to TFCC's Water Right No. 1-209, the most senior SWC natural flows water right predicted to be injured. Using the ESPAM2.2, the Department has determined that the continued curtailment of ground water rights bearing priority dates junior to October 11, 1900, would produce a volume of water of 78,500 AF in the near Blackfoot to Minidoka reach between July 1 and September 30 of this irrigation season. This would result in a volume of water less than the predicted July IDS of 741,100 acre-feet. Accordingly, continuing the curtailment of ground water rights junior to October 11, 1900, is necessary for curtailment to offset as much of the July IDS as possible.

7. Because the curtailment date remains October 11, 1900, the Director will not issue a new curtailment order under Step 6. The May 14, 2026 *Curtailment Order*, as subsequently modified by the June 17, 2026 *Order Amending Curtailment List to Include Unmitigated Ground Water Rights*, will remain in full force and effect.[3]

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED as follows:

The Director predicts an in-season IDS of 741,100 acre-feet. The May 14, 2026 *Curtailment Order*, as modified by the June 17, 2026 *Order Amending Curtailment List to*

[3] There are five approved mitigation plans responding to the SWC delivery call, each is stipulated to by the SWC: (1) No. CM-MP-2015-003 for the benefit of A&B; (2) No. CM-MP-2010-001 for the benefit of Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID"); (3) No. CM-MP-2024-003 for the benefit of the Ground Water Districts; (4) No. CM-MP-2019-001 for the benefit of the Coalition of Cities; and (5) No. CM-MP-2007-001 for the benefit of the Water Mitigation Coalition. Due to the nature of the mitigation plans for A&B, SWID, the Ground Water Districts, the Coalition of Cities, and the Water Mitigation Coalition, these entities do not need to establish that they can mitigate for their proportionate share of the predicted IDS. On May 1, 2026, Hearing Officer Gerald Schroeder issued a *Preliminary Order Approving Falls Water's Stipulated Mitigation Plan* in Department Docket No. CM-MP-2026-002. Exceptions to the *Preliminary Order* are pending so the order has not become final yet pursuant to Idaho Code § 67-5245 and IDAPA 37.01.01.730.

Include Unmitigated Ground Water Rights, remains in full force and effect. All ground water users holding water rights listed in Attachment A to the May 14, 2026 *Curtailment Order* and listed in the June 17, 2026 *Order Amending Curtailment List to Include Unmitigated Ground Water Rights* bearing priority dates junior to October 11, 1900, shall continue to be curtailed from diversion and use of ground water pursuant to those water rights unless they are mitigating in accordance with an approved mitigation plan or are notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

Dated this 21st day of July 2026.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of July 2026, the above and foregoing was served by the method indicated below and addressed to the following:

John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email

Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Zachary H. Jones City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 zjones@idahofalls.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

Jerry R. Rigby
Michelle Mortimer
RIGBY, ANDRUS & RIGBY LAW, PLLC
jrigby@rex-law.com
mmortimer@rex-law.com
Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
andy@sawtoothlaw.com

Sarah Tschohl
Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

The accompanying document is a "**Final Order"** issued by the Idaho Department of Water Resources ("Department") pursuant to Idaho Code § 67-5246. The following statements describe the procedures and time limits for seeking reconsideration or other administrative relief as required by Idaho Code § 67-5248.

PETITION FOR RECONSIDERATION

(*See* Idaho Code § 67-5246(4))

Any party may file a petition for reconsideration of this final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: the petition must be received by the Department within this fourteen (14) day period.** The presiding officer will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law.

REQUEST FOR HEARING

(*See* Idaho Code § 42-1701A(3))

Unless the right to a hearing before the Director or the Water Resource Board is otherwise provided by statute, any person aggrieved by any final decision, determination, order, or action of the Director of the Department and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the Director to contest the action. The person shall file with the Director, within fifteen (15) days after receipt of written notice of the action issued by the Director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the Director and requesting a hearing. **Note: The request must be received by the Department within this fifteen (15) day period.**

CERTIFICATE OF SERVICE

(*See* IDAPA 37.01.01.053, 37.01.01.202)

All documents filed with the Department in connection with a petition for reconsideration or a request for hearing of this final order shall be served on all other parties to the proceeding in accordance with Rules 53 and 202 of the Department's Rules of Procedure.

2026 SNAKE RIVER STORED WATER BY RESERVOIR

(ACRE-FEET)

RESERVOIR	SPACE	FILL	EVAPORATION	YIELD
JACKSON LAKE	786812.3	786812.3	23162.1	763650.2
PALISADES	871901.4	415618.1	12234.9	403383.2
PALISADES WWS	258300.0	258300.0	7603.8	250696.2
HENRYS LAKE	89341.0	73163.0	2153.8	71009.2
ISLAND PARK	150204.0	92125.7	2712.0	89413.7
GRASSY LAKE	0.0	0.0	0.0	0.0
RIRIE	80500.0	21865.0	643.7	21221.3
AMERICAN WWS	156830.0	156830.0	4616.8	152213.2
AMERICAN FALLS	1490159.0	1490159.0	43867.2	1446291.8
LAKE WALCOTT	95200.0	95200.0	2802.5	92397.5
RENTAL LTF	156246.3	0.0	0.0	0.0
PALISADES PWRH	157000.0	150596.1	4433.2	146162.9
SUB TOTAL	4292494.0	3540669.2	104230.0	3436439.2
MILNER	37000.0	46978.3	0.0	46978.3
TOTAL	4329494.0	3587647.5	104230.0	3483417.5

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

IRWIN TO LORENZO

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13010500	JACKSON LAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13022450	WY STORAGE USE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13032450	PALISADES	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13032510	P BYRD	0	0	15	0	0	0	0	0	0	0	0	0	0	15.0
13032515	BOY SCOUT PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13032520	A ROSTAD	0	0	240	0	0	0	0	0	0	0	0	0	0	240.0
13032920	R ROSE	0	0	50	0	0	0	0	0	0	0	0	0	0	50.0
13033010	PALISADES CNL	0	0	1162	0	0	0	0	0	0	0	0	0	0	1161.8
13033643	J FLEMING	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13033650	MERT OGDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13033660	LYNN DIXON	0	0	530	0	0	0	0	0	0	0	0	0	0	530.0
13033698	J CHICK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13034460	L JACOBSON	0	0	250	0	0	0	0	0	0	0	0	0	0	250.0
13037305	I SPAULDING	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037490	B FOSTER	0	0	259	0	0	0	0	0	0	0	0	0	0	259.0
13037505	ANDERSON (1A)	8245	17319	293	11790	0	0	0	0	0	12946	0	1494	0	52087.0
13037510	M & M CATTLE	0	0	300	0	0	0	0	0	0	0	0	0	0	300.0
13037855	M NEWBY #1(2A)	0	0	640	0	0	0	0	0	0	0	0	0	0	640.0
13037860	M NEWBY #2(2B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037880	M NEWBY #3(2C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037975	EAGLE ROCK(1B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037980	FARMERS FRIEND	2000	5590	411	3810	0	0	0	0	0	0	0	0	0	11811.2
13037985	ENTERPRIZE	4508	9604	83	1820	0	0	0	0	0	8779	0	15070	0	39863.5
13037997	C HICKMAN	0	0	15	0	0	0	0	0	0	0	0	0	0	15.0
13038025	BUTLER ISLAND	0	0	0	250	0	0	0	0	0	0	0	0	0	250.0
13038030	ROSS AND RAND	0	0	163	0	0	0	0	0	0	0	0	0	0	163.0
13038055	HARRISON	10670	18860	487	4640	0	0	0	0	0	11832	0	1273	0	47762.0
13038075	G SCOTT #1(3A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038079	J BROWN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038081	G SCOTT #2(3B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038084	SUBDIV PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038085	RUDY	3530	13700	2541	2000	0	0	0	0	0	2606	0	0	0	24376.5
13038090	LOWDER SLOUGH	1040	1200	224	400	0	0	0	0	0	0	0	0	0	2864.0
13038098	KITE & NORD	0	0	304	0	0	0	0	0	0	0	0	0	0	304.0
13038110	BURGESS (4A)	10603	23400	205	8000	0	0	0	0	0	9343	0	0	0	51550.5
13038113	M H HILL	0	0	285	0	0	0	0	0	0	0	0	0	0	285.0
13038115	CLARK & ED(5A)	0	140	45	660	0	0	0	0	0	0	0	0	0	845.0
13038140	K HILL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038145	CROFT	0	0	60	0	0	0	0	0	0	0	0	0	0	60.0
13038146	MILLER PUMP	0	0	150	0	0	0	0	0	0	0	0	0	0	150.0
13038147	J EDWARDS (5D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038148	G HOLMAN	0	0	40	0	0	0	0	0	0	0	0	0	0	40.0
13038149	G MUMA	0	0	74	0	0	0	0	0	0	0	0	0	0	74.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

IRWIN TO LORENZO

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13038150	EAST LABELLE	0	0	90	800	0	0	0	0	0	0	0	0	0	890.0
13038151	B GROVER (5B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038180	RIGBY	0	4350	0	1450	0	0	0	0	0	0	500	0	0	6300.0
13038183	K FOSTER (5C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038201	WHITE ISLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038204	DILTS LAT (6B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038205	DILTS (6A)	511	940	0	260	0	0	0	0	0	871	0	0	0	2582.0
13038210	ISLAND (30A)	0	3390	0	1310	0	0	0	0	0	0	0	0	0	4700.0
13038225	W LBL&LG I(7A)	0	6000	925	0	0	0	0	0	0	0	0	0	0	6925.0
13038305	PARKS & LEWSVL	0	2950	1	2550	0	0	0	0	0	0	0	0	0	5501.0
13038315	NORTH RIGBY	0	192	0	540	0	0	0	0	0	0	468	0	0	1200.0
13038340	WHITE DTCH(7B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038352	D PHILLIPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038356	VON BARON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038360	BRAMWELL (8A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038362	ELLIS (30B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038365	FRESH PAC (8B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038371	J T JONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038372	C JONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038375	A ZOHNER (7D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038376	GNEITING (36B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038382	W DABELL (7E)	0	0	120	0	0	0	0	0	0	0	0	0	0	120.0
13038384	D STOKER (7C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038385	SKAAR PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038386	J N ERICKSON	0	0	1222	0	0	0	0	0	0	0	0	0	0	1222.0
13038388	MATTSON-CRAIG	0	1290	0	0	0	0	0	0	0	0	0	0	0	1290.0
13038392	SUNNYDELL(29A)	3366	4920	1689	1380	0	0	0	0	0	0	634	0	0	11988.5
13038393	B COVINGTON	0	0	1100	0	0	0	0	0	0	0	0	0	0	1100.0
13038405	T PARKINSON	0	0	720	0	0	0	0	0	0	0	0	0	0	720.0
13038410	R GROVER	0	0	706	0	0	0	0	0	0	0	0	0	0	706.0
13038415	BYBEE PMP(29B)	0	0	293	0	0	0	0	0	0	0	0	0	0	293.0
13038417	D CHENEY	0	0	15	0	0	0	0	0	0	0	0	0	0	15.0
13038422	L ROBINSON	0	0	150	0	0	0	0	0	0	0	0	0	0	150.0
13038426	LENROOT	3234	6320	15	1530	0	0	0	0	0	3805	0	2000	0	16904.0
13038428	R BURNS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038431	REID	1472	1220	0	1930	0	0	0	0	0	2507	0	0	0	7129.0
13038432	WILCOX	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038434	TEXAS & LIBRTY	0	1420	200	3280	0	0	0	0	0	0	0	0	0	4900.0
13038435	BANNOCK JIM	0	0	1031	0	0	0	0	0	0	0	0	0	0	1031.0
13038436	HILL PETTINGER	0	0	440	0	0	0	0	0	0	0	0	0	0	440.0
13038437	NELSON COREY	0	0	354	0	0	0	0	0	0	0	0	0	0	354.0
13038438	L HILL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038439	TANNER PUMP	0	0	450	0	0	0	0	0	0	0	0	0	0	450.0
	TOTAL	49179	122805	18345	48400	0	0	0	0	0	52689	0	21439	0	0	312857.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

LORENZO TO BLACKFOOT

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13056501	BEAVER DICK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057012	L HARTERT(20B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057013	GUNDERSON(20C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057014	MILR-BARN(20D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057021	BTTE SLGH(20E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057025	BTTE-MKTL(20A)	2695	36750	204	7250	0	0	0	0	0	4591	0	0	0	51490.0
13057030	BEAR TRAP	0	0	1450	0	0	0	0	0	0	0	0	0	0	1450.0
13057038	WALKER FARMS	0	0	370	0	0	0	0	0	0	0	0	0	0	370.0
13057046	M TOMCHAK	0	0	85	0	0	0	0	0	0	0	0	0	0	85.0
13057090	A WILDE PUMP	0	0	89	0	0	0	0	0	0	0	0	0	0	89.0
13057091	K ALBERTSON	0	0	93	0	0	0	0	0	0	0	0	0	0	93.0
13057097	N FULLMER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057105	D BOYCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057106	B TOMCHAK #1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057108	B TOMCHAK #3	0	0	1300	0	0	0	0	0	0	0	0	0	0	1300.0
13057113	RHODEHOUSE (20	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057114	STIENKE-MURDOC	0	0	465	0	0	0	0	0	0	0	0	0	0	465.0
13057115	L CARLSON N(4B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057116	B TOMCHAK #2	0	0	550	0	0	0	0	0	0	0	0	0	0	550.0
13057117	L CARLSON S(4C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057118	H BROWN	0	0	248	0	0	0	0	0	0	0	0	0	0	248.0
13057119	OSGOOD GR PMP	0	0	152	0	0	0	0	0	0	0	0	0	0	152.0
13057120	KINGSTON NTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057121	G OFFUT (4D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057122	KINGSTON STH	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057123	BEAR ISL NORTH	55	0	0	0	0	0	0	0	0	100	0	0	0	155.0
13057124	BEAR ISL WEST	55	0	0	0	0	0	0	0	0	87	0	0	0	142.0
13057125	OSGOOD	7771	0	40	0	0	0	0	0	0	3930	0	0	0	11741.0
13057126	CLEMENTS	196	0	516	0	0	0	0	0	0	70	0	0	0	782.0
13057130	KENNEDY	200	0	637	0	0	0	0	0	0	0	0	0	0	837.0
13057135	GREAT WST(21A)	22516	23421	2777	10920	0	0	0	0	0	27290	0	5009	0	91933.0
13057139	G ELLSWORTH (4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057140	L HANSEN E(4E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057141	A ZOHNER	0	0	160	0	0	0	0	0	0	0	0	0	0	160.0
13057143	M BOAM (4F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057144	R MACKAY (4G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057145	IDAHO (33A)	13230	45760	876	13040	0	0	0	0	0	15864	0	6678	0	95448.0
13057146	MORTMER P(33B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057147	SCHWIEDER PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057148	D & A PUMP (33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057149	JOHNSN PMP (4J	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057150	JACOBS WELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057250	PORTER (21B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

LORENZO TO BLACKFOOT

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13059050	IDAHO FLS POWR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059490	IF MONROC LYON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059500	RYDER PARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059504	CITY OF IDF PI	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059505	WOODVILLE(22A)	3491	4910	0	1090	0	0	0	0	0	5948	0	0	0	15439.0
13059510	WDVL PMP1(22B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059513	MULBERRY PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059515	WDVL PMP2(22C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059520	WDVL SIPH(22D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059523	GEM LAKE WILDL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059525	SNKE R VY(23A)	30225	20591	0	7700	0	0	0	0	0	25942	0	7009	0	91467.0
13060050	A CORBETT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060055	P HILL (23B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060500	RESERV MITIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060501	RESERVATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060505	OXBOW PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061430	BLACKFOOT	7370	0	0	3550	0	0	0	0	0	12558	0	500	0	23978.0
13061520	NEW LAVSD(24A)	0	9570	0	2180	0	0	0	0	0	0	0	0	0	11750.0
13061521	ADAMS STH(25B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061523	ADAMS NTH(25C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061525	PEOPLES (25A)	20365	27166	0	6540	0	0	0	0	0	21070	0	1294	0	76435.0
13061610	ABERDEEEN	67203	120418	0	22860	0	0	0	0	0	52263	0	3500	0	266244.0
13061625	SWID	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061650	CORBETT	1961	4120	0	2180	0	0	0	0	0	1592	0	1750	0	11603.0
13061670	NIELSON-HANSEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061677	R LAMBERT(26B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061685	LAVSD PMPS(24B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061705	RIVERSIDE(26A)	0	320	0	980	0	0	0	0	0	0	0	200	0	1500.0
13061995	DANSKIN	0	170	0	1780	0	0	0	0	0	0	0	400	0	2350.0
13062050	TREGO	758	2620	0	580	0	0	0	0	0	1293	0	0	0	5251.0
13062051	JENSEN GROVE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13062503	WEARYRICK	0	20	0	430	0	0	0	0	0	0	0	150	0	600.0
13062504	WADSWORTH(32A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13062505	WADSWORTH(32B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13062506	WATSON	0	1102	0	904	0	0	0	0	0	0	0	50	0	2056.0
13062507	PARSONS	0	758	0	136	0	0	0	0	0	0	0	100	0	994.0
	TOTAL	178091	297696	10012	82120	0	0	0	0	0	172598	0	26640	0	767157.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

BLACKFOOT TO MILNER

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE	AM WWS	AM FLS	L WLCT	RN LTF	PL PWR	RENTAL	TOTAL
13069569	J RANDALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13075800	PORTNEUF RENTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13075900	FT HALL MICHAU	0	83900	0	0	0	0	0	0	0	46931	0	0	0	0	130831.0
13076400	FALLS IRRIGATI	0	32900	0	0	0	0	0	0	0	22925	0	8000	0	0	63825.0
13076500	AMERICAN FALLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13076751	AMERICAN F LTF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13077652	M OSBORN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13077755	CALL FARMS	0	0	905	0	0	0	0	0	0	0	0	0	0	0	905.0
13077775	R EVANS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13080000	MINIDKA N(27A)	144030	29672	0	5328	0	0	0	0	0	82216	63308	42000	0	0	366554.0
13080500	MINIDKA S(27B)	0	36528	0	2672	0	0	0	0	0	146953	31892	8442	0	0	226487.0
13081000	LAKE WALCOTT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13081400	MINIDOKA POWER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13081750	LHC PROP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084590	L LEBSACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084598	MID MISC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084599	MILNER MISC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084610	LAW-KER FAMRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084640	BURLEY GC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084650	CITY OF BURLEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084655	SIMPLOT FTLZR	0	1796	0	0	0	0	0	0	0	0	0	704	0	0	2500.0
13084690	AMALGA SUGAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084691	JACKSON 4K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084710	R TILLEY PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084720	MILLERCOORS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084725	K SANDMANN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085270	H SCHODDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085275	PR ENT #1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085300	PR ENT #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085350	SWID PUMPS	0	0	1040	0	0	0	0	0	0	0	0	0	0	0	1040.0
13085390	P HOBSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085400	V HOBSON	0	0	300	0	0	0	0	0	0	0	0	0	0	0	300.0
13085500	A & B IRR DIST	0	90636	0	0	0	0	0	0	0	46826	0	164	0	0	137626.0
13085800	PA LATERL(28B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086000	MILNER IRRIG	0	44500	2910	0	0	0	0	0	0	44951	0	0	0	0	92361.0
13086510	A LATERL (28C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086512	J BRUNE (28D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086520	NS XCUT (28E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086530	RES DIST #2	0	0	0	0	0	0	0	0	0	393550	0	0	0	0	393550.0
13087000	NRTHSDE TF(28A	312007	0	0	116600	0	0	0	0	9248	422043	0	0	0	0	859898.0
13087500	TWIN FALLS SOU	97183	0	0	0	0	0	0	0	147582	1165	0	0	0	0	245930.0
	TOTAL	553220	319932	5155	124600	0	0	0	0	1568301	207560	95200	59310	0	0	2521807.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

MAIN STEM HENRYS FRK

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13039000	HENRYS LAKE	0	0	0	0	0	0	0	0	0	0	0	659	0	0	659.0
13042000	ISLAND PARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13042600	ASHTON POWER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045655	G MAROTZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045675	N FK HIGHLANDS	0	0	50	0	0	0	0	0	0	0	0	0	0	0	50.0
13045705	F HOWELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045710	S BOLLAERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045721	F VANDERSLOOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045724	F VANDERSLOOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045727	F VANDERSLOOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045755	T HOLCOMB	0	0	70	0	0	0	0	0	0	0	0	0	0	0	70.0
13045780	R LEE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045805	Z EGBERT 1(9B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045807	R RITCHEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045810	N MLLER 1(10A)	0	0	0	0	0	103	0	0	0	0	0	0	0	0	103.0
13045811	N MLLER 2(10B)	0	0	0	0	0	90	0	0	0	0	0	0	0	0	90.0
13045813	Z EGBERT #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045823	R D BAKER	0	0	45	0	0	0	0	0	0	0	0	0	0	0	45.0
13045829	D PHELPS (9C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045849	D SEELEY	0	0	200	0	0	0	0	0	0	0	0	0	0	0	200.0
13045850	TY NEDROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045860	Z EGBERT 3(9D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045880	Z EGBERT #4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045930	Z EGBERT #5	0	0	0	0	0	140	0	0	0	0	0	0	0	0	140.0
13045940	G NEDROW	0	0	0	0	0	47	0	0	0	0	0	0	0	0	47.0
13045950	BAKER & NEDROW	0	0	0	0	0	306	0	0	0	0	0	0	0	0	306.0
13045960	M REYNOLDS #1	0	0	0	0	0	167	0	0	0	0	0	0	0	0	167.0
13046015	R & C BAUM	0	0	0	0	0	186	0	0	0	0	0	0	0	0	186.0
13046020	J MCCULLOCH	0	0	290	0	0	0	0	0	0	0	0	0	0	0	290.0
13046025	M REYNOLDS #2	0	0	0	0	0	41	0	0	0	0	0	0	0	0	41.0
13046070	A NEDROW #1	0	0	50	0	0	0	0	0	0	0	0	0	0	0	50.0
13046072	A NEDROW #2	0	0	50	0	0	0	0	0	0	0	0	0	0	0	50.0
13046075	J NEDROW	0	0	100	0	0	206	0	0	0	0	0	0	0	0	306.0
13046083	V & D KIRKHAM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13046084	D NEDROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13046086	L FRANSEN(11B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13046090	L BRATT	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10.0
13046095	L LOOSLI #1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4.0
13046310	DEWEY	0	0	0	0	0	395	0	0	0	0	0	0	0	0	395.0
13046315	J SEELEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

MAIN STEM HENRYS FRK

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13049550	LAST CHANCE	0	0	0	0	9973	1824	0	0	0	0	0	0	0	11797.4
13049560	XCUT TO TETN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13049561	XCUT FAL R(16B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13049705	FARMERS FRIEND	0	0	0	0	0	5165	0	0	0	0	0	0	0	5165.0
13049710	TWIN GROVES	0	0	0	0	0	4819	0	0	0	0	0	0	0	4819.0
13049725	ST ANTH U(17A)	0	0	0	0	7445	3592	0	0	0	0	0	0	0	11037.1
13049805	SALEM UNION CA	0	0	0	0	22210	7600	0	0	0	0	0	0	0	29810.2
13050525	EGIN	0	0	0	0	7445	2298	0	0	0	0	0	0	0	9743.1
13050530	ST AN U FD(17B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13050535	INDEPENDENT	0	0	0	0	23943	9052	0	0	0	0	0	0	0	32995.4
13050545	CONSOLIDATED F	0	0	0	0	18324	8027	0	0	0	0	0	0	0	26350.8
	TOTAL	0	0	865	0	89341	44062	0	0	0	0	0	659	0	0	134927.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

FALLS RIVER

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13046500	GRASSY LAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047305	YELLOWSTONE	0	0	1646	0	0	1916	0	0	0	0	0	0	0	3562.0
13047474	ATCHLEY P(9E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047475	MARYSVILLE(9A)	0	0	743	0	0	25260	0	0	0	0	0	0	0	26003.0
13047515	F & L GRIFFEL	0	0	0	0	0	200	0	0	0	0	0	0	0	200.0
13047565	R BAUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047568	ORME PLACE	0	0	302	0	0	0	0	0	0	0	0	0	0	302.0
13047570	G/6 (9F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047575	FRMRS OWN(11A)	0	0	72	0	0	0	0	0	0	0	0	0	0	72.0
13047605	W SCAFE	0	0	0	0	0	100	0	0	0	0	0	0	0	100.0
13047615	R STURM #2(9G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047616	R STURM #1(9H)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047625	M GRIFFEL	0	0	175	0	0	100	0	0	0	0	0	0	0	275.0
13047635	L LOOSLI #2	0	0	203	0	0	259	0	0	0	0	0	0	0	462.0
13047636	C MALOUF	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13047681	CONANT CNL(12A	0	0	0	0	0	2366	0	0	0	0	0	0	0	2366.0
13047710	K NYBORG	0	0	0	0	0	50	0	0	0	0	0	0	0	50.0
13047900	BOOM CRK (13A)	0	0	0	0	0	860	0	0	0	0	0	0	0	860.0
13048050	ORME CANAL	0	0	0	0	0	100	0	0	0	0	0	0	0	100.0
13048060	SQUIR P 3(14A)	0	0	0	0	0	240	0	0	0	0	0	0	0	240.0
13048070	L ORME PUMP	0	0	0	0	0	100	0	0	0	0	0	0	0	100.0
13048080	HARSHBRGR(13B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13048255	SQUIR P 1(14B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13048265	D ZUNDELL(12B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13048275	L LOOSLI 3(15A	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13048280	L LOOSLI 4(15B	0	0	0	0	0	328	0	0	0	0	0	0	0	328.0
13048290	D BUDGE	0	0	0	0	0	120	0	0	0	0	0	0	0	120.0
13048350	J HILL (12C)	0	0	0	0	0	20	0	0	0	0	0	0	0	20.0
13048430	D REYNOLDS	0	0	0	0	0	170	0	0	0	0	0	0	0	170.0
13048440	C LOOSLI	0	0	0	0	0	160	0	0	0	0	0	0	0	160.0
13048470	T POTTER	0	0	0	0	0	60	0	0	0	0	0	0	0	60.0
13048475	ENTERPRISE	5883	0	0	0	0	9706	0	0	0	10024	0	0	0	25613.0
13048485	R D MILLER	0	0	0	0	0	120	0	0	0	0	0	0	0	120.0
13048551	C ATCHLEY (9I)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13048556	W C DAVIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13048560	FALL R CNL(16A	0	0	0	0	0	7869	0	0	0	0	0	0	0	7869.0
13048705	CHESTER	0	0	0	0	0	1161	0	0	0	0	0	0	0	1161.0
13049008	MCBEE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13049010	SILKEY	0	0	0	0	0	37	0	0	0	0	0	0	0	37.0
13049015	CURR	0	0	0	0	0	10	0	0	0	0	0	0	0	10.0
13049310	RLF PUMP	0	0	0	0	0	80	0	0	0	0	0	0	0	80.0
13049490	L LOOSLI #5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13049495	G BLANCHARD	0	0	0	0	0	45	0	0	0	0	0	0	0	45.0
	TOTAL	5883	0	3141	0	0	51437	0	0	0	10024	0	0	0	70485.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

TETON RIVER

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13053951	SOUTH PIPE(31A	0	0	0	0	0	1202	0	0	0	0	0	0	0	1202.0
13053971	J RICKS (31B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054031	BOELKE (31C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054042	CLEMNTSVL(31D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054045	HIBBERT FARMS	0	0	0	0	0	120	0	0	0	0	0	0	0	120.0
13054111	R & J BROWN	0	0	0	0	0	114	0	0	0	0	0	0	0	114.0
13054291	P L STOTT	0	0	0	0	0	12	0	0	0	0	0	0	0	12.0
13054420	B PARKINSON	0	0	0	0	0	105	0	0	0	0	0	0	0	105.0
13054515	CANYON CR CANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054575	LINDERMAN (31E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054577	G CRAPO	0	0	0	0	0	30	0	0	0	0	0	0	0	30.0
13054590	P STEVENS	0	0	0	0	0	881	0	0	0	0	0	0	0	881.0
13054705	V SCHWENDIMAN	0	0	0	0	0	432	0	0	0	0	0	0	0	432.0
13054772	R B RICKS	0	0	0	0	0	38	0	0	0	0	0	0	0	38.0
13054801	CANYON CR LAT	0	0	0	0	0	808	0	0	0	0	0	0	0	808.0
13054850	SIDDOWAY SHEEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054930	D PETERSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054940	H BISCHOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055030	WILFORD	0	0	0	0	0	3597	0	0	0	0	0	0	0	3597.0
13055032	D ALLEN (18B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055033	B TUCKER (18C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055036	B PARKER (18D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055037	SIDWY PMP(18E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055039	MCKINNLEY(18F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055040	TETON IRR(18A)	0	0	0	0	0	1490	0	0	0	0	0	0	0	1490.0
13055042	SIDDOWAY (18G)	0	0	0	0	0	421	0	0	0	0	0	0	0	421.0
13055050	PIONEER	0	0	0	0	0	145	0	0	0	0	0	0	0	145.0
13055060	STEWART	0	0	0	0	0	469	0	0	0	0	0	0	0	469.0
13055193	N BIRCH	0	0	0	0	0	30	0	0	0	0	0	0	0	30.0
13055195	B LEAVITT	0	0	0	0	0	90	0	0	0	0	0	0	0	90.0
13055205	PINCOCK-BYGTON	0	0	0	0	0	290	0	0	0	0	0	0	0	290.0
13055206	B HOLLIST	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055209	TITI RCHG PIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055210	TETON ISLAND F	0	0	0	0	0	9234	0	0	0	0	0	0	0	9234.0
13055245	SALEM UNION B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055263	J HARRIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055275	ROXANA	0	0	0	0	0	707	0	0	0	0	0	0	0	707.0
13055280	ISLAND WARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055295	SAUREY	0	0	0	0	0	110	0	0	0	0	0	0	0	110.0
13055309	CARTER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055310	BASS POND	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055311	PINCOCK-GARNER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055313	GARDNER-BEDDES	0	0	0	0	0	120	0	0	0	0	0	0	0	120.0
13055314	BIGLER SLOUGH	0	0	0	0	0	58	0	0	0	0	0	0	0	58.0
13055315	WDMNSE-JSN(19A	0	0	0	0	0	1138	0	0	0	0	0	0	0	1138.0
13055319	G GODFREY	0	0	0	0	0	5	0	0	0	0	0	0	0	5.0
13055321	R R RICKS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055323	CITY OF REXBUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055325	T BRUNSON(19B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055327	J S WRIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

13055328 CMTRY PUMP (35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055334 REXBURG IRRIG	0	0	0	0	0	4281	0	0	0	0	0	0	0	0	4281.0
13055339 WALTER PND (34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL	0	0	0	0	0	25927	0	0	0	0	0	0	0	0	25927.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

WILLOW CREEK

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13057938	LOERTSCHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057950	RIRIE RESRVR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058015	BOYD FOSTER	0	0	841	0	0	0	0	0	0	0	0	0	0	841.0
13058050	CENTURY HOLDIN	0	0	1400	0	0	0	0	0	0	0	0	0	0	1400.0
13058090	SCHWENDIMAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058104	CRAIG PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058105	LOVELL # 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058125	FERGUSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058145	LOVELL # 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058165	W REID #1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058210	SARGENT & SUMM	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058220	MAX COOPER PUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058230	DURTSCHI PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058250	W REED #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058265	FOSTER-SARGENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058266	WEEKS PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058270	SPERRY	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058280	BRINKERHOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058290	ORVAL AVERY	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058310	ROY AVERY	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058330	STUCKI PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058340	SCHWENDIMAN #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058350	O AVERY PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058370	ROY COOPER SAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058380	ROY COOPER WIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058508	D KEELER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058510	PROGRESSIVE SA	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058512	BEAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058514	W & O COOPER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058515	IDAHO FR SAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058519	DEMICK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13058530	PROGRESSIVE WI	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	TOTAL	0	0	2241	0	0	0	0	0	0	0	0	0	0	2241.0

2026 WATER DISTRICT 1 RESERVOIR SPACE BY USER ASSUMING FULL RESERVOIRS (ACRE-FEET)

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	MISCELLANEOUS TOTAL
99999100	POCATELLO CITY	0	23139	0	0	0	0	0	0	0	0	26861	0	0	50000.0
99999150	IWRB	0	5000	0	0	0	0	0	0	0	0	0	0	0	5000.0
99999200	FRE-MAD SNAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999250	WYOMING COMPCT	0	33000	0	0	0	0	0	0	0	0	0	0	0	33000.0
99999300	PALISADES USRS	0	0	12506	560	0	0	0	0	0	0	805	0	0	13871.0
99999350	IDAHO POWER CO	0	0	0	0	0	0	0	0	0	44275	0	0	0	44275.0
99999400	BUREAU OF REC	439	1705	0	0	0	0	0	0	0	219	0	20532	157000 0	179895.0
99999410	ARTESIAN IRR	0	0	0	0	0	0	0	0	0	2794	0	0	0	2794.0
99999500	SNAKE UNALC BK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999525	FREE-MAD TRANS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999550	FRE-MAD MISC	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999600	F-M UNALLCATED	0	0	0	0	0	28778	0	0	0	0	0	0	0	28778.0
99999700	MITIGATION INC	0	16360	0	2620	0	0	0	80500	0	0	0	0	0	99480.0
99999725	GROUND WTR EX	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999950	MILNER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999990	OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	TOTAL	439	79204	12506	3180	0	28778	0	80500	0	47288	0	48198	157000 0	457093.0

2026 WATER DISTRICT 1 RENTAL LAST TO FILL SPACE FROM ORIGINATING RESERVOIR, BY USER (ACRE-FEET)

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT	TOTAL
13037505	ANDERSON (1A)	553	941	0	0	0	0	0	0	0	0	0	1494.0
13037985	ENTERPRIZE	6744	8326	0	0	0	0	0	0	0	0	0	15070.0
13038055	HARRISON	1273	0	0	0	0	0	0	0	0	0	0	1273.0
13038180	RIGBY	0	500	0	0	0	0	0	0	0	0	0	500.0
13038315	NORTH RIGBY	0	468	0	0	0	0	0	0	0	0	0	468.0
13038392	SUNNYDELL(29A)	634	0	0	0	0	0	0	0	0	0	0	634.0
13038426	LENROOT	2000	0	0	0	0	0	0	0	0	0	0	2000.0
13039000	HENRYS LAKE	0	0	0	0	659	0	0	0	0	0	0	659.0
13057135	GREAT WST(21A)	0	5009	0	0	0	0	0	0	0	0	0	5009.0
13057145	IDAHO (33A)	0	0	0	0	0	0	0	0	0	6678	0	6678.0
13059525	SNKE R VY(23A)	0	7009	0	0	0	0	0	0	0	0	0	7009.0
13061430	BLACKFOOT	0	0	0	500	0	0	0	0	0	0	0	500.0
13061525	PEOPLES (25A)	0	1294	0	0	0	0	0	0	0	0	0	1294.0
13061610	ABERDEEEN	3500	0	0	0	0	0	0	0	0	0	0	3500.0
13061650	CORBETT	0	0	0	0	0	0	0	0	0	1750	0	1750.0
13061705	RIVERSIDE(26A)	0	0	0	200	0	0	0	0	0	0	0	200.0
13061995	DANSKIN	0	0	0	400	0	0	0	0	0	0	0	400.0
13062503	WEARYRICK	0	0	0	150	0	0	0	0	0	0	0	150.0
13062506	WATSON	0	0	0	50	0	0	0	0	0	0	0	50.0
13062507	PARSONS	0	100	0	0	0	0	0	0	0	0	0	100.0
13076400	FALLS IRRIGATI	0	8000	0	0	0	0	0	0	0	0	0	8000.0
13080000	MINIDKA N(27A)	42000	0	0	0	0	0	0	0	0	0	0	42000.0
13080500	MINIDKA S(27B)	0	0	0	0	0	0	0	0	0	8442	0	8442.0
13084655	SIMPLOT FTLZR	0	704	0	0	0	0	0	0	0	0	0	704.0
13085500	A & B IRR DIST	0	164	0	0	0	0	0	0	0	0	0	164.0
99999100	POCATELLO CITY	0	26861	0	0	0	0	0	0	0	0	0	26860.9
99999300	PALISADES USRS	0	0	805	0	0	0	0	0	0	0	0	805.4
99999400	BUREAU OF REC	3484	8317	0	0	0	0	0	0	0	8731	0	20532.0
	TOTAL	60188	67693	805	1300	659	0	0	0	0	25601	0	156246.3

PART 1

2026 WATER DISTRICT 1 RESERVOIR SPACE BY REACH ASSUMING FULL RESERVOIRS WITHOUT RENTAL POOL(ACRE-FEET)

RIVER REACH	JACKSON	PALISADES	PAL USR	PAL WWS	HENRYS LAKE	ISLAND PARK	GRASSY LAKE
IRWIN TO LORENZO	49179.3	122804.7	18345.0	48400.0	0.0	0.0	0.0
LORENZO TO BLACKFOOT	178091.0	297696.0	10012.0	82120.0	0.0	0.0	0.0
BLACKFOOT TO MILNER	553220.0	319932.0	5155.0	124600.0	0.0	0.0	0.0
MAIN STEM HENRYS FRK	0.0	0.0	865.0	0.0	89341.0	44062.0	0.0
FALLS RIVER	5883.0	0.0	3141.0	0.0	0.0	51437.0	0.0
TETON RIVER	0.0	0.0	0.0	0.0	0.0	25927.0	0.0
WILLOW CREEK	0.0	0.0	2241.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	439.0	79204.1	12505.6	3180.0	0.0	28778.0	0.0
TOTAL	786812.3	819636.8	52264.6	258300.0	89341.0	150204.0	0.0

RIVER REACH	RIRIE	AM WWS	AM FALLS	LAKE WALCOTT	RNT LTF	PAL PWR	RENTAL POOL	TOTAL
IRWIN TO LORENZO	0.0	0.0	52689.0	0.0	21439.0	0.0	0.0	312857.0
LORENZO TO BLACKFOOT	0.0	0.0	172598.0	0.0	26640.0	0.0	0.0	767157.0
BLACKFOOT TO MILNER	0.0	156830.0	1207560.0	95200.0	59310.0	0.0	0.0	2521807.0
MAIN STEM HENRYS FRK	0.0	0.0	0.0	0.0	659.0	0.0	0.0	134927.0
FALLS RIVER	0.0	0.0	10024.0	0.0	0.0	0.0	0.0	70485.0
TETON RIVER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25927.0
WILLOW CREEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2241.0
MISCELLANEOUS	80500.0	0.0	47288.0	0.0	48198.3	157000.0	0.0	457093.0
TOTAL	80500.0	156830.0	1490159.0	95200.0	156246.3	157000.0	0.0	4292494.0

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

IRWIN TO LORENZO

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13010500	JACKSON LAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13022450	WY STORAGE USE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13032450	PALISADES	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13032510	P BYRD	0	0	6	0	0	0	0	0	0	0	0	0	0	5.5
13032515	BOY SCOUT PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13032520	A ROSTAD	0	0	89	0	0	0	0	0	0	0	0	0	0	88.6
13032920	R ROSE	0	0	18	0	0	0	0	0	0	0	0	0	0	18.5
13033010	PALISADES CNL	0	0	429	0	0	0	0	0	0	0	0	0	0	428.7
13033643	J FLEMING	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13033650	MERT OGDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13033660	LYNN DIXON	0	0	196	0	0	0	0	0	0	0	0	0	0	195.6
13033698	J CHICK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13034460	L JACOBSON	0	0	92	0	0	0	0	0	0	0	0	0	0	92.3
13037305	I SPAULDING	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037490	B FOSTER	0	0	96	0	0	0	0	0	0	0	0	0	0	95.6
13037505	ANDERSON (1A)	8003	1345	108	11443	0	0	0	0	0	12565	0	0	-1633	31830.3
13037510	M & M CATTLE	0	0	111	0	0	0	0	0	0	0	0	0	0	110.7
13037855	M NEWBY #1(2A)	0	0	236	0	0	0	0	0	0	0	0	0	0	236.2
13037860	M NEWBY #2(2B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037880	M NEWBY #3(2C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037975	EAGLE ROCK(1B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13037980	FARMERS FRIEND	1941	3351	152	3698	0	0	0	0	0	0	0	0	-440	8701.8
13037985	ENTERPRIZE	4375	884	30	1766	0	0	0	0	0	8521	0	0	-761	14815.4
13037997	C HICKMAN	0	0	6	0	0	0	0	0	0	0	0	0	0	5.5
13038025	BUTLER ISLAND	0	0	0	243	0	0	0	0	0	0	0	0	-12	230.7
13038030	ROSS AND RAND	0	0	60	0	0	0	0	0	0	0	0	0	0	60.1
13038055	HARRISON	10356	1052	180	4503	0	0	0	0	0	11484	0	0	-1342	26233.1
13038075	G SCOTT #1(3A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038079	J BROWN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038081	G SCOTT #2(3B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038084	SUBDIV PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038085	RUDY	3426	703	937	1941	0	0	0	0	0	2529	0	0	-421	9115.6
13038090	LOWDER SLOUGH	1009	72	83	388	0	0	0	0	0	0	0	0	-72	1480.0
13038098	KITE & NORD	0	0	112	0	0	0	0	0	0	0	0	0	0	112.2
13038110	BURGESS (4A)	10291	1405	75	7764	0	0	0	0	0	9068	0	0	-1397	27207.2
13038113	M H HILL	0	0	105	0	0	0	0	0	0	0	0	0	0	105.2
13038115	CLARK & ED(5A)	0	136	17	641	0	0	0	0	0	0	0	0	-38	755.1
13038140	K HILL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038145	CROFT	0	0	22	0	0	0	0	0	0	0	0	0	0	22.1
13038146	MILLER PUMP	0	0	55	0	0	0	0	0	0	0	0	0	0	55.4
13038147	J EDWARDS (5D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038148	G HOLMAN	0	0	15	0	0	0	0	0	0	0	0	0	0	14.8
13038149	G MUMA	0	0	27	0	0	0	0	0	0	0	0	0	0	27.3

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

IRWIN TO LORENZO

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13038150	EAST LABELLE	0	0	33	776	0	0	0	0	0	0	0	0	-38	771.7
13038151	B GROVER (5B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038180	RIGBY	0	2059	0	1407	0	0	0	0	0	0	0	0	-170	3296.9
13038183	K FOSTER (5C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038201	WHITE ISLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038204	DILTS LAT (6B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038205	DILTS (6A)	496	54	0	252	0	0	0	0	0	845	0	0	-81	1566.7
13038210	ISLAND (30A)	0	839	0	1271	0	0	0	0	0	0	0	0	-103	2007.0
13038225	W LBL&LG I(7A)	0	4296	341	0	0	0	0	0	0	0	0	0	-210	4426.8
13038305	PARKS & LEWSVL	0	391	0	2475	0	0	0	0	0	0	0	0	-140	2726.1
13038315	NORTH RIGBY	0	54	0	524	0	0	0	0	0	0	0	0	-28	549.5
13038340	WHITE DTCH(7B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038352	D PHILLIPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038356	VON BARON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038360	BRAMWELL (8A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038362	ELLIS (30B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038365	FRESH PAC (8B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038371	J T JONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038372	C JONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038375	A ZOHNER (7D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038376	GNEITING (36B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038382	W DABELL (7E)	0	0	44	0	0	0	0	0	0	0	0	0	0	44.3
13038384	D STOKER (7C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038385	SKAAR PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038386	J N ERICKSON	0	0	451	0	0	0	0	0	0	0	0	0	0	450.9
13038388	MATTSON-CRAIG	0	602	0	0	0	0	0	0	0	0	0	0	-30	572.2
13038392	SUNNYDELL(29A)	3267	282	623	1339	0	0	0	0	0	0	0	0	-239	5272.0
13038393	B COVINGTON	0	0	406	0	0	0	0	0	0	0	0	0	0	405.9
13038405	T PARKINSON	0	0	266	0	0	0	0	0	0	0	0	0	0	265.7
13038410	R GROVER	0	0	261	0	0	0	0	0	0	0	0	0	0	260.5
13038415	BYBEE PMP(29B)	0	0	108	0	0	0	0	0	0	0	0	0	0	108.1
13038417	D CHENEY	0	0	6	0	0	0	0	0	0	0	0	0	0	5.5
13038422	L ROBINSON	0	0	55	0	0	0	0	0	0	0	0	0	0	55.4
13038426	LENROOT	3139	351	6	1485	0	0	0	0	0	3693	0	0	-425	8249.2
13038428	R BURNS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038431	REID	1429	414	0	1873	0	0	0	0	0	2433	0	0	-301	5848.4
13038432	WILCOX	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038434	TEXAS & LIBRTY	0	1354	74	3183	0	0	0	0	0	0	0	0	-222	4389.1
13038435	BANNOCK JIM	0	0	380	0	0	0	0	0	0	0	0	0	0	380.5
13038436	HILL PETTINGER	0	0	162	0	0	0	0	0	0	0	0	0	0	162.4
13038437	NELSON COREY	0	0	131	0	0	0	0	0	0	0	0	0	0	130.6
13038438	L HILL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13038439	TANNER PUMP	0	0	166	0	0	0	0	0	0	0	0	0	0	166.1
	TOTAL	47732	19644	6770	46975	0	0	0	0	0	51138	0	0	-8104	164154.5

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

LORENZO TO BLACKFOOT

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13056501	BEAVER DICK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057012	L HARTERT(20B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057013	GUNDERSON(20C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057014	MILR-BARN(20D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057021	BTTE SLGH(20E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057025	BTTE-MKTL(20A)	2616	20058	75	7037	0	0	0	0	0	4456	0	0	-1673	32568.4
13057030	BEAR TRAP	0	0	535	0	0	0	0	0	0	0	0	0	0	535.1
13057038	WALKER FARMS	0	0	137	0	0	0	0	0	0	0	0	0	0	136.5
13057046	M TOMCHAK	0	0	31	0	0	0	0	0	0	0	0	0	0	31.4
13057090	A WILDE PUMP	0	0	33	0	0	0	0	0	0	0	0	0	0	32.8
13057091	K ALBERTSON	0	0	34	0	0	0	0	0	0	0	0	0	0	34.3
13057097	N FULLMER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057105	D BOYCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057106	B TOMCHAK #1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057108	B TOMCHAK #3	0	0	480	0	0	0	0	0	0	0	0	0	0	479.7
13057113	RHODEHOUSE (20	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057114	STIENKE-MURDOC	0	0	172	0	0	0	0	0	0	0	0	0	0	171.6
13057115	L CARLSON N(4B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057116	B TOMCHAK #2	0	0	203	0	0	0	0	0	0	0	0	0	0	203.0
13057117	L CARLSON S(4C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057118	H BROWN	0	0	92	0	0	0	0	0	0	0	0	0	0	91.5
13057119	OSGOOD GR PMP	0	0	56	0	0	0	0	0	0	0	0	0	0	56.1
13057120	KINGSTON NTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057121	G OFFUT (4D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057122	KINGSTON STH	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057123	BEAR ISL NORTH	53	0	0	0	0	0	0	0	0	97	0	0	0	150.4
13057124	BEAR ISL WEST	53	0	0	0	0	0	0	0	0	84	0	0	-7	131.1
13057125	OSGOOD	7542	0	15	0	0	0	0	0	0	3814	0	0	-556	10815.2
13057126	CLEMENTS	190	0	190	0	0	0	0	0	0	68	0	0	-13	436.0
13057130	KENNEDY	194	0	235	0	0	0	0	0	0	0	0	0	-10	419.7
13057135	GREAT WST(21A)	21853	13902	1025	10599	0	0	0	0	0	26487	0	0	-3567	70298.6
13057139	G ELLSWORTH (4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057140	L HANSEN E(4E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057141	A ZOHNER	0	0	59	0	0	0	0	0	0	0	0	0	0	59.0
13057143	M BOAM (4F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057144	R MACKAY (4G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057145	IDAHO (33A)	12841	39489	323	12656	0	0	0	0	0	15397	0	0	-3936	76770.0
13057146	MORTMER P(33B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057147	SCHWIEDER PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057148	D & A PUMP (33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057149	JOHNSN PMP (4J	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057150	JACOBS WELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13057250	PORTER (21B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

LORENZO TO BLACKFOOT

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE	AM WWS	AM FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13059050	IDAHO FLS POWR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059490	IF MONROC LYON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059500	RYDER PARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059504	CITY OF IDF PI	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059505	WOODVILLE(22A)	3388	1125	0	1058	0	0	0	0	0	5773	0	0	-556	10788.6
13059510	WDVL PMP1(22B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059513	MULBERRY PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059515	WDVL PMP2(22C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059520	WDVL SIPH(22D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059523	GEM LAKE WILDL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13059525	SNKE R VY(23A)	29335	13087	0	7473	0	0	0	0	0	25178	0	0	-3676	71397.3
13060050	A CORBETT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060055	P HILL (23B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060500	RESERV MITIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060501	RESERVATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13060505	OXBOW PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061430	BLACKFOOT	7153	0	0	3445	0	0	0	0	0	12188	0	0	-1116	21671.0
13061520	NEW LAVSD(24A)	0	8234	0	2116	0	0	0	0	0	0	0	0	-507	9843.2
13061521	ADAMS STH(25B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061523	ADAMS NTH(25C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061525	PEOPLES (25A)	19765	14873	0	6347	0	0	0	0	0	20450	0	0	-3009	58426.9
13061610	ABERDEEEN	65225	6413	0	22187	0	0	0	0	0	50724	0	0	-7079	137470.9
13061625	SWID	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061650	CORBETT	1903	3600	0	2116	0	0	0	0	0	1545	0	0	-449	8715.9
13061670	NIELSON-HANSEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061677	R LAMBERT(26B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061685	LAVSD PMPS(24B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13061705	RIVERSIDE(26A)	0	311	0	951	0	0	0	0	0	0	0	0	-62	1199.9
13061995	DANSKIN	0	165	0	1728	0	0	0	0	0	0	0	0	-93	1799.9
13062050	TREGO	736	720	0	563	0	0	0	0	0	1255	0	0	-160	3112.8
13062051	JENSEN GROVE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13062503	WEARYRICK	0	19	0	417	0	0	0	0	0	0	0	0	-21	415.4
13062504	WADSWORTH(32A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13062505	WADSWORTH(32B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13062506	WATSON	0	980	0	877	0	0	0	0	0	0	0	0	-91	1766.1
13062507	PARSONS	0	576	0	132	0	0	0	0	0	0	0	0	-35	673.8
	TOTAL	172848	123553	3695	79703	0	0	0	0	0	167517	0	0	-26614	520702.0

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

BLACKFOOT TO MILNER

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13069569	J RANDALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13075800	PORTNEUF RENTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13075900	FT HALL MICHAU	0	33153	0	0	0	0	0	0	0	45549	0	0	0	78702.2
13076400	FALLS IRRIGATI	0	26456	0	0	0	0	0	0	0	22250	0	0	-2385	46320.6
13076500	AMERICAN FALLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13076751	AMERICAN F LTF	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13077652	M OSBORN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13077755	CALL FARMS	0	0	334	0	0	0	0	0	0	0	0	0	0	334.0
13077775	R EVANS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13080000	MINIDKA N(27A)	139790	1567	0	5171	0	0	0	0	0	79796	61444	0	0 -14092	273675.9
13080500	MINIDKA S(27B)	0	31176	0	2593	0	0	0	0	0	142627	30953	0	0 -10154	197195.8
13081000	LAKE WALCOTT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13081400	MINIDOKA POWER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13081750	LHC PROP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084590	L LEBSACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084598	MID MISC	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084599	MILNER MISC	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084610	LAW-KER FAMRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084640	BURLEY GC	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084650	CITY OF BURLEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084655	SIMPLOT FTLZR	0	1442	0	0	0	0	0	0	0	0	0	0	-71	1371.7
13084690	AMALGA SUGAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084691	JACKSON 4K	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084710	R TILLEY PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084720	MILLERCOORS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13084725	K SANDMANN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085270	H SCHODDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085275	PR ENT #1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085300	PR ENT #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085350	SWID PUMPS	0	0	384	0	0	0	0	0	0	0	0	0	0	383.8
13085390	P HOBSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13085400	V HOBSON	0	0	111	0	0	0	0	0	0	0	0	0	0	110.7
13085500	A & B IRR DIST	0	66245	0	0	0	0	0	0	0	45448	0	0	-5470	106223.4
13085800	PA LATERL(28B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086000	MILNER IRRIG	0	30814	1074	0	0	0	0	0	0	43628	0	0	-3645	71870.4
13086510	A LATERL (28C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086512	J BRUNE (28D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086520	NS XCUT (28E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13086530	RES DIST #2	0	0	0	0	0	0	0	0	0	381965	0	0	0 -18705	363259.8
13087000	NRTHSDE TF(28A	302822	0	0	113168	0	0	0	0	8976	409619	0	0	0 -40870	793714.8
13087500	TWIN FALLS SOU	94322	0	0	0	0	0	0	0	143237	1131	0	0	0 -11689	227001.7
	TOTAL	536934	190853	1902	120932	0	0	0	0	1522131	172012	92398	0	0-107080	2160164.7

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

MAIN STEM HENRYS FRK

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13039000	HENRYS LAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13042000	ISLAND PARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13042600	ASHTON POWER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045655	G MAROTZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045675	N FK HIGHLANDS	0	0	18	0	0	0	0	0	0	0	0	0	0	18.5
13045705	F HOWELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045710	S BOLLAERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045721	F VANDERSLOOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045724	F VANDERSLOOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045727	F VANDERSLOOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045755	T HOLCOMB	0	0	26	0	0	0	0	0	0	0	0	0	0	25.8
13045780	R LEE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045805	Z EGBERT 1(9B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045807	R RITCHEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045810	N MLLER 1(10A)	0	0	0	0	0	61	0	0	0	0	0	0	0	61.3
13045811	N MLLER 2(10B)	0	0	0	0	0	54	0	0	0	0	0	0	0	53.6
13045813	Z EGBERT #2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045823	R D BAKER	0	0	17	0	0	0	0	0	0	0	0	0	0	16.6
13045829	D PHELPS (9C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045849	D SEELEY	0	0	74	0	0	0	0	0	0	0	0	0	0	73.8
13045850	TY NEDROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045860	Z EGBERT 3(9D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045880	Z EGBERT #4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13045930	Z EGBERT #5	0	0	0	0	0	83	0	0	0	0	0	0	0	83.3
13045940	G NEDROW	0	0	0	0	0	28	0	0	0	0	0	0	0	28.0
13045950	BAKER & NEDROW	0	0	0	0	0	182	0	0	0	0	0	0	0	182.2
13045960	M REYNOLDS #1	0	0	0	0	0	99	0	0	0	0	0	0	0	99.4
13046015	R & C BAUM	0	0	0	0	0	111	0	0	0	0	0	0	0	110.7
13046020	J MCCULLOCH	0	0	107	0	0	0	0	0	0	0	0	0	0	107.0
13046025	M REYNOLDS #2	0	0	0	0	0	24	0	0	0	0	0	0	0	24.4
13046070	A NEDROW #1	0	0	18	0	0	0	0	0	0	0	0	0	0	18.5
13046072	A NEDROW #2	0	0	18	0	0	0	0	0	0	0	0	0	0	18.5
13046075	J NEDROW	0	0	37	0	0	123	0	0	0	0	0	0	0	159.5
13046083	V & D KIRKHAM	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13046084	D NEDROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13046086	L FRANSEN(11B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13046090	L BRATT	0	0	4	0	0	0	0	0	0	0	0	0	0	3.7
13046095	L LOOSLI #1	0	0	0	0	0	2	0	0	0	0	0	0	0	2.4
13046310	DEWEY	0	0	0	0	0	235	0	0	0	0	0	0	0	235.1
13046315	J SEELEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

MAIN STEM HENRYS FRK

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR	RENTAL	TOTAL
13049550	LAST CHANCE	0	0	0	0	9278	1086	0	0	0	0	0	0	0	-454	9909.1
13049560	XCUT TO TETN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13049561	XCUT FAL R(16B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13049705	FARMERS FRIEND	0	0	0	0	0	3075	0	0	0	0	0	0	0	0	3074.6
13049710	TWIN GROVES	0	0	0	0	0	2869	0	0	0	0	0	0	0	0	2868.7
13049725	ST ANTH U(17A)	0	0	0	0	6926	2138	0	0	0	0	0	0	0	-339	8724.8
13049805	SALEM UNION CA	0	0	0	0	14721	4524	0	0	0	0	0	0	0	-721	18524.6
13050525	EGIN	0	0	0	0	6926	1368	0	0	0	0	0	0	0	-339	7954.5
13050530	ST AN U FD(17B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13050535	INDEPENDENT	0	0	0	0	22273	5388	0	0	0	0	0	0	0	-1091	26570.8
13050545	CONSOLIDATED F	0	0	0	0	10886	4778	0	0	0	0	0	0	0	-533	15131.1
	TOTAL	0	0	319	0	71009	26229	0	0	0	0	0	0	0	-3477	94080.3

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

FALLS RIVER

NUMBER	USER	JACKSN PALSDS PL USR	PL WWS HNRY L	ISL PK GRSY L	RIRIE AM WWS AM	FLS L WLCT RN	LTF PL PWR RENTAL	TOTAL
13046500	GRASSY LAKE	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047305	YELLOWSTONE	0 0 607	0 0	1141 0	0 0	0 0	0 0	1748.0
13047474	ATCHLEY P(9E)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047475	MARYSVILLE(9A)	0 0 274	0 0	15037 0	0 0	0 0	0 0	15311.0
13047515	F & L GRIFFEL	0 0 0	0 0	119 0	0 0	0 0	0 0	119.1
13047565	R BAUM	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047568	ORME PLACE	0 0 111	0 0	0 0	0 0	0 0	0 0	111.4
13047570	G/6 (9F)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047575	FRMRS OWN(11A)	0 0 27	0 0	0 0	0 0	0 0	0 0	26.6
13047605	W SCAFE	0 0 0	0 0	60 0	0 0	0 0	0 0	59.5
13047615	R STURM #2(9G)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047616	R STURM #1(9H)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047625	M GRIFFEL	0 0 65	0 0	60 0	0 0	0 0	0 0	124.1
13047635	L LOOSLI #2	0 0 75	0 0	154 0	0 0	0 0	0 0	229.1
13047636	C MALOUF	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13047681	CONANT CNL(12A	0 0 0	0 0	1408 0	0 0	0 0	0 0	1408.4
13047710	K NYBORG	0 0 0	0 0	30 0	0 0	0 0	0 0	29.8
13047900	BOOM CRK (13A)	0 0 0	0 0	512 0	0 0	0 0	0 0	511.9
13048050	ORME CANAL	0 0 0	0 0	60 0	0 0	0 0	0 0	59.5
13048060	SQUIR P 3(14A)	0 0 0	0 0	143 0	0 0	0 0	0 0	142.9
13048070	L ORME PUMP	0 0 0	0 0	60 0	0 0	0 0	0 0	59.5
13048080	HARSHBRGR(13B)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13048255	SQUIR P 1(14B)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13048265	D ZUNDELL(12B)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13048275	L LOOSLI 3(15A	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13048280	L LOOSLI 4(15B	0 0 0	0 0	195 0	0 0	0 0	0 0	195.3
13048290	D BUDGE	0 0 0	0 0	71 0	0 0	0 0	0 0	71.4
13048350	J HILL (12C)	0 0 0	0 0	12 0	0 0	0 0	0 0	11.9
13048430	D REYNOLDS	0 0 0	0 0	101 0	0 0	0 0	0 0	101.2
13048440	C LOOSLI	0 0 0	0 0	95 0	0 0	0 0	0 0	95.2
13048470	T POTTER	0 0 0	0 0	36 0	0 0	0 0	0 0	35.7
13048475	ENTERPRISE	5710 0 0	0 0	5778 0	0 0	9729 0	0 -756	20460.5
13048485	R D MILLER	0 0 0	0 0	71 0	0 0	0 0	0 0	71.4
13048551	C ATCHLEY (9I)	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13048556	W C DAVIS	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13048560	FALL R CNL(16A	0 0 0	0 0	4684 0	0 0	0 0	0 0	4684.3
13048705	CHESTER	0 0 0	0 0	691 0	0 0	0 0	0 0	691.1
13049008	MCBEE	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13049010	SILKEY	0 0 0	0 0	22 0	0 0	0 0	0 0	22.0
13049015	CURR	0 0 0	0 0	6 0	0 0	0 0	0 0	6.0
13049310	RLF PUMP	0 0 0	0 0	48 0	0 0	0 0	0 0	47.6
13049490	L LOOSLI #5	0 0 0	0 0	0 0	0 0	0 0	0 0	0.0
13049495	G BLANCHARD	0 0 0	0 0	27 0	0 0	0 0	0 0	26.8
	TOTAL	5710 0 1159	0 0	30620 0	0 0	9729 0	0 -756	46461.3

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

TETON RIVER

NUMBER	USER	JACKSN	PALSDS	PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE AM	WWS AM	FLS L	WLCT RN	LTF PL	PWR RENTAL	TOTAL
13053951	SOUTH PIPE(31A	0	0	0	0	0	716	0	0	0	0	0	0	0	715.5
13053971	J RICKS (31B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054031	BOELKE (31C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054042	CLEMNTSVL(31D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054045	HIBBERT FARMS	0	0	0	0	0	71	0	0	0	0	0	0	0	71.4
13054111	R & J BROWN	0	0	0	0	0	68	0	0	0	0	0	0	0	67.9
13054291	P L STOTT	0	0	0	0	0	7	0	0	0	0	0	0	0	7.1
13054420	B PARKINSON	0	0	0	0	0	63	0	0	0	0	0	0	0	62.5
13054515	CANYON CR CANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054575	LINDERMAN (31E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054577	G CRAPO	0	0	0	0	0	18	0	0	0	0	0	0	0	17.9
13054590	P STEVENS	0	0	0	0	0	524	0	0	0	0	0	0	0	524.4
13054705	V SCHWENDIMAN	0	0	0	0	0	257	0	0	0	0	0	0	0	257.2
13054772	R B RICKS	0	0	0	0	0	23	0	0	0	0	0	0	0	22.6
13054801	CANYON CR LAT	0	0	0	0	0	481	0	0	0	0	0	0	0	481.0
13054850	SIDDOWAY SHEEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054930	D PETERSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13054940	H BISCHOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055030	WILFORD	0	0	0	0	0	2141	0	0	0	0	0	0	0	2141.2
13055032	D ALLEN (18B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055033	B TUCKER (18C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055036	B PARKER (18D)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055037	SIDWY PMP(18E)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055039	MCKINNLEY(18F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055040	TETON IRR(18A)	0	0	0	0	0	887	0	0	0	0	0	0	0	887.0
13055042	SIDDOWAY (18G)	0	0	0	0	0	251	0	0	0	0	0	0	0	250.6
13055050	PIONEER	0	0	0	0	0	86	0	0	0	0	0	0	0	86.3
13055060	STEWART	0	0	0	0	0	279	0	0	0	0	0	0	0	279.2
13055193	N BIRCH	0	0	0	0	0	18	0	0	0	0	0	0	0	17.9
13055195	B LEAVITT	0	0	0	0	0	54	0	0	0	0	0	0	0	53.6
13055205	PINCOCK-BYGTON	0	0	0	0	0	173	0	0	0	0	0	0	0	172.6
13055206	B HOLLIST	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055209	TITI RCHG PIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055210	TETON ISLAND F	0	0	0	0	0	5497	0	0	0	0	0	0	0	5496.8
13055245	SALEM UNION B	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055263	J HARRIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055275	ROXANA	0	0	0	0	0	421	0	0	0	0	0	0	0	420.9
13055280	ISLAND WARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055295	SAUREY	0	0	0	0	0	65	0	0	0	0	0	0	0	65.5
13055309	CARTER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055310	BASS POND	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055311	PINCOCK-GARNER	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055313	GARDNER-BEDDES	0	0	0	0	0	71	0	0	0	0	0	0	0	71.4
13055314	BIGLER SLOUGH	0	0	0	0	0	35	0	0	0	0	0	0	0	34.5
13055315	WDMNSE-JSN(19A	0	0	0	0	0	677	0	0	0	0	0	0	0	677.4
13055319	G GODFREY	0	0	0	0	0	3	0	0	0	0	0	0	0	3.0
13055321	R R RICKS	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055323	CITY OF REXBUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055325	T BRUNSON(19B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055327	J S WRIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

13055328 CMTRY PUMP (35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13055334 REXBURG IRRIG	0	0	0	0	0	2548	0	0	0	0	0	0	0	0	2548.4
13055339 WALTER PND (34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL	0	0	0	0	0	15434	0	0	0	0	0	0	0	0	15433.9

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

WILLOW CREEK

NUMBER	USER	JACKSN PALSDS PL USR PL	WWS HNRY L	ISL PK GRSY L	RIRIE AM WWS AM FLS L	WLCT RN LTF PL PWR	RENTAL	TOTAL
13057938	LOERTSCHER	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13057950	RIRIE RESRVR	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058015	BOYD FOSTER	0 0 310	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	310.3
13058050	CENTURY HOLDIN	0 0 517	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	516.6
13058090	SCHWENDIMAN	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058104	CRAIG PUMP	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058105	LOVELL # 1	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058125	FERGUSON	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058145	LOVELL # 2	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058165	W REID #1	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058210	SARGENT & SUMM	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058220	MAX COOPER PUM	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058230	DURTSCHI PUMPS	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058250	W REED #2	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058265	FOSTER-SARGENT	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058266	WEEKS PUMP	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058270	SPERRY	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058280	BRINKERHOFF	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058290	ORVAL AVERY	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058310	ROY AVERY	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058330	STUCKI PUMPS	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058340	SCHWENDIMAN #2	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058350	O AVERY PUMP	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058370	ROY COOPER SAN	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058380	ROY COOPER WIL	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058508	D KEELER	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058510	PROGRESSIVE SA	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058512	BEAN	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058514	W & O COOPER	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058515	IDAHO FR SAND	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058519	DEMICK	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
13058530	PROGRESSIVE WI	0 0 0	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	0.0
	TOTAL	0 0 827	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0	827.0

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY USER AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

NUMBER	USER	JACKSN	PALSDS	MISCELLANEOUS PL USR	PL WWS	HNRY L	ISL PK	GRSY L	RIRIE	AM WWS	AM FLS L	WLCT RN	LTF PL	PWR	RENTAL	TOTAL
99999100	POCATELLO CITY	0	16440	0	0	0	0	0	0	0	0	0	0	0	-805	15635.3
99999150	IWRB	0	4251	0	0	0	0	0	0	0	0	0	0	0	-208	4042.9
99999200	FRE-MAD SNAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999250	WYOMING COMPCT	0	28057	0	0	0	0	0	0	0	0	0	0	0	-1374	26683.0
99999300	PALISADES USRS	0	0	4615	544	0	0	0	0	0	0	0	0	0	-971	4187.1
99999350	IDAHO POWER CO	0	0	0	0	0	0	0	0	0	42972	0	0	0	-2104	40867.3
99999400	BUREAU OF REC	426	449	0	0	0	0	0	0	0	213	0	0	146163	0	147250.1
99999410	ARTESIAN IRR	0	0	0	0	0	0	0	0	0	2712	0	0	0	-133	2578.9
99999500	SNAKE UNALC BK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999525	FREE-MAD TRANS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999550	FRE-MAD MISC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999600	F-M UNALLCATED	0	0	0	0	0	17131	0	0	0	0	0	0	0	-4379	12752.4
99999700	MITIGATION INC	0	850	0	2543	0	0	0	21221	0	0	0	0	0	-1205	23408.5
99999725	GROUND WTR EX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999950	MILNER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
99999990	OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	TOTAL	426	50047	4615	3086	0	17131	0	21221	0	45896	0	0	146163	-11179	277405.6

PART 2

2026 WATER DISTRICT 1 RESERVOIR STORAGE BY REACH AFTER PERCENT FILL AND EVAPORATION, WITH RENTAL POOL(ACRE-FEET)

RIVER REACH	JACKSON	PALISADES	PAL USR	PAL WWS	HENRYS LAKE	ISLAND PARK	GRASSY LAKE
IRWIN TO LORENZO	47731.6	19644.1	6769.5	46975.2	0.0	0.0	0.0
LORENZO TO BLACKFOOT	172848.4	123553.0	3694.6	79702.6	0.0	0.0	0.0
BLACKFOOT TO MILNER	536934.3	190853.1	1902.3	120932.0	0.0	0.0	0.0
MAIN STEM HENRYS FRK	0.0	0.0	319.2	0.0	71009.2	26229.3	0.0
FALLS RIVER	5709.8	0.0	1159.1	0.0	0.0	30619.5	0.0
TETON RIVER	0.0	0.0	0.0	0.0	0.0	15433.9	0.0
WILLOW CREEK	0.0	0.0	827.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	426.1	50046.5	4614.7	3086.4	0.0	17131.0	0.0
TOTAL	763650.1	384096.9	19286.3	250696.2	71009.2	89413.7	0.0

RIVER REACH	RIRIE	AM WWS	AM FALLS	LAKE WALCOTT	RNT LTF	PAL PWR	RENTAL POOL	TOTAL
IRWIN TO LORENZO	0.0	0.0	51137.9	0.0	0.0	0.0	-8103.9	164154.5
LORENZO TO BLACKFOOT	0.0	0.0	167517.0	0.0	0.0	0.0	-26613.6	520702.0
BLACKFOOT TO MILNER	0.0	152213.2	1172011.8	92397.5	0.0	0.0	-107079.5	2160164.7
MAIN STEM HENRYS FRK	0.0	0.0	0.0	0.0	0.0	0.0	-3477.4	94080.3
FALLS RIVER	0.0	0.0	9728.9	0.0	0.0	0.0	-756.0	46461.3
TETON RIVER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15433.9
WILLOW CREEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	827.0
MISCELLANEOUS	21221.3	0.0	45895.9	0.0	0.0	146162.9	-11179.3	277405.6

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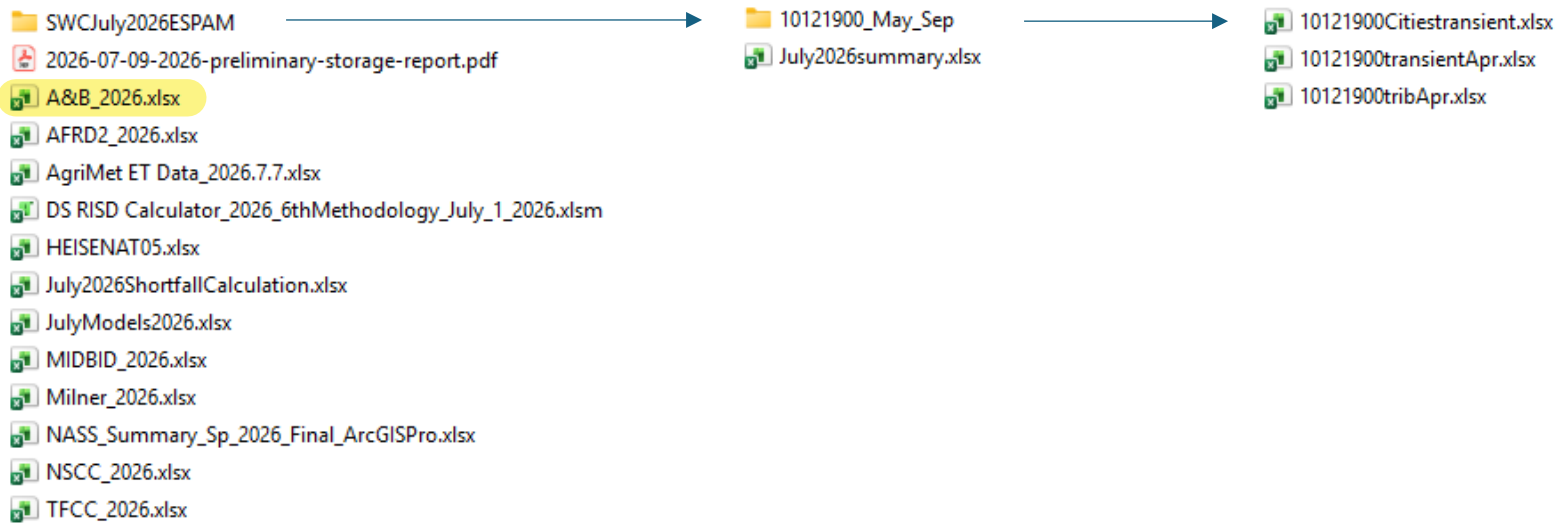

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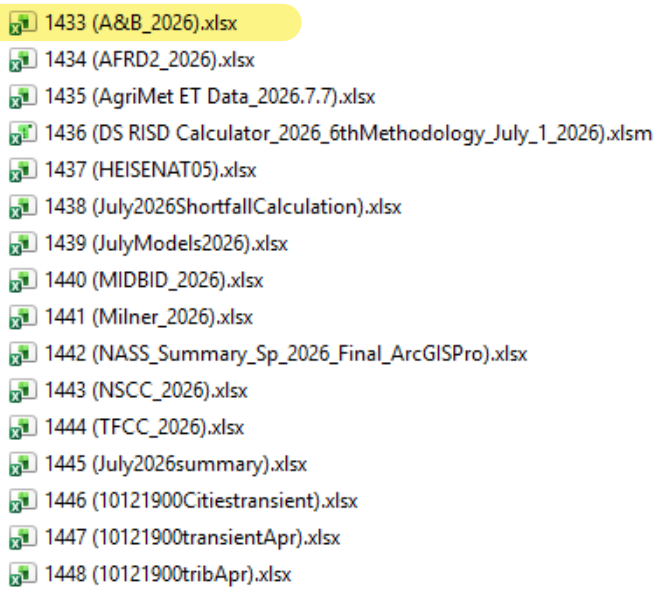

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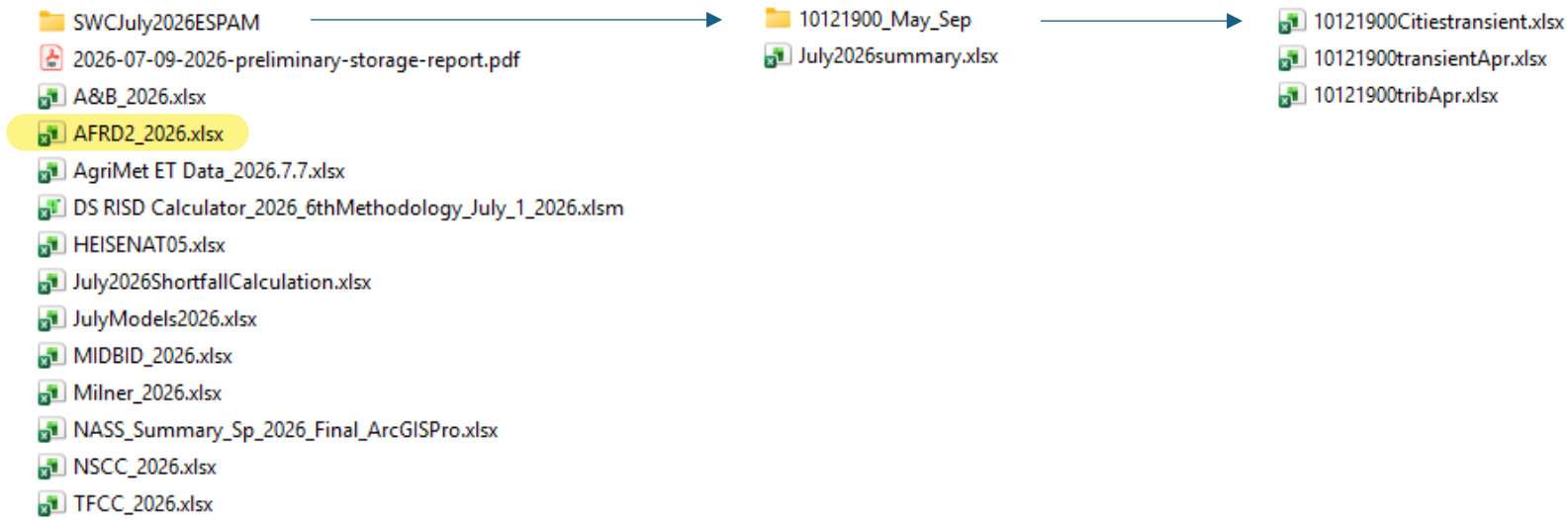

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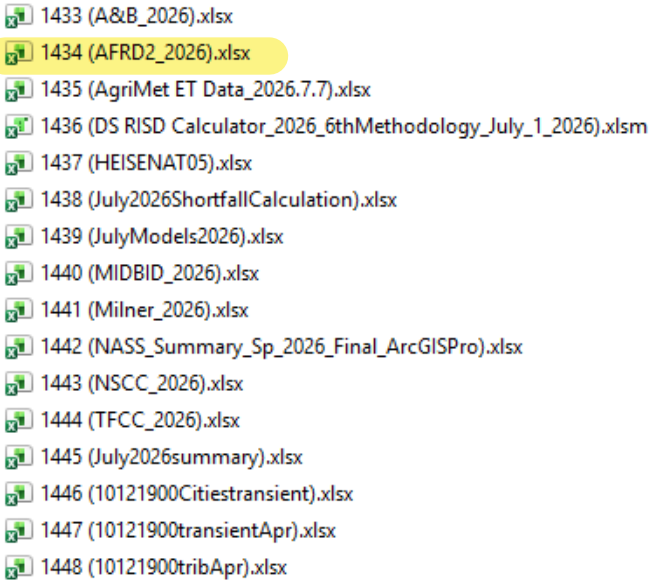

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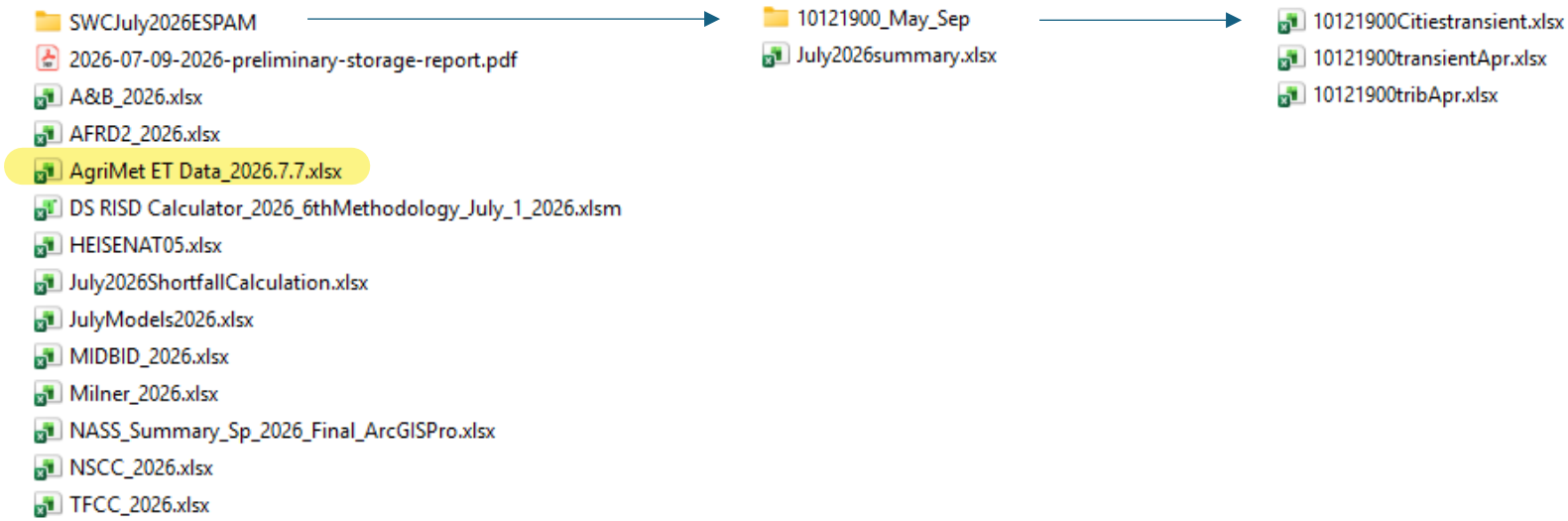

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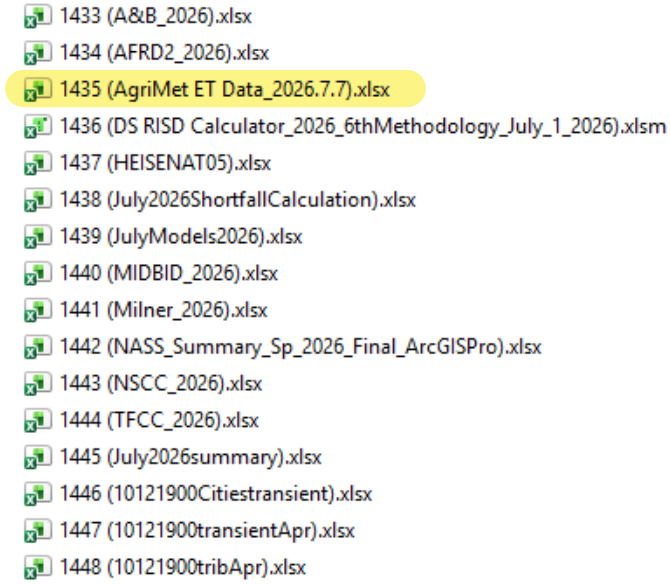

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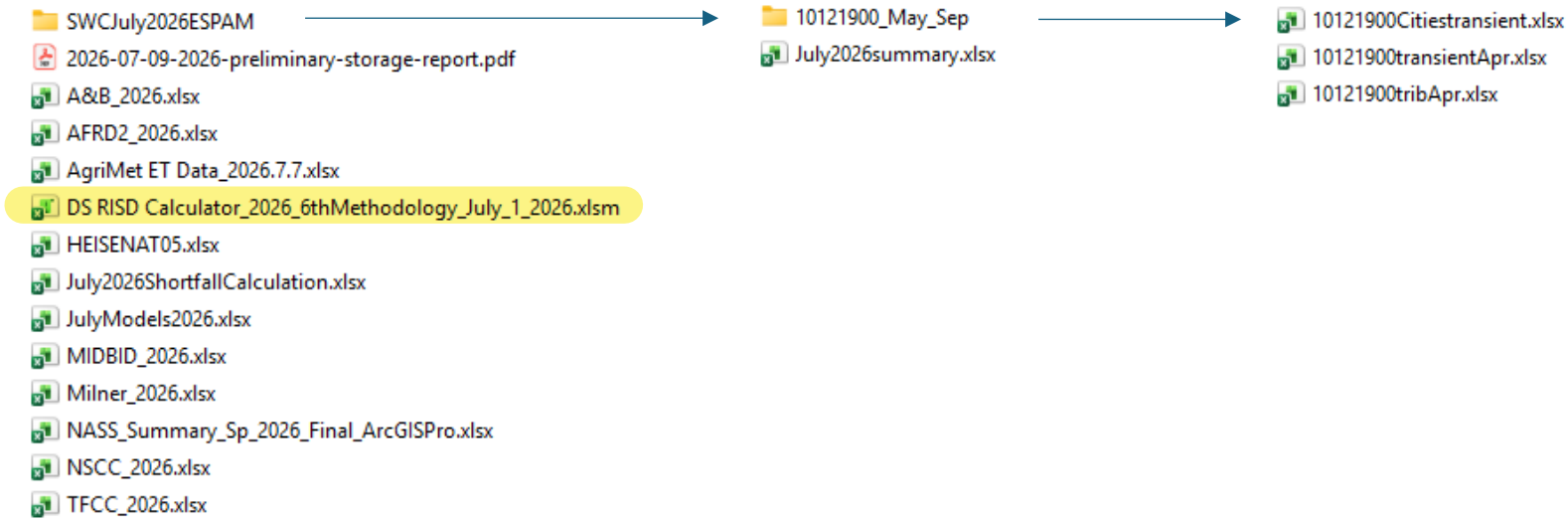

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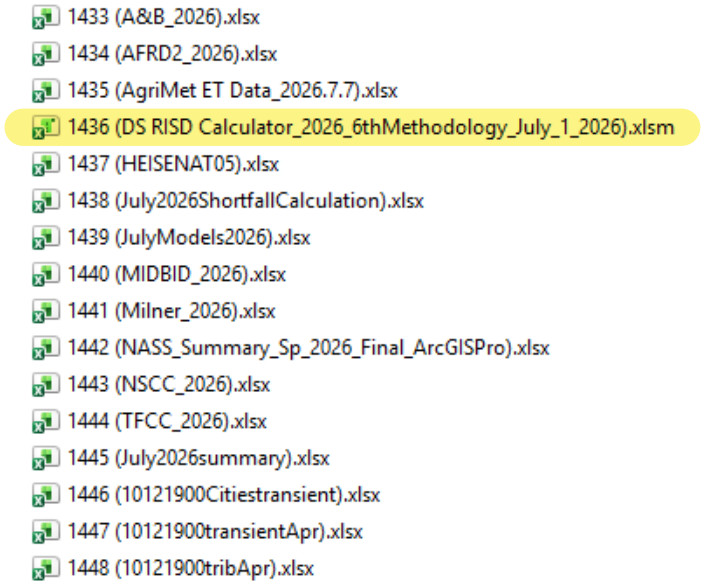

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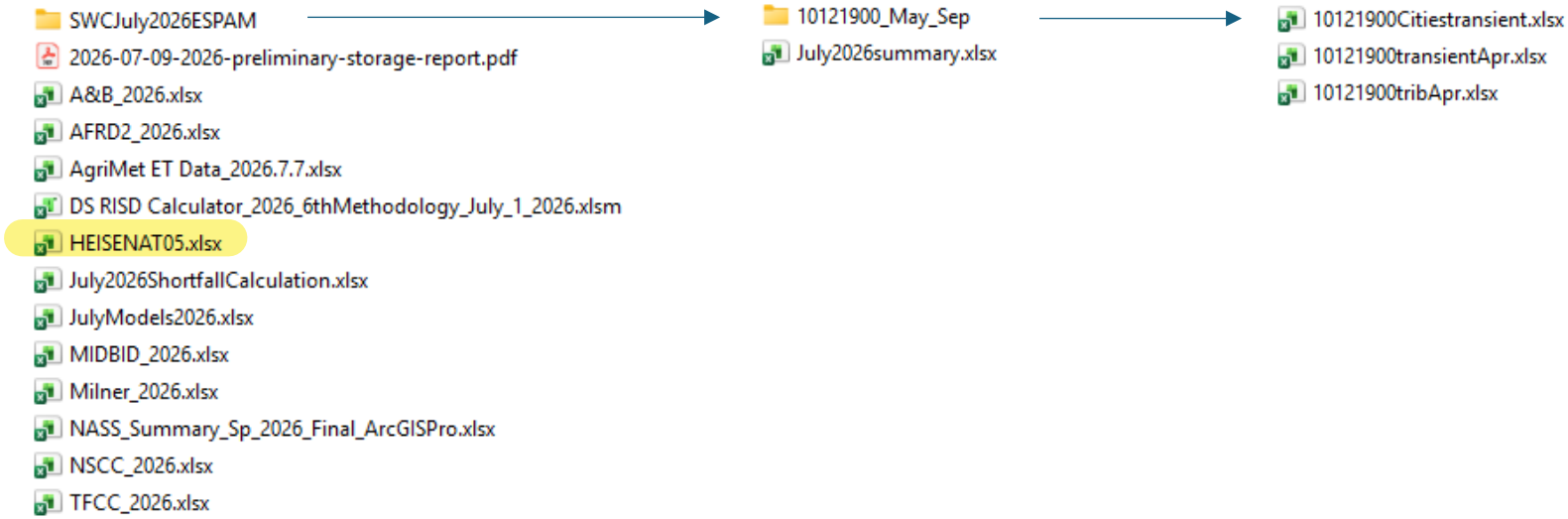

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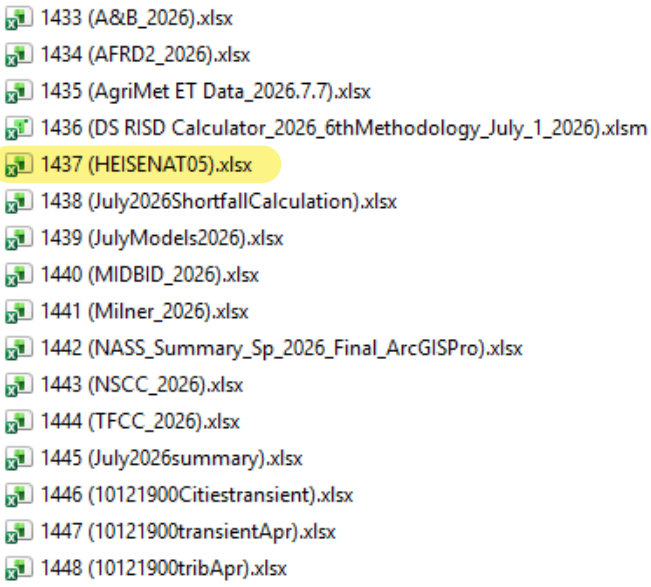

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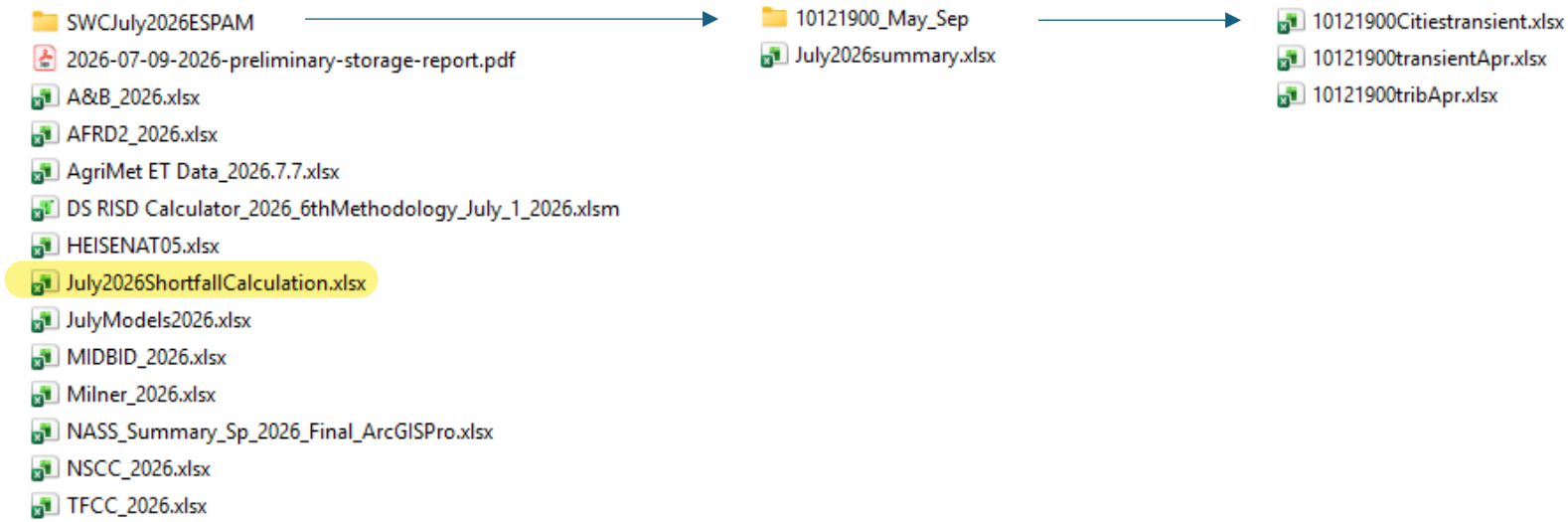

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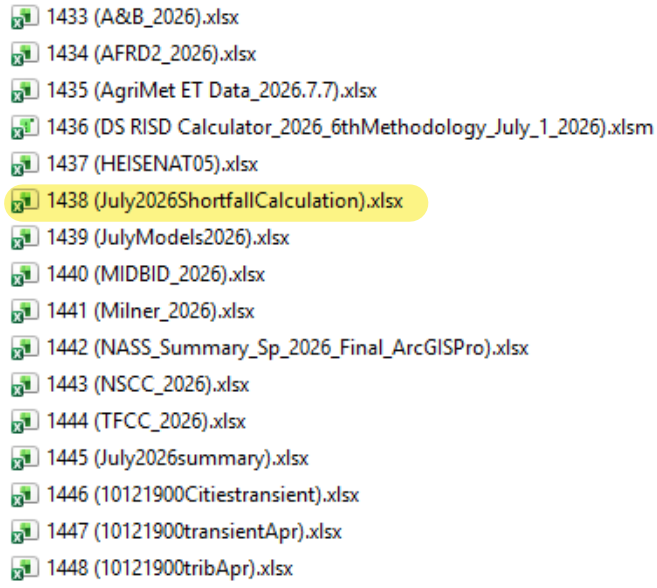

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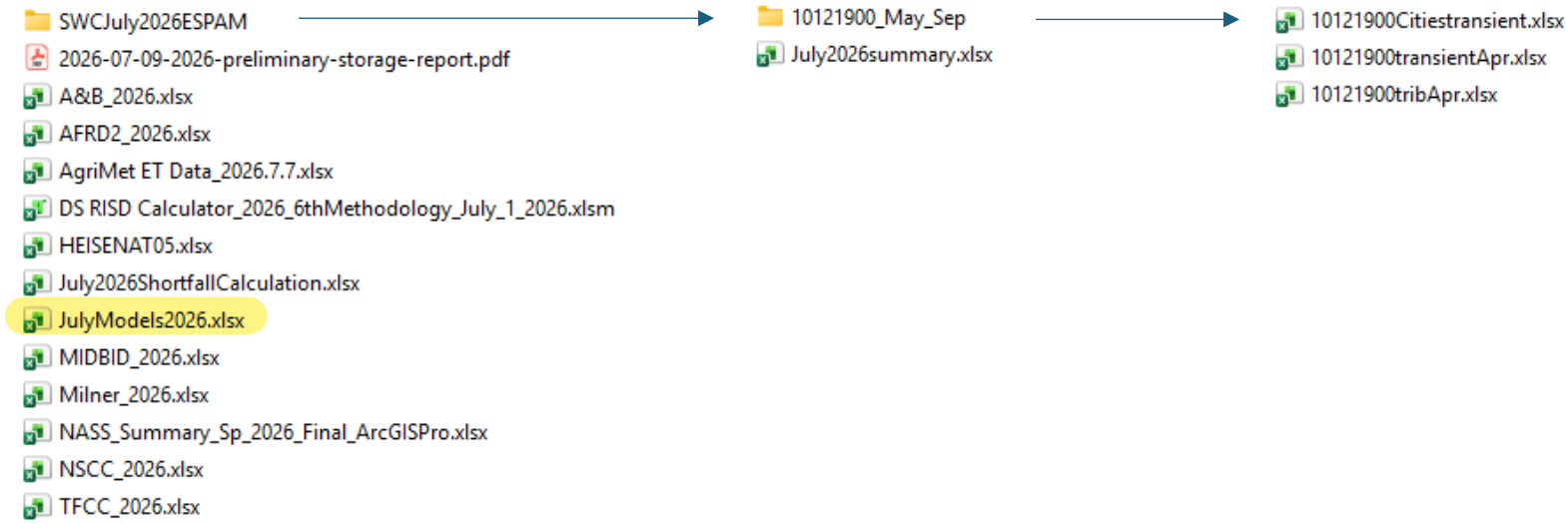

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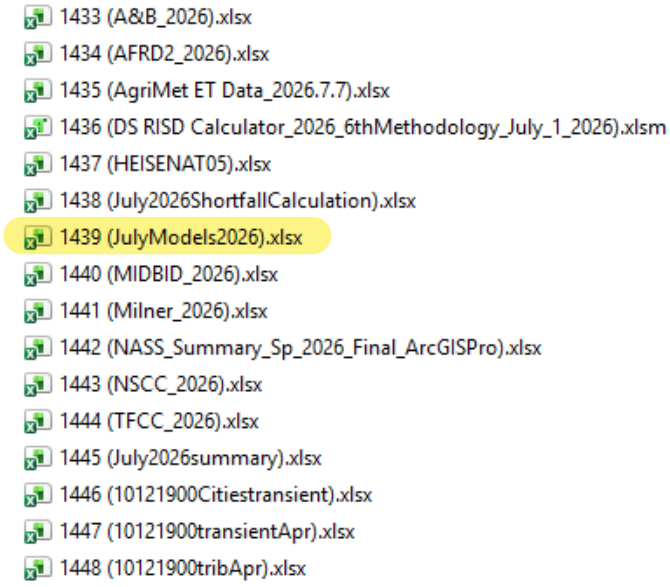

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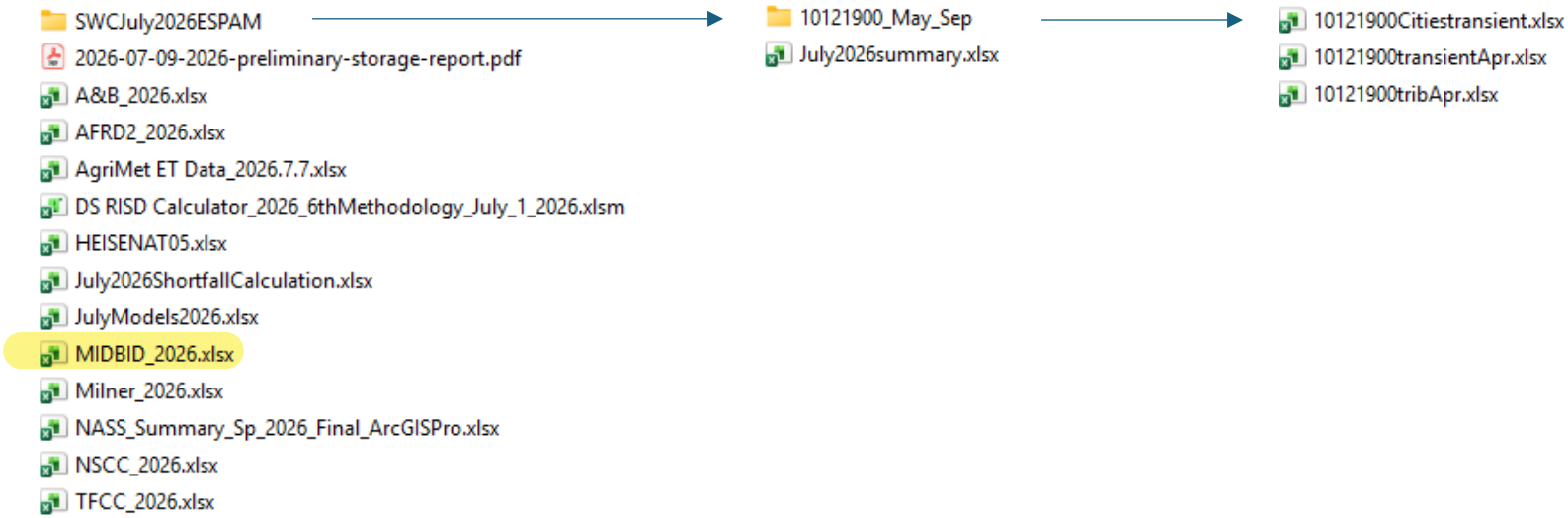

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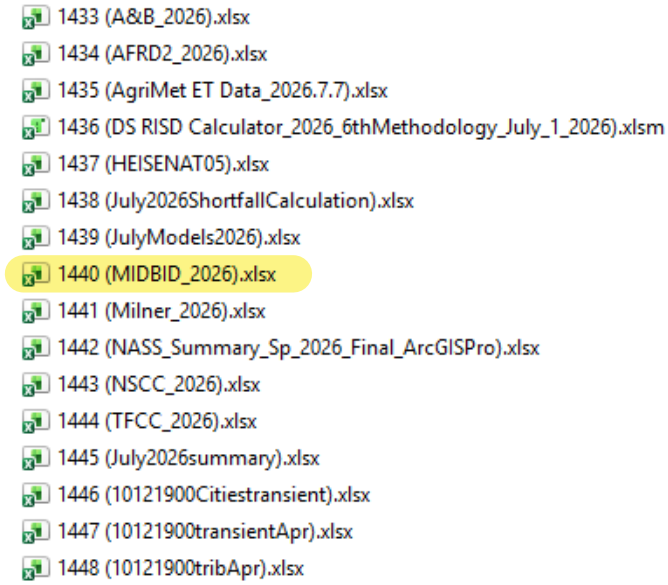

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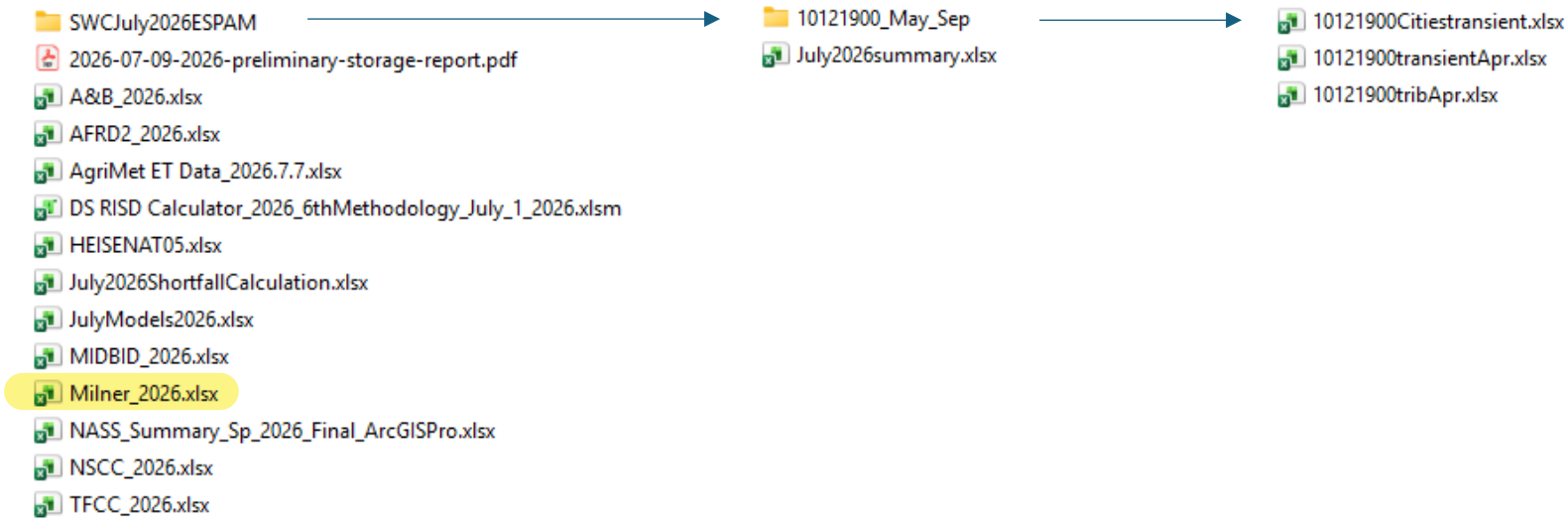

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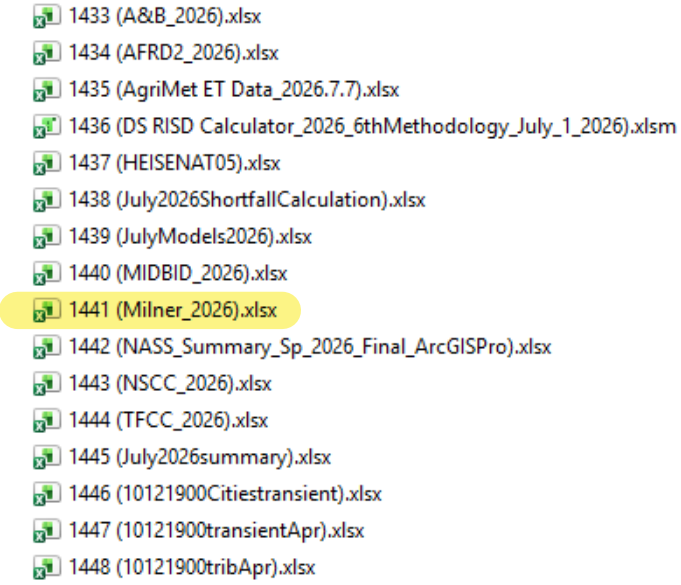

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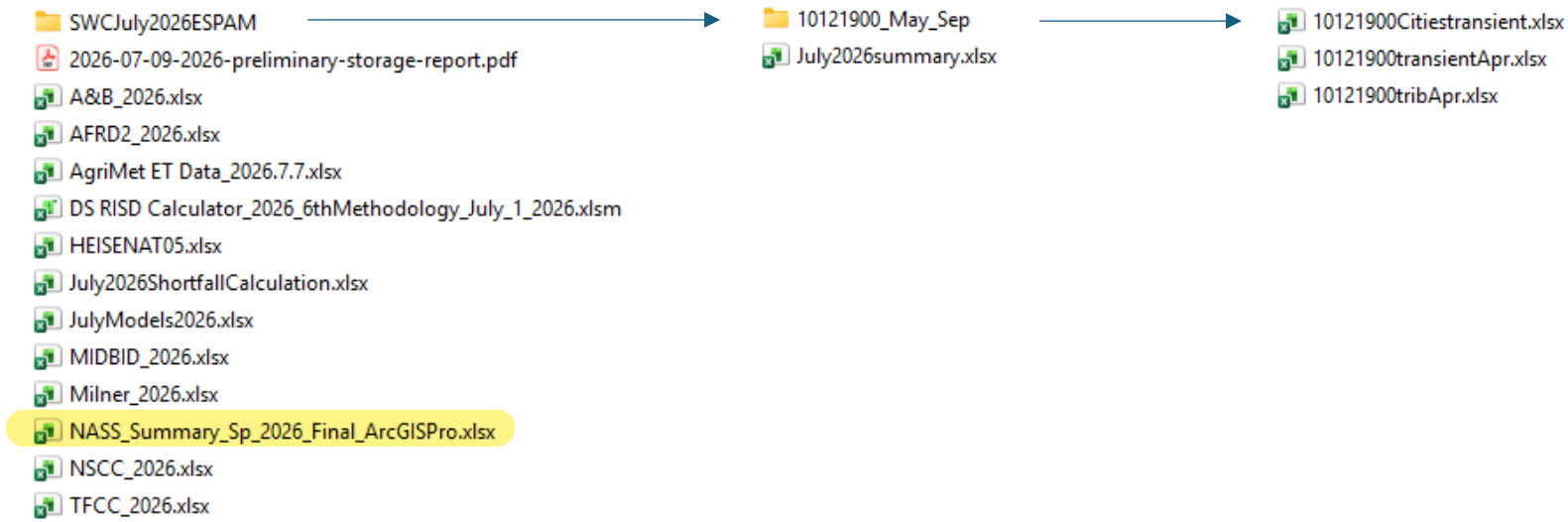

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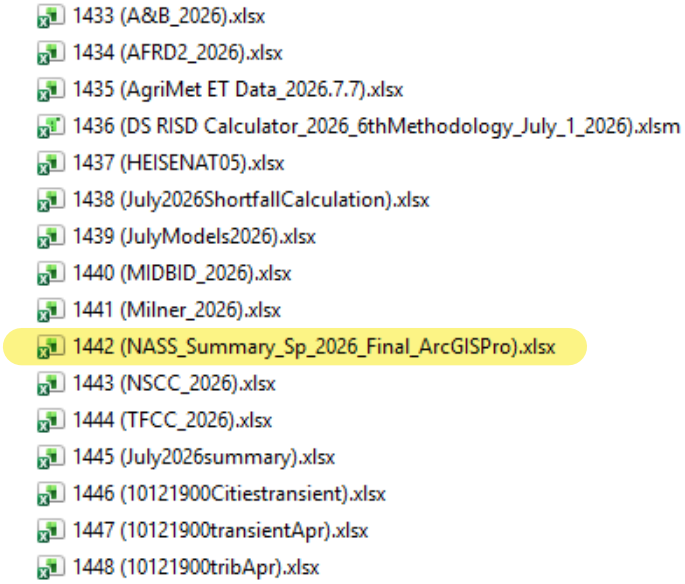

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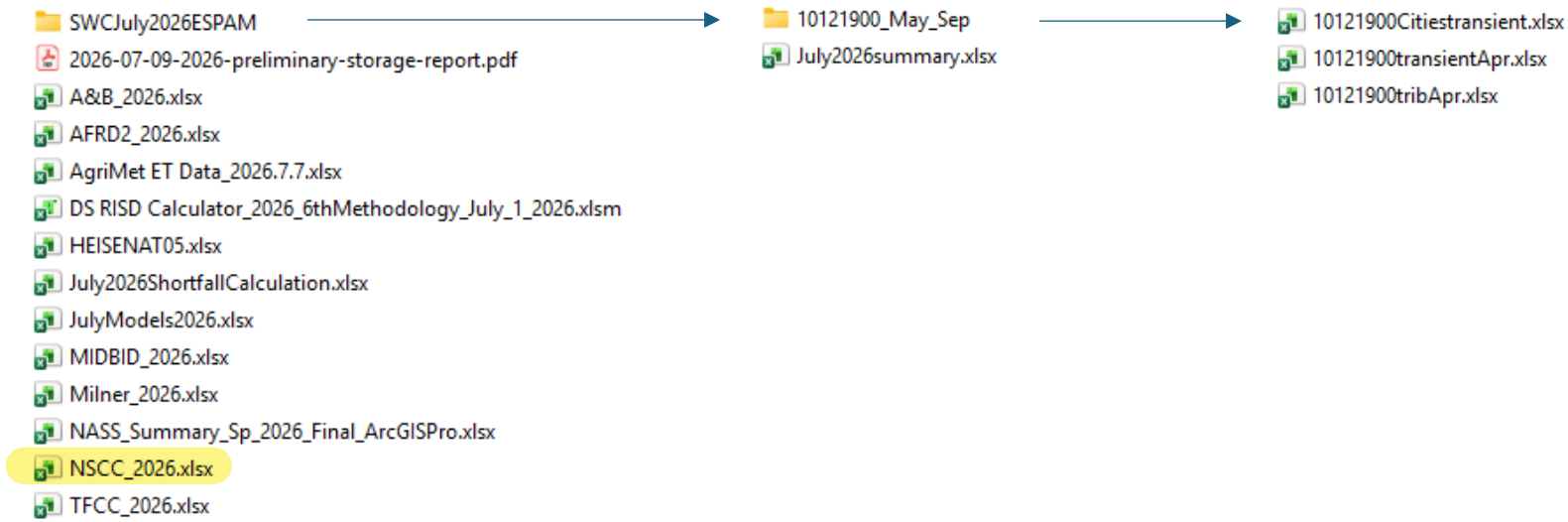

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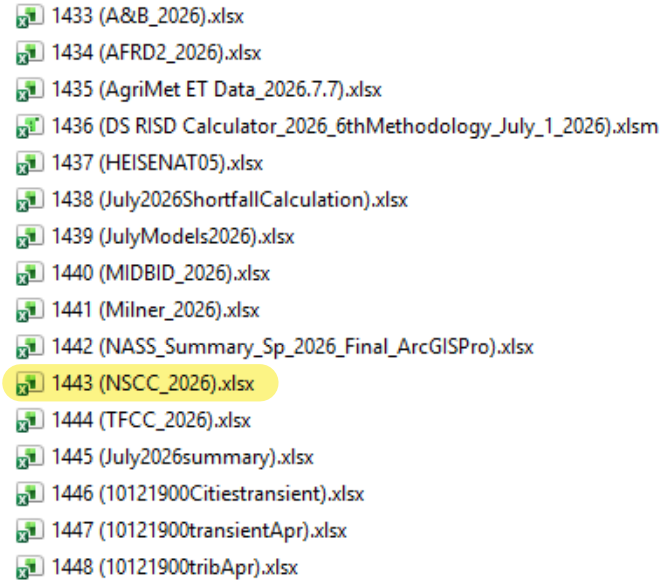

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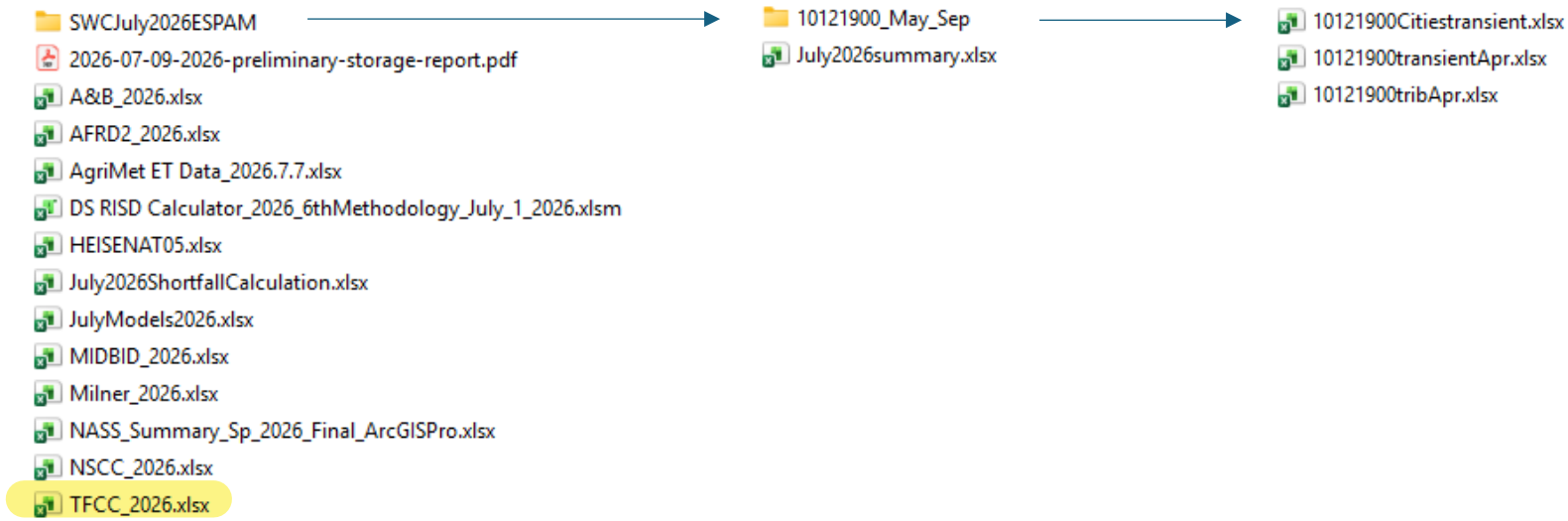

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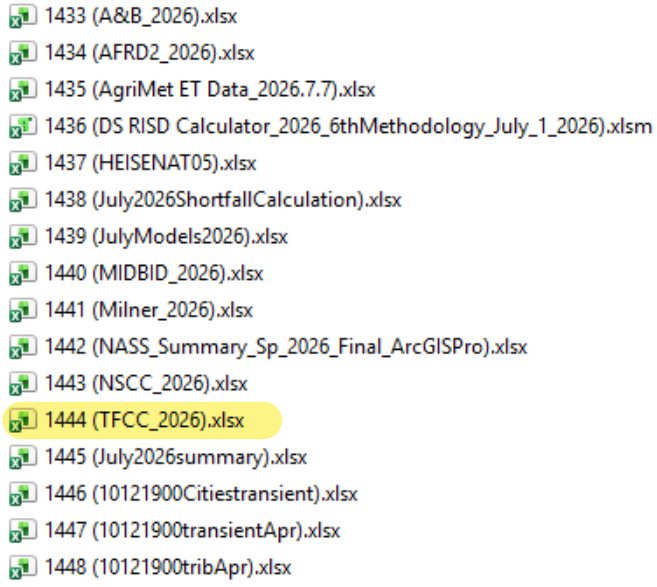

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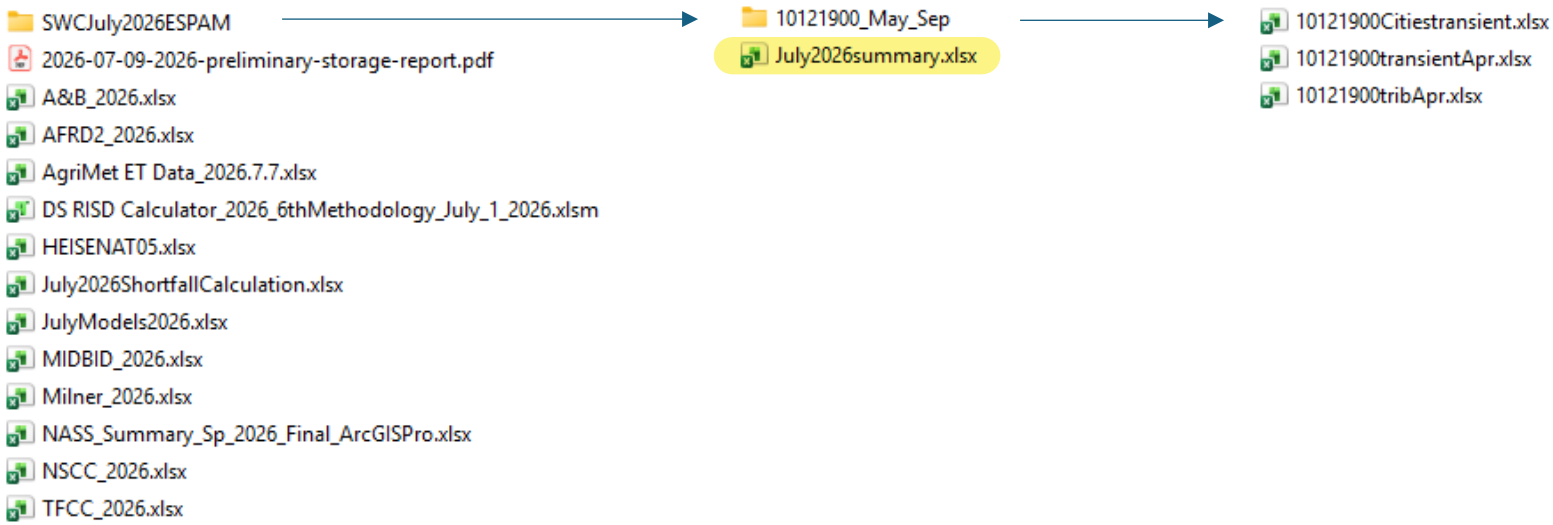
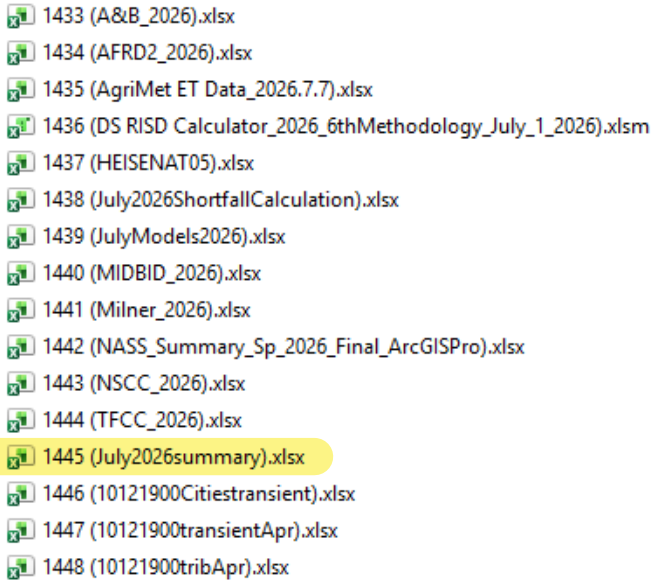


The above Excel data files cannot reasonably be converted into a Portable Document Format (PDF). Therefore, the Excel files cannot be electronically filed with the Court or directly integrated into this PDF agency record. *See* I.R.E.F.S. 5(o). For ease of reference and incorporation into the agency record, each of the above Excel files have been assigned an agency record bates number and produced and filed seperately in accordance with the notices of lodging filed in this case. The Agency Record Excel Files have been produced in connected with this agency record as follows:



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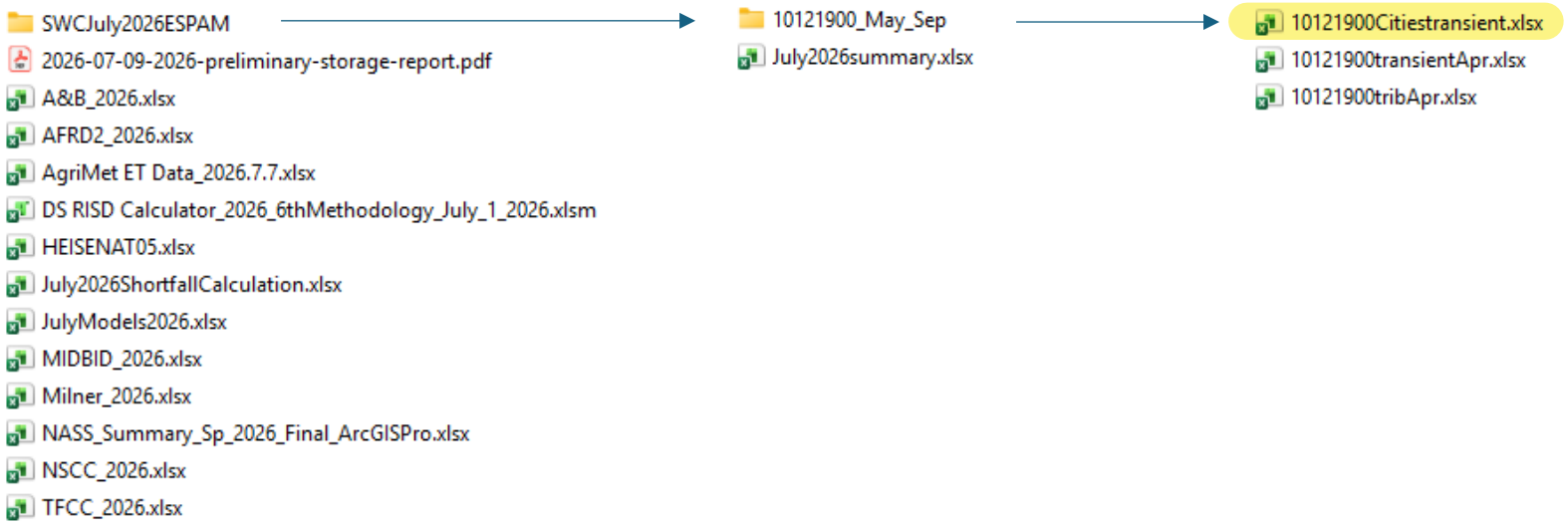

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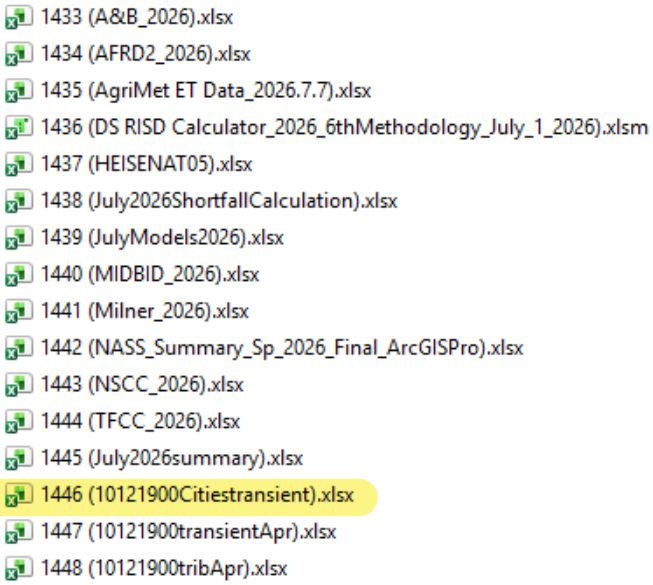

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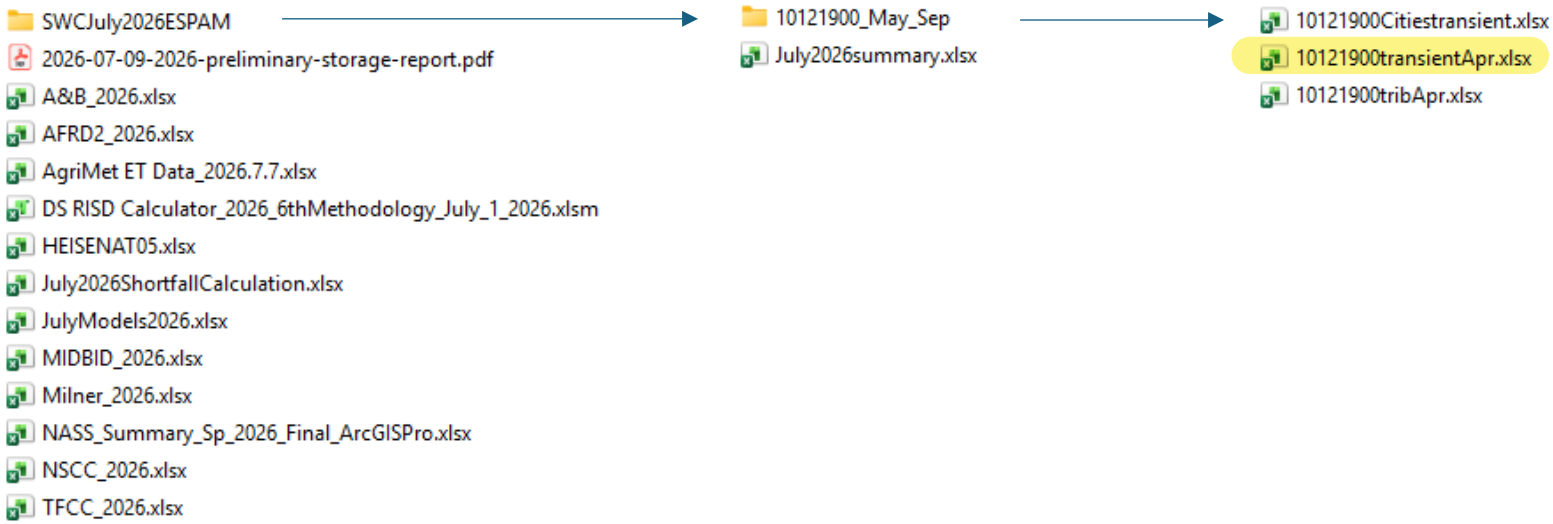

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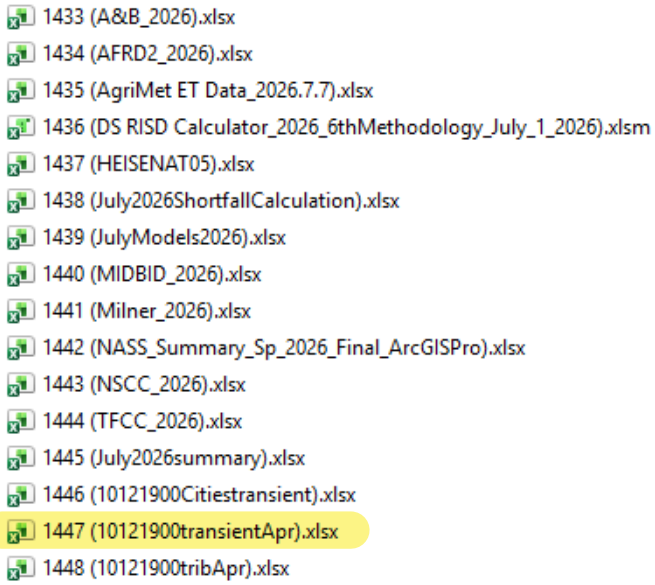

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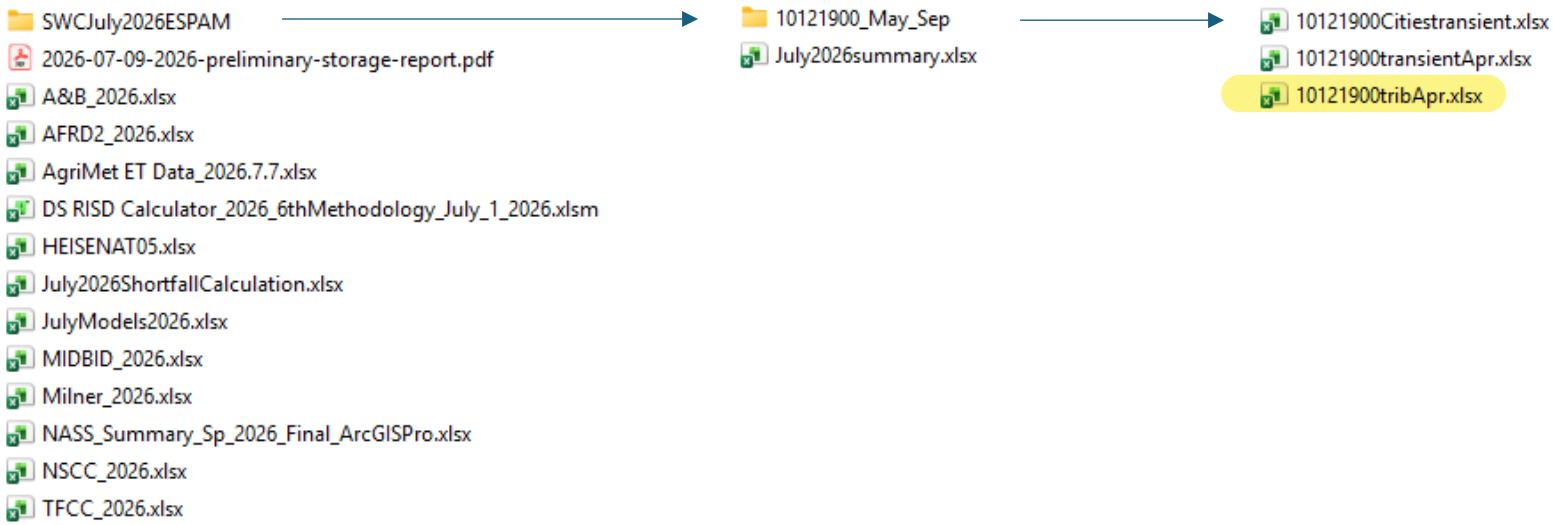

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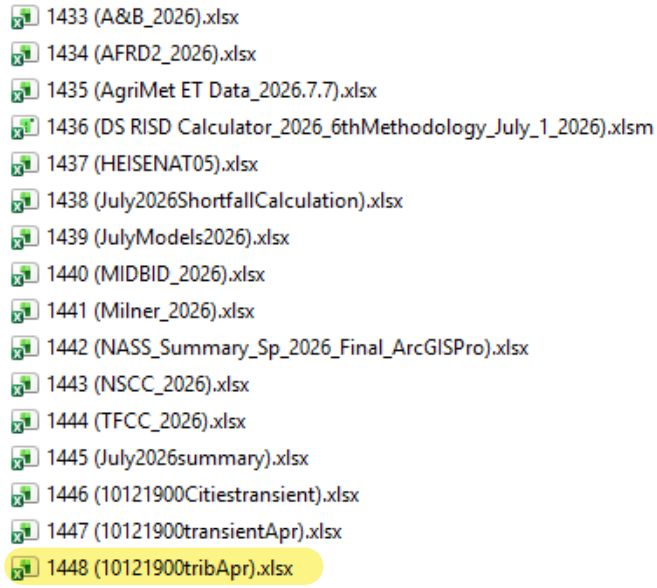

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DEPARTMENT OF
WATER RESOURCES

Reed W. Larsen (3427)
COOPER & LARSEN, CHARTERED
151 North 3rd Avenue, 2nd Floor
P.O. Box 4229
Pocatello, ID 83205-4229
Telephone: (208) 235-1145
Facsimile: (208) 235-1182
reed@cooper-larsen.com

Attorney for Jerry D. Bingham and Valerie H. Bingham

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY.	Docket No. CM-DC-2010-001 **JERRY D. BINGHAM'S AND VALERIE H. BINGHAM'S PETITION FOR RECONSIDERATION AND REQUEST FOR HEARING**

COME NOW Jerry D. Bingham and Valerie H. Bingham ("Binghams"), by and through counsel of record, and hereby petition the Idaho Department of Water Resources ("IDWR") for reconsideration pursuant to Idaho Code § 64-5246(4), and request a hearing in the above-referenced matter pursuant to Idaho Code § 42-1701A(3).

Binghams' water rights have been curtailed under the Director's Order Revising April 2026 Forecast Supply and Continuing May 16, 2026 Curtailment Order issued on July 21, 2026. As an aggrieved party, Binghams submit the following list of issues regarding the Director's order issued on July 21, 2026. These issues do not challenge the Director's authority to administer the Delivery

Call or mitigation requirements for In-Season Demand Shortfalls ("IDS"). Rather, they challenge whether the current methodology allocates mitigation responsibilities in a manner that is consistent, priority-based, and equitable. As currently implemented, the methodology imposes disproportionate obligations on certain groundwater users, including Binghams, while similarly situated water users, or more importantly users that are junior to Binghams, are treated differently or excluded from comparable responsibility. Binghams reserve the right to supplement this request as necessary.

1. Whether the Order Contains a Lack of Priority-Based Allocation Among Groundwater Users.

The Director's Order Revising April 2026 Forecast Supply and Continuing May 16, 2026 Curtailment Order focuses on junior groundwater users continuing to divert out of priority while not being administered on a time-priority basis for IDS responsibility. Specifically, the methodology appears to treat groundwater rights of different priorities as equivalent when assigning IDS responsibility. As a result, certain users, including Binghams, bear a disproportionate share of the mitigation burden while other junior-priority diversions continue to operate without a commensurate obligation.

Priority appears to be recognized for some administrative purposes but disregarded when allocating IDS responsibility. That raises a question of whether the methodology is consistent with the framework of the Idaho Constitution, Idaho statutes, and Conjunctive Management Rules (37.03.11 et seq.) requiring administration according to priority.

2. Whether Allocation of IDS Should be Assigned Only Among Groundwater Rights.

Under the Order Revising April 2026 Forecast Supply and Continuing May 16, 2026 Curtailment Order, the Director is apparently assigning IDS responsibility only among groundwater

users rather than among all water rights according to priority. By limiting responsibility to one category of users, the methodology creates a distinction between groundwater and surface-water rights that is not supported by the doctrine of prior appropriation. The July 21, 2026 Order focuses more on technical accounting than on the unequal treatment of similarly situated appropriators. By assigning IDS responsibility exclusively among groundwater users, the methodology departs from a priority-based administration framework and instead creates a categorical distinction between groundwater and surface-water rights not supported by governing law, including IDAPA 37.03.11, which provides for conjunctive management of surface and ground water resources; Idaho Code §§ 42-101 et. seq., which governs the use of any of the waters of the state to include both ground water and surface water; and Article XV of the Idaho Constitution.

3. Whether the Director's Order Uses Inconsistent Hydrologic Methodology.

The methodology of the Director's Order Revising April 2026 Forecast Supply and Continuing May 16, 2026 Curtailment Order applies different hydrologic assumptions to two mitigation mechanisms intended to address the same water-supply deficiency. This potentially results in disproportionate allocations of responsibility and an inequitable burden on affected water users.

Under the July 21, 2026 Order, storage obligations are allocated using long-term steady-state impacts, while conservation obligations are allocated under a different framework. The obvious question is whether there is a rational basis for valuing these mitigation actions under different hydrologic standards. The current methodology employed by the IDWR moves away from priority administration and instead relies on a series of administrative and methodological distinctions that produce unequal outcomes.

Binghams reserve the right to identify additional issues as necessary in this proceeding.

As previously stated above, Binghams petition IDWR for reconsideration of the Director's Order Revising April 2026 Forecast Supply and Continuing May 16, 2026 Curtailment Order pursuant to Idaho Code § 64-5246(4); and request a hearing pursuant to Idaho Code § 42-1701A(3). Binghams are aggrieved under Idaho Code § 42-1701A(3), as they have not been afforded an opportunity for a hearing on the Director's final order, and are entitled to an administrative hearing on the matter pursuant to Idaho law.

Respectfully submitted.

DATED this 3rd day of August, 2026.

COOPER & LARSEN, CHARTERED

By /s/ Reed W. Larsen
REED W. LARSEN
Attorney for Jerry D. Bingham and Valerie H. Bingham

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 3rd day of August, 2026, I served a true and correct copy of the above and foregoing document to the following person(s) as follows:

Mathew Weaver, Director Garrick Baxter IDAHO DEPT. OF WATER RESOURCES P.O. Box 83720 Boise, Idaho 83720-0098	[ ] [ ] [x]	U.S. Mail/Postage Prepaid Hand Delivery Email file@idwr.idaho.gov mathew.weaver@idwr.idaho.gov garrick.baxter@idwr.idaho.gov
Thomas J. Budge RACINE OLSON, PLLP P.O. Box 1391 Pocatello, Idaho 83204	[ ] [ ] [x]	U.S. Mail/Postage Prepaid Hand Delivery Email tj@racineolson.com
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER P.O. Box 63 Twin Falls. Idaho 83303-0063	[ ] [ ] [x]	U.S. Mail/Postage Prepaid Hand Delivery Email tthompson @parsonsbehle.com abitzenburg@parsonsbehle.com
Norman M. Semanko Garrett Kitamura PARSONS BEHLE & LATIMER 800 W. Main St. Suite 1300 Boise, Idaho 83702	[ ] [ ] [x]	U.S. Mail/Postage Prepaid Hand Delivery Email nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com
David W. Gehlert Natural Resources Section U.S. DOJ, Environment & Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202	[ ] [ ] [x]	U.S. Mail/Postage Prepaid Hand Delivery Email david.gehlert@usdoj.go
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234	[ ] [ ] [x]	U.S. Mail/Postage Prepaid Hand Delivery Email mhoward@usbr.gov

Sarah A Klahn	[ ]	U.S. Mail/Postage Prepaid
Maximilian C. Bricker	[ ]	Hand Delivery
Somach Simmons & Dunn	[x]	Email
1155 Canyon Blvd, Ste. 110		sklahn@somachlaw.com
Boulder, CO 80302		mbricker@somachlaw.com
Rich Diehl	[ ]	U.S. Mail/Postage Prepaid
City of Pocatello	[ ]	Hand Delivery
P.O. Box 4169	[x]	Email
Pocatello, ID 83205		rdiehl@pocatello.us
Candice McHugh	[ ]	U.S. Mail/Postage Prepaid
Chris Bromley	[ ]	Hand Delivery
MCHUGH BROMLEY, PLLC	[x]	Email
P.O. Box 107		cmchugh@mchughbromley.com
Boise, ID 83701		cbromley@mchughbromley.com
Robert E. Williams	[ ]	U.S. Mail/Postage Prepaid
WILLIAMS, MESERVY, & LOTHSPEICH, LLP	[ ]	Hand Delivery
P.O. Box 168	[x]	Email
Jerome, ID 83338		rewilliams@wmlattys.com
Robert L. Harris	[ ]	U.S. Mail/Postage Prepaid
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC	[ ]	Hand Delivery
P.O. Box 50130	[x]	Email
Idaho Falls, ID 83405		rharris@holdenlegal.com
Zachary H. Jones	[ ]	U.S. Mail/Postage Prepaid
City of Idaho Falls	[ ]	Hand Delivery
P.O. Box 50220	[x]	Email
Idaho Falls, ID 83405		zjones@idahofalls.gov
Skyler C. Johns	[ ]	U.S. Mail/Postage Prepaid
Nathan M. Olsen	[ ]	Hand Delivery
Steven L. Taggart	[x]	Email
OLSEN TAGGART PLLC		sjohns@olsentaggart.com
P.O. Box 3005		nolsen@olsentaggart.com
Idaho Falls, ID 83403		staggart@olsentaggart.com

Dylan Anderson	[ ]	U.S. Mail/Postage Prepaid
DYLAN ANDERSON LAW PLLC	[ ]	Hand Delivery
P.O. Box 35	[x]	Email
Rexburg, ID 83440		dylan@dylanandersonlaw.com

/s/ Reed W. Larsen

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Aug 12, 2026
DEPARTMENT OF
WATER RESOURCES

Thomas J. Budge (ISB# 7465)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
Phone: (208) 232-6101
tj@racineolson.com
Attorneys for IGWA

STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **IGWA'S RESPONSE TO JERRY D. BINGHAM'S AND VALERIE H. BINGHAM'S PETITION FOR RECONSIDERATION AND REQUEST FOR HEARING**

Idaho Ground Water Appropriators, Inc. ("IGWA"), through counsel and on behalf of its member ground water districts, submits this response in opposition to Jerry D. Bingham's and Valerie H. Bingham's Petition for Reconsideration and Request for Hearing ("Petition"), filed August 3, 2026, in this matter. As explained below, the Petition does not identify any error in the Order Revising April 2026 Forecast Supply and Continuing May 16, 2026 Curtailment Order issued July 21, 2026 ("July 2026 As-Applied Order") that warrants reconsideration.

The first issue for which the Binghams seek reconsideration—"whether the order contains a lack of priority-based allocation among groundwater users"—asks the Director to revisit the same proportionate-share theory A&B Irrigation District raised in response to the 2025 As-Applied Orders in this matter. *See A&B Proportionate Share Expert Report* at 4, Docket No. CM-DC-2010-001 (Nov. 7, 2025) ("ESPA methodology calculation of IDS is caused by decades of junior groundwater pumping, and the mitigation responsibility should consider priority. . . . IDWR should explain how the groundwater rights with a priority date senior to the time of over-appropriation are equally responsible for mitigating the IDS as groundwater rights junior to that time"). That case is now pending on appeal in Minidoka County District Court, Case No. CV34-26-462.

Reconsideration is not a vehicle for duplicative litigation of issues already presented in this contested case and now before the district court. *See Losser v. Bradstreet*, 145 Idaho 670, 674 (2008) ("This Court has emphasized the desirability of avoiding piecemeal litigation"). The Petition does not identify a distinct legal theory or materially different factual record that would justify

reopening that issue here. Therefore, the Department should decline to take up the issue again in the interest of orderly administration and judicial economy.

The Binghams' second issue—"whether allocation of IDS should be assigned only among groundwater rights"—misapprehends the scope of this proceeding. This matter involves the administration of groundwater rights under the Conjunctive Management Rules. It does not involve surface-to-surface water-right administration, which occurs within water districts under Idaho Code § 42-602. If the Binghams disagree with the way water districts are administering surface-water rights, they must challenge those actions in a separate proceeding, not through this conjunctive-management case. Because the Binghams' second issue falls outside the scope of this proceeding, reconsideration is improper.

The Binghams' third issue—"whether the Director's order uses inconsistent hydrologic methodology"—goes beyond the parameters of the July 2026 As-Applied Order. The Petition alleges that "storage obligations are allocated using long-term steady-state impacts, while conservation obligations are allocated under a different framework." Petition at 3. However, the July 2026 As-Applied Order does not allocate storage water or conservation obligations at all.

The Binghams appear to be conflating the July 2026 As-Applied Order with the mitigation plan approved in Docket No. CM-MP-2024-003 (the "2024 Plan"). Those are separate matters. The July 2026 As-Applied Order applies the Methodology Order to determine material injury under Conjunctive Management Rule 42. The 2024 Plan, by contrast, defines obligations of groundwater users participating in a mitigation plan approved under Conjunctive Management Rule 43. The July 2026 As-Applied Order and the 2024 Plan therefore address different questions under different rules. An alleged inconsistency between those separate administrative decisions is not an error in the July 2026 As-Applied Order and provides no basis for reconsideration.

To the extent the Petition challenges the Department's use of modeling at different steps in the Methodology Order, that issue also overlaps with A&B Irrigation District's challenge to the 2025 As-Applied Orders, which is on appeal. *See A&B Proportionate Share Expert Report* at 3 ("Whether the steady-state use of the ESPAM 2.2 in identifying A&B's proportionate share is consistent with the transient use of the model in identifying ground water rights subject to curtailment as outlined in the *Sixth Methodology Order*"). Accordingly, the Department should decline to take up the issue again in the interest of orderly administration and judicial economy.

For the foregoing reasons, the Department should deny the Petition.

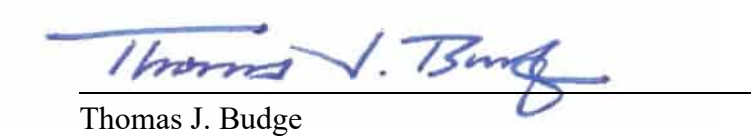
DATED this 12th day of August, 2026.

RACINE OLSON, PLLP

By: _____
Thomas J. Budge
Attorneys for IGWA

CERTIFICATE OF SERVICE

I hereby certify that on this 12th day of August 2026, I caused the foregoing document to be served on the persons below via email:



Thomas J. Budge

Gerald F. Schroeder Director Mat Weaver Garrick Baxter Sarah Tschohl Megan Carter IDAHO DEPT. OF WATER RESOURCES 322 E Front St. Boise, ID 83720-0098	gerald_23107@msn.com mat.weaver@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov meghan.carter@idwr.idaho.gov file@idwr.idaho.gov
Travis Thompson Abigail R. Bitzenburg PARSONS BEHLE & LATIMER P.O. Box 63 Twin Falls, ID 83303-0063	tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com jnielsen@parsonsbehle.com
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main St., Suite 1300 Boise, ID 83702	nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com kaulenbacher@parsonsbehle.com
Skyler C. Johns Nathan Olsen Steve Taggart OLSEN TAGGART PLLC 1449 E 17th St, Ste A P.O. Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com
Sarah A Klahn Maximilian C. Bricker SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, CO 80302	sklahn@somachlaw.com mbricker@somachlaw.com vfrancisco@somachlaw.com

Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
John K. Simpson IdaH20, PLLC P.O. Box 152 Boise, ID 83701	jks@idahowaters.com

COURTESY COPIES TO:

Corey Skinner IDWR – Southern Region 650 Addison Ave W., Ste. 500 Twin Falls, ID 83301-5858	corey.skinner@idwr.idaho.gov
Craig Chandler IDWR – Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402	craig.chandler@idwr.idaho.gov

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **ORDER DENYING JERRY D. AND VALERIE H. BINGHAMS' PETITION FOR RECONSIDERATION AND REQUEST FOR HEARING**

BACKGROUND

On July 19, 2023, the Department issued its *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Methodology Order*"). The *Methodology Order* established nine steps for determining material injury to members of the Surface Water Coalition ("SWC").

On July 21, 2026, the Director issued the *Order Revising April 2026 Forecast Supply and Continuing May 14, 2026 Curtailment Order (Methodology Steps 5-6)* ("*July As-Applied Order*"). The *July As-Applied Order* applied steps 5 and 6 of the *Methodology Order* and continued the effect of the *Final Order Curtailing Ground Water Rights Junior to October 11, 1900*, issued by the Director on May 14, 2026.

Step 5 of the *Methodology Order* addresses the final injury determination to reasonable carryover for members of the SWC. Step 5 states:

> If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall. If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report . . . the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC.

Methodology Order, at 43.

Step 6 of the *Methodology Order* states:

> Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC: (1) recalculate RISD [Reasonable In-Season Demand]; (2) issue a revised FS [Forecast Supply]; and (3) estimate the Time of Need date.

Id. (footnote omitted).

Following the application of steps 5 and 6 of the *Methodology Order*, the Director issued the *July As-Applied Order*, predicting a July in-season demand shortfall of 741,100 acre-feet. *July As-Applied Order*, at 11. Due to the predicted shortfall, the Director ordered:

> The May 14, 2026 *Curtailment Order*, as modified by the June 17, 2026 *Order Amending Curtailment List to Include Unmitigated Ground Water Rights*, remains in full force and effect. All ground water users holding water rights listed in Attachment A to the May 14, 2026 *Curtailment Order* and listed in the June 17, 2026 *Order Amending Curtailment List to Include Unmitigated Ground Water Rights* bearing priority dates junior to October 11, 1900, shall continue to be curtailed from diversion and use of ground water pursuant to those water rights unless they are mitigating in accordance with an approved mitigation plan or are notified by the Department that the order of curtailment has been modified or rescinded as to their water rights.

Id. at 11–12.

On August 3, 2026, Jerry and Valerie Bingham ("Binghams") filed with the Department, *Jerry D. Bingham's and Valerie H. Bingham's Petition for Reconsideration and Request for Hearing* ("*Petition and Request*"), challenging the *July As-Applied Order*. *Petition and Request*, at 1.

On August 12, 2026, Idaho Ground Water Appropriators, Inc. ("IGWA") filed *IGWA's Response to Jerry D. Bingham's and Valerie H. Bingham's Petition for Reconsideration and Request for Hearing* ("*Response*"). The *Response* argues the Binghams fail to identify any error in the *July As-Applied Order* that warrants reconsideration. *Response*, at 1.

ANALYSIS

The Binghams' filing is styled as both a petition for reconsideration and a request for hearing. While the analysis of the petition for reconsideration and the request for hearing is largely similar, the Director will consider the merits of each request separately.

1. The Binghams identify no basis to reconsider the *July As-Applied Order*.

Idaho Code § 67-5246(4) governs petitions for reconsideration of final orders. It states:

> Unless otherwise provided by statute or rule, any party may file a motion for reconsideration of any final order issued by the agency head within fourteen (14) days of the service date of that order. The agency head shall issue a written order disposing of the petition. The petition is deemed denied if the agency head does not dispose of it within twenty-one (21) days after the filing of the petition.

The *Petition and Request* filed by the Binghams states that they seek reconsideration of the *July As-Applied Order*. The *July As-Applied Order* applied Steps 5 and 6 of the *Methodology Order*. *July As-Applied Order*, at 1–2, 11. Step 5 addresses the final determination of injury to

reasonable carryover. *July As-Applied Order*, at 1; *see also Methodology Order*, at 43. Step 6 requires the Director to recalculate the reasonable in-season demand and revise the forecast supply. *July As-Applied Order*, at 2; *see also Methodology Order*, at 43. The *July As-Applied Order* made the determinations required by those steps. *July As-Applied Order*, at 11.

The fundamental problem with the Binghams' petition for reconsideration is that the Binghams do not identify a finding of fact, conclusion of law, calculation, or directive in the *July As-Applied Order* that they contend is erroneous and should be reconsidered. They do not challenge the Director's Step 5 determination, the recalculated reasonable in-season demand, the revised forecast supply, the resulting in-season demand shortfall, or the factual information and calculations underlying those determinations. Instead, the three issues identified in the *Petition and Request* concern the structure of the underlying methodology and the allocation of mitigation responsibilities—matters not determined by the *July As-Applied Order*. *See Petition and Request*, at 2–3.

The Binghams' own description of their challenge confirms this conclusion. They state that their "issues do not challenge the Director's authority to administer the Delivery Call or mitigation requirements for In-Season Demand Shortfalls," but instead "challenge whether the current methodology allocates mitigation responsibilities in a manner that is consistent, priority-based, and equitable." *Petition and Request*, at 1–2. Thus, although the Binghams say they seek reconsideration of the *July As-Applied Order*, the substance of their challenge is directed to the *Methodology Order* and framework for allocating mitigation responsibilities under the SWC Delivery Call.

A petition for reconsideration of the *July As-Applied Order* must identify a basis for the Director to reconsider a determination made in the *July As-Applied Order*. The Binghams identify none. Their three stated issues instead challenge the *Methodology Order* and the framework for allocating mitigation responsibilities under the SWC Delivery Call—matters that were not established or decided in the *July As-Applied Order*. The methodology underlying the SWC Delivery Call has been the subject of extensive litigation. The Idaho Supreme Court has affirmed that the Director may employ a baseline methodology as a starting point for administration of the interconnected surface and ground water rights at issue in the SWC Delivery Call. *In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irrigation Dist.*, 155 Idaho 640, 650, 315 P.3d 828, 838 (2013). In 2023, following an administrative hearing concerning the revisions to the methodology, the Director issued the current *Methodology Order* as a final order of the Department. Certain aspects of the *Methodology Order* were challenged on judicial review, and Judge Wildman affirmed the Department. *City of Idaho Falls v. Idaho Dep't of Water Res.*, No. CV01-23-13238 (Ada Cnty. Dist. Ct. Idaho 2024); *Memorandum Decision and Order*, at 27, *Idaho Ground Water Appropriators Inc. v. Idaho Dep't of Water Res.*, No. CV01-23-13173 (Ada Cnty. Dist. Ct. Idaho May 31, 2024). [1] The Binghams cannot use a petition for reconsideration of the *July As-Applied Order* to collaterally challenge determinations made in the *Methodology Order*. Because the

[1] In No. CV01-23-13173, one challenge remains pending because the matter was stayed during proceedings on reconsideration.

Binghams identify no error in the findings, calculations, conclusions, or directives contained in the *July As-Applied Order*, the *Petition for Reconsideration* should be denied.

2. The Binghams' request for hearing does not state grounds for contesting the *July As-Applied Order*.

Idaho Code § 42-1701A(3) governs petitions requesting a hearing before the Department. It states, in pertinent part:

> [A]ny person aggrieved by any action of the director, including any decision, determination, order or other action, including action upon any application for a permit, license, certificate, approval, registration, or similar form of permission required by law to be issued by the director, who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing.

Idaho Code § 42-1701A(3) therefore entitles a person aggrieved by an action of the Director, who has not previously been afforded an opportunity for a hearing on the matter, a hearing to contest the action. The petition must state the grounds for contesting the Director's action.

The Binghams request a hearing on the *July As-Applied Order*. As discussed above, however, the *Petition and Request* does not identify a determination made in the *July As-Applied Order* that the Binghams seek to contest. They do not challenge the Director's Step 5 determination, recalculation of reasonable in-season demand, revised forecast supply, resulting in-season demand shortfall, or the factual information and calculations underlying those determinations. Instead, the Binghams expressly state that their issues "challenge whether the current methodology allocates mitigation responsibilities in a manner that is consistent, priority-based, and equitable." *Petition and Request*, at 2. The grounds stated in the *Petition and Request* thus concern the validity and structure of the *Methodology Order* and the framework for allocating mitigation responsibilities under the SWC Delivery Call, not the determinations made in the *July As-Applied Order*. The distinction is significant under Idaho Code § 42-1701A(3). To the extent the Binghams seek a hearing to contest the determinations made in the *July As-Applied Order*, their petition does not state grounds for contesting those determinations. To the extent they instead seek a hearing to challenge the *Methodology Order*, Idaho Code § 42-1701A(3) does not permit the Binghams to obtain a hearing on the *Methodology Order* merely by directing their request at a later as-applied order. The *Methodology Order* was issued in 2023, following an administrative hearing pursuant to Idaho Code § 42-1701A(3), and has already been subject to judicial review. Because the Binghams state no grounds for contesting the determinations made in the *July As-Applied Order*, the request for hearing should be denied.

ORDER

IT IS HEREBY ORDERED that *Jerry D. Bingham's and Valerie H. Bingham's Petition for Reconsideration and Request for Hearing* is DENIED.

Dated this 24th day of August 2026.



MATHEW WEAVER
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 24th day of August 2026, the above and foregoing was served by the method indicated below, and addressed to the following:

Reed W. Larsen COOPER & LARSEN, CHARTERED PO Box 4229 Pocatello, ID 83205-4229 reed@cooper-larsen.com	☒ U.S. Mail, postage prepaid ☒ Email
John K. Simpson IdaH20, PLLC PO Box 152 Boise, ID 83701-0152 jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson Abby R. Bitzenburg PARSONS BEHLE & LATIMER PO Box 63 Twin Falls, ID 83303-0063 tthompson@parsonsbehle.com abitzenburg@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Norman M. Semanko Garrett M. Kitamura PARSONS BEHLE & LATIMER 800 W. Main Street, Suite 1300 Boise, Idaho 83702 nsemanko@parsonsbehle.com gkitamura@parsonsbehle.com	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge RACINE OLSON PO Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section U.S. DOJ, Environment and Natural Resources Div. 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Maximilian C. Bricker Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com mbricker@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

Rich Diehl City of Pocatello PO Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC PO Box 107 Boise, ID 83701 cmchugh@mchughbromley.com cbromley@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP PO Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC PO Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Zachary H. Jones City Attorney, City of Idaho Falls PO Box 50220 Idaho Falls, ID 83405 zjones@idahofalls.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC PO Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Dylan Anderson DYLAN ANDERSON LAW PLLC PO Box 35 Rexburg, Idaho 83440 dylan@dylanandersonlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

COURTESY COPIES VIA EMAIL TO:

Craig Chandler
IDWR—Eastern Region
craig.chandler@idwr.idaho.gov

Corey Skinner
IDWR—Southern Region
corey.skinner@idwr.idaho.gov

William A. Parsons
PARSONS, LOVELAND, SHIRLEY & MILLER, LLP
wparsons@pmt.org
wparsons@magicvalley.law

Jerry R. Rigby
Michelle Mortimer
RIGBY, ANDRUS & RIGBY LAW, PLLC
jrigby@rex-law.com
mmortimer@rex-law.com

Andrew J. Waldera
SAWTOOTH LAW OFFICES, PLLC
andy@sawtoothlaw.com

Sarah Tschohl, Paralegal

EXPLANATORY INFORMATION TO ACCOMPANY AN ORDER DENYING PETITION FOR RECONSIDERATION OF A FINAL ORDER

(To be used in connection with Final Orders, reconsideration of which is now denied, issued by the Director or the Board)

The accompanying document is an **Order Denying Petition for Reconsideration** of the "**Final Order**" issued previously in this proceeding by the agency head of the Idaho Department of Water Resources ("Department") or the Idaho Water Resource Board ("Board") pursuant to Idaho Code § 67-5246.

The following statements describe the procedures and time limits for seeking appeal of the final order previously issued in this proceeding:

APPEAL TO DISTRICT COURT

(*See* Idaho Code §§ 67-5270 through 67-5279)

Within twenty-eight (28) days after the service date of the presiding officer's denial of a petition for reconsideration, any party may file a petition for judicial review of the final order with a district court. Filing an appeal to a district court does not in itself stay the effectiveness or enforcement of the final order appealed.

FILING AND SERVICE

(*See* I.R.C.P. 84)

Any petition for judicial review filed in connection with an appeal of the final order shall be served on the agency and all parties to the administrative proceeding in accordance with Idaho Rule of Civil Procedure 84.

Please see electronic file folder labeled “1468”
for Materials Department Witnesses May Rely Upon at Hearing
(File Folder), May 5, 2023.

Please see electronic file folder labeled “1469”
for Officially Noticed 2023 Milner and Minidoka Shapefiles
(File Folder), June 6, 2023.

John K. Simpson, ISB #4242
Travis L. Thompson, ISB #6168
MARTEN LAW LLP
163 Second Ave. W.
P.O. Box 63
Twin Falls, Idaho 83303-0063
Telephone: (208) 733-0700
Email: jsimpson@martenlaw.com
tthompson@martenlaw.com

Attorneys for A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, & Twin Falls Canal Company

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **DIRECT TESTIMONY OF JAY BARLOGI**

Q. CAN YOU PLEASE STATE YOUR FULL NAME AND ADDRESS?

A. My name is Jay Barlogi and I live at 212 6th Street in Filer, Idaho.

Q. CAN YOU DESCRIBE YOUR BACKGROUND?

A. I grew up near Curry and I graduated from Filer High School. I started working for Twin Falls Canal Company in 1993. I worked as a Ditch Rider for three years, then as the East End

Watermaster for about 14 years, then as the Field Supervisor before being appointed as the General Manager in June 2021.

Q. DID YOU SUBMIT PRE-FILED TESTIMONY IN THIS PROCEEDING BACK IN 2005?

A. Yes.

Q. DID THAT TESTIMONY FAIRLY DESCRIBE THE VARIOUS WATER DELIVERY RELATED ROLES IN THE COMPANY?

A. Yes. Those duties are pretty much the same today, except that the Watermasters probably interact more with the Ditch Riders for purposes of quality assurance and periodically reviewing return flow spills off the project. TFCC delivers water to shareholders at over 4,000 headgates spread out on a landscape of approximately 315 square miles. The company employs 3 Water Masters, and 3 Dam Tenders to tend to the duties at Milner Dam, Murtaugh Lake Dam, and the Forks, where the Mainline Canal bifurcates into the High Line Canal and the Low Line Canal. These Water Masters and Dam Tenders regulate the Flow of water in the over 100 miles of Main Canals. A team of 24 Ditch Riders then divert water out of the main canal and into over 1,000 miles of smaller delivery canals and divert and measure water to the shareholder via over 4,000 headgates. Water Masters, Dam Tenders, and Ditch Riders are highly trained in water management and water measurement. While many canal companies simply claim to measure all of the water that is conveyed and delivered within their systems, The Twin Falls Canal Company meticulously measures the water within the system and at the headgates on a daily basis throughout the irrigation season.

Q. WHAT ARE YOUR GENERAL RESPONSIBILITES AS GENERAL MANAGER?

A. I oversee the operation and maintenance of the Twin Falls Canal Company and the canal system described above that delivers water represented by 202,690.93 water shares to shareholders in our project. I am responsible for the supervision of 65 full time employees, company property management, and company budget and finances.

Q: HAVE THE COMPANY'S INTERNAL WATER DELIVERY AND MAINTENANCE OPERATIONS CHANGED SUBSTANTIALLY SINCE 2010?

A. No, from an overall standpoint our operations to maintain the canal system and deliver water are in line with our past practices over the past ten years.

Q. WHAT CHANGES OR EXTERNAL FACTORS HAVE YOU NOTICED THAT HAVE IMPACTED YOUR WATER DELIVERY OPERATIONS?

A. Several things have changed since 2010 that have impacted our operations. The Dairy industry in the area to a large extent has re-defined the crop mix in the area. Crop mix dictates water demand, and water demand dictates diversions and delivery schedules. Conversion from gravity irrigated acres to sprinkler irrigated acres continues on the project, and has had an effect on the company's ability to re-use waste water within the system. Development in the area has become a challenge as we work hard to protect the canal system and our ability to maintain the system as land use changes from agricultural uses to residential, commercial and industrial uses.

Q. CAN YOU GENERALLY DESCRIBE WATER DELIVERY OPERATIONS?

A. I have listed a brief summary of our water operations over the course of an irrigation season by month below:

April

April 1st typically marks the start of the irrigation season each year. We usually tell shareholders water will be available within a week of April 15th depending upon the year. This is the time when canal operators begin preparing for the irrigation season ahead. First, we prepare the canal system for water, burn weeds out of the canals, shape the canals and in general make sure that the waterways within the system are in good shape to begin the irrigation season. Second, we have to "charge" the system. Snowpack, water supply, and weather conditions are all accounted for when the date is determined when canal managers must make water available for delivery to the water users.

The TFCC canal system consists of over 100 miles of main canals, and over 1,000 miles of smaller delivery canals with multiple canal deliveries on each of the Main Canal and smaller canals. It requires 7 to 10 days to "charge" the system depending on the weather conditions. Watermasters and Ditch Riders work together to bring the water into the system and prepare for that eventual "delivery date". Once the system is fully charged, Ditch Riders begin taking water orders. Shareholders will contact their appropriate Ditch Rider and order their water on. At this point Ditch Riders will communicate every day with their Water Masters to relay the amount of water being diverted to shareholders so that the Water Masters can manage the flows in the main canal. Just like balancing your checkbook, if we divert more water out of the canal system to water users than the canal system contains, water users at the end of the system will dry up. Decisions are made and adjustments are made daily to ensure the balance of water within the canal system will sustain the needs of the water users. On the converse side of the issue, unlike balancing your checkbook, if more water is brought into the system than water orders demand,

flooding can occur at the tail end of the system, as the canals at the tail end of the system are significantly smaller than the canals at the head end of the system.

Water users in the early part of the season surprisingly order much of their water on in April. Farming practices are different in an open channel system in that each headgate may service multiple fields and not just a single large potato field or corn field. Water users may need to build some moisture into the soil profile to begin working the land and prepare for the ultimate planting of the crops. Depending upon climatic conditions, water users in April can begin irrigating pasture lands, grain crops, sugar beets and alfalfa crops too. Water users also often have an extensive ditch system of their own and may order water in early just to prepare and "charge" their own individual systems. Finally, Water Users often have pasture that they would like to put water on early in the season to free up the duty of their water later in the season when the farm crop needs the water. Keep in mind, that the dairy industry remains in need of feed, and after a long winter their feed supply has dwindled and they are anxious for that first cutting of hay as soon as possible, leading producers to get water to the alfalfa fields quickly.

Mother Nature can be fickle, and often this time of year Water Managers plan to meet the needs of the Water Users, Water Users plan to meet the needs of the crops, and Mother Nature steps in and changes everyone's plans. It is not unusual for a rainstorm or even a snowstorm to move through the area and completely remove the need for any water use. Inevitably those wet days will be followed by 2 or 3 warm dry days when the wind blows and dries everything out to the point of everybody being behind again. Rinse and repeat 2 or 3 times each spring. The size of the Twin Falls Canal system is such that it takes 3 days to get water from the Snake River to the end of the canal system, this makes reacting to these kinds of events very difficult given the clarity of our crystal ball.

May:

A typical May is anything but typical as weather conditions from year to year are never the same. Weather in May often causes us to experience snow, rain, wind, and a few days later, near 90-degree temperatures. Water users in May are generally making sure that pasture lands, grain crops, sugar beets and alfalfa crops are being watered in an attempt to ensure that water is available to pre-water for dried bean and corn crops to be planted late May and early June as weather conditions often create the need for. This variability in weather creates a challenge for water managers as they attempt to react to ever changing weather conditions and watch weather forecasts in an effort to plan and prepare for water diversions in the coming days. It is not uncommon for water managers to bring water into the system to meet the expected future demands, and experience rainy and wet weather for the next two or three days. The opposite also occurs when water managers react to wet and cold temperatures resulting in little demand to be followed by nearly 90-degree temperatures and twenty-mile per hour winds.

June/July/August:

June, July and August represent the "meat" of the irrigation season. During this period of time diversions are commonly at or near the highest diversion rates of the season as we experience peak demands. All of the crops on the system will require water and Water Users will carefully schedule their water supply to meet the needs of their crops. A Water User that gets behind in his water schedule this time of year will likely not find an opportunity to catch back up without stressing crops somewhere on his farm. Since crop water needs can exceed deliveries during this time it highlights the importance of early season watering to build soil moisture profiles. Company water managers *(Ditch Riders and Water Masters)* will carefully measure and lock all water deliveries and be required to have acute focus on canal system water elevations in an effort

to provide a high level of continuous water delivery to our Water Users while operating the canal system in a prudent manner to ensure no loss of delivery as a result of a canal break. Company Maintenance crews are very busy this time of year cleaning canals, managing weed growth, management of aquatic weed growth, and managing sediment within the system in the many sedimentation ponds that exist within the system.

September:

September historically has marked the beginning of the end of the irrigation season. Diversions in the past would be on a steady decline and crop demands dropped and diversions reduced as many crops have been harvested or are reaching maturity and are soon to be harvested. In recent years the month of September has changed somewhat. The smell of fall is certainly still in the air when September arrives and many of the same reduced demand and diversions the we have experienced in the past remain true, the reduction in diversion and demand are not at the same level that they were previously. Producers who were historically content with three cuttings of alfalfa per year now find themselves attempting to meet the demands of the dairy industry and aspire to obtain four and even five cuttings per year. This increase in alfalfa production has resulted in increased late season demand for water. The corn acreage on the project have increased significantly in recent years as well in response to the needs of the dairy industry. Historically there were several thousands of acres of sweet corn produced on the project and the Green Giant Company had a processing plant in Buhl. Several years ago the Green Giant plant closed its doors and the sweet corn crop which had a shorter growing season has now been replaced with the much more water consumptive field corn varieties. This too has resulted in increased late season demand in September. September can also feel the effects of an

unusually cold and wet spring that delays the planting of many of the more water intensive crops thereby extending the irrigation needs of the crop later into the year.

October:

Demands for water delivery in October have changed to an extent over the years. Certainly, demand for water begins to decline as crops are harvested and the end of the season is near, but canal operators cannot simply shut the water off to the shareholders if they choose to continue to receive water. The dairy industry has created a portion of the change as some producers have started double cropping and when their crop is harvested they will quickly plant triticale to either green chop for the dairies or graze. Most alfalfa hay producers in the area have historically been content with 3 cuttings per year but the dairy industry and the never-ending need for feed has resulted in many producers striving to get 5 cuttings per year and driving the late season demand. Years with particularly wet springs can also create a delay in the corn planting, cooler winters can create a delay in the corn harvest, both resulting in late season demands being higher in recent years than they have been in the past. Cover crops and soil health concerns have created a late season demand as producers will plant a cover crop in the fall to improve soil health, increase agricultural productivity, and build climate resilience.

Q. HAVE YOU NOTICED ANY CROPPING PATTERN CHANGES IN THE LAST 10-15 YEARS?

A. With the dairy industry looming so large in the county, it's no surprise that the industry has a major effect on the local and state economy, and supports 10's of thousands of jobs in the area. For cows to produce milk they require feed, and feed requires water. Much of the farm economy in Twin Falls County is now supported by the dairies. A significant increase in forage crops, Alfalfa Hay, Corn, and Triticale are now in considered staple crops within the TFCC tract.

The historical crop rotation that included Alfalfa, dry beans, corn, wheat and barley, sugar beets and potatoes, has changed dramatically as a result of the dairy industry. Current crop rotation includes significantly more acres of the big water consumers, alfalfa hay, and corn. In an effort to continue to provide a consistent reliable delivery of water to the agricultural producers in the county, The Twin Falls Canal Company has no doubt had to focus on efficiencies in an effort to provide water to this new cropping landscape while operating within our water right.

Q. WHAT HAVE YOU NOTICED ABOUT DOUBLE CROPPING ON THE PROJECT OR OTHER LATE SEASON WATER USE?

A. In addition to the increase in more water intensive crops being introduced into the local crop mix, there is also an increase in double cropping as producers continue to attempt to meet the needs of the dairy industry. Each year more and more acres of grain or beans are harvested, and producers prepare the field for a late crop of triticale. If shareholders have his late season demand we will continue to make those deliveries as requested within our water right.

Over and above the double cropping, there has been in recent years more emphasis on soil health as producers will plant a cover crop in the fall to improve soil health, increase agricultural productivity, and build climate resilience.

Q: CAN YOU GENERALLY DESCRIBE THE COMPANY'S MAINTENANCE ACTIVITIES?

A. To a great extent, all canal maintenance activities are performed to target efficiencies. As stated, before in this document, canal system capacity dictates maintenance activities to provide consistent reliable water delivery to all shareholders while protecting the integrity of the canal

system. It is impossible to protect the integrity of the canal system and operate the system over and above the designed capacity of the system at the same time.

Canal Cleaning:

Twin Falls Canal Company has always boasted to having the largest construction company in the area. With 9 excavators, two backhoes, 3 bulldozers, 2 road graders, a fleet of 10, 15-yard capacity dump trucks, 3 loaders, 12 tractors and a large assortment of trucks and trailers, we are the only construction crew in the area that works all year long. Winter, Spring, Summer, and Fall, Twin Falls Canal Company crews are on the job site. Many contractors in the area have *(tongue in cheek*) thanked us over the years for providing a training ground for equipment operators in the area.

Some of the best excavator operators in the area are in a constant effort to clean the canals on the project. With over 100 miles of main canal and over 1,000 miles of smaller canals it is truly a job that is never done. Sediments fall out of the irrigation water and deposit in the canal bottoms to the point that water management staff cannot push the necessary flow of water through the canals. When canals get in this condition, evaporation increases and more and more water soaks into the canal banks as water rises to overcome the partial blockage in the canals. Without these crews and machinery, efficiency would suffer tremendously as canal operators would be forced to bring in more water in an attempt to push through the partially blocked section of canal. A big part of operating a canal system efficiently is regular maintenance of the system. The Twin Falls Canal Company maintains millions of dollars' worth of equipment and expends nearly $1,500,000 per year in payroll just for the maintenance crews that take care of the Twin Falls Canal Company canal system.

Aquatic Plant Growth Management:

Aquatic Plant Management is another part of canal system maintenance that is not only a never-ending job, but an absolute essential activity required of canal maintenance crews in an effort to make the canal system as efficient as possible. As aquatic plants begin to grow in the canal system each year, they, much like the sediment can completely ruin a canals ability to flow freely. When this ability to flow freely is compromised, water elevations rise, evaporation loss increases, water soaks into the perimeter of the canal at a much higher rate, and canal operators are forced to either push harder with more water to get the water to flow through the canals or remove the aquatic plant growth. Removal of the aquatic plants is no easy task. Twin Falls Canal Company Crews use a multitude of methods to remove the plants including, cleaning the canals with excavators, dragging heavy chains through the canals in an effort to make the plant break loose, or chemical removal of the plants. The Twin Falls Canal Company spends over $500,000.00 per year for chemicals to remove the moss and aquatic plants that grow in the canals and threaten canal operation efficiency.



The picture above shows how moss can obstruct flow in a lateral.



The picture above is an example of our chemical treatment application to manage aquatic weed growth.

Weed Spraying and Mowing Program:

Weeds growing along the edge of the canals are a definite challenge to open system canal operating efficiencies. As weeds and grasses grow on the sides of the canals there is no doubt where they are getting the water that sustains their growth, but that is only part of the issue. As these weeds and grasses approach maturity in the heat of the season the begin to fall over into the flow of the canals and just like the aquatic plant growth, they attempt to occlude the path of the water flow. Water managers are forced to either push harder with more water or remove the obstacle. The Twin Falls Canal Company crews operate 10 mowing tractors throughout the irrigation season in an attempt to combat this weed growth and allow the water in the canals to flow freely. The Twin Falls Canal Company also employe 2 employees who have the responsibility to operate our two spray trucks throughout the season and apply weed spray in our continued effort to complete yet another job that is never done. Cost of the weed spraying and mowing crews annually is nearly $350,000.00.



The above shows a typical mowing operation to cut weeds and grass on the side of a main canal.



This picture shows removal of grass and weeds that have covered a lateral.

Canal Piping:

Continued use and maintenance of open channels in residential, commercial, or industrial areas can be difficult. Piping waterways can have a positive impact on these operations and can help efficiencies by preventing water loss. We have worked closely with the cities that exist within our project boundaries and the county planners, to require developers to pipe waterways when land use changes from agricultural uses to residential, commercial, or industrial uses. Many miles of open waterways have been piped over the course of the last 20 years and local officials and the Twin Falls Canal Company will continue to require that piping.

Russian Olive Removal

If you have a chance to look at aerial imagery of the Twin Falls Canal Company tract in the 1960's you will definitely notice an absolute absence of the Russian Olive trees that have now infested every corner of the tract. These trees although drought tolerant prefer to grow at water's edge along any waterway they take root in. These trees can consume 10 to 20 gallons of water per week per tree. Not only do they drink an enormous amount of water but they too like the weeds and grasses along the canals have the tendency to grow out in the waterway and fall over in the waterway. Management of the Twin Falls Canal Company was at the leading edge of a movement a few years ago to try to get the Russian Olive tree listed as a noxious weed in Idaho and establish a path forward in eradicating these trees from our state. That Movement was ultimately unsuccessful and The Twin Falls Canal Company Crews will have to continue the methods of management that we have embraced as a part of our responsibility to ensure the most efficient use of the water. Twin Falls Canal Company Crews have for years identified specific problem areas, and worked with property owners in those areas to remove large growths of Russian Olive from the banks of the canals.

Q: WHAT ARE THE IMPROVEMENTS THE COMPANY HAS MADE FROM A WATER DELIVERY STANDPOINT SINCE YOU STARTED WORKING?

A: In addition to all the work listed above, we have undertaken the following to improve water deliveries and ensure efficient canal operations.

Automation:

In the early 90's the Twin Falls Canal Company recognized the affect that potential crop mix changes and conversion to sprinkler would have on the company's ability to continue to provide a consistent and reliable water delivery to all of its shareholders, and embarked on a mission to install automation within the canal system to improve canal efficiencies and address these challenges. Currently the canal system has nearly 60 automated sites that measure, regulate, and limit water flows within the system to help us make sure that the water gets where it needs to go while minimizing waste and providing a timely and high level of service to our water users. The bulk of the Automation equipment has been Sutron brand equipment, but we have also used technology from Langman Automated Gate Systems from Canada, Rubicon Water Slip-meters and Piko-meters from the Rubicon Water Company in Australia, and Obermeyer Hydro in Fort Collins Colorado.

These automated sites come at a high cost and the Twin Falls Canal Company has partnered with shareholders, and secured grant funding through the Bureau of Reclamation WaterSmart program as well as the Idaho Water Resource Board funding. At an overall cost of well nearly $5,000,000.00, and annual costs of over $100,000.00, the Twin Falls Canal Company commitment to canal efficiency is obvious, unparalleled, and ongoing.





These pictures show examples of automated gates on the canal system.

Concrete Structures:

The Twin Falls Canal Company Tract is home to over 10,000 concrete structures. The structures are all designed to manage, regulate and measure the flow of water within the canal system. Although concrete is a durable and long-lasting product, it too has a life span. If Twin Falls Canal Company crews replace 100 concrete structures per year, the concrete inventory can be turned over once every 100 years. A very important part of the maintenance crew's responsibility is keeping concrete structure inventory up to date and replacing and improving concrete measurement facilities, as these structures are key to efficient operation of the canal system.

Canal Lining:

Canal Lining projects that have taken place for decades (likely over a century) on the Twin Falls Canal Company canal system. Recently we have done 2 large scale lining projects with HDPE liners and have another project scheduled for next year (2023-2024), but that doesn't suggest that lining projects are new to the Twin Falls Canal Tract. Liner projects have always been a part of our annual maintenance activities throughout the entire existence of the tract, and crews have for years removed gravelly materials from canal bottoms and hauled in huge amounts of good clay material, bentonite, cinders and polyacrylamide to line canals. These and many other activities aimed at constant improvement of our system efficiencies have always been and continue to be considered a huge part our responsibility in the operation of the canal system. The first picture below shows an example of a clay material lining project on the Low Line Canal. The next picture shows installation of the HDPE liner we installed on the High Line Canal in 2019.





Padlocks:

Many don't realize that the 4,000 + headgates that the Twin Falls Canal Company uses to measure and deliver water to the shareholders are really a 2 structure gate system. To lock one of the two structures is not adequate. Locking just one of the structures would provide no assurance that water users would not be tempted to increase the water flowing from their headgate and onto their crops. Both structures are locked throughout the irrigation season to ensure adequate control of the delivery system and efficiency in the operation of the system.

The Twin Falls Canal Company padlock inventory totals approximately 9,000 padlocks. All of these padlocks are out in the field year-round and exposed to the elements, therefore creating their own life span. If we can get 20 years out of a padlock, we only have to replace about 450 each year, resulting in approximately $9,000.00 annual expense just to keep the current inventory operational.

Q. HAVE YOU DEVELOPED ANY ADDITIONAL RE-REGULATING RESERVOIRS SINCE 2010?

A. Yes, we constructed the Kinyon Pond on the far west end of the Highline Canal south of Castleford in 2012-13.

Q. CAN YOU DESCRIBE HOW THAT POND WORKS AND WHAT IT DOES?

A. The Kinyon Pond was constructed to help the company overcome a very specific challenge to our ability to provide a high level of service to our Water Users, while protecting the capacity of the canal system and focusing on our efficiencies. There is a three-day travel time for water diverted at the head end of our canal system at Milner Dam that is destined to be delivered at the tail end of the system. In the past, many water users at the end of the canal system endured water supply shortages as a result of fluctuations that occurred within the system. When these fluctuations occurred, the tail end of the system dried up, and those Water Users would experience water a shortage for three days while water managers shuttled water through the system to restore flow to these users. Three days out of water is not acceptable and water managers were forced to carry extra water within the system if an effort to ensure that these Water Users at the end of the system continued to have water in spite of the inevitable fluctuations that can occur. The Kinyon Pond has a capacity of approx. 300AF of water and has been designed to provide water to these Water Users when these fluctuations occur. The Kinyon Pond capacity is filled early in the season when we experience wet cold periods and water demand suddenly drops, the facility then remains full and ready to supply the necessary flow to overcome the three-day travel time required to replace the water supply when fluctuations occur. Water managers then watch closely for a break in the weather or demand to identify their next opportunity to refill the capacity of the pond and be prepared and ready for the next event. Since the construction of the Kinyon Pond water managers no longer need to carry artificially high

flows within the system to ensure a consistent and reliable water supply to our water users at the end of the system. The pictures below show the Kinyon Pond.

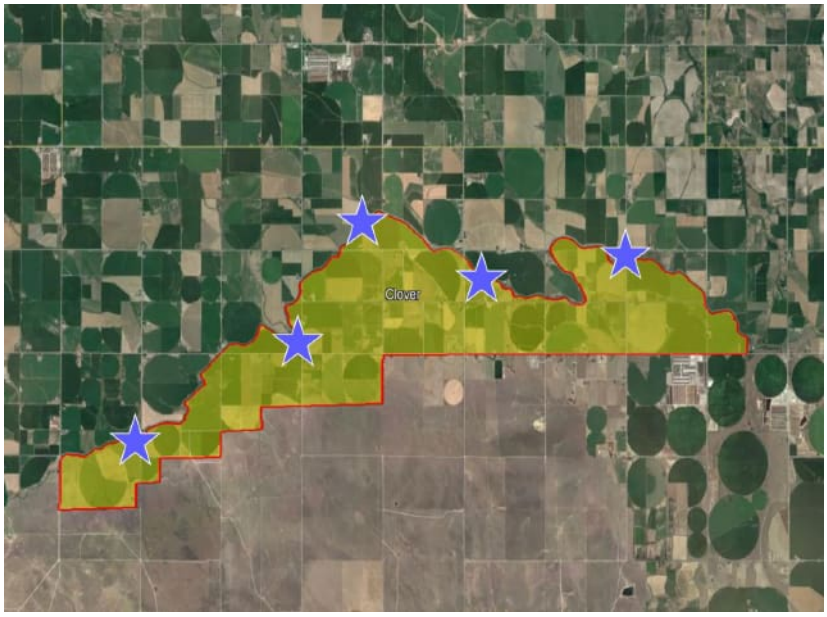




Q. WHAT IMPROVEMENTS ARE BEING MADE AT THE CLOVER PROJECT?

A. The Clover Irrigation Pump Company represents approximately 4,000 acres on the south side of the company's High Line Canal. Being positioned on the south side of the High Line Canal means that the ground elevation of the Clover tract is higher than the water surface elevation in the High Line Canal, and all of the water delivered to Clover needs to be pumped out of the High Line Canal. The Clover tract has been in existence since the early 1900's and pumps water from the High Line Canal into a series of smaller, gravity flow canals where it is delivered to the 4,000 acres within the tract. In 2021 The Twin Falls Canal Company assisted

the Clover Irrigation Pump Company in securing an NRCS grant. The upgrade involved a three phase, five-year plan to replace the 100-year-old pump and 48-inch pipe that had served well past its life expectancy. The pump and pipeline are to be replaced with five new smaller pump stations feeding smaller pipes enroute to the end goal which is to pressurize the entire 4,000-acre tract. TFCC crews in 2022 completed the company's commitment to phase 1 of the project by installing two new diversion structures on the High Line Canal. To ensure accurate measurement at these new diversion structures, the company installed three new automated Rubicon Piko-Meters with the help of a cost shared grant from the Idaho Water Resource Board. The next two phases of the project will include three more diversion structures along with three more automated Rubicon Piko-Meters. The following map outlines the sites for the proposed five pumping plants and their general locations on the High Line Canal.



Q. WHAT CHANGES HAVE YOU NOTICED WITH REGARD TO CHANGES TO SPRINKLER IRRIGATION ON THE PROJECT?

A. When taking a quick look at the 1992 imagery available on Google Earth it is important to recognize the fact that there are virtually no circles on the Twin Falls Canal Company Tract. Over the course of the past 30+ years the conversion from gravity irrigation to sprinkler irrigation has consumed approximately 50-60% percent of the tract.

Commonly, sprinklers are considered to be much more efficient irrigation system than gravity irrigation, leading one to assume that less water may be required as acres convert to sprinkler. While on-farm efficiencies are no doubt improved, from a canal management perspective the opposite is true.

Historically under gravity irrigation, acres upon acres of ground was being furrow irrigated with sod ditches, concrete ditches and siphon tubes. In the past, under furrow irrigation, waste ditches existed at the end of every field and waste water was collected in these waste ditches and conveyed back into the canal system to be re-delivered to other down gradient acres on the project. This reuse of wasted water went a long way towards the efficiency numbers on the tract as we were able to deliver the same water to potentially 3, 4, maybe 5 or more different water users. Somewhere in the archives of historical information about the Twin Falls Canal Company a state engineer was quoted as saying that *"a drop of water is thoroughly exhausted by the time the Twin Falls Canal Company is through with it"*, referring to this ability to recapture waste water and re-deliver it again and again. With the conversion to sprinklers there is no longer waste water flowing off of those fields and available for reuse, but those downstream water users remain, who are still entitled to their water. We simply have to bring in more water into the

system to supply those needs instead of the way we historically provided much of that water as a result of the upstream neighbor's waste water.

Bringing "*more water into the system"* has never been considered a viable option, and in fact, system capacity precludes it. At maximum diversion rate in the heat of the summer the system is at its most vulnerable point. Freeboard on the systems main canals as well as all of the smaller delivery canals is minimal, and the capacity for more water simply isn't there. Instead, the Twin Falls Canal Company has implemented standard operating procedures within the company, and identified and implemented water efficiency practices and projects to ensure the company's ability to deliver consistent and reliable water delivery to all Twin Falls Canal Company shareholders.

Seep tile and tunnel returns continue to decline as sprinkler irrigated ground does not provide the same percolation into the shallow aquifers as gravity irrigated ground used to. It is also important to understand the engineering that went into the Twin Falls Canal Company canal system when it was originally constructed in the very early 1900s, and understand the relationship between the company's High Line Canal and the Low Line Canal. All acres irrigated from the High Line Canal (approx. 73,000 acres) waste back into the Low Line Canal allowing us to again recapture the water and re-deliver it to other down gradient acres on the tract.

Q. HOW MANY RETURN FLOW SITES ARE MONITORED ACROSS THE PROJECT?

A. Across the Twin Falls Canal Company System, 28 drains have been identified. These 28 drains make up the bulk of all of the waste water leaving the system into the Snake River. These drains are measured regularly throughout the irrigation season and the resulting measurements

are totaled and used to monitor and determine Twin Falls Canal System efficiencies at any given time. Typically, (for example) if we determine that the total sum of the return flow network is at a reasonably low level we know that the canal system is running pretty tightly. If we see that the total sum of the Return Flow Network is unreasonably high, we can determine that the canal system might be running loosely and we can use these measurements to identify areas within the tract where we need to tighten up to improve efficiencies.

Q. HAVE YOU NOTICED ANYTHING ABOUT RETURN FLOW TRENDS IN GENERAL?

A. End of the system returns to the Snake River have always been of particular interest to the water managers within the Twin Falls Canal Company. That being said we are always on a quest to reduce end of the system returns to the river. In system returns, or waste water returns that come off of individual farms or individual farm fields have historically been a big component of our overall water supply. Waste returns of this type have for decades returned to the canal system in a manner that allowed water managers to re-deliver the water, time and time again. Conversion to sprinkler irrigation on the project has altered the flow patterns of both of these types of returns. The in system returns that historically conveyed waste water through waste ditches and back into canal company facilities do not exist when conversion to sprinkler occurs. The inability to recapture and redeliver that waste water becomes a challenge for water managers to continue to provide water to those down gradient users that were supplied at least a portion of the water supply via these waste water returns. On the other side of the same conversation, after significant sprinkler installation, return flows to the Snake River can become much more volatile. As weather events occur during the irrigation season for example, a July or August rain or hail storm may cause many irrigators to turn off their sprinkler at the same time

resulting in sudden increases in waste water leaving the canal system and into the river. Much of this often happened historically as well but its much easier to shut off your pivot from your phone that it is to go out in the field and adjust your gravity irrigation set during a rain or hail storm. Power outages are another conversation completely as all sprinkler irrigation will shut off and completely over flow drainages until power is restored or canal adjustments can be made and the effect of those adjustments may take hour or even days to be realized. By the time the effects of those adjustments are realized, the event is history and water managers must scramble to reverse the effect of the adjustments and restore the waters supply.

Q. HOW MANY SHARES DO YOU DELIVER WATER TO?

A. We have issued 202,690.93 shares that are delivered through 24 different rides.

Q. DO SHAREHOLDERS ALWAYS HAVE 1 SHARE PER ACRE?

A. No, some shareholders may have less than 1 share per acre and others may have up to 1.5 shares per acre.

Q. HAVE YOU NOTICED NEW RESIDENTIAL DEVELOPMENTS IN TWIN FALLS COUNTY SINCE 2013?

A. Yes, mostly around the City of Twin Falls, along with other subdivisions around Kimberly, Filer, and Buhl.

Q. DO THESE DEVELOPMENTS STILL RECEIVE SURFACE WATER FROM TFCC?

A. It is my understanding that the County and Cities require new developments to continue to receive surface water from TFCC through pressurized irrigation systems.

Q. DO YOU STILL DELIVER WATER UNDER THE SAME NUMBER OF SHARES?

A. To residential developments yes, however to certain commercial or industrial developments we may deliver less.

Q. DO SUBDIVISIONS REQUIRE THE SAME AMOUNT DELIVERY EVEN THOUGH LESS ACRES MAY BE IRRIGATED THAN BEFORE? HOW IS THE IRRIGAITON OPERATION DIFFERENT THAN A FARM?

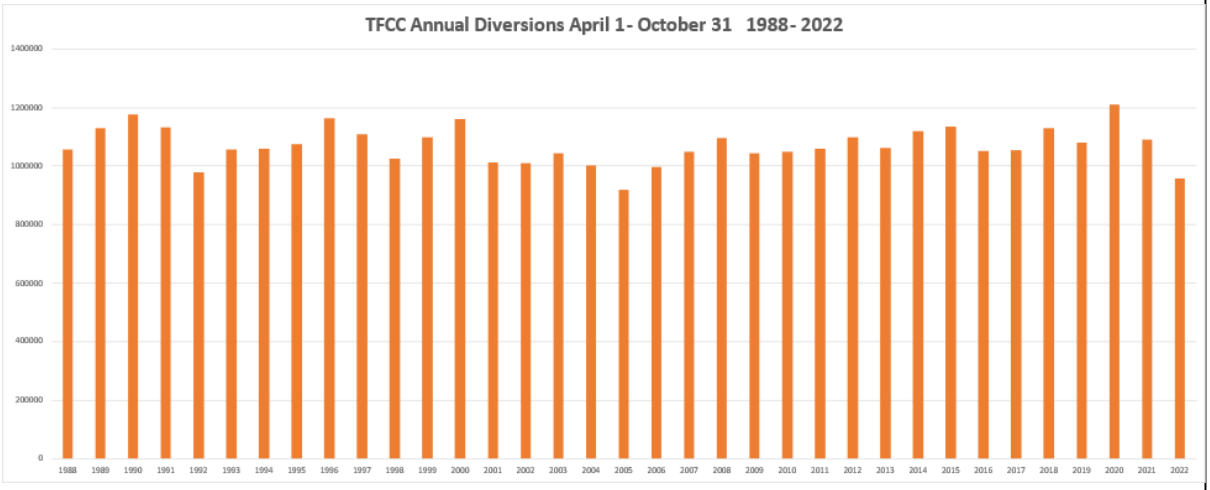
A. Water use in new residential subdivision within the Twin Falls Canal Company project area are generally required, by the city they exist in, or by the County if they are in an unincorporated area to provide water within the subdivision via a pressurized irrigation (PI) station. Developers are required to install PI stations with any new development with full water shares, or one share per acre of developed land. New subdivisions plats often include large tracts of land, and plats consuming 40, 80, and sometimes over 160 acres have been in various phases of development for the past 20 years. Water use in residential subdivisions is very different than water use in the agricultural lands on the project. While a farmer has 160 shares on his 160 acres, the farmer is never watering the entire 160 acres at the same time, in fact, he is likely to have multiple different crops, all with different water needs, planted within his 160-acre farm. In a residential subdivision, all of the homes within the development have a sprinkler system installed to provide water to their lawns and ornamental spaces. Timers on those sprinkles systems are set for irrigation to occur at a time that is least disruptive to the lifestyles of the residents within the subdivision. It is very common for these PI stations to operate at a maximum diversion rate daily between the hours of 5:00 a.m. and 10:00 a.m. in the morning with little or no use the rest of the day, requiring a peak demand over and above peak delivery. This demand to delivery ratio requires storage capacity to work and even with significant storage capacity, low pressure issues create problems for the operators of the PI stations.

Q. IN YOUR OPINION IS THE COMPANY OPERATING AND DELIVERING WATER IN A REASONABLE MANNER?

A. In my opinion the Twin Falls Canal Company has always, and continues to set the bar in open canal operation. The Company, it's Management, and Board of Directors has always kept a keen eye on operations of the company, Maintenance of the system, and opportunities to improve our operations and delivery of water in any way possible.

Q. ANYTHING ELSE IN CONLCUSION?

A. Over the last 30 years the Twin Falls Canal Company's annual diversion rate has been right around 1,100,000 af per year. Some years just a bit higher and some years a bit lower but by and large 1,100,000 af. The Twin Falls Canal Company has adapted to the cropping pattern changes and the conversion to sprinkle in a manner that allows us to continue to provide a constant and reliable water supply to our water users while continuing to divert 1,100,000 af per year. I compiled Water District 01 data from 1988 through 2022 and created this graph below which to me does not show an increase in diversions over time.



As identified throughout this document, operating an open channel canal system efficiently is neither easy or inexpensive. The Twin Falls Canal Company has and will continue to make every effort to operate efficiently and constantly explore new ways and new opportunities to improve our canal system efficiencies.

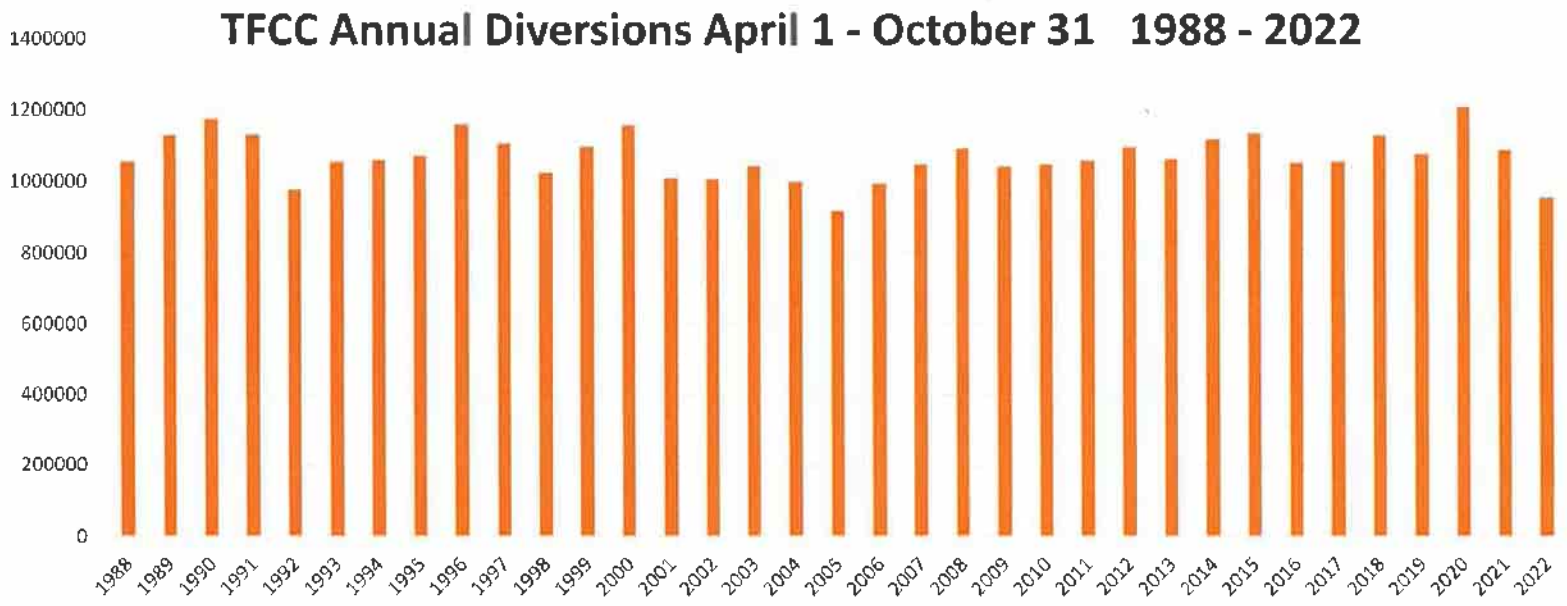

TFCC Annual Diversions April 1 - October 31 1988 - 2022
1400000
1200000
1000000
800000
600000
400000
200000
0
1988
1989
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Exhibit 1A
Wednesday, June 7, 2023
Reported by:
Andrea Check, CSR 748, RPR, CRR

Exhibit 2

Conversion Water – Acre-Feet Delivered to Unit B Lands (3,576.6 acres)

Year	Natural Flow	Storage	Groundwater	Total Acre-Feet
2016	790.4	7812.9	21.8	8,625.1
2017	4351.3	3963.3	277.9	8,592.5
2018	3304	5040.8	569.5	8,914.3
2019	1965.7	4959.5	1157.8	8,083.0
2020	3057.3	5738.9	796.7	9,592.9
2021	239.8	8181.0	1025.7	9,456.5
2022	0.0	7370.6	1461.9	8,832.5

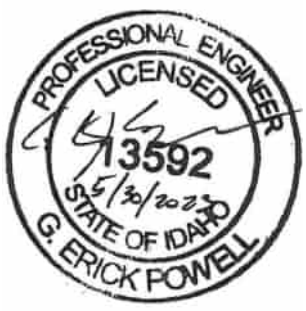
Docket No. CM-DC-2010-001

FIFTH AMENDED FINAL ORDER REGARDING METHODOLOGY FOR DETERMINING MATERIAL INJURY TO REASONABLE IN-SEASON DEMAND AND REASONABLE CARRYOVER

Surface Water Coalition Expert Report

May 2023





Authors
David C. Colvin, P.G.
Erick Powell, Ph.D., P.E.

1. Introduction

This report presents the opinions of David Colvin and Erick Powell. We are groundwater experts who have been retained by the Surface Water Coalition (SWC) for issues being addressed in Docket CM-DC-2010-001. David Colvin is the primary author of this report, has 27 years of experience and is licensed as a Professional Geologist in Idaho. Erick Powell is a supporting author, has 17 years of experience and is licensed by the State as a Professional Engineer. Our resumes are included as Attachment A and B, respectively. We are basing our opinions on the information available at this time and reserve the right to alter our opinions should new or different information become available in the future.

On April 21, 2023, the Director of the Idaho Department of Water Resources (IDWR) issued the Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover (IDWR, 2023a, "Fifth Methodology Order") and the Final Order Regarding April 2023 Forecast Supply (IDWR, 2023b, "2023 As-Applied Order"). In the Fifth Methodology Order, the Director restated the nine steps prescribed by the methodology with updates to various aspects of the prediction of forecasted supply (FS), estimates of reasonable in-season demand (RISD), determination of the in-season demand shortfall (IDS), and determination of curtailment requirements. The Fifth Methodology Order requires curtailment for junior groundwater rights that:

- Do not have approved mitigation plans;
- Fail to secure the required water consistent with their approved mitigation plans; or
- Otherwise fail to comply with their approved mitigation plans.

The As-Applied Order predicts a 75,200 acre-foot (AF) IDS for the 2023 irrigation season, which will result in mitigation requirements or curtailment for groundwater rights with priority dates junior to December 30, 1953. Additional details of the IDS are presented as proportionate shares associated with various water user entities.

Summary of Opinions

Below is a summary of our opinions related to the information presented in the the Fifth Methodology Order and the 2023 As-Applied Order. Additional discussion is in the pages that follow.

1. The Eastern Snake Plain Aquifer Model (ESPAM) Version 2.2 is widely accepted as the best available scientific tool for evaluating regional Easter Snake Plain Aquifer (ESPA) hydrology, specifically the reach gain/loss impacts of curtailing groundwater pumping.
2. The use of the steady-state version of ESPAM is inappropriate for determining the priority date of a curtailment intended to mitigate in-season demand shortfalls (IDS), as required by the methodology. The steady-state version of ESPAM 2.2 has been demonstrated to overestimate the curtailment in-season benefits by more than an order of magnitude.

3. The transient superposition version of ESPAM 2.2 is the appropriate model type for calculating the in-season Snake River near Blackfoot to Minidoka reach gain benefits of curtailing junior groundwater pumping.
4. Regardless of the prior modeling approaches required, the Fifth Methodology Order correctly requires that transient modeling has to be used to calculate the in-season benefits of groundwater curtailment.
5. Transient groundwater modeling of the ESPA has been common practice for over a decade and is routinely utilized for evaluating the transient impacts of groundwater pumping on Snake River gains/losses.
6. The 2023 As-Applied Order utilizes a steady-state model to calculate the proportionate share of IDS that various entities are responsible for mitigating. These proportionate share amounts can only be met by direct delivery of surface water and are not relevant to understanding the benefits of groundwater curtailment.

2. Discussion of Opinions

a. ESPAM introduction

Groundwater modeling prescribed in the steps in the Fifth Methodology Order utilizes the Eastern Snake Plain Aquifer Model (ESPAM), originally known as the Enhanced Snake Plain Aquifer Model. ESPAM was developed and is maintained by IDWR staff. ESPAM development and updates are guided by the input of the Eastern Snake Hydrologic Modeling Committee (ESHMC), a multi-stakeholder group of scientists and engineers representing federal/state agencies and water users across the ESPA. (Sukow, 2021a)

ESPAM 2.2 is supported by the ESHMC and broader scientific community as representing the best available science for regional hydrologic analysis of the ESPA. The latest version of the model is ESPAM 2.2 which received approval from the ESHMC in 2021 and has been adopted for regional aquifer management planning and water rights analyses.

ESPAM 2.2 is an appropriate and reliable tool for the evaluation of regional hydrologic conditions and scenarios within the ESPA. Its use at local scales must be evaluated on a site-by-site basis to confirm that regional model generalizations, simplifications, and assumptions are appropriate for the local scale of the specific model scenarios being run. (Sukow, 2021a)

After transient calibration, IDWR created steady-state and transient superposition versions of ESPAM 2.2 for predictive analyses. Superposition models are generally created to represent hydrologic interactions within the aquifer in a way that allows for the isolation of model inputs so that their impacts are not conflated with other changes in the system. (Sukow, 2021c) IDWR ran scenarios using a previous version of ESPAM comparing the transient superposition model to the fully populated model that represents monthly inputs for the calibration period. The transient

superposition model showed minimal differences compared to the fully populated model. (Sukow, 2012)

Steady-state models depict equilibrium conditions with no change through time. They are best used to evaluate the ultimate impact of a change, without regard to time. The steady-state superposition version of ESPAM 2.2 consists of a single stress period with average hydrologic inputs.

Transient models allow model inputs and outputs to vary with time and can represent changing hydrologic conditions. The transient superposition version of ESPAM 2.2 has monthly stress periods with average hydrologic inputs from the calibration period of 1980 to 2018. This model allows for many years of predictive calculations while representing the seasonal fluctuations in hydrologic model inputs and outputs. (Sukow, 2021c)

b. ESPAM Curtailment Analysis

During the development of ESPAM 2.2, IDWR utilized the superposition versions of the model to calculate the impacts of various curtailment dates as a demonstration of appropriate model use for regional hydrologic analysis. The curtailment analyses calculated the changes to spring flow and Snake River gains/losses due to the curtailment of groundwater pumping for five different priority dates. The ESHMC reviewed these model runs and approved the associated report in 2021 (Sukow, 2021c).

OPINION #1: ESPAM 2.2 is widely accepted as the best available scientific tool for evaluating regional ESPA hydrology, specifically the reach gain/loss impacts of curtailing groundwater pumping.

c. Methodology Technical Working Group

During November and December of 2022, IDWR convened a Technical Working Group (TWG) to provide input on potential changes to the Fourth Methodology Order (IDWR, 2016). The TWG consisted of technical experts and legal representatives for the SWC, IGWA, and other stakeholders. IDWR presented various potential changes to the methodology, including a November 28, 2022 presentation comparing the steady-state and transient superposition versions of ESPAM 2.2 for curtailment analysis. (Sukow, 2022)

In this presentation, Jennifer Sukow (IDWR) used 2022 curtailments ordered under the methodology to demonstrate the differences between transient model calculations for in-year, in-season increases for the Snake River near Blackfoot to Minidoka (nBF-M) reach gains compared to steady-state model calculations representing ultimate reach gains without regard to any realistic time frame.

Utilizing the steps detailed in the Fourth Methodology Order, the April Demand Shortfall forecast

was predicted to be 162,600 AF. As prescribed by the Fourth Methodology Order, the steady-state simulation of curtailment to December 25, 1979 resulted in an increase in nBF-M reach gains sufficient to mitigate the 162,600 AF Demand Shortfall. The use of the steady state model essentially represented the reach gain impacts over infinite time.

The same curtailment date used in the transient model resulted in an increase of only 16,200 AF of nBF-M reach gains from May through September 2022. This result is less than 10% of the April 2022 Demand Shortfall.

This pattern of steady-state responses significantly over-estimating the in-season benefits of curtailment is also demonstrated at other curtailment dates, as shown in **Figure 1** below.

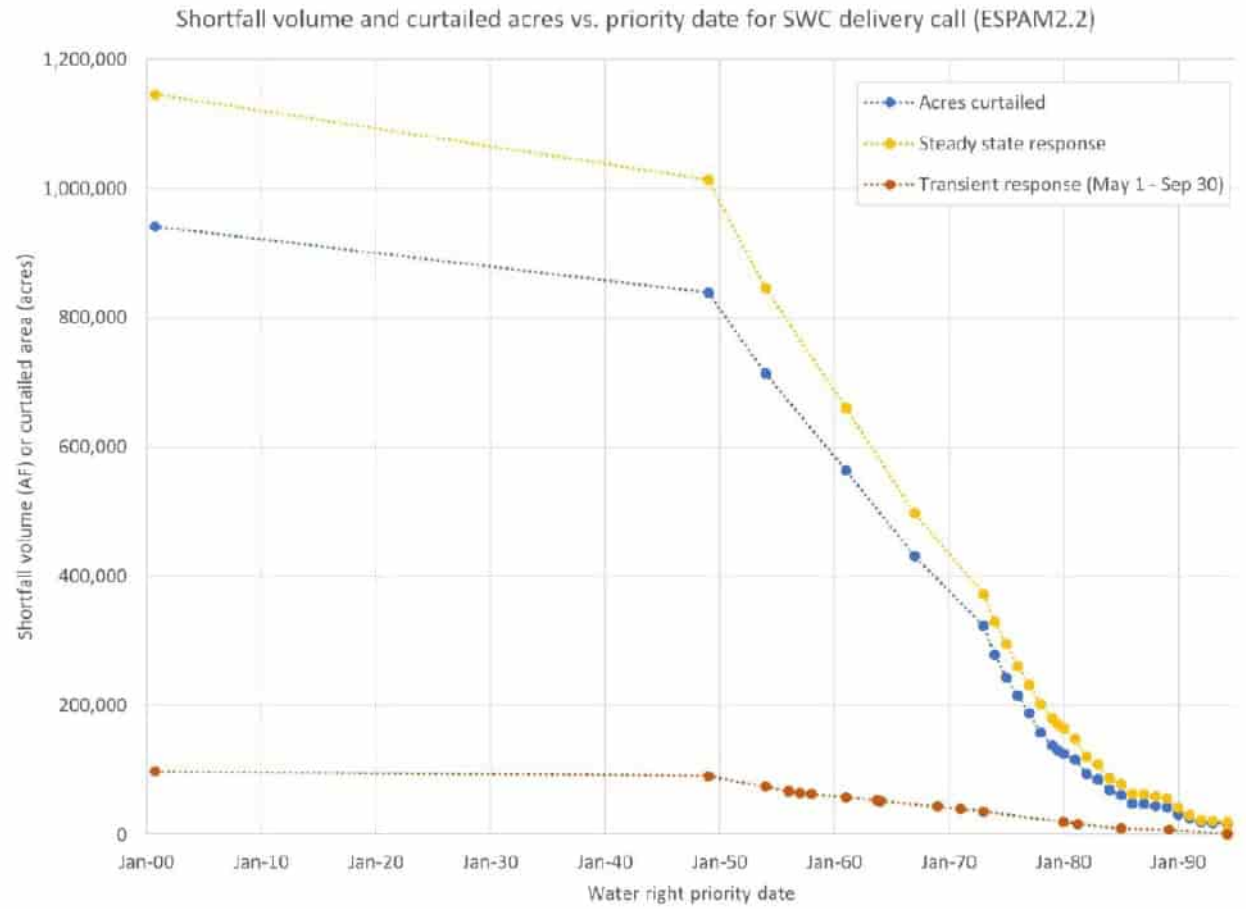


Figure 1 - Steady-State and Transient Model Response for Different Priority Dates (adapted from Sukow, 2022)

In her presentation slides, Ms. Sukow concluded the following:

- *"Steady state simulations are appropriate for evaluating the impact of aquifer stresses that have been applied for decades (i.e. groundwater pumping, continuous curtailment to same date every year)*

- *Transient simulations are appropriate to evaluate the impacts of aquifer stresses applied for short periods of time (i.e. short term curtailments with varying priority dates)*
- *Steady state simulations of continuous curtailment do not simulate the short term curtailments prescribed in the SWC methodology*
- *Transient simulations better simulate the short term curtailments prescribed in the SWC methodology"*

We agree with these conclusions.

OPINION #2: The use of the steady-state version of ESPAM is inappropriate for determining the priority date of a curtailment intended to mitigate In-season Demand Shortfalls (IDS), as required by the methodology. The steady-state version of ESPAM 2.2 has been demonstrated to over-estimate the curtailment benefits by more than an order of magnitude.

OPINION #3: The transient superposition version of ESPAM 2.2 is the appropriate model type for calculating the in-season Snake River near Blackfoot to Minidoka reach gain benefits of curtailing junior groundwater pumping.

d. Fifth Methodology Order Groundwater Modeling Topics

On April 21, 2023, the Director of IDWR issued the Fifth Methodology Order (IDWR, 2023a). The Fifth Methodology Order Conclusions of Law provide the legal requirements that must be met by the Methodology steps to protect the senior priority surface water rights in time, place, and quantity. Any identified Demand Shortfall must be mitigated in-season. If curtailment of junior groundwater pumping is the mitigation method, the short term results of curtailment need to be predicted in-season, within months of implementation.

The in-season time considerations of the Fifth Methodology Order are a critical consideration of the supporting modeling steps, and why a transient model must be used. Findings of Fact #84 provides a clear description of why a steady state model is inappropriate for the Methodology requirements of determining the in-season reach gain impacts of curtailment. Findings of Fact #89 justifies the use of a transient model.

The steady-state model curtailment results have been clearly demonstrated to be in grievous error. No credible scientific assertion can justify the use of steady-state model to meet the requirements of the Methodology because a steady-state model cannot calculate in-season curtailment benefits. The Fifth Methodology Order's transient modeling requirement is a much more accurate representation of reality.

OPINION #4: Regardless of the prior modeling approaches required, the Fifth Methodology Order correctly requires that transient modeling has to be used to calculate the in-season benefits of groundwater curtailment.

Transient groundwater modeling is not a novel idea, having been implemented by IDWR and the water user community routinely for a decade or more. ESPAM 2.1 was approved in 2013 with a calibrated transient version utilizing monthly stress periods, similar to ESPAM 2.2. Since at least 2013, the transient version of ESPAM has been used by IDWR and the water user community to evaluate the impacts of transferring ESPA groundwater rights (IDWR, 2022). In these transfer modeling scenarios, ESPAM is used to calculate the transient impacts to Snake River reach gains/loses, similar to the curtailment benefit analyses described above.

IDWR has also developed a groundwater model for the Big Wood River alluvial aquifer system. In the 2021 administrative hearing, use of the transient version of the model was required for evaluation of in-season changes to pumping stresses.

OPINION #5: Transient groundwater modeling of the ESPA has been common practice for over a decade and is routinely utilized for evaluating the transient impacts of groundwater pumping on Snake River gains/losses.

e. 2023 As-Applied Order Groundwater Modeling Topics

On April 21, 2023, the Director of IDWR issued the 2023 As-Applied Order (IDWR, 2023b). The 2023 As-Applied Order determined a SWC forecasted supply with a 75,200 AF IDS. Utilizing the transient modeling analysis prescribed in the Fifth Methodology Order, a curtailment date of December 31, 1953 was identified as providing an increase in nBF-M gains sufficient to mitigate the IDS.

The 2023 As-Applied Order also presents a steady-state analysis of the proportionate share of the IDS. The analysis intended to associate the percentage of the IDS that water user entities were responsible for, thereby identifying the amount of IDS they are responsible for mitigating. The rationale for this approach is that the IDS represents the legacy impacts of many decades of groundwater pumping. The use of the steady-state version of ESPAM 2.2 is premised on the assumption that the aquifer, groundwater pumping, and other hydrologic model inputs are all at equilibrium conditions. While this is not accurate or true, it may be an acceptable simplification of the system because it likely does not lead to unacceptable errors when calculating the proportionate shares of specific water user entities.

IDWR's use of the steady-state model to represent decades of legacy pumping impacts highlights the multi-year challenge of protecting senior SWC water rights.

However, the proportionate share mitigation requirements identified needs to be limited to mitigation with direct delivery of surface water. Because the proportionate shares are determined using a steady-state model, they have no bearing on IDS mitigation with groundwater curtailment of the various water user entities.

OPINION #6: The 2023 As-Applied Order utilizes a steady-state model to calculate the proportionate share of IDS that various entities are responsible for mitigating. These proportionate share amounts can only be met by direct delivery of surface water and are not relevant to understanding the benefits of groundwater curtailment.

3. Groundwater Modeling Summary

Both the Fifth Methodology Order and 2023 As-Applied Order appropriately utilize the best available tool for evaluating ESPA hydrology, ESPAM 2.2. The evaluation of curtailment benefits requires the use of a transient model because of the in-season mitigation or curtailment requirements of the Fifth Methodology Order. The steady-state version of ESPAM 2.2 grossly exaggerates the benefits of curtailment for in-season mitigation and is inappropriate for determining a curtailment priority date. Because it uses the steady-state version of ESPAM 2.2, the proportionate share analysis presented in the 2023 As-Applied Order can only be used to determine the amount of surface water a water user entity could provide as mitigation of their portion of the IDS. The proportionate share analysis has no relevance to evaluating groundwater curtailment benefits.

References

IDWR, 2016. Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

IDWR, 2022. *Use of the ESPA Model Transfer Spreadsheet (ETRAN) & Mitigation Analysis Spreadsheet for Water Right Transfers in the Eastern Snake Plain Aquifer*, Idaho Department of Water Resources; October 2016, revised January 2022.

IDWR, 2023a. Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

IDWR, 2023b. Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)

McVay, 2018. *Evapotranspiration for the Enhanced Snake Plain Aquifer Model Version 2.2*, Idaho Department of Water Resources.

Sukow, 2012. *Comparison of Enhanced Snake Plain Aquifer Model Version 2.0 with Version 1.1 Via the Curtailment Scenario*, Idaho Department of Water Resources.

Sukow, 2021a. *Model Calibration Report, Eastern Snake Plain Aquifer Model Version 2.2*, Idaho Department of Water Resources.

Sukow, 2021b. *Comparison of Eastern Snake Plain Aquifer Model Version 2.2 with Version 2.1 via the Curtailment Scenario*, Idaho Department of Water Resources.

Sukow, 2021c. *Comparison of Superposition Model with Fully-Populated Model for Eastern Snake Plain Aquifer Model Version 2.2*, Idaho Department of Water Resources.

Sukow, 2021d. *Predictive Uncertainty Analysis, Eastern Snake Plain Aquifer Model Version 2.2*, Idaho Department of Water Resources.

Sukow, 2022. *SWC methodology calculation of priority dates for curtailment of junior groundwater users.* November 28, 2022 presentation slides, Idaho Department of Water Resources

Exhibit 3

Attachment A - Resume for David Colvin, P.G.

DAVE COLVIN, PG, PMP

Groundwater Team Leader | Senior Project Manager | Principal

EDUCATION

M.S. Environmental Science and Engineering, Colorado School of Mines, 2002

B.S. Geology, Syracuse University, 1996

PROFESSIONAL REGISTRATION

Professional Geoscientist
- AZ RG#68926
- ID #PGL-1453
- TX #11440
- WY #PG-3602
- KS #958

Project Management Professional (PMP) #1749472

PROFESSIONAL ACTIVITIES

AWRA Colorado
- 2017/2018 Past President

Water Education Colorado
- 2012 Water Leaders Program

Colorado Groundwater Association

National Groundwater Association

Dave is a Principal Hydrogeologist and Senior Project Manager with over 25 years of experience in groundwater hydrology, water resources, and environmental sciences. He supervises teams of diverse subject matter experts and provides technical leadership to solve today's water resource challenges. Dave serves as the Groundwater Team Leader responsible for managing staff, resources, projects and clients for a group of hydrogeologists. His technical expertise subject areas include water supply development, groundwater management, groundwater governance/administration, surface water/groundwater interaction, riverbank filtration (RBF), soil aquifer treatment (SAT), managed aquifer recharge (MAR), aquifer storage and recovery (ASR), aquifer characterization, groundwater modeling, and subsidence caused by groundwater pumping.

FEATURED PROGRAM & PROJECT EXPERIENCE

Surface Water Coalition, Idaho (2019-ongoing)

Lead Hydrogeologist and Project Manager providing litigation support related to water management of the Eastern Snake Plain Aquifer. Provides protection of surface water flows and senior surface water rights from negative impacts due to junior groundwater pumping. Serves on the Eastern Snake Plain Hydrologic Modeling Committee supporting MODFLOW modeling activities related to complex surface water/groundwater management and water rights administration. Also serves as the SWC representative on technical working groups guiding the implementation and adaptation of a settlement agreement between the SWC and Idaho Ground Water Appropriators including monitoring/evaluation of hydrology, pumping reductions, consumptive use and planning for managed aquifer recharge.

Salt River Project – Gila River Basin Adjudication, Arizona Superior Court Case W1-103, San Pedro Basin, AZ (2018 – ongoing)

Hydrogeologist providing groundwater analysis and modeling supporting adjudication of water rights in the San Pedro Basin. Tasks include oversight of groundwater model development, calibration and uncertainty analysis, and trial/litigation support. Provides protection of surface water flows, riparian habitat, and water rights from negative impacts due to groundwater pumping.

City of Aurora – Horizontal Well Project; Weld County, CO (2019 – ongoing)
Project Manager for feasibility evaluation and planning of two radial collector wells for the City's Prairie Waters System. The project targets increasing system yield while maximizing riverbank filtration water quality improvements. Investigation included hydrogeophysical surveys, exploratory drilling, aquifer testing, and groundwater modeling. Results included design of horizontal wells that maintain the existing system water quality while providing adaptable system operations that can increase yield during drought demands. Currently the Lead Hydrogeologist providing design phase services.

City of Northglenn – ASR Feasibility Evaluation and Pilot Testing (2020 – ongoing)
Lead hydrogeologist and Project Manager for feasibility investigation and pilot test system design services. Support includes ASR feasibility data analysis, water quality evaluation, DWR and EPA UIC permitting, pilot system design and test planning. The project will provide pilot storage of the City's fully consumable water rights, providing more surface storage space for other supplies. If recovered water quality is compatible, the pilot system will be converted into permanent infrastructure as the first phase of a larger ASR system.

Riverence Holdings LLC – Snake River Spring Supply Support (2022-ongoing)
Project Manager and lead hydrogeologist supporting multiple fish hatcheries throughout Idaho's Magic Valley. Provides hydrogeologic planning of spring fed aquaculture focusing on upgradient aquifer pumping and recharge impacts on water rights, water quality, and water supply reliability.

City of Aurora – Box Elder Basin Aquifer Storage and Recover (ASR) Feasibility Investigation and Pilot Testing (2018 – Ongoing)
Project Manager and lead hydrogeologist investigating the feasibility of recharging and storing water in the Box Elder alluvial aquifer at the Aurora Center for Renewable Energy (ACRE). Tasks included hydrogeophysical surveys, exploratory drilling/test pits, and infiltration testing. The project identified recharge as a viable option for innovative storage opportunities and has moved into a pilot test planning phase. Current services include recharge source water characterization, water rights and permitting planning, water quality evaluation, groundwater modeling, and pilot system design.

Dominion Water and Sanitation District – Groundwater Support; Douglas County, CO (2015-ongoing)
Lead Hydrogeologist providing Denver Basin and South Platte alluvial aquifer groundwater resources planning services including water rights evaluation, water quality assessment, well field yield estimation and project planning. Provided hydrogeologic and contractor management support during Denver Basin well site design, construction, testing, aquifer characterization, and sampling. Additional technical support included documentation for County hearings, interactions with local water agencies, and groundwater transaction due diligence.

Town of Erie – Water Supply Planning Support (2018 – ongoing)
Lead hydrogeologist and Project Manager providing groundwater support related to water supply planning. Services include aquifer characterization, water quality studies, horizontal directionally drilled well field design, ASR feasibility analysis, and water rights. Prepared Colorado Water Conservation Board and Division of Local Affairs grant applications to obtain project funding. The project will provide a 3,000 GPM expansion of the Town's water supplies.

Town of Castle Rock – Groundwater Support; Douglas County, CO (2015-ongoing)

Project Manager providing comprehensive groundwater support. Projects have included:

- Denver Basin Well Drilling, Testing, and Aquifer Storage and Recovery (ASR) – Support includes Denver Basin ASR planning/permitting, bidding services, contractor management, construction oversight, well/pump design, aquifer testing, and groundwater regulatory support.
- Alluvial Well Field Expansion and Rehabilitation – Project Manager for two projects aimed at improving yields in well fields affected by biofouling and performance issues. Oversaw construction and testing of six horizontal directional drilled (HDD) wells installed to increase yield, performance, and sustainability.
- City of Aurora and Town of Castle Rock – Lost Creek Underground Storage Pilot Project; Lost Creek Designated Basin, CO (2017-2018)
- Project Manager for aquifer characterization and evaluation of recharge potential for underground water storage pilot project. Obtained grant funding and facilitated multiple stakeholder project planning and implementation. The project identified important field investigation methods and results for storage related aquifer characteristics previously overlooked in desktop studies.

City of Aurora – Prairie Waters North Campus Master Plan; Adams and Weld Counties, CO (2017-2019)

Lead hydrogeologist providing master planning services for approximately 20 MGD expansion of the Prairie Waters Project – North Campus over the next 20 years. Facility expansion included riverbank filtration well field, pipelines, and storage reservoirs. Led facilities operational planning, supported water resource planning, gap analysis, and capital improvements planning.

Denver Water – Aquifer Storage and Recovery (ASR) Pilot Project, City and County of Denver, CO (2016-current)

Groundwater technical support and project management for ASR feasibility investigation. Provided Denver Basin aquifer characterization including exploratory borehole drilling, hydrogeophysical investigation (Nuclear Magnetic Resonance and conventional methods), and 3-D geologic modeling. Current services include an advisory role for installation of a multi-aquifer Westbay Denver Basin monitoring well.

City of Greeley – ASR Feasibility Evaluation (2019-2021)

Senior Technical Advisor for a project evaluating the feasibility of new and existing ASR projects in multiple bedrock aquifers. Includes evaluation of water quality, aquifer characteristics, well construction/testing, project planning, and regulatory support, including negotiating an EPA UIC Rule Authorization in less than two months.

Colorado Water Conservation Board - HB16-1256 South Platte Storage Study; CO (2018)

Lead hydrogeologist providing evaluation of underground water storage options for the Lower South Platte alluvial aquifer. Provided alluvial storage site evaluation, conceptual design, cost estimates, and comparison to surface storage options.

Aurora Prairie Waters Project – North Campus; Weld County, CO (2008)

Supported City of Aurora's Prairie Waters project near the South Platte River, CO. Acted as team liaison for multi-consultant, multi-disciplinary project team. Field investigation and construction tasks included field

oversight of drilling, well construction, pump/motor installation, aquifer testing, system start up testing, well field yield optimization, and geotechnical investigations. Support also included the design, construction, and operation of alluvial recharge and riverbank filtration pilot test facilities. Developed and implemented pilot test procedures, including tracer studies to assess flow paths, travel times, and stream/aquifer interaction. MODFLOW modeling support for the Prairie Waters Project included development of regional groundwater model for Colorado Division 1 case 2006CW104. Performed parallel processing model calibration using UCODE. Prepared expert and rebuttal reports, exhibits and materials used in settlement negotiations.

Eagle River Water and Sanitation District and Upper Eagle Regional Water Authority – Groundwater Support; Eagle County, CO (2010-ongoing)

Project Manager and lead Hydrogeologist for alluvial well field groundwater support. Projects have included:

- GWUDI Evaluation – Regulatory support, groundwater modeling and operational monitoring of alluvial well fields in support of CDPHE GWUDI evaluation
- Lake Creek Well Field Planning – Services included groundwater modeling, well drilling, aquifer testing, source water quality characterization, regulatory support for Eagle County 1041, CDPHE, and DWR permitting
- Well field maintenance and rehabilitation support – well rehabilitation in response to well issues including pump issues, casing holes, and water quality contamination

Dominion Water and Sanitation District – Groundwater Support; Douglas County, CO (2015-ongoing)

Denver Basin groundwater supply planning services including water rights evaluation, water quality assessment, well field yield estimation and project planning. Technical support included documentation for County hearings, interactions with local water agencies, and groundwater sale transactions.

City of Steamboat Springs – Infiltration Gallery System Expansion; Routt County, CO (2018-ongoing)

Project Manager for feasibility evaluation of alluvial groundwater supply expansion alternatives. Expansion options being considered include vertical and horizontal well options. Tasks included exploratory drilling, aquifer testing, groundwater modeling and conceptual expansion system design. Modeling was performed to optimize well siting to maximize yield, maintain water quality, and to minimize pipeline costs.

Texas Water Development Board – Statewide Subsidence Risk Evaluation (2018)

Technical advisor for risk evaluation of subsidence due to groundwater pumping in all Texas major and minor aquifers. The project used well lithology data with model predicted water level declines to create a statewide risk map and prioritized table. Recommended follow up actions for identified areas of risk. The project provided important subsidence risk information for statewide planning and local user considerations.

Village at Taos Ski Valley – Spring Water Supply Expansion; Taos County, NM (2018-ongoing)

Senior Technical Advisor providing groundwater evaluation into the management, protection and expansion of spring water supplies.

City of Phoenix – ASR Tracer Test Design; Maricopa County, AZ (2017)
Provided MT3D groundwater modeling to assist in aquifer characterization, travel time estimates, and the design of an ASR tracer injection test for feasibility. The testing was in support of the Northeast Phoenix Reclaimed Water Recharge and Recovery Study. The system is intended to create a potable water resource through Indirect Potable Reuse (IPR), provide additional non-potable supplies, and to mitigate land subsidence issues.

Groundwater Relief – Kutupalong Refugee Camp Groundwater Supplies; Cox's Bazaar, Bangladesh (2019)
Volunteer hydrogeologist providing well testing and water quality support to field geologists. The project is developing emergency water supplies for nearly 1 million Rohingya refugees who have fled religious persecution in Myanamar.

City of San Angelo – Riverbank Filtration Feasibility Evaluation; Tom Green County, TX (2018)
Provided feasibility evaluation, preliminary siting, design and costs for a potential riverbank filtration (RBF) well field near the Concho River. This information was used to evaluate RBF as an alternative for expansion of the City's water supply.

Tarrant Regional Water District – Cedar Creek Wetlands; Kaufman County, TX (2013)
Project manager and lead Hydrogeologist for riverbank filtration feasibility investigation along the Trinity River. Project tasks include geotechnical, hydrogeologic, and surface geophysical surveys, groundwater modeling, and design, construction and testing of riverbank filtration pilot test sites.

Rangen, Inc. – Water Rights Support; Gooding County, ID (2010-2016)
Expert witness providing testimony and trial support for a water rights hearing (IDWR Case No. CM-DC-2011-004) involving springs and complex surface water/groundwater interaction of the Eastern Snake Plain Aquifer. Represented a fish hatchery reliant on spring flow that was being impacted by groundwater pumping. Served on the Eastern Snake Plain Hydrologic Modeling Committee supporting MODFLOW modeling activities in the Eastern Snake Plain of Idaho.

Overturf, McGath, and Hull, P.C. – Stewart No. 1 Ditch Company; Pitkin County, CO (2017)
Expert witness support including expert and rebuttal reports, depositions, and settlement negotiations for a civil case involving alleged roadway water damage from ditch operations.

Fredrickson Law Offices – In-Play Golf; Weld County, CO (2017)
Expert witness providing expert and rebuttal reports, depositions, and trial support for a civil case involving alleged water damages from golf course irrigation.

Boulder Valley School District – Douglass Elementary Non-Tributary Well Support; Boulder County, CO (2018)
Project Manager for a non-tributary well application in the Boulder Complex Area of the Denver Basin Aquifers. Provided aquifer characterization and regulatory support leading to a non-tributary determination and permit approval.

Boulder County Parks and Recreation – Kenosha Ponds Groundwater Evaluation; Boulder County, CO (2016)
Expert witness providing hydrogeology water rights support for a Boulder County Parks and Recreation augmentation pond. Technical support included expert report writing and trial exhibit preparation for the hydrologic characterization of a recharge pond between two streams where the pond bottom was below the water table.

City of Burkburnett, Texas – Alluvial Well Field Evaluation; Wichita County, TX (2016)
Project Manager and groundwater lead for evaluation of underperforming well fields near the Red River. Wells ranged from 3-50 years old with a variety of issues causing low yields. Project tasks included well operational data integration, analysis, and development of alternatives to improve well yields.

Penrose Water District – Arkansas River Alluvial Well Field; Fremont County, CO (2016)
Groundwater technical management for planning, design, and construction of an alluvial well field for diversion of Arkansas River water rights. Tasks included aquifer characterization, water rights support, groundwater modeling, contractor management, well drilling, construction and testing.

Salt River Project – New River Agua Fria Underground Storage Project; Phoenix, AZ (2013)
Project involved optimization and in-channel expansion design for an existing recharge facility. Support included evaluation of operational data and adaptation of an existing MODFLOW model for operational optimization and feasibility testing.

City of San Marcos, Texas – Well Performance Investigation and Replacement Plan; Hays County, TX (2015)
Project Manager and groundwater lead for investigation into reduced yield problems for a well in the Edwards Aquifer. Well construction and operational data were analyzed to test viability of rehabilitation or equipment replacement. Provided ultimate solution of siting a replacement well in a more productive aquifer area.

Oakwood Homes – Neighborhood Scale Dewatering Systems and Water Rights; CO (2016)
Project Manager and groundwater lead for planning, design, and permitting of neighborhood scale dewatering systems. Managed project work including groundwater modeling, system design, data analysis, contractor coordination, DWR and CDPHE permitting, and water rights evaluations.

Winkler Services – Well Field Siting and Design; Wink County, Texas (2017)
Technical advisor for well field siting in the Pecos Valley Alluvium and Upper Dockum Aquifer. Support included project planning, aquifer characterization, and geologic modeling.

Donala Water and Sanitation District – Reuse Evaluation; El Paso County, CO (2015)
Preliminary feasibility investigation into riverbank filtration alternatives for indirect potable reuse. Evaluated hydrogeologic conditions for permitting, cost, and performance feasibility considerations.

Confidential Client; Groundwater Supply and Subsidence Analysis; AZ (2011)
Development of regional MODFLOW models used to estimate well field yield and land subsidence due to groundwater pumping in Arizona. Work included statewide study of subsidence-related empirical

relationships and prediction methods, aquifer characterization, 3-D geologic and groundwater flow modeling, automated model calibration and predictive uncertainty analysis using PEST, and numerical MODFLOW subsidence modeling.

City of Scottsbluff – Well Field Uranium Investigation and Monitoring; Scotts Bluff County, NE (2016)

Technical advisor for a project aimed at reducing uranium concentrations in an alluvial groundwater supply. Provided aquifer characterization and uranium monitoring data analysis.

Confidential Client - Oilfield Produced Water Infiltration Modeling, San Louis Obispo County, CA(2010)

Lead Hydrogeologist for the development of an engineering design MODFLOW-SURFACT model with the goal of infiltrating 13 acre-feet of water per day into the subsurface of a 200 acre alluvial site. Performed model calibration using PEST software in a parallel processing environment utilized 50 geologic conceptualizations for stochastic predictions of system performance.

CDPHE – Summitville Superfund Site; Summitville, CO (2008)

Provided support for abandoned mine hydrology and geochemistry, field sampling, monitoring and mine facility inspection, and database support. The project goal was to monitor and minimize mine waste impacts on the Alamosa River.

Various Mines – Groundwater Modeling and Analysis; Basin and Range Province; NV (2010)

Provided MODFLOW modeling and water balance studies in support of mine water management and regulatory reporting. Analyses included point flow surface water modeling to evaluate stream gain/loss; detailed water balance quantifications; well inventories and pumping estimates; groundwater underflow assessments.

Miron Construction - Laramie-Fox Hills Well; Hudson, Colorado (2008)

Assisted in design and field engineering for the construction and testing of a 960-foot deep, large capacity, municipal/industrial, Laramie-Fox Hills water supply well at the Hudson Correctional Facility.

Perini/US Army Corps of Engineers – Groundwater System Design and Optimization; Baghdad, Iraq (2007)

MODFLOW modeling support for the U.S. Agency for International Development in Baghdad, Iraq. Developed a numerical groundwater model for the optimization of water supply well locations and pumping operations. Main objectives were to maximize well yields while minimizing differential land subsidence across newly constructed East End Barracks.

Colorado Haiti Project (Volunteer Position); Petit Trou de Nippes, Haiti (2013)

Technical advisor for groundwater development, management, and protection in a rural, developing area of Haiti.

Water For People Groundwater Management Project (Volunteer Position); San Pedro Sula, Honduras (2008)
Technical advisor for development of a scope of work for a participatory groundwater management plan aimed at restoring and protecting an over utilized alluvial aquifer in a developing region.

ASARCO - California Gulch Superfund Site; Leadville, Colorado (2000-2005)
Conducted environmental sampling for the Kids First Program to identify and address sources of lead exposure for children in residential areas. Provided statistical analysis and reporting for evaluation of program effectiveness. Designed sampling plan and performed soil sampling and analysis to delineate extent of metals contamination at the Arkansas Valley Smelter Operable Unit. Provided technical support for hydrogeological and geochemical characterization of the Apache Tailings site; and implemented the surface water and groundwater performance monitoring program to assess the effectiveness of the remedial action. Conducted synoptic surface water flow measurement and water quality sampling.

Asarco - Omaha Lead Site, Omaha, Nebraska (2003)
Assisted in the development of program to identify sources of lead exposure for children in residential areas.

Mine Waste and Tailings Pile Sites, Various Locations (2000-2004)
Performed hydrologic evaluation of remedial alternatives for repository evaluation using Hydrologic Evaluation of Landfill Performance (HELP) model.

Industrial Groundwater Contamination Sites, Various Locations (2000-2005)
Performed groundwater modeling to assist design of groundwater extraction remediation wells using MODFLOW modeling code.

EPA - Vasquez Boulevard and Interstate 70 Superfund Site, Denver, Colorado (2002)
Designed, directed, and performed environmental sampling for project intended to identify sources of lead and arsenic exposure for children in residential areas.

Hertz Rent-a-Car - Former Underground Storage Tank, Colorado Springs, Colorado (2002)
Project Hydrogeologist and technical lead for the characterization, monitoring, and remediation of hydrocarbon contaminated soils and groundwater at a former underground storage tank site. Performed quarterly monitoring and reporting; developed and implemented an in-situ chemical oxidation remediation program.

R&R Super Service - Former Underground Storage Tank, Arvada, Colorado (2002)
Project Manager and technical lead for the characterization and remediation of soils and groundwater contaminated by petroleum hydrocarbons at a former service station. Responsibilities included client and regulatory interaction; site characterization activities to delineate the nature and extent of contamination in soil and groundwater; modeling of vapor and mass extraction rates using VENT2D; respirometry testing to quantify biodegradation rates in vadose zone soils; startup testing; operating, maintaining, and monitoring of an air sparge/soil vapor extraction system.

City and County of Denver - Former Stapleton International Airport Remediation; Denver, Colorado (2000)
Served as a hydrogeologist conducting field investigations to define nature and extent of hydrocarbon contamination and to determine remediation. Field tasks included lithologic logging with a hollow-stem auger and direct-push drilling rigs; soil, groundwater, and soil vapor testing, remediation system construction/operation/maintenance, data evaluation and reporting.

National Park Service – Mt. Rainier National Park, Longmire, Washington (1996-1997)
Biologist and crew leader for aquatic ecosystem studies in Mt. Rainier National Park. Conducted field surveys and sub-alpine wetland monitoring. Performed aquatic field sampling, wetland classification, biological species identification, and aquatic laboratory analyses.

PRESENTATIONS & PUBLICATIONS

Colvin, Dave, 2020. "Moving from Conflict to Collaboration: The Role of MAR in Mitigating Groundwater Pumping Impacts to Surface Water" 17th Biennial Symposium on Managed Aquifer Recharge. *Tempe, AZ.*

Colvin, Dave, 2020. "Drawing the Line in the Sand between Underground Water Storage and Augmentation Recharge." American Water Resources Association – Colorado Chapter & Colorado Groundwater Association Joint *Annual Symposium. Denver, CO*

Colvin, Dave, 2019. "Demonstrating Dominion and Control – Moving from Black Magic to Understandable Science." American Groundwater Trust Annual Colorado Groundwater *Conference. Denver, CO.*

Colvin, Dave, 2019. "Now We Know What We Don't Know: An ASR Regulatory Update". Colorado Groundwater Association *September Meeting. Denver, CO.*

Colvin, Dave, 2019. "The Evolution of Colorado Underground Water Storage Administration". American Water Resource Association / Colorado Groundwater Association 2019 Joint Annual *Symposium. Denver, CO.*

Colvin, Dave, 2018. "Technical Considerations for ASR Planning in Colorado's Front Range". American Groundwater Trust Annual Colorado Groundwater *Conference. Denver, CO.*

Colvin, Dave, 2018. "ASR Panel Discussion: The Revolution of Subsurface Water Storage". American Water Works Association ACE18 *Conference. Las Vegas, Nevada.*

Colvin, Dave, and Keester, Michael, 2017. "Applying Web-Based Information Management Tools to Increase Efficiency and Expand Opportunities for Groundwater Conservation Districts". Texas Association of Groundwater Districts Ground*water Summit. San Marcos, TX.*

Colvin, Dave, and Pence, Rachel, 2017. "Using NMR and Hydrogeophysics to Evaluate ASR Feasibility in the Denver Basin". 2017 NGWA Conference on Hydrogeophysics and Deep Groundwater, Denver, CO. (https://ngwa.confex.com/ngwa/hdg2017/webprogram/Paper11286.html)

Colvin, Dave, and Justus, Heather, 2016. "Benefits of Directionally Drilled Alluvial Well Lateral Arms in the Town of Castle Rock". 2016 RMSAWWA/RMWEA Joint A*nnual Conference, Keystone, CO.*

Colvin, Dave, and Furnans, Jordan, 2016. "Can/Should Texas learn from Colorado? A primer on groundwater-surface water interactions and regulation methods". 2016 Texas Water Conservation Association Spring meeting, Woodlands, TX. (http://www.slideshare.net/TWCA/twca-annual-convention-canshould-texas-learn-from-colorado-j*ordan-furnans-and-dave-colvin)*

Colvin, Dave, 2015. "Methods for Confident Model Predictions and Integration". Colorado Water Congress 2015 Annual Conference; DARCA Workshop Series, "The Next Step: Modeling Col*orado's Water Plan", Denver, CO.*

Colvin, Dave, 2014. "Groundwater Challenges and Solutions for Colorado Watersheds." 2014 Colorado Sustaining W*atersheds Conference, Avon, CO.*

Colvin, Dave and Loopesko, William, 2014. "Advantages of Alluvial Aquifer Storage Alternatives for Managing Hydrologic Extremes and Future Water Supply Risks." 2014 Upper Colorado River Basin Water Forum, Grand Junction, CO.

Colvin, Dave, 2014. "Groundwater Solutions for Indirect Potable Reuse." 2014 Rocky Mountain Wa*ter Reuse Workshop, Golden, CO.*

Colvin, Dave, Bauer, Jacob, and Noack, Tim, 2013. "Effective Tools and Project Planning for Riverbank Filtration Feasibility Investigation" Poster session at 2014 Texas Water, Dallas, TX. (http://s3.amazonaws.com/eventmobi-assets/events/txwater14/documents/person/1366969/201404_RB*F_Feasibility_Poster_Final.pdf)*

Colvin, Dave, and Bauer, Jacob, 2013. "Cost Effective Feasibility Investigation of Natural Subsurface Reuse Treatment Systems." Poster session at the 2013 National Wat*er Reuse Symposium, Denver, CO.*

Colvin, Dave, Bauer, Jacob, and Neupauer, Roseanna, 2013. "Riverbank Filtration Feasibility Modeling." MODFLOW and More 2013. Integrated Groundwat*er Modeling Center. Golden, CO.*

Colvin, David C., 2012. "Comparison of One and Three Dimensional MODFLOW Subsidence Results." 2012 Groundwater Summit, National Groundwate*r Association, Westerville, OH.*

Colvin, David C., 2012. "One Dimensional MODFLOW Modeling of Land Subsidence Due to Fluid withdrawal." GSA 2012 Cordilleran Section Meeting, Vol. 44, No. 3. Geological Society of America. Boulder, CO.

EXPERT TESTIMONY

Dave has provided expert testimony in trial or depositions in the following cases:

Idaho Surface Water Coalition; Idaho Department of Water Resources Docket No. AA-GWMA-2016-001, Order Designating the Eastern Snake Plain Aquifer Groundwater Management Area, February 2020

Stewart No. 1 Ditch Company; Pitkin County Case No: 2014CV30084, Pitkin County Board of County Commissioners v. Brothers, et. al., September, 2015.

In-Play Golf, Inc; Weld County Case 12CV727, Helen Hawkins et. al. v. Vista Ridge Development Corporation et. al., August, 2015.

Rangen, Inc.; In the Matter of Application for Water Rights Permit No., 36-17011, February, 2015.

Rangen, Inc.; Idaho Department of Water Resources Case No. CM-DC-2011-004, Distribution of Water To Water Right Nos. 36-02551 and 36-07694, May, 2013.

EXPERT REPORTS

Dave has performed groundwater analysis, provided assistance in settlement negotiations, and authored or contributed to reports in the following cases.

Idaho Surface Water Coalition; Idaho Department of Water Resources Docket No. AA-GWMA-2016-001, Order Designating the Eastern Snake Plain Aquifer Groundwater Management Area, February 2020

Town of Erie; CO Division 1 Case Nos. 2019CW3063 and 2019CW3064, Application for Underground Water Rights and Plan for Augmentation, 2020.

Salt River Project; AZ Big Chino Cooperative Agreement #1, Evaluation of Big Chino Water Ranch impacts on Upper Verde Springs discharge, 2016 - ongoing.

Salt River Project; AZ Gila River Adjudication Contested Case No. W1-103, Groundwater adjudication and subflow depletion evaluation, 2017 – ongoing.

In-Play Golf, Inc; Weld County Case 12CV727, Helen Hawkins et. al. v. Vista Ridge Development Corporation et. al., August, 2015.

Stewart No. 1 Ditch Company; Pitkin County Case No: 2014CV30084, Pitkin County Board of County Commissioners v. Brothers, et. al., September, 2015.

Rangen, Inc.; In the Matter of Application for Permit No., 36-17011, February, 2015.

Rangen, Inc.; Idaho Department of Water Resources Case No. CM-DC-2011-004, Distribution of Water To Water Right Nos. 36-02551 and 36-07694, May, 2013.

Boulder County Parks and Open Space; CO Division 1 Case No. 2010CW320, Change of Use and Plan for Augmentation for Kenosha Ponds Open Space, 2013.

City of Aurora; CO Division 1 Case No. 2006CW104, Aurora's Prairie Waters Project, 2007.

Exhibit 3

Attachment B - Resume for Erick Powell, Ph.D., P.E.

G. ERICK POWELL, PH.D., P.E.

Brockway Engineering, PLLC
2016 Washington St N, Suite 4 Twin Falls, Idaho 83301
(208) 736-8543 • erick.powell@brockwayeng.com

Education

Ph.D. The Ohio State University Agricultural Engineering 2006
Advisor: Dr. Andrew D. Ward
Title: *Evaluating geomorphology and water quality of channel-forming discharges in Ohio headwater streams*

MS Brigham Young University Civil and Environmental Engineering 2002
Advisor: Dr. E. James Nelson
Title: *Bathymetry delineation and data collection preparing a CE-QUAL-W2 model on Scofield Reservoir, Utah*

BS Brigham Young University Major: Civil and Environmental Engineering 2001
Minor: Agronomy

Professional Experience

Project Engineer 2006 - Present
Brockway Engineering, PLLC
Twin Falls, Idaho

Project Engineering on hydrologic and hydraulic engineering design tasks, including: well design, well construction, well testing, water rights, water right transfers, pipeline design, water distribution systems, stream channel evaluation, floodplain assessment, irrigation water demand, and potable water demand.

P.E. Registrations in Idaho (13592), Utah (4859937-2202), Nevada (028772) and Oregon (91026)

Graduate Research Assistant 2002 - 2006
Department of Food, Agricultural, and Biological
Engineering The Ohio State University, Columbus, Ohio

Research consisting of: 1) evaluation of channel forming discharges, 2) two-stage channel design procedures, 3) nutrient performance within two-stage agricultural channels, and 4) theoretical nutrient spiraling under restored riparian projects.

Areas of Expertise

Groundwater modeling, flood plain evaluations, stream bank restoration and protection, surface water quality modeling, and water right transactions. Numerical groundwater flow simulations using FEMWATER, MODFLOW, and Groundwater Modeling System (GMS).

Professional Associations

American Society of Civil Engineers (ASCE)
American Ecological Engineering Society (AEES)
American Society of Agricultural and Biological Engineers (ASABE)
American Society for Engineering Education (ASEE)
Alpha Epsilon (ASABE Honor Society)

Selected Publications

Powell, G.E., A.D. Ward, D.E. Mecklenburg, and A.D. Jayakaran. 2007. Two-stage channel systems: Part 1, a practical approach for sizing agricultural ditches. J. of Soil and Water Conservation. 62(4):pp.

Powell, G.E., A.D. Ward, D.E. Micklengburg, J. Draper, and W. Word. 2007. Two-stage channel systems: Part 2, case studies. J. of Soil and Water Conservation. 62(4):pp.

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Exhibit 4

Surface Water Coalition Expert Report on Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

Docket No. CM-DC-2010-001

Charles G. Brockway, Ph.D., P.E., Brockway Engineering PLLC
G. Erick Powell, Ph.D., P.E., Brockway Engineering PLLC
David Shaw, P.E., ERO Resources Corporation

May 30, 2023







A. Evaluation of TFCC Project Acres

The project irrigated area for TFCC utilized in the Fifth Methodology is 194,732 acres. This figure is based on detailed aerial photo inspection and a delineation created by TFCC consultants in 2013. The acreage decreed in the Snake River Basin Adjudication is 196,162 acres. IDWR performed independent delineations in 2011 and 2017 in the course of developing its "irrigated lands dataset." This work involved manual inspection of aerial photography. Shapefiles developed from the 2011 and 2017 work indicate irrigated areas of 179,486 acres and 180,956 acres, respectively, or about 7 to 8% less than the 2013 acres used in the Fifth Methodology.

Raster files were provided by IDWR and shape files were created using ArcMap. The shape files were intersected with the 2013 acres to create shape files representing the difference between the two delineations. The 2011 and 2017 difference shape files were nearly identical. The 2017 difference shape file is shown in Figure 1.

Inspection the difference shape files reveals that the primary reason for the irrigated area difference is the removal of the following categories of areas: Ditches and ponds, fields that are apparently unirrigated, pivot corners, developed areas around the fringe of municipalities, and roadways.

Numerous factors influence the determination of acreage within a large canal company where shareholders operate independently from the company in terms of irrigation practices:

1. Ditches, ponds, or other waterways, whether private or company-owned, represent real evaporative and evapotranspirative demands on the system, just as much as irrigated lands. Water must be diverted from the river in order to meet these operational demands.

2. Fields are not irrigated every single year. Fields that look unirrigated one year may be irrigated the next year and may have been left idle due to a limited water supply and the desire to use available water on a higher value crop. And some lands which appear unirrigated may actually be lightly irrigated. An example of this potential error is illustrated in Figure 2, which shows a portion of the service area west of the City of Twin Falls in which clearly-irrigated fields were excluded from the 2017 delineation.

3. An aerial photo represents only a snapshot in time. Fields that look unirrigated in the snapshot of an aerial photo may actually be irrigated that year (for example, the photo may have been taken prior to planting or after harvest).

4. Development of an agricultural parcel into a residential area cannot be assumed to reduce the water demand. For example, a 40-acre parcel with 40 canal shares might be developed into a parcel containing 20 acres of actual irrigation after subtracting rooftops and hardscape. However, the 40 shares are still appurtenant to the parcel and the company is obligated to deliver them. Furthermore, the residential development will very likely have a peak demand at least as large as the previous agricultural use even though the irrigated acreage is less, due to the nature of small residential systems.

5. Many growers will double-crop, or may leave acreage fallow and put water on other land at the same on-farm efficiency. This can frequently occur when land is not fully covered by canal shares, and can lead to the appearance of unirrigated area.

6. Transfers of shares routinely occurs within a canal company in accordance with internal policies and procedures. These transfers can occur within a season from one season to the next. This is another reason why a snapshot in time may not provide an accurate picture of irrigated acreage.

7. The company's obligation is to be prepared to deliver water under all outstanding shares, regardless of the status of the underlying land. The company has no way of knowing whether land covered by shares will or will not be irrigated and must prepare to meet the share delivery obligation.

In addition to the factors above, one technical factor also causes potential errors in the 2017 irrigation delineation. Registration differences between the public land survey system lines and the aerial photo can result in different delineations particularly at the edges of fields where roadways exist. For example, Figure 3 shows a snippet of area near Filer. The aerial photos used for the 2013 and 2017 delineations are rectified differently against the section lines. This resulted in roadway areas being removed in the 2017 delineation, but the 2013 roadways areas were not added back in. The results in a double-counting of non-irrigated road areas.

Given the factors described above, together with the uncertainty in calculated irrigated acreage from aerial photo snapshots, the acreage used in the Fifth Methodology is reasonable and there is no clear and convincing evidence at this time to adopt a different figure.

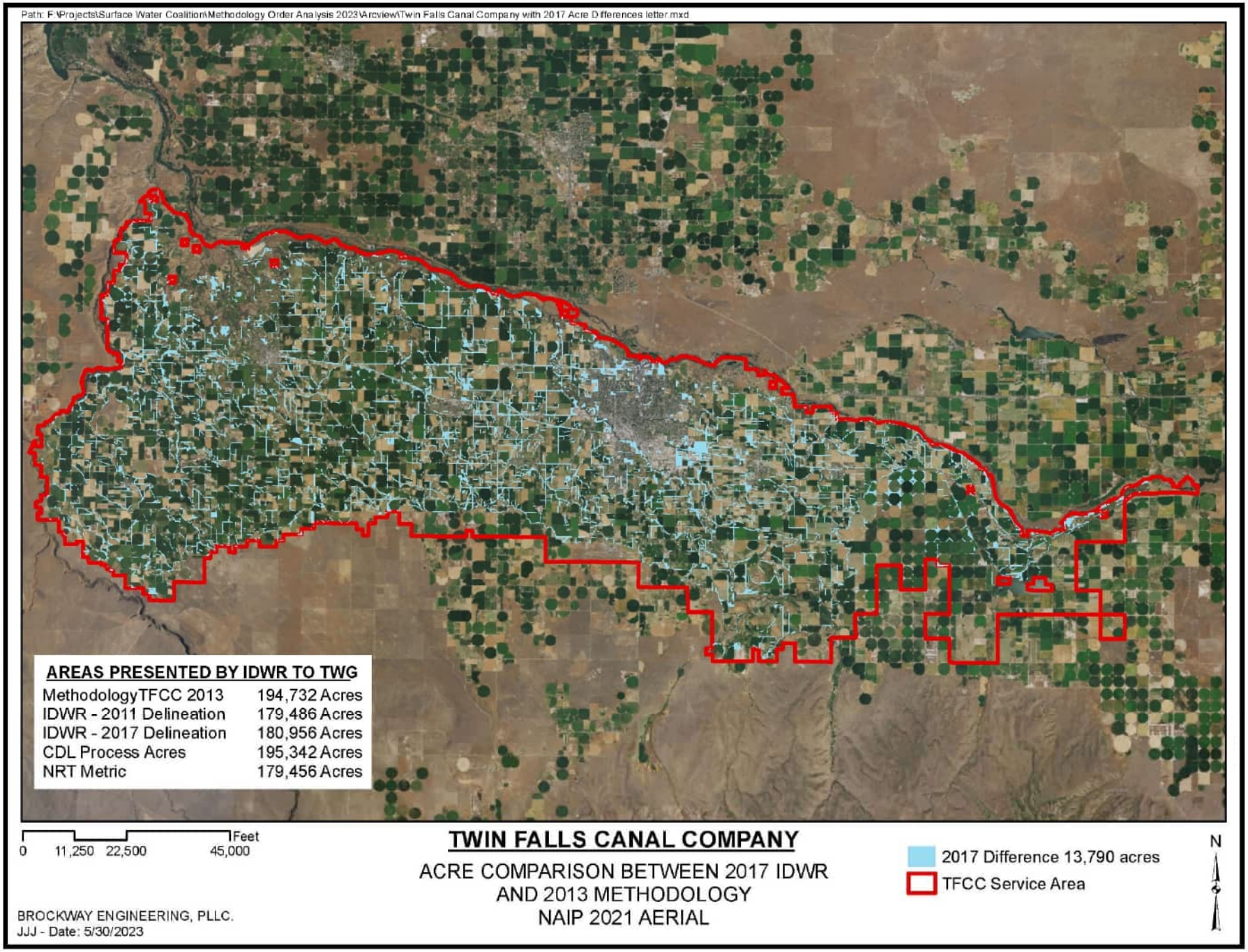

Figure 1. Map showing difference between IDWR's 2017 irrigated acreage delineation and the acreage used in the Methodology.

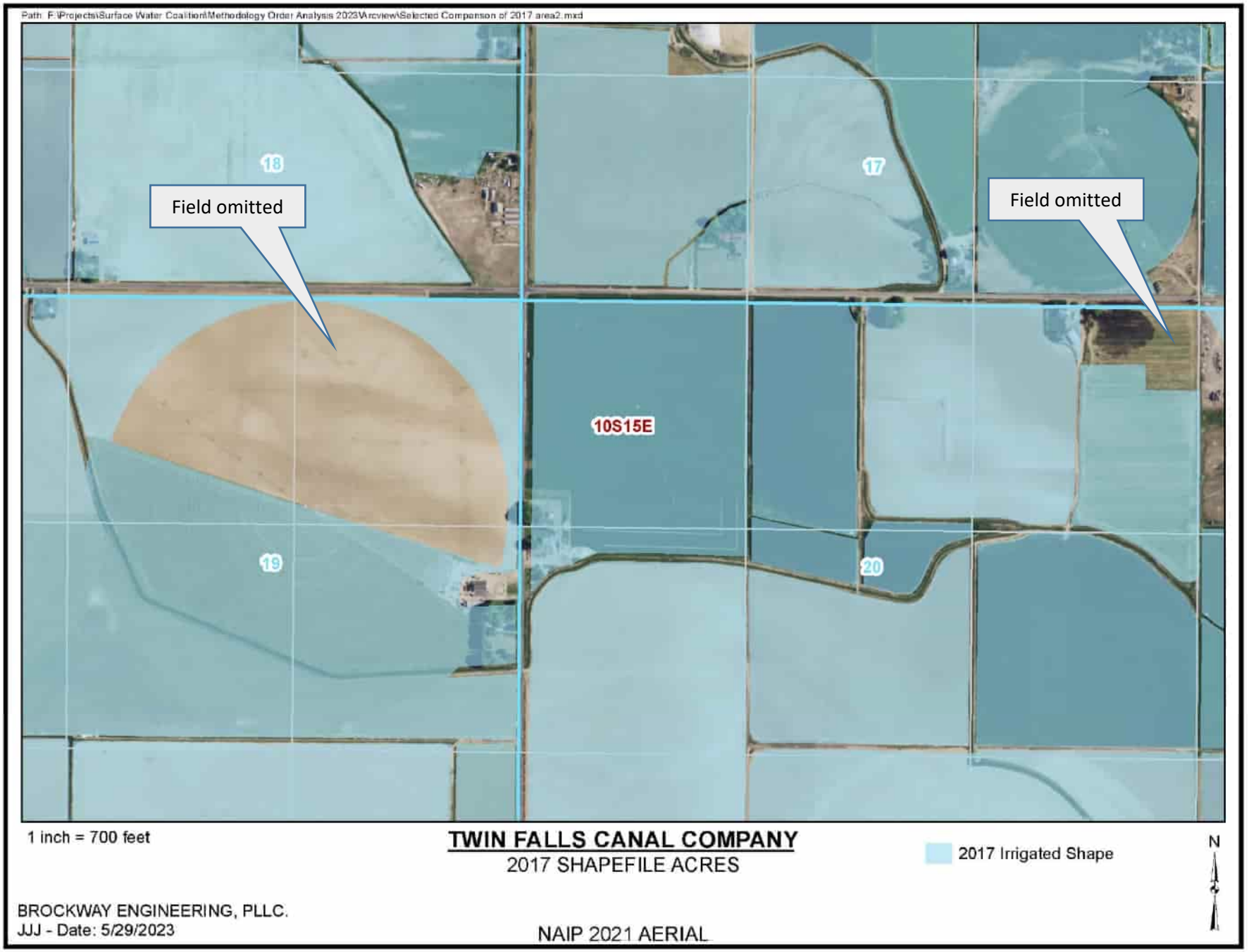

Figure 2. Example of irrigated fields omitted in IDWR's 2017 irrigated lands shape file.

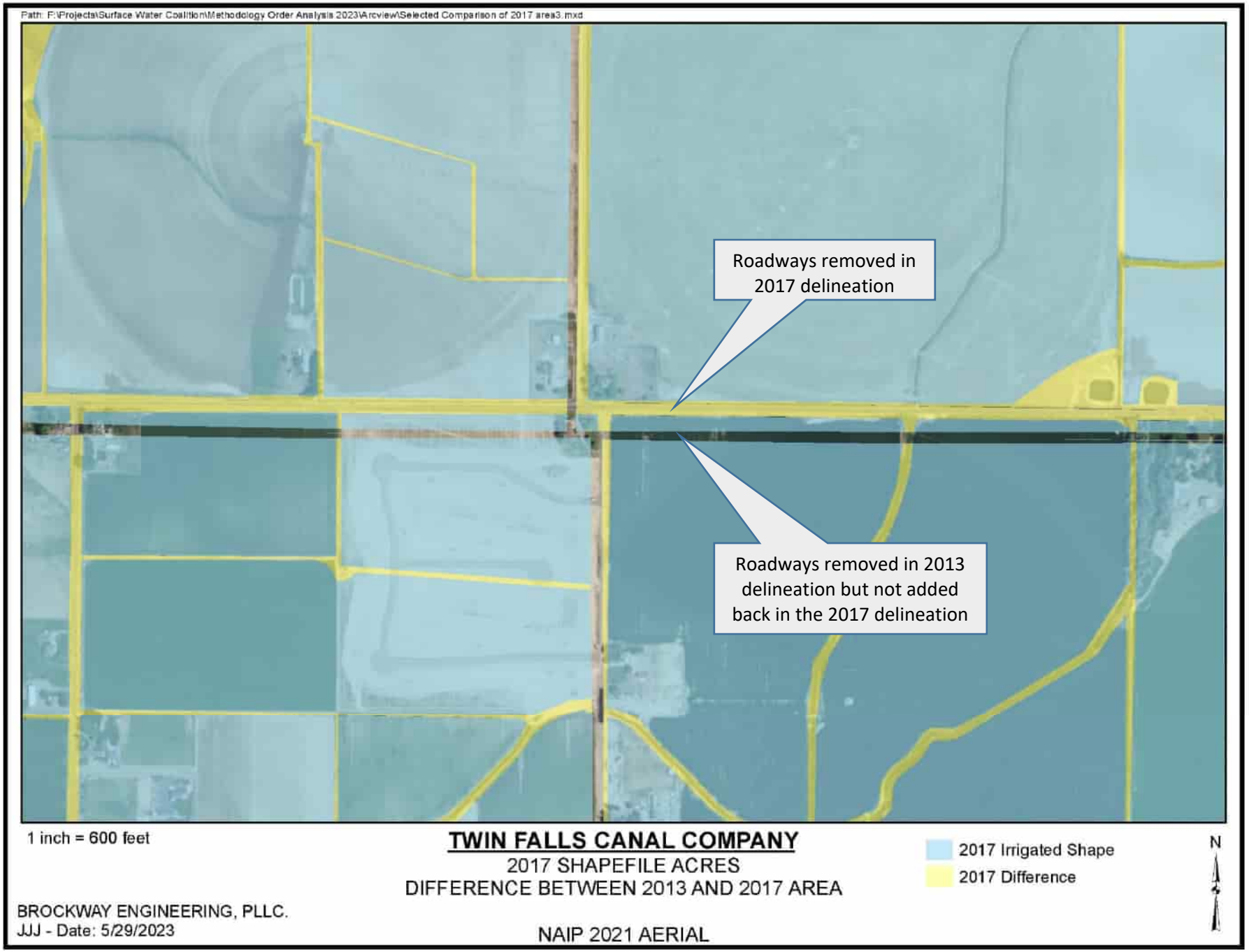

Figure 3. Example of PLSS registration difference that results in over-counting of acreage removed.

B. Trend in Twin Falls Canal Company Diversions

There have been statements alleging that the Twin Falls Canal Company (TFCC) diversions have been increasing over time. In order to evaluate these statements, the TFCC annual diversion data was analyzed for trends using a Mann-Kendall analysis. The Mann-Kendall test is a nonparametric statistical method to identify the presence of a significant trend in data over time.

TFCC diversion data were downloaded from Water District 1 (2023) to obtain diversion volume from 1977 through 2022. IDWR has produced adjusted diversion volumes accounting for wheeled or recharge water for the years 2000 through 2021. When wheeled or recharge water volume existed during specific year, those volumes were subtracted from the annual TFCC diversion volumes. The annual Water District 1 volumes, IDWR adjustments, and adjusted annual TFCC volumes are presented in Table 1 and plotted in Figure 4.

Table 1. Annual TFCC Diversion Volumes (ac-ft) from 1977 through 2022, IDWR wheeled or recharge water volumes, and adjusted TFCC annual volumes.

Year	WD1 Volume (acft)	IDWR Adjustments (acft)	Adjusted Volume (acft)	Year	WD1 Volume (acft)	IDWR Adjustments (acft)	Adjusted Volume (acft)
1977	1,023,025	0	1,023,025	2000	1,160,453	0	1,160,453
1978	1,024,890	0	1,024,890	2001	1,012,202	0	1,012,202
1979	1,094,456	0	1,094,456	2002	1,009,091	0	1,009,091
1980	1,071,378	0	1,071,378	2003	1,046,623	0	1,046,623
1981	1,140,875	0	1,140,875	2004	1,001,779	0	1,001,779
1982	1,014,250	0	1,014,250	2005	918,012	0	918,012
1983	1,053,918	0	1,053,918	2006	995,823	0	995,823
1984	986,043	0	986,043	2007	1,048,965	0	1,048,965
1985	1,104,979	0	1,104,979	2008	1,094,941	0	1,094,941
1986	1,132,849	0	1,132,849	2009	1,043,006	0	1,043,006
1987	1,118,738	0	1,118,738	2010	1,048,927	19,282	1,029,645
1988	1,054,224	0	1,054,224	2011	1,059,071	4,636	1,054,435
1989	1,130,828	0	1,130,828	2012	1,097,878	8,609	1,089,269
1990	1,177,216	0	1,177,216	2013	1,062,417	4,261	1,058,156
1991	1,132,599	0	1,132,599	2014	1,119,390	4,980	1,114,410
1992	978,113	0	978,113	2015	1,135,261	32,849	1,102,412
1993	1,056,573	0	1,056,573	2016	1,052,908	7,341	1,045,567
1994	1,060,839	0	1,060,839	2017	1,055,504	1,776	1,053,728
1995	1,076,070	0	1,076,070	2018	1,129,733	2,560	1,127,173
1996	1,162,930	0	1,162,930	2019	1,080,033	4,060	1,075,973
1997	1,108,898	0	1,108,898	2020	1,209,490	3,104	1,206,386
1998	1,026,848	0	1,026,848	2021	1,091,457	6,867	1,084,590
1999	1,099,775	0	1,099,775	2022	956,921	0	956,921

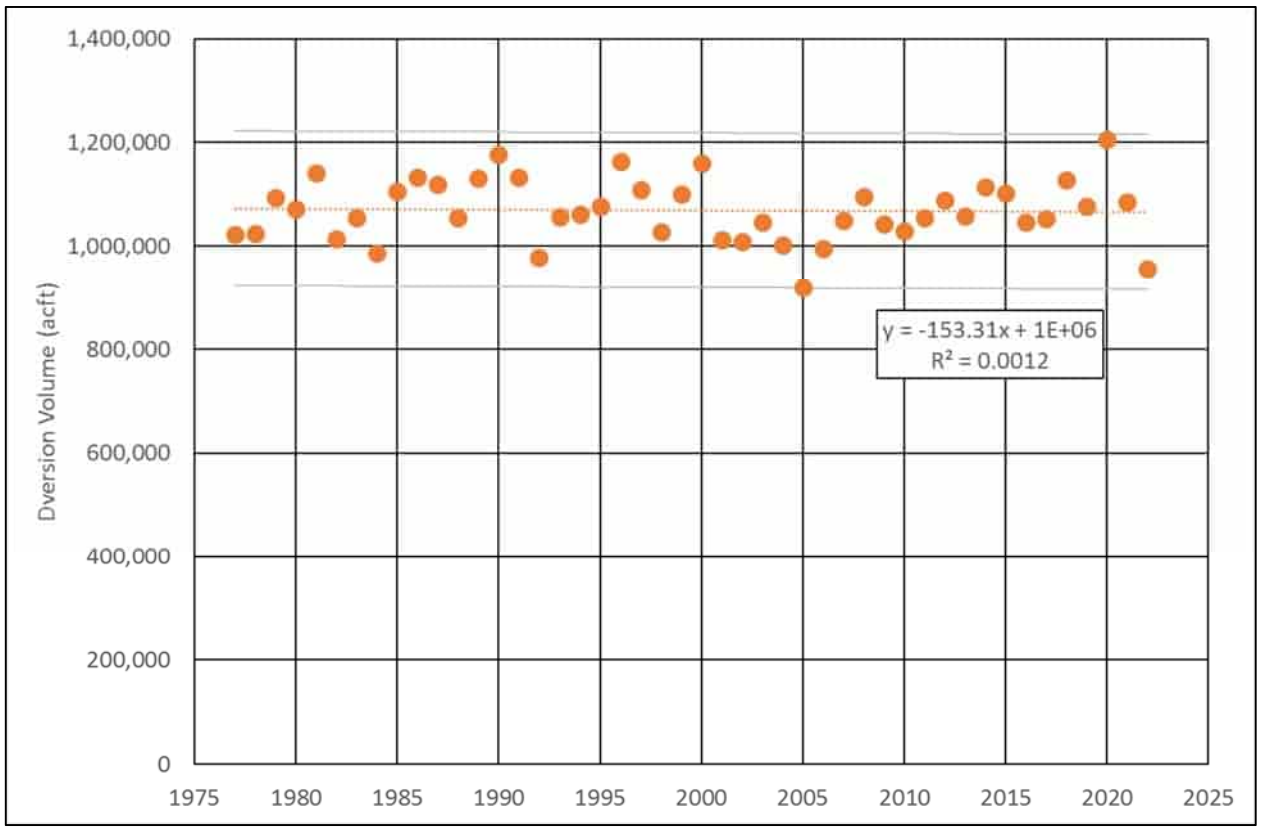

Figure 4. Adjusted annual TFCC diversion data from 1977 through 2022, presented in Table 1.

Figure 4 also includes a linear regression line through the data set, which is relatively level, but does have a slight downward slope. The R-squared value is 0.0012, which indicates that the linear regression equation is a poor estimator of the annual data points. However, all annual diversion data are within plus or minus 150,000 ac-ft of the estimated line, as shown in Figure 4.

Adjusted annual delivery data in Table 1 were subjected to the Mann-Kendall analysis to determine if there is a statistically significant trend in the diversion data. Based on the 46 years of data, the Mann-Kendall resulted with a Mann-Kendall T of -0.0126 and a p-value of 0.90954 (p-values of less than 0.05 are considered to have a significant trend), indicating that there is no statistically significant trend in the data set, and if any trend exists, it is a very weak downward trend. TFCC diversion data does not support the statements that the TFCC diversion are increasing over time.

C. SWC Crop Water Needs

Crop water needs (CWN) are a fundamental element in the determination of irrigation demand and irrigation project efficiency, E_p. Crop water needs are a function of weather conditions, i.e., temperature and precipitation, and crop mix since different irrigated crops require differing amounts of irrigation water at differing times of the year to meet the Et requirement of the individual crop.

IDWR has used the AgriMet stations at Twin Falls Kimberly and Rupert to determine temperature, precipitation and Et although there were discussions during the recent TWG meetings of changing to near real time (NRT) METRIC and PRISM to determine Et and precipitation. IDWR concluded they were not yet ready to change from the current use of the data from the AgriMet stations.

Determining the crop mix for the various SWC members has changed over the years as new data and data collection methods have become available. Prior to 2007, crop mix was based on NASS data reported on a county wide basis. Some, probably most, of these data were self-reported by growers with little verification by NASS. IDWR then prepared crop mix estimates for each SWC member by averaging the crop mix from the counties within which a SWC member's service area was located. The process of averaging the percentage of crop mix from the various counties has occurred since the methodology order was first implemented. The current DS RISD Calculator_2022 (Calculator) contains the crop mix averages for the period 2000 through 2014 as the basis for determining SWC member crop mix for that period.

As the Calculator currently exists, the CWN for the period 2000 – 2014 are based on the average crop mix for that period and the percentages of crop acreage that have changed in the mix over time are now lost in the calculation of crop water need on an annual basis. In other words, E_p is based on the adjusted irrigation demand for a given year in the 2000 - 2014 period, compared to the average crop mix for that period.

These conditions make any E_p trend analysis for the period 2000 – 2014 of little value because the crop mix to determine the CWN for any year has been lost in the Calculator.

Also during this period, the acreage used for TFCC was 183,589, for BID was 44,715 and for MID was 70,144 acres. The acreages for all 3 entities were increased beginning in 2015.

Since 2015 the CWN for a given year is based on the prior 3-year rolling average of the crop mix reported by the cropland data layers (CDLs) from NASS. The 3-year rolling average may have been implemented since the CDL data are not available until after the fact and the 3-year average is a method of estimating the crop mix for the current year to estimate the current CWN. The SWC list of issues urged the CWN need for each year be recalculated when the CDL data for that year become available, that way the CWN for each year used in the long-term average will be based on the crop mix for the year and not be based on the average crop mix of the 3 prior years.

An example of how the 3-year rolling average does not represent the following year Et, let alone the crop mix, is shown in Figure 5 below.

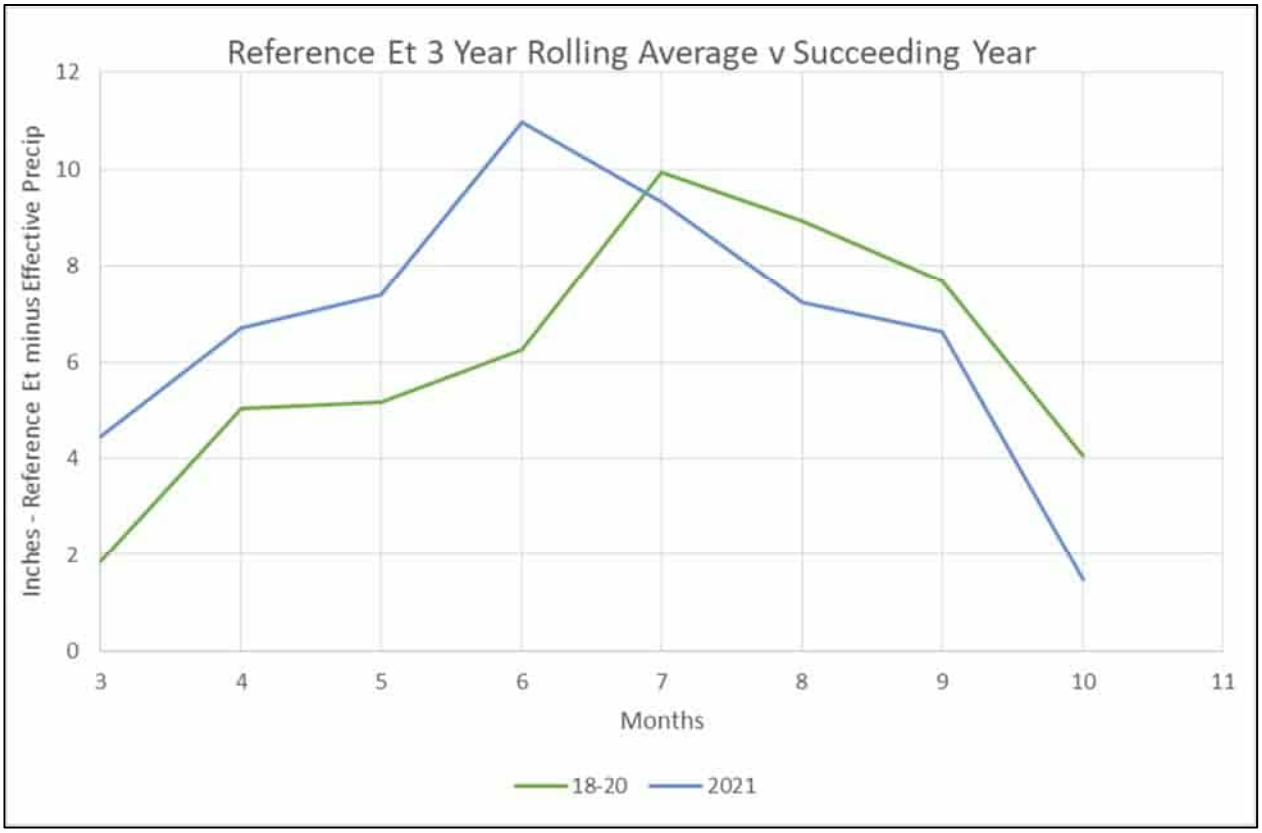

Figure 5. Reference ET 3-year rolling average vs. succeeding year.

Figure 5 shows the disconnect between the 3-year average currently used by IDWR to estimate the CWN for the following year and then not updating the efficiency calculations with the crop mix from the CDL data when those data become available. In this case, the calculated efficiency for the first part of the irrigation season will be artificially low since the actual water need will be over 1/3 higher during that part of the year than the Methodology indicates is required.

The recommendation to base the current year projected E_p on a 15-year rolling average seemed reasonable because that period covers the time when CDL data are available beginning in 2007. However, the 2007 – 2014 E_p calculations are not based on that 8-year period, but rather on the 2000 – 2014 period including years before CDL data became available and crop mix determinations were based on county averages.

As illustrated by the example above, if the 15-year rolling average is going to be implemented, the E_p needs to be recalculated for those 15 years so actual efficiencies are used instead of the rolling average.

C.1. Efficiency Trends Calculated with Existing Data Are Not Reliable

The ground water users are making the argument the efficiency trends since 2016 don't show efficient use of the available water supply or diligent management by the SWC Managers. As illustrated above, attempting to trend E_p for the SWC is not reliable due to the current method of

calculating CWN. In Manager Barlogi's deposition we heard about the continual improvements being implemented by the Twin Falls Canal Co. (TFCC) and when CWN's are appropriately calculated we believe those improvements will show continued reasonable use of the water resource.

The ground water users also complain the shoulder season (April and May, September and October) efficiencies vary unpredictably. The method of determining CWN affects the efficiencies during all times of the year, but the shoulder season efficiencies will always be more impacted by changing weather conditions than other times of the year. As Manager Barlogi testified it takes 3 days for changes in diversion rate by TFCC to reach the end of their system. TFCC has constructed a reregulation reservoir near the end of their delivery system to aid in making delivery adjustments at the end of their delivery system but changes in weather conditions, particularly precipitation, often lasts less than 3 days and trying to make diversion adjustments for precipitation occurring near the end of the delivery system isn't practical. Manager Barlogi also testified the TFCC system is large enough that weather conditions at one end of their system can be entirely different than at the other end of their system. Those conditions raise concerns about relying solely on the Twin Falls AgriMet station at Kimberly to adequately represent conditions throughout the TFCC service area as well as conditions throughout the North Side Canal Company, American Falls Reservoir District #2 and Milner Irrigation District service areas. In Matt Anders continued deposition on May 26 he testified about not having adequate staff resources to switch from using AgriMet stations for determining crop water needs to using NRT METRIC and PRISM to make those determinations. Perhaps those improvements can be implemented in the future.

As to the ground water user's recommendation to use a seasonal average efficiency to determine reasonable water use, the recommendation would not benefit either the water users or administrators. Neither would know if the water use was meeting standards until the season is over. Using monthly efficiencies allows both the water users and administrators to track the water use monthly and not need to wait until the end of the season to determine if the water use was reasonable.

C.2. Changes in Cropping Patterns Since the SWC 2007 Report

In Manager Barlogi's deposition he testified about the changes in cropping patterns since the number of dairies have increased in the Magic Valley. He mentioned particularly the increase in the number of acres of alfalfa hay and corn as well as the introduction of some double cropping acres with small grains or Triticale followed by corn in the same season[1]. Figure 6 below shows the change in alfalfa and corn acres since 2007 along with an increase in diversions by TFCC to meet the demands of the more water intensive crops.

[1] In IDWR's conversion of CDL crop types to AgriMet crop types on the Crop Water Need tab, IDWR considers only the small grain portion of the CWN and appears to omit the CWN for the corn crop that is grown in the same season.

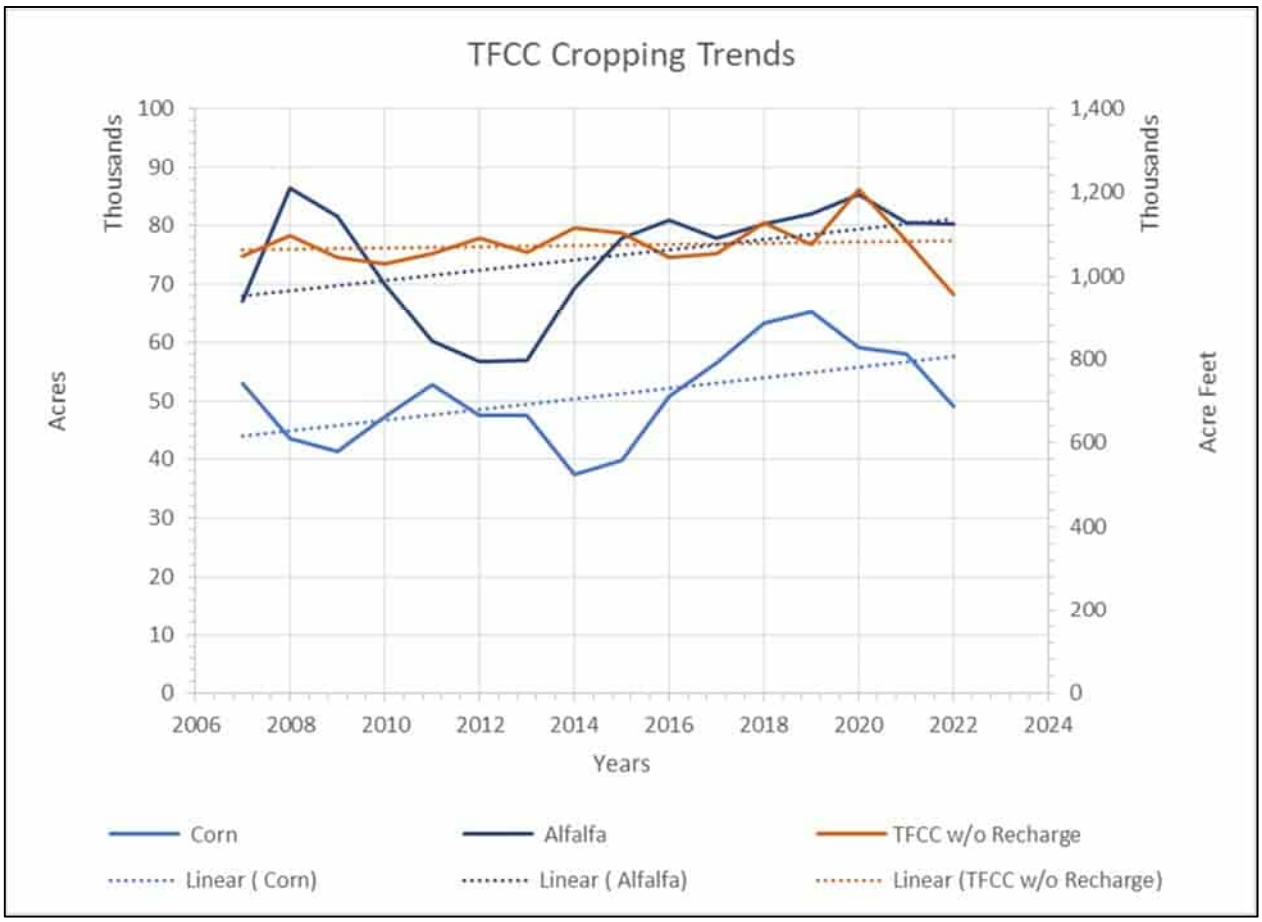

Figure 6. TFCC cropping trends.

This analysis was only completed for TFCC due to time constraints, but similar changes likely have occurred in the crop mix in other SWC member service areas.

Surface water delivery changes have also occurred in A&B Irrigation District with the delivery of surface water to acres in the Unit B portion of the project. Exhibit 1 attached shows the amount of surface water delivered to Unit B lands beginning in 2016. These diversions are included in the WD01 surface water delivery quantities and should be deducted from the total diversions when calculating the project efficiencies for the A&B water deliveries.

D. Factors Affecting Project Efficiency

Project efficiency (E_p) is defined as crop water need (CWN) divided by adjusted diversion. The Fifth Methodology Order uses an average monthly E_p based on a rolling average of the previous 15 years (see above discussion on calculation inconsistencies in the RISD spreadsheet). The project efficiency is a lumped parameter that accounts for all operational water requirements that are necessary for the project operation but do not directly go toward meeting the evapotranspirative demand of the crops.

Factors affecting project efficiency, i.e. factors that require diverting more than CWN, include the following

1. On-farm efficiency may range from 50% for gravity methods to 85% for a high-efficiency center pivot system.

2. Canal seepage varies from project to project, but can typically range from 20% to 30% of total diversion. Canal seepage is generally greatest during the initial startup of the project, when canal beds are dry.

3. Operational spill is always necessary in order to deliver water to users within the systems. Spill must be maintained in order to account for variations in demands by irrigators. Without spill it would be impossible to reliably serve the tail ends of the system.

4. Changes in meteorological conditions will affect on-farm demand, but the overall project diversion cannot respond to short-term demand changes. For example, the onset of a cool, rainy period could lead to rapid decreases in on-farm demand, but if the project diversion were to be reduced, delivery shortages would likely occur when the ordinary warm weather returned, and these shortages would be concentrated toward the lower end of the project. Only if the cool period were sustained for many days could the project diversions potentially be adjusted.

5. Conversion to sprinkler methods from gravity methods always leads to an increase in on-farm efficiency, but may actually lead to a decrease in overall efficiency in a large system for the following reasons:

    1) the on-off nature of sprinkler pumping leads to more variation in demand and a greater need for operational spill;

    2) reduction in incidental recharge from irrigation leads to reduction in drain flows that are relied upon for re-delivery. With gravity irrigation methods, subsurface storage occurs, drain flows are sustained, and the drain water is treated as project water that can be reused by downstream irrigators later in time. Lower drain flow necessitates greater total diversion from the river and greater flows within laterals to serve lands that may have been previously served primarily by drain flows. A similar effect occurs when runoff is reduced by conversion of fields to sprinkler irrigation.

    For these reasons, it is not correct to assume that conversion to sprinkler methods will necessarily lead to an increase in overall project efficiency.

6. In the shoulders of the irrigation season, efficiencies are naturally low. When canals are turned on in April, it make take several days to "charge" the system by filling the volume within the canals and laterals and overcoming the high initial seepage rate. During this time, CWN is low, on-farm irrigation diversions are minimal, and overall project efficiency is therefore very low. Similarly, during October the CWN is low but water is still needed in the

canal system in order to convey water to the end of the system to meet tail-end delivery obligations. In addition, late-season water may be used by irrigators to increase soil moisture storage or for erosion mitigation rather than to meet CWN. The Fifth Methodology incorporates provisions to ensure that the RISD is not underestimated in April, nor under- or over-estimated in October.

SWC projects have been implementing a number of measures to better manage water within their projects. Specifically, within the last 10 years the Twin Falls Canal Company has implemented

- Flow measurement with telemetry
- Automated lateral gates
- Regulating storage (Kenyon Pond)
- Canal lining
- Reduction in operational spill to minimum necessary

In summary, when a system is comprised of thousands of farms and all of the operational water requirements within the project are considered, overall project efficiency is much lower than on-farm efficiency and a value of 35% to 50% is typical and reasonable. A simple example calculation demonstrates this: assuming that the average on-farm efficiency is 65% (half gravity at 50% efficiency and half sprinkler at 80% efficiency), canal loss is 20% of the diversion, and required operational spill to run the system is 15% of the diversion, the overall project efficiency would be 42%. This does not account for other harder to quantify factors such as seasonal shoulder effects and weather changes reducing CWN or providing effective precipitation.

Changing from an 8-year average to a 15-year average project efficiency is justified based on reduction of variability. If a project efficiency estimate can be assumed to be approximately normally distributed, the standard deviation of the estimate is proportional to $1/\sqrt{n}$, where n is the number of years in the period of record. Moving from an 8-year to a 15-year average would reduce the standard deviation of the estimate by 27%.

F. Effect of Irrigated Area Reduction on RISD

It has been asserted that if the irrigated area within the TFCC service area is actually 180,956 acres instead of 194,732 acres, the RISD would be reduced proportionally by 86,600 acre-feet and thus the in-season demand shortfall would be eliminated. The 86,600 acre-feet figure was calculated by multiplying the difference in acres (13,776) by the crop irrigation requirement of 2.2 ac-ft/acre, and dividing by the average monthly project efficiency of 0.35 (G. Sullivan declaration, May 7, 2023).

This assertion does not account for the fact that in the Methodology, the monthly project efficiencies are calculated as crop water need for the full 194,732 acres (for the 2015-2021 period) divided by the observed diversions, and then RISD for the current season is based on 1) the baseline year observed diversion demand and 2) in-season adjustments based on monthly

crop water need and project efficiency. If the acreage were in fact less than 194,732, the calculated project efficiency would also be lower. In other words, it is not valid to divide the crop irrigation requirement by 0.35, because 0.35 is not the correct number if the acreage were in fact lower than 194,732. A reduction in RISD would only be valid if project efficiency is independent of acreage, but in fact efficiency is directly dependent on acreage. Further, it has been demonstrated herein that the project efficiency is reasonable.

G. Supplemental Groundwater Usage

Usage of private groundwater wells for supplemental purposes on surface water irrigated lands occurs within the Twin Falls Canal Company service area, but the percentage of water supply provided by groundwater is generally low due to the overall reliability of the surface water shares.

Groundwater supply systems on a particular farm are rarely standalone systems, but are hydraulically interconnected with the surface water supply systems. Typical configurations involve multiple fields, pumps, and application systems that are interconnected and used in a complicated fashion. The only way to accurately assess the degree of groundwater usage and equivalent acreage irrigated by groundwater would be to ground-truth each individual system with the farm operator. Insufficient data exists to make this determination.

The usage of groundwater, even if it could be quantified, would likely not change the total irrigated acreage since groundwater is generally used as a supplemental supply to land already covered by canal shares and it is required to use surface water as the primary supply.

Furthermore, even if groundwater-supplied acreage could be quantified, it would have the effect of slightly lowering the calculated project efficiencies, because the same surface water diversion volumes would be applied to fewer acres. These lower efficiencies would then be utilized in the methodology for determining RISD.

H. Baseline Year Discussion

In order to quantify the initial surface water demand in the Methodology Order, IDWR identifies a Baseline Year (BLY). The order requires that the BLY have the following characteristics: (1) above average surface water coalition diversion volume, (2) above average temperature, (3) above average evapotranspiration (ET), (4) below average precipitation, and (5) not be a year of limited supply. The data and criteria were presented to the TWG in November 2022 by Matt Anders, and the summary table is replicated below in Table 2 (Anders, 2022). Furthermore, detailed explanation of each criteria, including graphs of the data, are included in the Fifth Methodology Order.

Table 2. BLY Selection Criteria presented by M. Anders on November 11, 2022 to the TWG. Only two years met all of the evaluation criteria, which were 2018 and 2020 (highlighted in yellow).

	(1)	(2)	(3)	(4)	(5)	
Year	Above Average SWC Diversions (2000-2001)	Above Average GDD (1992-2021)	Above Average ET (1991-2021)	Below Average Precipitation (1992-2021)	Above Average Heise Runoff (1992-2021)	Supply Not Limited (Above Average) (1992-2021)
2000	X	X		X		
2001		X	X	X		
2002			X	X		
2003		X	X			
2004				X		
2005						
2006		X	X		X	X
2007	X	X	X	X		
2008	X		X	X	X	X
2009	X				X	X
2010				X		
2011				X	X	X
2012	X	X	X	X		
2013	X	X	X	X		
2014	X	X			X	X
2015	X	X		X		
2016		X				
2017		X		X	X	X
2018	X	X	X	X	X	X
2019	X				X	X
2020	X	X	X	X	X	X
2021	X	X	X	X		

IGWA argued that IDWR should consider the rank within the period of record when updating the BLY, stating that it should be similar to the previous BLY (Sigstedt, 2023). However, the rank of diversion volume of BLY is not one of the criterion to be used by IDWR in establishing a BLY. The previous BLY was an average of years 2006, 2008, and 2012, and IGWA reported the diversion volume rank of about the 55-th percentile for the period of record 2000-2015 (Sigstedt, 2023). IGWA further argues that the 2018 diversion volume of 3.381 maf is at the 90-th percentile and is therefore too high.

In the Fifth methodology order, IDWR states, "Equality in sharing the risk will not adequately protect the senior priority surface water right holder from injury. Actual demand shortfalls to a senior surface water right holder resulting from predictions at the start of the irrigation season based on average data unreasonably shifts the risk of shortage to the senior surface water right holder. Therefore, a BLY should represent a year(s) of above average diversions and should not represents year(s) of average or below average diversions." (emphasis added)

The percentiles provided by IGWA appear to be derived from a ranking analysis of available data. To illustrate the percentiles in more accurate detail, a normal distribution was fit to the annual diversion data and percentiles estimated from the distribution (a normal distribution

appears to be a good choice in this case; a lognormal assumption yields almost identical percentiles). Statistics calculated in this way from the 2000-2021 dataset are shown in Table 4.

Table 4. Statistics of total annual SWC diversion calculated from a normal distribution fit.

Statistic	Value (MAF)
Mean	3.201
+1 s.d.	3.380
+2 s.d.	3.559
50-th	3.201
75-th	3.322
80-th	3.387
90-th	3.430
95-th	3.495
99-th	3.617

In order to protect the senior water right holders, the diversion volume of a BLY should be above average, not average or close to average. IDWR has determined that years with an average diversion will not be protective of the senior water right holders. IGWA proposes a BLY with a diversion volume of 3.225, just above average at the 55th percentile (Table 4). The volume at one standard deviation from the mean (84th percentile) is 3.380 maf, essentially the same volume as 2018. A more conservative approach would be two standard deviations from the mean or 3.559 maf, which would be in-line with standard engineering practices when a very high level of certainty is desired. Still, using 2018 as the BLY provides a reasonable factor of safety without being extreme, and we concur with this selection.

One potential approach that could be evaluated is identifying a BLY for each SWC entity, because a universal BLY selection does not likely take into account all of the variables that may influence the diversion volume for particular entities. This approach would result in a potentially different BLY based on the closest year to 1 standard deviation from the mean for each SWC entity, as follows: A&B = 2018, AFRD2 = 2014, BID = 2018, Milner = 2017, Minidoka = 2007, NSCC = 2020, and TFCC = 2018. The total diversion volume of these years sums to 3.41 maf.

I. Conclusions

- Twin Falls Canal Company surface water diversions show no statistically-significant trend.
- Applying a reasonableness test of project efficiencies based on operational water requirements and constraints within large canal project demonstrates that efficiencies calculated in the Fifth Methodology area reasonable.

- It is not unreasonable to see flat or declining project efficiencies even though sprinkler conversions are continuing to occur.

- Changing from an 8-year to a 15-year rolling average is justifiable based on statistical considerations.

- The irrigated acreage used for Twin Falls Canal Company in the Fifth Methodology Order is reasonable.

- In the Fifth Methodology calculation procedures, use of a lower irrigated acreage for Twin Falls Canal Company would not change the in-season demand shortfall, because even though a lower acreage would result in lower crop water need, it would also result in a lower project efficiency and the RISD would remain unchanged.

- Supplemental groundwater diversion or acreage cannot be accurately assessed with the available data.

- The diversion volume in the Fifth Methodology baseline year of 2018 is at the 84th percentile and provides a reasonable factor of safety to protect senior water right holders. If higher certainty is desired, the value at two standard deviations from the mean could be used.

- Annual project efficiencies, E_p, need to be recalculated with the CDL data for each year to better represent the actual E_p. Calculating actual E_p values will better address changes in cropping patterns over time.

Exhibit 1
A&B Irrigation District Unit B Deliveries

Conversion Water - Acre Feet Pumped to Unit B Lands

Year	Natural Flow	Storage	Groundwater	Total Pumped
2016	790.4	7812.9	21.8	8,625.1
2017	4351.3	3963.3	277.9	8,592.5
2018	3304	5040.8	569.5	8,914.3
2019	1965.7	4959.5	1157.8	8,083.0
2020	3057.3	5738.9	796.7	9,592.9
2021	239.8	8191.0	1025.7	9,456.5
2022	0.0	7370.6	1461.9	8,832.5

Attachment A
Curriculum Vitae

CHARLES G. BROCKWAY, Ph.D., P.E.

Brockway Engineering, PLLC
2016 Washington St N, Suite 4
Twin Falls, Idaho 83301
(208) 736-8543 • charles.g.brockway@brockwayeng.com

EDUCATION

1992-1995	University of Iowa, Iowa City, Iowa Iowa Institute of Hydraulic Research Ph.D., Civil and Environmental Engineering Research was conducted under the Hunter Rouse Scholarship, leading to the doctorate granted in December 1995.
1989-1992	University of Idaho, Moscow, Idaho. B.S., Civil Engineering
1988-1989	Northwest Nazarene College, Nampa, Idaho. Major: Physics.

EXPERIENCE

Professional

Managing Member, Brockway Engineering, PLLC
August 1995 to present. Areas of particular expertise include:

- Hydraulic, hydrologic, and environmental evaluations
- Design of groundwater wells and irrigation systems
- Computer modeling of water resources systems
- Statistical analysis and stochastic modeling
- Design of hydraulic control structures and systems
- Rainfall-runoff and flood plain-floodway analysis
- Idaho and western states water right transactions
- Economic analysis of water resources systems

P.E. Registrations: Idaho, Wyoming, Nevada

Research

Graduate research: Quantitative assessment of the uncertainties associated with hydrologic reconstructions in augmenting historical information about low-flow phenomena.
Dr. A. Allen Bradley, Iowa Institute of Hydraulic Research, University of Iowa.

Undergraduate research: Leak detection in long oil pipelines under transient conditions
Dr. C. P. Liou, University of Idaho.

HONORS and AWARDS

University of Idaho Alumni Award for Excellence, 1992
Outstanding Senior Civil Engineering Student, 1992
Tau Beta Pi member
Phi Kappa Phi member
Golden Key National Honor Society member
National Dean's List member
Hunter Rouse Fellow, University of Iowa, 1992 - 1995

ACADEMIC PUBLICATIONS

Brockway, C. G. and A. Allen Bradley (1995). Errors in streamflow drought statistics reconstructed from tree ring data. *Water Resources Research*, 31(9), 2279-2293.

Brockway, C. G. (1995). An evaluation of streamflow reconstructions for estimation of drought statistics. Ph.D. Thesis, University of Iowa, Iowa City, Iowa.

Brockway, C. G. and A. Allen Bradley (1996). Errors in reconstructed streamflow drought statistics. *13th Conference on Probability and Statistics in the Atmospheric Sciences*, American Meteorological Society.

Liou, C.P., C. G. Brockway, and R. B. Miller (1991). Pipeline variable uncertainties and their effects on leak detectability. *1992 API Cybernetics Symposium*, Houston, Texas.

Powell, G.E., C.E. Brockway, C.G. Brockway, and Z. Latham. 2009. Spring Source Streams in Idaho. ASABE Annual International Meeting. Reno, Nevada.

OTHER PUBLICATIONS

Dr. Brockway is the author or co-author of over 100 technical publications related to consulting services performed in the hydraulics, hydrology, and water resources fields. A listing can be provided upon request.

AREAS OF EXPERTISE AND PRACTICE

Computer Modeling

Development, testing, and implementation of computer models for deterministic and stochastic analysis of hydraulic and hydrologic systems, both surface water and groundwater.

Groundwater Evaluations

Data collection, evaluation, and analysis of groundwater flow systems and contaminant transport.

Hydraulic Analysis and Design

Design and analysis of canal diversion and regulation structures, water measurement structures, spillways, pipelines, culverts, aqueducts, canals, pumping stations, surge-control devices, groundwater wells, irrigation systems, pipeline networks, municipal distribution systems.

Land Application of Wastewater

Evaluation and design of all aspects of wastewater treatment by land application, including hydrogeologic analysis and modeling, parameter loading analysis, environmental impact evaluation, system management and design, and permit acquisition and compliance.

Stream Bank Protection

Analysis of sedimentation and meander pattern evolution in natural waterways, both mountainous and low-gradient. Design of bank stabilization and protection structures. Design of river management projects including flood channel restoration, natural gravel bar removal, drop structures, and sills.

Water Rights Evaluations

Hydrologic analysis and transaction preparation for water right permits and transfers in compliance with current state policies, rules, and statutes. Crop evapotranspiration determination, climatic analysis; statistical analysis of climate and crop use variables; water requirements evaluations for irrigation, domestic, commercial, and industrial applications; consumptive use determination; field investigations, measurement and analysis of diversion capacity and water requirements.

Flood Analysis and Control

Estimation of flood-frequency relationships in natural and man-made drainages using statistical and deterministic approaches. Hydraulic analysis and computer modeling of waterways to predict water surface elevations and extent of inundation during flood events. Design of flood control structures and bank protection structures.

Water Demand and Sufficiency Analyses

Analysis and determination of water supply suitability, source development feasibility, and other factors affecting water supplies for municipalities, residential developments, and industry.

Hydrography

Discharge measurements in open-channels and closed-conduits using current meters, in-pipe impeller and propeller meters, and non-intrusive ultrasonic meters.

G. ERICK POWELL, PH.D., P.E.

2016 Washington Street N., Suite 4
Twin Falls, Idaho 83301
Office: (208) 736-8543
Fax: (208) 736-8506

2245 Settler's Lane
Twin Falls, Idaho 83301
Residence: (208) 734-9808
erick@epowell.org

http://www.epowell.org

Education

Degree	University	Field	Year
Ph.D.	The Ohio State University Advisor: Dr. Andrew D. Ward Title: *Evaluating geomorphology and water quality of channel-forming discharges in Ohio headwater streams*	Agricultural Engineering	2006
MS	Brigham Young University Advisor: Dr. E. James Nelson Title: *Bathymetry delineation and data collection preparing a CE-QUAL-W2 model on Scofield Reservoir, Utah*	Civil and Environmental Engineering	2002
BS	Brigham Young University	Major: Civil and Environmental Engineering Minor: Agronomy	2001

Professional Experience

Project Engineer — 2006 – Present
Brockway Engineering, PLLC
Twin Falls, Idaho

Project Engineering on hydrologic and hydraulic engineering design, including: well design, well construction, well testing, water rights, water right transfers, pipeline design, water distribution systems, stream channel evaluation, floodplain assessment, irrigation water demand, and potable water demand.

P.E. Registrations: Idaho, Utah, and Oregon

Graduate Research Assistant — 2002 – 2006
Department of Food, Agricultural, and Biological Engineering
The Ohio State University, Columbus, Ohio

Research consisting of: 1) evaluation of channel forming discharges, 2) two-stage channel design procedures, 3) nutrient performance within two-stage agricultural channels, and 4) theoretical nutrient spiraling under restored riparian projects.

Areas of Expertise

Developed numerical groundwater flow simulations using FEMWATER and Groundwater Modeling System (GMS). Experience in groundwater modeling, flood plain evaluations, stream bank restoration and protection, surface water quality modeling, and water right transactions.

Professional Associations

American Society of Civil Engineers (ASCE)
American Ecological Engineering Society (AEES)
American Society of Agricultural and Biological Engineers (ASABE)
American Society for Engineering Education (ASEE)
Alpha Epsilon (ASABE Honor Society)

Selected Publications

Powell, G.E., A.D. Ward, D.E. Mecklenburg, and A.D. Jayakaran. 2007. Two-stage channel systems: Part 1, a practical approach for sizing agricultural ditches. J. of Soil and Water Conservation. 62(4):pp.

Powell, G.E., A.D. Ward, D.E. Micklengburg, J. Draper, and W. Word. 2007. Two-stage channel systems: Part 2, case studies. J. of Soil and Water Conservation. 62(4):pp.

Powell, G.E. 2006. Examination, application, and evaluation of geomorphic principles and resulting water quality in Midwest agricultural streams and rivers. The Ohio State University. Doctoral dissertation.

Powell, G.E., D. Mecklenburg, and A.D. Ward. 2006. Evaluation of Channel-Forming Discharges: A Study of Large Rivers in Ohio. Trans. of ASABE. 49(1):35-46.

Martin, J.F., S.A. Diemont, G.E. Powell, M. Stanton, and S. Levy-Tacher. 2006. Emergy evaluation of the performance and sustainability of three agricultural systems with different scales and management. Agriculture, Ecosystems, and Environment. 115(2006):128-140.

RESUME

David Shaw, Engineer

EDUCATION
M.S. 1972, Agricultural Engineering, University of Idaho
B.S. 1966, Agricultural Engineering, University of Idaho

CERTIFICATIONS AND AFFILIATIONS
National Council of Examiners for Engineering and Surveying, NCEES #16269
American Society of Agricultural and Biological Engineers
Idaho Society of Professional Land Surveyors
Idaho Certified Water Right Examiner
Oregon Certified Water Right Examiner, #74051WRE

LICENSURE
Professional Engineer and Land Surveyor, Idaho, #2648
Professional Engineer, Oregon, #74051PE
Professional Engineer, Arizona, #40134
Professional Engineer, Colorado, #415169

BACKGROUND

David is an engineer in the Denver-based natural resources consulting firm of ERO Resources Corporation (ERO). For over 25 years, David has managed ERO's Idaho office. He specializes in the identification, analysis, and resolution of water issues including coordination with other professionals in multidisciplinary projects. David has more than 45 years of experience and expertise in water resources and management, covering a broad spectrum of disciplines including surface and ground water supply and use studies, water right evaluations, water quality evaluation and monitoring, project management, alternative dispute resolution, litigation support and expert witness testimony, and technical input on legislative and administrative matters.

SUMMARY OF EXPERIENCE

Water Right Investigations
For 11 years, acted as project manager for IDWR's role in the SRBA. An understanding of water rights and management ability were essential for the successful development of the criteria and process for the identification and evaluation of 150,000 claims to water rights. David continues to assist clients with water right investigations including adjudication and administrative processing, evaluation and transfer, and the development of new rights and protection of senior rights.

Litigation Support and Alternative Dispute Resolution
Designated as an expert in water right adjudications by the SRBA court. Provides expert testimony before the court on all aspects of water right adjudications as well as hydrology and water right administration issues. Provides expert testimony and settlement support for storm water conflicts and right-of-way issues between water users and nonwater users.

Water Supply Evaluations, Development, and Permitting
Assists clients with the permitting and development of water uses. A water supply evaluation is required for most new water right filings and for many filings for changes. Delivery system designs are sometimes included with the development and supply evaluations.

Water Quality Evaluation, Monitoring, and Management
Experienced in designing and implementing water quality monitoring programs for various water users. This includes knowledge of state standards and Total Maximum Daily Load requirements, and how water users can help protect their water uses with water quality data.

Project Experience:
Water Right Investigations

Surface Water Coalition, ID
Provided analysis and recommendations for resolution of water delivery call by senior surface water users against junior ground water users. Analyzed historical water distribution practices for delivery of storage and natural flow water to preserve historical enjoyment of the water resource.

Snake River Basin Adjudication, ID
Developed criteria and procedures to investigate the existence and extent of tens of thousands of water rights.

Little Land and Livestock, Inc., ID
Evaluated water rights for a potential land purchase. Secured new water rights for development of additional land for irrigated agriculture. Provided technical analysis to resolve conflicts between potential new water use and existing water uses.

Modoc Point Irrigation District, OR
Determined the extent of water use for irrigation in support of water right claims in the Klamath River Adjudication.

Litigation Support and Alternative Dispute Resolution

Office of the Idaho Attorney General, ID
Designated by the SRBA court as an expert in water right adjudications. Provided mediation support for resolution of federal reserved water rights. Acted as hydrology expert for litigation of federal reserved water right claims.

Surface Water Coalition, ID
Provided mediation support and expert testimony in support of water delivery call by senior surface water users.

Settlers Irrigation District, ID
Provided mediation support and expert testimony to resolve conflict over irrigation district rights-of-way and encroachment from storm water discharge.

Middle Fork Lodge, ID
Provided expert testimony to establish right-of-way for water delivery prior to creation of a wilderness area and designation of the forest.

Shoshone-Bannock Reserved Water Right Negotiations, ID
Acted as co-chair of the state, Indian, federal, and private technical advisory committee.

Riddle Ranch, ID
Served as technical expert/negotiator for resolution of federal reserved water rights of the Duck Valley Indian Reservation.

Methow Valley Ditch Users Association, WA
Analyzed ground water/surface water interaction and supply.

Federal Instream Flow Coalition, ID
Provided mediation support for resolution of federal reserved water rights and Endangered Species Act water demands.

Idaho Office of the Attorney General, ID
Acted as hydrology expert for litigation of federal reserved water rights.

Water Supply Evaluations, Development, and Permitting

Idaho Office of the Attorney General, ID
Evaluated the surface water supply of a river drainage basin for equitable allocation among state law-based water right water users and federal reserved-based water right water users.

Surface Water Coalition, ID
Evaluated the impact of surface water supply by the diversion and use of ground water.

Idaho Power Co., ID
Evaluated the impact of the proposed development of the company's water supply for power generation.

Big Lost River Basin, ID
Provided expertise regarding the surface and ground water hydrology and the administration requirements for a ground water recharge project.

District Water Supply, Boise River, ID
Evaluated the impact of a proposed water right transfer on irrigation. Identified and quantified changes to ground and surface water supply if the transfer was approved.

City of Coeur d' Alene, ID
Prepared an application for consolidation of all city water rights to allow for full use of the water rights and development of a new well.

Federal Instream Flow Coalition, ID
Evaluated the hydrologic impact of the historical water development in southern Idaho on river flows for Endangered Species Act-listed salmonids.

Water Quality Evaluation, Monitoring, and Management

Pioneer Irrigation District, ID
Provided project design, implementation, and management for their water quality sampling program.

Wilder Irrigation District, ID
Provided project design, implementation, and management for their water quality sampling program.

Water Users in Owyhee County, ID
Provided project design, implementation, and management for their water quality sampling program.

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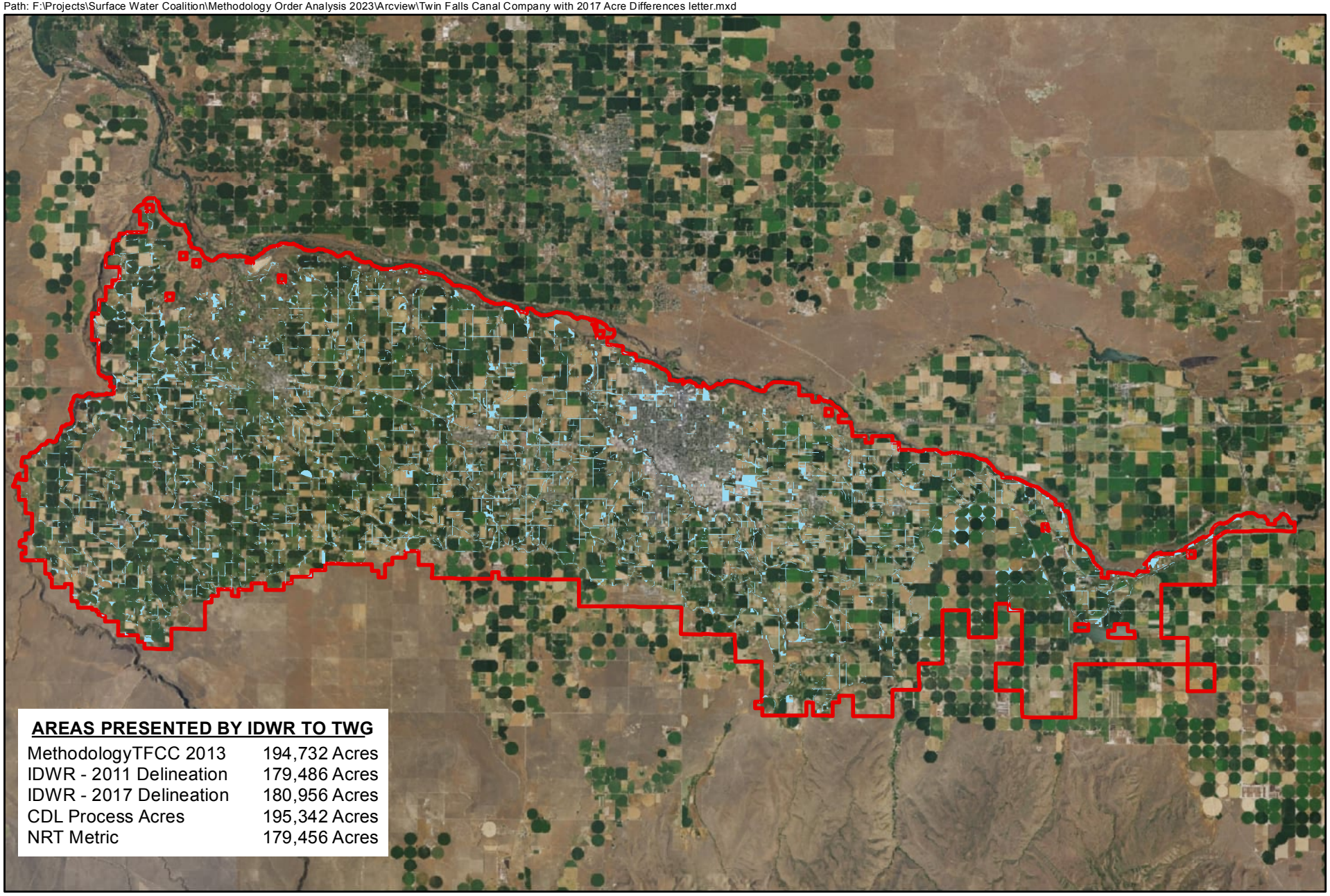

AREAS PRESENTED BY IDWR TO TWG

MethodologyTFCC 2013	194,732 Acres
IDWR - 2011 Delineation	179,486 Acres
IDWR - 2017 Delineation	180,956 Acres
CDL Process Acres	195,342 Acres
NRT Metric	179,456 Acres

0 11,250 22,500 45,000 Feet

TWIN FALLS CANAL COMPANY

ACRE COMPARISON BETWEEN 2017 IDWR
AND 2013 METHODOLOGY
NAIP 2021 AERIAL

2017 Difference 13,790 acres
TFCC Service Area

N

BROCKWAY ENGINEERING, PLLC.
JJJ - Date: 5/30/2023

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1 inch = 700 feet

TWIN FALLS CANAL COMPANY

2017 SHAPEFILE ACRES

2017 Irrigated Shape

N

BROCKWAY ENGINEERING, PLLC.
JJJ - Date: 5/29/2023

NAIP 2021 AERIAL

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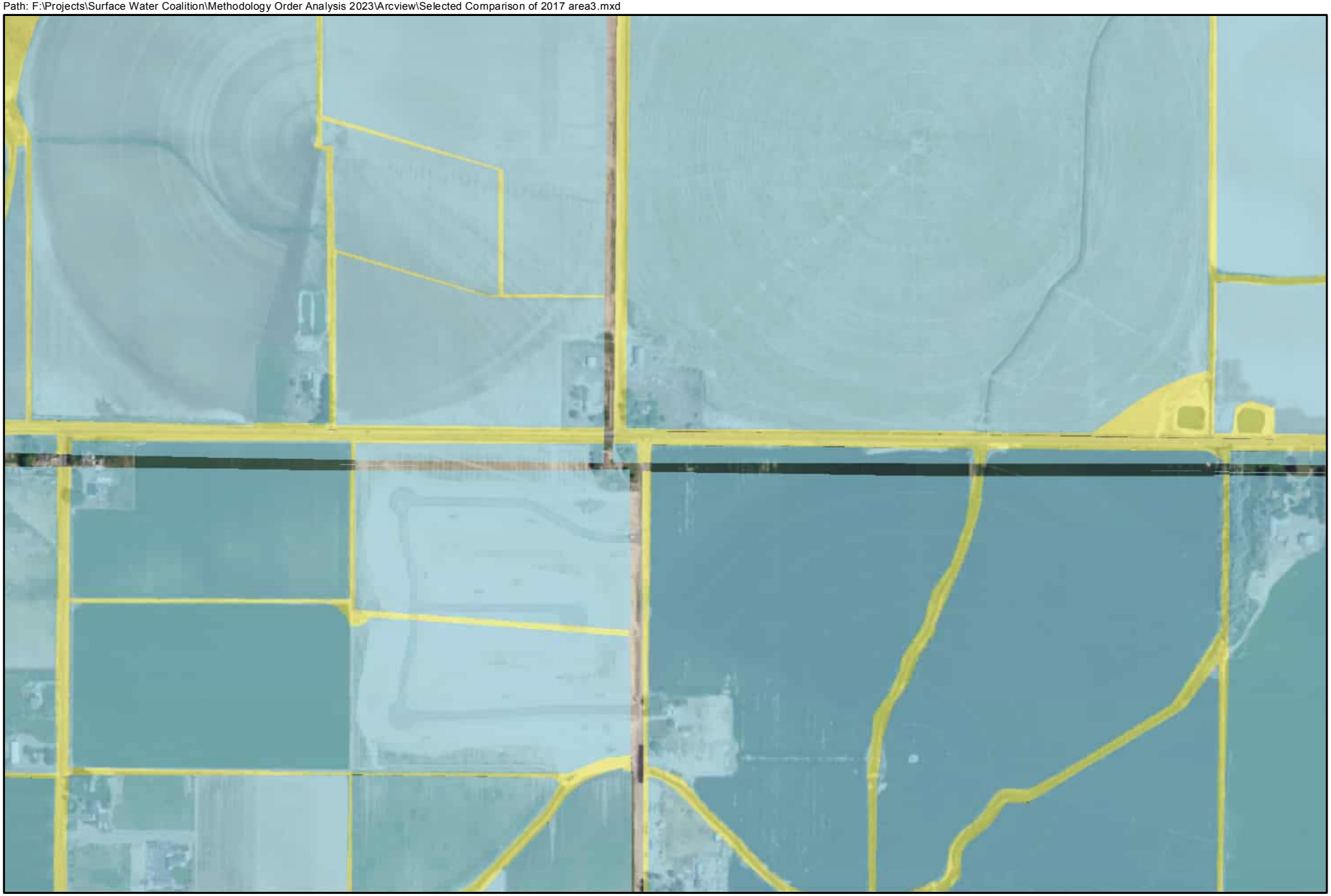

1 inch = 600 feet

TWIN FALLS CANAL COMPANY

2017 SHAPEFILE ACRES

DIFFERENCE BETWEEN 2013 AND 2017 AREA

2017 Irrigated Shape

2017 Difference

N

BROCKWAY ENGINEERING, PLLC.

JJJ - Date: 5/29/2023

NAIP 2021 AERIAL

2011 ANNUAL REPORT

WATER DISTRICT 1

SNAKE RIVER AND TRIBUTARIES

ABOVE MILNER, IDAHO

Lyle R. Swank, Watermaster
Idaho Department of Water Resources
Eastern Regional Office
900 North Skyline Drive, Suite A
Idaho Falls, Idaho 83402

EXHIBIT 8
6/8/23
M&M Court Reporting Service
Reported by: Andrea Check

TABLE 6. Diversions During 2011 Irrigation Year from Snake River between Irwin and Dry Bed (Great Feeder Canal).

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13032510	P Byrd Pump	0	180	0.0
13032515	Boy Scout Camp Pump	0	(a)	-
13032520	A Rostad Pump	0	86	0.0
13032920	R Rose Pump	5	5	1.0
13033010	Palisades Canal	10,900	4,490	2.4
13033643	W Fleming Pump	130	250	0.5
13033650	M Ogden Pump	0	(a)	-
13033660	L Dixon Pump	0	(a)	-
13033670	R Jacobson Pump	0	(a)	-
13033698	J Chick Pump	2	106	0.0
13034460	L Jacobson Pump	70	100	0.7
13037305	I Spaulding Pump	0	(a)	-
13037490	Foster Agro Pump	810	301	2.7
13037505	Progressive Irrigation District	241,400 (b)	30,425	7.9
13037510	M & M Cattle Pump	230	177	1.3
13037855	Newby Pumps	680 (c)	145	4.7
13037980	Farmers Friend Canal	103,200	10,860	9.5
13037985	Enterprize Canal	50,900	4,850	10.5
	TOTAL	408,327 (d)	51,975	7.9 (e)

(a) Acreage not determined.
(b) Progressive Irrigation District's Anderson (13037505) and Eagle Rock (13037975) Canals. Does not include additional Willow Creek water diverted [see footnote (e) on Table 16].
(c) Includes diversions 13037860 and 13037880.
(d) Does not include the additional amount received from Willow Creek (see note b).
(e) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 7. Diversions During 2011 Irrigation Year from Snake River, Dry Bed (Great Feeder Canal).

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13037997	C Hickman Pump	0	10	0.0
13038025	Butler Island Canal	10,700	990	10.8
13038030	Ross & Rand Canal	1,200	170	7.1
13038050	Steele Canal	0	140	0.0
13038055	Harrison Canal	117,400	14,230	8.3
13038065	Cheney Canal	0	130	0.0
13038075	G Scott #1 Pump	230	(c)	-
13038079	J Brown Pump	30	14	2.1
13038080	Butler Island #2 Canal	0	(c)	-
13038081	G Scott #2 Pump	130	(c)	-
13038084	Subdivision Pump	230	(c)	-
13038085	Rudy Canal	70,100	5,530	12.7
13038090	Lowder Slough Canal	13,700	1,000	13.7
13038098	Kite & Nord Canal	2,500	210	11.9
13038110	Burgess Canal	262,100	22,200	11.8
13038113	M Hill Pump	330	50	6.6
13038115	Clark & Edwards Canal	19,500	1,740	11.2
13038145	Croft Canal	350	60	5.8
13038147	J Edwards Pump	30	19	1.6
13038148	G Holman Pump	8	6	1.3
13038149	G Muma Pump	9	3	3.0
13038150	East Labelle Canal	37,800	2,850	13.3
13038151	B Grover Pump	80	25	3.2
13038180	Rigby Canal	44,200	3,920	11.3
13038183	K Foster Pump	190	80	2.4
13038201	White Island Pump	160	140	1.1
13038205	Dilts Canal	6,300 (a)	630	10.0
13038210	Island Canal	45,800	3,760	12.2
13038225	West Labelle & Long Island Canal	123,600	10,500	11.8
13038305	Parks & Lewisville Canal	117,800	9,800	12.0
13038315	North Rigby Canal	16,200	1,210	13.4
13038331	Jefferson Hills Pump	0	110	0.0
13038340	White Canal	1,100	110	10.0
13038352	D Phillips Pump	0	52	0.0
13038356	Von Baron Pump	0	(c)	-
13038360	Bramwell Canal	270	160	1.7
13038362	Ellis Canal	380	60	6.3
13038363	D Scott Pump	0	(c)	-
13038365	Idaho Fresh Pac Pump	840	145	5.8
13038371	J T Jones Pump	0	(c)	-
13038372	C Jones Pump	170	40	4.3
13038382	W Dabell Pump	70	231	0.3
13038384	D Stoker Pump	210	206	1.0
13038385	Skaar Pump	160	(c)	-
13038386	J N Erickson Pump	330	177	1.9
	TOTAL	894,207	80,708	11.1 (b)

(a) Includes diversion 13038204.
(b) Does not include diversions with unknown acreage or zero amounts diverted.
(c) Acreage not determined.

TABLE 8. Diversions During 2011 Irrigation Year from Snake River between Dry Bed (Great Feeder Canal) and Lorenzo.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13038387	Nelson Canal	0	55	0.0
13038388	Mattson-Craig Canal	3,300	485	6.8
13038392	Sunnydell Canal	39,500	3,860	10.2
13038393	Covington Brothers Pump	1,000	960	1.0
13038405	T Parkinson Pump	500	520	1.0
13038410	R Grover Pump	480	390	1.2
13038415	Bybee Pump	100	(a)	-
13038417	D Cheney Pump	20	15	1.3
13038422	L Robinson Pump	0	(a)	-
13038426	Lenroot Canal	36,000	3,030	11.9
13038428	G Burns Pump	50	(a)	-
13038431	Reid Canal	48,600	5,600	8.7
13038434	Texas & Liberty Canal	54,800	9,460	5.8
13038435	Bannock-Jim Canal	5,400	600	9.0
13038436	Hill-Pettinger Canal	1,600	170	9.4
13038437	Nelson-Corey Canal	630	260	2.4
13038438	L Hill Pump	240	62	3.9
	TOTAL	192,220	25,467	7.6 (b)

(a) Acreage not determined.

(b) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 9. Diversions During 2011 Irrigation Year from Snake River between Lorenzo and Idaho Falls.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13056501	Beaver Dick Pump	20	(b)	-
13057012	L A Hartert Pump	70	142	0.5
13057013	A Gunderson Pump	0	39	0.0
13057014	Miller-Barnes Pump	0	5	0.0
13057015	Fish & Game (Butte Slough Pump)	20 (a)	(b)	-
13057025	Butte & Market Lake Canal	69,000	22,000	3.1
13057030	Bear Trap Canal	5,300	2,380	2.2
13057038	Walker Farms Pump	280	80	3.5
13057046	M Tomchak Pump	0	35	0.0
13057090	A Wilde Pump	90	128	0.7
13057097	N Fullmer Pump	310	140	2.2
13057105	D Boyce Pump	170	146	1.2
13057106	B Tomchak #1 Pump	0	118	0.0
13057107	C Boyce Pump	0	89	0.0
13057114	Steinke-Murdock Pump	390	215	1.8
13057115	L Carlson (North) Pump	200	70	2.9
13057116	B Tomchak #2 Pump	240	139	1.7
13057117	L Carlson (South) Pump	290	100	2.9
13057118	H Brown Pump	150	133	1.1
13057119	Osgood Grain Pump	110	(b)	-
13057120	D Kingston North Pump	110	380	0.3
13057121	G Offut Pump	40	40	1.0
13057122	D Kingston South Pump	240	(b)	-
13057123	Bear Island North Pump	150	86	1.7
13057124	Bear Island West Pump	140	28	5.0
13057125	Osgood Canal	11,500	6,000	1.9
13057126	Clements Pumps	310	270	1.1
13057130	Kennedy Canal	4,300	1,400	3.1
13057135	Great Western & Porter Canals	170,200 (c)	28,130	6.1
13057140	L Hansen Pump	200	25	8.0
13057141	A Zohner Pump	40	40	1.0
13057142	V Cenell (Hegsted) Pump	0	40	0.0
13057143	M Boam Pump	30	15	2.0
13057144	M Mackay Pump	0	30	0.0
13057145	Idaho Canal	227,000 (d)	37,650	6.0
13057146	D Mortimer Pump	230	(b)	-
	TOTAL	491,130	100,093	4.9 (e)

(a) Includes diversions 13057018 and 13057021.
(b) Acreage not determined.
(c) Includes diversion 13057250.
(d) Received an additional 28,183 acre-feet from Sand Creek (13058515), not included.
(e) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 10. Diversions During 2011 Irrigation Year from Snake River between Idaho Falls and Blackfoot.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13059490	Monroc-Lyons Pump	480	120	4.0
13059505	Woodville Canal	18,000 (b)	2,650	6.8
13059523	Idaho Pump	6	(f)	-
13059525	Snake River Valley Canal	125,000	20,860	6.0
13060055	P Hill Pump	0	(a)	-
13060500	Reservation Canal	19,600 (c)	54,770	0.4
13061430	Blackfoot Canal	88,400	11,050	8.0
13061520	New Lavaside Canal	36,200	4,830	7.5
13061521	C Adams Pumps	110 (d)	50	2.2
13061525	Peoples Canal	77,300	15,480	5.0
13061610	Aberdeen Canal	343,900	35,420	9.7
13061650	Corbett Canal	43,400	4,460	9.7
13061670	Nielson-Hansen Canal	1,800	270	6.7
13061677	R Lambert Pump	20	25	0.8
13061685	K Christensen Pump	10	(f)	-
13061705	Riverside Canal	31,900	2,940	10.9
13061995	Danskin Canal	53,300	5,220	10.2
13062050	Trego Canal	21,600	1,300	16.6
13062051	Jensen Grove	12,000	(f)	-
13062503	Wearyrick Canal	9,000	1,540	5.8
13062504	Wadsworth Canal	50 (g)	(f)	-
13062506	Watson Canal	22,800	2,640	8.6
13062507	Parsons Canal	10,700	940	11.4
	TOTAL	915,576	164,565	5.5 (e)

(a) Non-irrigation pump.
(b) Includes diversions 13059510, 13059515, and 13059520.
(c) Received additional 82,226 acre-feet from Sand Creek (13064500), not included.
(d) Includes diversion 13061522 and 13061523.
(e) Does not include non-irrigation pumps, or diversions with unknown acreage or zero amounts diverted.
(f) Acreage not determined.
(g) Includes diversion 13062505.

TABLE 11. Diversions During 2011 Irrigation Year from Snake River between Blackfoot and Milner.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13075900	Fort Hall Michaud Pump	39,000	14,820	2.6
13076400	Falls Irrigation Pump	23,000	8,910	2.6
13077652	M Osborn Pump	110	377	0.3
13077755	Call Farms Pumps	2,300	810	2.8
13077775	R Evans Pump	130	(a)	-
13080000	Minidoka Irrigation District	287,500 (b)	77,200	3.7
13080500	Burley Irrigation District	258,200 (c)	48,000	5.4
13084590	E Herbert Pump	130	59	2.2
13084598	M.I.D. Misc. Pumps	150	(a)	-
13084599	Milner Pool Misc. Pumps	170	(a)	-
13084610	Law-Ker Farms Pump	120	(a)	-
13084640	Burley Golf Course Pump	210	85	2.5
13084650	City of Burley Pump	160	90	1.8
13084655	Simplot-Fertilizer Pump	0	(d)	-
13084690	Amalgamated Sugar Pump	100	73	1.4
13084710	R Tilley Pump	40	27	1.5
13084720	Coors Brewing Pump	180	196	0.9
13084725	K Sandmann Pump	6	16	0.4
13085270	H Schodde Pump	710	75	9.5
13085275	Bar-U-Ranch #1 Pump	130	70	1.9
13085300	Bar-U-Ranch #2 Pump	190	40	4.8
13085350	Southwest Irrigation District Pumps	14,500	(a)	-
13085390	M Hobson Pump	180	(a)	-
13085400	V Hobson Pump	170	119	1.4
13085500	A & B Irrigation	53,800	14,660	3.7
13086000	Milner Irrigation	57,500	13,640	4.2
13086512	J Brune Pump	620	(a)	-
13086530	Reservoir District #2	455,400 (e)	63,700	7.1
13087000	North Side Canal Co.	1,000,000 (f)	155,790	6.4
13087500	Twin Falls South Side	1,060,300	201,560	5.3
	TOTAL	3,255,006	600,317	5.4 (g)

(a) Acreage not determined.
(b) 52.7% of Minidoka Project total diversion.
(c) 47.3% of Minidoka Project total diversion.
(d) Non-irrigation pump.
(e) Gooding Canal below Twin Falls North Side Crosscut.
(f) Includes Twin Falls North Side Canal, A Lateral, PA Lateral, and North Side Crosscut from Gooding Canal.
(g) Does not include non-irrigation pumps, or diversions with unknown acreage or zero amounts diverted.

TABLE 12. Diversions During 2011 Irrigation Year from Henrys Fork between Island Park and Ashton.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13045655	G Marotz Pump	0	116	0.0
13045675	N Fork Highlands Pump	0	153	0.0
13045705	F Howell Pump	0	100	0.0
13045710	S Bollaert Pump	0	80	0.0
13045721	F Vandersloot Pumps	160 (a)	920	0.2
13045755	T Holcomb Pump	90	30	3.0
13045780	R Lee Pump	0	163	0.0
13045805	Z J Egbert #1 (Boat Dock) Pump	0	66	0.0
13045807	R Ritchey Pump	0	182	0.0
13045810	N Miller #1 & #2 Pumps	0 (b)	163	0.0
13045813	Z J Egbert #2 (Willow Cr) Pump	0	76	0.0
13045823	R Baker (Baker Springs) Pump	140	182	0.8
13045829	D Phelps Pump	0	201	0.0
13045849	D Seeley Pump	60	440	0.1
13045860	Z J Egbert #3 (Sewer Cr) Pump	0	269	0.0
13045880	Z J Egbert #4 Pump	20	24	0.8
13045930	Z J Egbert #5 (Lwr Rsvr) Pump	30	113	0.3
13045940	G Nedrow Pump	180	800	0.2
13045950	Baker-Nedrow Pump	120	(c)	-
13045960	M Reynolds #1 Pump	0	225	0.0
13046015	R & C Baum Pump	100	174	0.6
13046020	J McCulloch	120	220	0.5
	TOTAL	1,020	4,697	0.3 (d)

(a) Includes diversions 13045724 and 13045727.
(b) Includes diversion 13045811.
(c) Acreage not determined.
(d) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 13. Diversions During 2011 Irrigation Year from Henrys Fork below Ashton.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13046025	M Reynolds #2 Pump	110	225	0.5
13046070	A Nedrow #1 (Propane) Pump	50	100	0.5
13046072	A Nedrow #2 (Electric) Pump	20	93	0.2
13046075	J Nedrow Pump	190	267	0.7
13046083	V & D Kirkham Pump	40	(a)	-
13046084	D Nedrow Pump	140	(a)	-
13046086	D Fransen Pump	100	(a)	-
13046090	L Bratt Pump	0	12	0.0
13046095	L Loosli #1 (Black Sprgs) Pump	370	150	2.5
13046310	Dewey Canal	7,600	1,710	4.4
13046315	J Seeley Pump	0	139	0.0
13049550	Last Chance Canal	19,700	3,690	5.3
13049560	Crosscut Canal Loss blw Middle	4,500 (b)	(a)	-
13049705	Farmers Friend Canal	23,300	2,980	7.8
13049710	Twin Groves Canal	30,500	3,070	9.9
13049725	St. Anthony Union Canal	95,100	9,700	9.8
13049805	Salem Union Canal	68,600	4,980	13.8
13050525	Egin Canal	71,400	6,100	11.7
13050530	St. Anthony Union Feeder Canal	15,100	2,300	6.6
13050535	Independent Canal	53,900	7,270	7.4
13050545	Consolidated Farmers Canal	64,800	10,070	6.4
	TOTAL	455,520 (c)	52,856	8.6 (d)

(a) Acreage not determined.

(b) Crosscut Canal Middle (13050016) minus Crosscut Canal End (13050018) minus South Branch below Crosscut (13050108) plus South Branch above Crosscut (13050102).

(c) Does not include 36,720 acre-feet of Henrys Fork water diverted to Fall River Canal (Table 14) and 26,119 acre-feet of Henrys Fork water diverted to Lower Teton River (Table 15) via Crosscut Canal (13050018).

(d) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 14. Diversions During 2011 Irrigation Year from Falls River and Tributaries.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13047305	Yellowstone Canal	2,700	2,100	1.3
13047474	C Atchley Pumps	550	(a)	-
13047475	Marysville Canal	20,600	16,000	1.3
13047515	F & L Griffel Pump	250	420	0.6
13047565	R Baum Pump	140	176	0.8
13047570	G/6 Corp Pump	70	120	0.6
13047575	Farmers Own Canal	9,000	5,800	1.6
13047605	W Scafe Pump	40	77	0.5
13047615	R Sturm Pumps	220 (b)	167	1.3
13047625	M Griffel Pump	160	210	0.8
13047635	L Loosli #2(Oberhansly) Pump	90	200	0.5
13047636	C Malouf Pump	150	(a)	-
13047681	Conant Creek Canal	1,800	1,680	1.1
13047710	K Nyborg Pump	260	360	0.7
13047900	Boom Creek pump	410	955	0.4
13048050	Orme Canal/Pump	0	300	0.0
13048060	Squirrel Canal Pump #3	190	245	0.8
13048070	L Orme	90	(a)	-
13048080	D Harshbarger Pump	350	451	0.8
13048255	Squirrel Canal Pump #1	690	245	2.8
13048265	D Zundell Pump	200	(a)	-
13048275	L Loosli #3 (Upr Conant Cr) Pump	270	393	0.7 (c)
13048280	L Loosli #4 Pump	160	(c)	-
13048290	D Budge Pump	40	(a)	-
13048350	J Hill Pump	0	41	0.0
13048430	D Reynolds Pump	240	321	0.7
13048440	C Loosli (Ray Crouch) Pump	260	238	1.1
13048470	T Potter Pump	100	220	0.5
13048475	Enterprise Canal	16,100	6,880	2.3
13048485	R D Miller Pump	0	(a)	-
13048551	C Atchley Pump	250	(a)	-
13048556	W C Davis Pump	0	65	0.0
13048560	Fall River Canal	79,700 (d)	14,200	5.6
13048705	Chester Canal	11,700	2,200	5.3
13049008	McBee Canal	470	105	4.5
13049010	Silkey Canal	6,000	1,080	5.6
13049015	Curr Canal	9,700	1,300	7.5
13049310	RLF Pump	0	(a)	-
13049490	L Loosli #5	0	(a)	-
13049495	G Blanchard Pump	60	28	2.1
	TOTAL	163,010 (d)	56,577	2.9 (e)

(a) Acreage not determined.
(b) Includes diversion 13047616.
(c) Service area shared with 13048275 and 13048280.
(d) Includes 36,720 acre-feet of Henrys Fork water diverted to Fall River Canal via Crosscut Canal (13049560 minus 13050016 plus 13050108 minus 13050102).
(e) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 15. Diversions During 2011 Irrigation Year from Lower Teton River and Tributaries

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13053951	South Project (Clementsville) Pump	870	1,150	0.8
13053971	J Ricks Pump	140	460	0.3
13054031	Boelke (Clementsville) Pump	1,300	2,470	0.5
13054042	Clementsville Pump	2,900	6,790	0.4
13054045	Hibbert Farms Pump	240	(b)	-
13054111	R & J Brown Pump	1,300	1,120	1.2
13054291	P L Stott Pump	0	(b)	
13054420	Parkinson Farms Pump	3,000	2,820	1.1
13054515	Canyon Creek Canal	1,900	2,200	0.9
13054577	G Crapo Pump	0	670	0.0
13054590	P Stevens Pump	2,400	1,700	1.4
13054705	V Schwendiman Pump	3,400	3,280	1.0
13054772	R Brent Ricks Pump	350	300	1.2
13054801	Canyon Creek Lateral Pump	3,200	1,888	1.7
13054850	Siddoway Sheep Company	120	(b)	
13054940	H Bischoff Pump	60	50	1.2
13055030	Wilford Canal	29,000	2,600	11.2
13055032	Denton Allen Pump	20	(b)	
13055033	B Tucker Pump	6	(b)	
13055036	Brian Parker Pump	50	(b)	
13055037	Siddoway Pump	150	(b)	
13055039	McKinnley Pump	20	(b)	
13055040	Teton Irrigation Canal	13,800	3,110	4.4 (a)
13055042	Siddoway Sprinklers	2,000	(a)	
13055050	Pioneer Canal	1,600	310	5.2
13055060	Stewart Canal	1,300	400	3.3
13055193	N Birch Pump	20	16	1.3
13055195	B Leavitt Pump	50	50	1.0
13055205	Pincock-Byington Canal	2,500	270	9.3
13055206	B Hollist Pump	0	(b)	
13055210	Teton Island Feeder Canal	93,000	11,050	8.4
13055245	Salem Union B Canal	1,500 (c)	620	2.4
13055263	J Harris Pump	0	(b)	
13055275	Roxana Canal	3,700	810	4.6
13055280	Island Ward Canal	4,200	3,270	1.3
13055295	Saurey Canal	2,900	520	5.6
13055311	Pincock-Garner	10	(b)	
13055313	Gardner-Beddes Canal	460	71	6.5
13055314	Bigler Slough Canal	70	80	0.9
13055315	Woodmansee-Johnson Canal	780 (d)	1,290	0.6
13055319	Godfrey-Parkinson	150	(b)	
13055321	R R Ricks Pump	40	43	0.9
13055323	City of Rexburg Canal	3,500	950	3.7
13055325	T Brunson Pump	0	(b)	
13055327	J S Wright Pump	0	(b)	
13055334	Rexburg Irrigation Canal	40,300	6,750	6.0
	TOTAL	222,306 (e)	57,108	3.9 (f)

(a) Service area of Siddoway Sprinklers (13055042) included in Teton Irrigation Canal (13055040).
(b) Acreage not determined.
(c) Used additional water from Henrys Fork through Salem Union Canal, not included.
(d) Used additional water from Moody Creek, not included.
(e) Includes 26,119 acre-feet of Henrys Fork water diverted to Lower Teton River via Crosscut Canal (13050018).
(f) Does not include diversions with unknown acreage or zero amounts diverted.

TABLE 16. Diversions During 2011 Irrigation Year from Willow Creek.

Diversion Number	Name	Total Diverted (acre-feet)	Service Area (acres)	Ac-ft/ac Diverted
13057938	Loertscher Pump	20	388	0.1
13058015	B Foster Pump	1,100	1,346	0.8
13058090	Schwendiman Pump	260	160	1.6
13058105	Lovell #1 Pump	400	160	2.5
13058125	Ferguson Canal	870	73	11.9
13058145	Lovell #2 Pump	150	60	2.5
13058165	Reed #1 Pump	80	140	0.6
13058210	Sargent-Summers Canal	310	110	2.8
13058230	AH Durtschi Pump	170	93	1.8
13058250	Reed #2 Pump	170	128	1.3
13058265	Foster-Sargent Pump	270	50	5.4
13058270	J Sperry Pump	260	246	1.1
13058290	O Avery Canal	1,100	57	19.3
13058310	R Avery Canal	5,300	473	11.2
13058330	D Stucki Pump	140	102	1.4
13058340	Schwendiman # 2 Pump	1,200	(f)	-
13058350	O Avery Pump	0	(f)	-
13058370	R Cooper (Sand Cr) Canal	1,500	235	6.4
13058380	R Cooper (Willow Cr) Canal	1,100	98	11.2
13058508	D Keeler Pump	500	470	1.1
13058510	Progressive Sand Creek	132,000 (a)	(b)	-
13058512	Bean Canal	440	80	5.5
13058514	W & O Cooper Canal	1,400	464	3.0
13058515	Idaho Irrigation from Sand Creek	28,200	(c)	-
13058519	Demick Canal	440	80	5.5
13058530	Progressive Willow Creek	37,200	(b)	-
	TOTAL DIVERSIONS	214,580	5,013	3.2 (d)
	TOTAL (NET WILLOW CREEK)	26,618 (e)		

(a) Sand Creek nr Ucon (13058510) minus Idaho Irrigation from Sand Creek (13058515).
(b) Acreage included in service area shown in Table 6 (13037505).
(c) Acreage included in service area shown in Table 9 (13057145).
(d) Does not include diversions 13058515, 13058510, 13058530, and any diversions with unknown acreage or zero amounts.
(e) Total of net Willow Creek excluding Snake River rediversions calculated as follows: Willow Creek blw Tex Creek (13057940) minus Willow Creek Floodway nr Ucon (13058520) plus storage released from Ririe Reservoir from 11/01/2010 through 10/31/2011, minus sum of diversions in Table 16 not including 13058510, 13058515, and 13058530.
(f) Acreage not determined.

State of Idaho
DEPARTMENT OF WATER RESOURCES
322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098
Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: www.idwr.idaho.gov

C.L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Director

MEMORANDUM

To: Gary Spackman, Director

From: Liz Cresto, Technical Hydrologist LC
Matt Anders, Technical Hydrologist MA

Date: March 16, 2015

Subject: Recommended revisions to the Surface Water Coalition Methodology

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Introduction

On January 30, 2015, the Director of the Idaho Department of Water Resources (IDWR, Department) issued an order to staff directing them to convene a committee of experts to recommend specific technical changes to the "Second Amended Final Order Regarding Methodology For Determining Material Injury To Reasonable In-Season Demand And Reasonable Carryover" (Methodology) signed on June 23, 2010. Department staff created a committee in response to the Director's order composed of IDWR staff and experts representing parties involved in litigation of the Surface Water Coalition's (SWC) 2005 delivery call. In his January 30 order, the Director requested recommendations for technical changes to the Methodology by March 16, 2015, regarding the following specific issues:

1. Revising natural flow forecast methods for Twin Falls Canal Company.
2. Identifying more accurate and current crop data to determine crop water need.
3. Improving the mid-season reasonable in-season demand forecast.

Committee

The committee held multiple meetings and corresponded though email regarding the issues identified in the order. The committee comprises the following members:

Committee Member	Organization	Representing
Charles G. Brockway	Brockway Engineering	Surface Water Coalition
Chuck Brendecke	Lynker Technologies	Idaho Ground Water Users
Dave Shaw	ERO Resources	Surface Water Coalition
David Hoekema	IDWR	IDWR
Greg Sullivan	Spronk Water Engineers	City of Pocatello
Liz Cresto	IDWR	IDWR
Matt Anders	IDWR	IDWR
Scott King	SPF Water Engineering	Idaho Ground Water Users
Sean Vincent	IDWR	IDWR
Sophia Sigstedt	Lynker Technologies	Idaho Ground Water Users

The committee collectively decided that the most efficient method for consolidating member comments while still adhering to the March 16, 2015 deadline was to have committee members attach their comments to this memorandum. All of the committee members had an opportunity to review this memorandum and all of their comments that we received are attached in Appendix B.

Section 1 – Natural Flow Forecast

Background

The Methodology requires the Director to issue an order determining the demand shortfall of the SWC members for the irrigation season. The SWC members include A & B Irrigation District (A&B), American Falls Irrigation District #2 (AFRD2), Burley Irrigation District (BID), Milner Irrigation District (Milner), Minidoka Irrigation District (MID), North Side Canal Company (NSCC), and Twin Falls Canal Company (TFCC). The shortfall is the difference between the forecast supply and the forecast demand for each SWC member. The forecast supply is comprised of two components: the predicted natural flow supply and the predicted storage allocation for each SWC member. Pursuant to the Methodology, the Department undertakes an April forecast and mid-irrigation season forecast.

In the current Methodology, the April predicted natural flow supply is based on a regression analysis comparing the total natural flow in the Snake River near Heise between April and July to the annual natural flow diverted by each SWC member. While the Director only requested revisions to the natural flow forecast recommendations for TFCC, the committee also identified improved models for AFRD2, BID, MID, and NSCC through its work on revised natural flow forecast methods for TFCC. This memo includes recommendations for revising the April predicted natural flow supply forecasts for TFCC, AFRD2, BID, MID and NSCC.

The mid-irrigation season forecast is addressed in Step 6 of the Methodology. The forecast supply in Step 6 is the sum of the actual year-to-date natural flow diverted, plus the predicted natural flow supply for the remainder of the season, plus the actual preliminary storage allocation. The predicted natural flow supply for the remainder of the season was forecast by selecting an analogous year based on the Snake River Blackfoot to Milner reach gains. The selection of the analogous year typically occurred in August and a revised forecasted supply was issued. In working to meet the request of the Director's January 30 order, the committee reviewed a host of models that predict the natural flow supply for each SWC member from July 1 through October 31.

The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains which occur in the Snake River between the Blackfoot to Milner reach. The committee reviewed several different models for predicting both the April and mid-season natural flow supply for each SWC member. While many different predictor variables were considered, the following variables were ultimately selected: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Oceans Plateau SNOTEL site; Box Canyon Springs discharge; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The recommended model predictors vary by SWC member and by model implementation date (i.e. April 1 vs. July 1) and are summarized in the sections below.

April 1 Forecast

April forecast natural flow supply models were developed using data from 1990 through 2013. Data from 2014 was excluded from model development for two reasons: 1) the dataset for 2014 was still provisional at the time of model development and 2) record rainfall in August of 2014

resulted in significant data anomalies. For these reasons, we decided to exclude 2014 values from the dataset.

Both single linear regression and multiple linear regression models were considered. We recommend that natural flow supply forecast for A&B and Milner continue to be based on single linear regression models, in which the natural flow at the Snake River near Heise is the predictor variable. We believe the natural flow at the Snake River near Heise is a good predictor because A&B and Milner have relatively junior water rights and typically only divert natural flow during the spring runoff events. When applied, the April 1 forecast will utilize the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation joint forecast of total natural flow in the Snake River near Heise from April-July. Alternative models were evaluated, but we found they added additional complexity without significantly improving the existing A&B and Milner models.

New multiple linear regression models are recommended to replace the existing regression models for TFCC, AFRD2, BID, MID, and NSCC. For these entities, the final predictor variables selected for their respective April 1 models included the total April through July natural flow in the Snake River near Heise and the total November to March discharge at Box Canyon Springs. The predictor variable, natural flow in the Snake River near Heise, was considered a good indicator of the natural flow supplied by snowmelt runoff. The predictor variable, Box Canyon Springs, was considered a good indicator for the natural flow supplied by the reach gains in the Blackfoot to Milner reach. If applied, the April 1 forecast models will utilize the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation joint forecast of the natural flow in the Snake River near Heise from April-July.

Below is a table comparing the models used in the current Methodology to the recommended models. The recommended models for each member of the SWC have a better model fit (higher adjusted r^2) and a lower standard error than the models used in the current Methodology.

SWC Member	Models from Current Methodology[1]		Recommended Models	
	Adjusted r^2	Standard Error	Adjusted r^2	Standard Error
AFRD2	0.8317	39,700	0.8448	37,290
BID	0.7964	20,690	0.8546	17,100
MID	0.7896	29,710	0.8786	22,070
NSCC	0.8952	63,580	0.9151	55,950
TFCC	0.5416	71,990	0.8564	37,940

Appendix A contains graphs of the April models in comparison to the actual natural flow diversions for each SWC member.

July 1 Forecast

Step 6 of the Methodology requires the Department to issue a revised forecast supply "approximately halfway through the irrigation season". New natural flow predictor models have been developed for each SWC member for the specific period July 1 – October 31. We recommended that the July 1 models be implemented when revising the forecast supply in Step 6 of the Methodology.

Using data from 1990 to 2013, regression models were developed for A&B, AFRD2, and Milner by comparing snow water equivalent at the Two Oceans Plateau SNOTEL site on July 1 to the total

[1] Final Order Regarding April 2014 Forecast Supply, April 18, 2014.

natural flow diverted for the period July 1 through October 31. Data from 1997 was excluded from model development because of significant data anomalies as of a result of the high runoff year. The snow water equivalent at the Two Oceans Plateau SNOTEL site was considered a good indicator of additional natural flow diversions after July1. Years with zero (0) snow water equivalent on July 1 were excluded from the model dataset. It is recommended that in years with zero (0) snow water equivalent at the Two Oceans Plateau SNOTEL site on July 1, the predicted natural flow supply for the period July 1 – October 31 for A&B, AFRD2, and Milner will also be zero (0). For A&B, AFRD2, and Milner, the regression models would only be used in those years when the July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site is greater than zero.

Multiple linear regression models were developed for BID, MID, NSCC, and TFCC. The regressions for BID, MID, and NSCC were developed with data from 1990 to 2013 and correlations were developed between the total natural flow diversions from July 1 through October 31and three predictor variables: (1) natural flow in the Snake River near Heise (April – June), (2) snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15, and (3) March depth to water at well 05S31E27ABA1. Manual well measurements were historically taken from March 13 to March 30, with an average date of March 23. A transducer installed in May 2010 replaced the need for manual measurements. The combination of historical manual measurements and March 23 transducer readings will be utilized in the models.

The regression model to predict TFCC natural flow diversions from July 1 through October 31 relies on data from 1990 to 2013 and utilizes three predictor variables: (1) natural flow in the Snake River near Heise (April – June), (2) snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15, and (3) Spring Creek total discharge (January – May). Below are summary statistics for the recommended models.

	Regression based on Two Oceans Plateau Snow Water Equivalent		Multiple Linear Regression	
SWC Member	Adjusted R^2	Standard Error	Adjusted R^2	Standard Error
A&B	0.9294	741		
AFRD2	0.8699	7,502		
BID			0.8932	11,480
Milner	0.8382	2,939		
MID			0.9037	15,720
NSCC			0.8615	46,930
TFCC			0.8511	29,270

Appendix A contains graphs of the July predictor models in comparison to the actual natural flow diversions for each SWC member.

Section 2 – Current Crop Mix Data

Current Method

Crop mix is one of the variables used in the current Methodology to calculate the crop water need of the SWC members. Crop mix is defined as the acreage of each crop type grown by each SWC member. The current method for determining crop mix is a three step process:

1) Tabular crop acreages from 1990 to the present are downloaded by county from the USDA National Agricultural Statistics Service (NASS).

2) Based on the tabular data available from 1990 to the present, an average crop mix for each county is determined.

3) The average crop mix of the counties is applied to each SWC member based on the proportion of land the SWC member has in each county.

Shortcomings of the current cropping pattern method include: NASS tabular data is adjusted to protect farmer privacy and is becoming increasing incomplete with fewer acreage totals being reported since 2005, average acreages for a 25-year period do not reflect current crop mix patterns, and county-wide crop mix may not represent the crop mix of SWC members.

Recommended Revision

Based on testing and with consideration of input from the committee, we recommend revising the method for determining crop mix. Instead of relying on county-wide tabular data, we propose using the digital Crop Data Layer (CDL) from the USDA National Agricultural Statistics Service (NASS). Benefits of this proposed method include: (1) using the most recent data available; and (2) restricting the geographic area of the data to the service area of each SWC member. The proposed method would involve the following steps each year:

1) Downloading the digital CDL dataset from the NASS website.

2) Removing crop type classification errors (speckling) in the CDL dataset with Zonal Statics in ArcGIS. A potential source of error associated with the Zonal Statics process is the intermittent availability of an annual field boundary dataset. However, our review of field boundary datasets and historical aerial photography revealed that field boundaries change infrequently and substituting field boundary datasets from previous years introduces minimal error. An additional possible source of error associated with the Zonal Statics process is the assignment of a single crop type to fields actually planted with multiple crop types. With respect to this concern our qualitative review of historical aerial photography and CDL datasets establishes that fields with multiple crops are rare and we conclude this concern represents a minimal source of error.

3) Clipping the CDL dataset in ArcGIS with an irrigated lands dataset for each SWC member.

4) Calculating the acreage by crop type for each SWC member.

5) Computing a 3-year average by crop type for each SWC member. In our analysis we have found the seven years of CDL data that are currently available do not depict a clear relation between cropping pattern and water supply. Because of this finding, a 3-year average appears adequate to reduce the influence of a single year while still being representative of the current cropping pattern.

Our comparison of the results of the tabular and CDL methods establishes that making this revision will cause the percentage of crop types identified for each SWC member to change between 0 and 30 percent (table below). This range of adjustment appears plausible given the change from a 20-year to a 3-year average and from a county-wide geographic area to the service areas of SWC members. A preliminary comparison of the crop water need calculated using the CDL and METRIC indicates the CDL and METRIC are in general agreement.

Comparison of Crop Mix Derived From NASS Tabular and NASS CDL.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
Alfalfa	20.2%	42.5%	40.4%	27.8%	36.9%	14.0%	29.5%
	19.2%	26.5%	16.8%	20.9%	29.8%	22.4%	22.4%
Barley	11.6%	3.3%	3.7%	12.0%	11.9%	20.1%	12.7%
	31.1%	5.6%	4.3%	15.4%	13.2%	6.9%	10.8%
Corn	3.6%	5.7%	27.8%	14.9%	9.1%	2.0%	11.2%
	3.1%	28.1%	6.8%	11.2%	2.7%	31.3%	18.9%
Developed-Open Space	---	---	---	---	---	---	---
	0.9%	1.1%	3.0%	0.4%	2.0%	1.6%	2.6%
Developed-Low Intensity	---	---	---	---	---	---	---
	0.0%	1.4%	1.9%	0.0%	3.4%	0.9%	2.0%
Developed-Med Intensity	---	---	---	---	---	---	---
	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.9%
Developed-High Intensity	---	---	---	---	---	---	---
	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Dry Beans	3.4%	4.4%	2.9%	9.2%	2.1%	3.6%	16.7%
	8.4%	2.5%	7.6%	13.0%	3.0%	3.6%	11.1%
Oats	0.2%	0.4%	0.4%	0.1%	0.8%	0.2%	0.2%
	0.1%	0.7%	0.1%	0.3%	0.2%	0.1%	1.0%
Pasture/Hay	---	---	---	---	---	---	---
	2.6%	17.1%	5.3%	1.6%	8.9%	11.9%	14.9%
Peas	---	---	---	---	---	---	---
	0.1%	0.0%	0.0%	0.4%	0.1%	0.1%	1.6%
Potatoes	12.2%	11.9%	10.2%	10.5%	7.1%	13.7%	6.3%
	8.7%	3.3%	10.7%	7.6%	11.9%	7.3%	2.7%
Spring Wheat	13.2%	5.2%	5.3%	8.3%	14.6%	15.0%	4.2%
	3.7%	3.7%	4.1%	3.7%	3.6%	1.8%	0.7%
Sugarbeets	12.6%	11.7%	4.0%	9.6%	12.0%	23.0%	6.7%
	18.7%	4.4%	20.6%	10.5%	11.9%	5.6%	3.0%
Winter Wheat	23.0%	14.9%	5.2%	7.5%	5.5%	8.4%	12.5%
	3.5%	5.5%	18.7%	15.0%	8.8%	6.5%	7.4%

---	Data not included in the NASS Tabular Data
Clear Cells	NASS Tabular Data: Average (1990-2010) % of Crop Harvested vs. Total Crops Harvested Irrigation District Wide
Shaded Cells	NASS CDL Data: 3-Year (2011-2013) Average Crop Pattern per SWC Member

Section 3- Reasonable In-Season Demand (RISD)

The committee began discussions on improving the mid-season reasonable in-season demand forecast. With the limited timeframe the committee was given, we were unable to conclude an analysis of methods to improve RISD forecasts. Because this analysis is not yet complete, we cannot currently recommend any changes to the current Methodology regarding this issue.

Section 4 – Future Committee Meetings

Committee members provided valuable technical input for revising the Methodology. We recommend continuing to convene this committee in the following manner:

1) At least one annual meeting to review implementation of the Methodology during the previous irrigation season. This would be an ongoing forum for identifying and reviewing potential technical revisions to the Methodology.

2) Multiple meetings during 2015 to finish reviewing the following subjects that were discussed by the committee, but require further discussion and analysis to develop a recommendation:

    a. Mid-season calculation of reasonable in-season demand (RISD): The current method uses average demand in 2006/2008 to predict the RISD for the remainder of the irrigation season. We are analyzing the potential for refining this predication by selecting a representative historical analogous year(s).

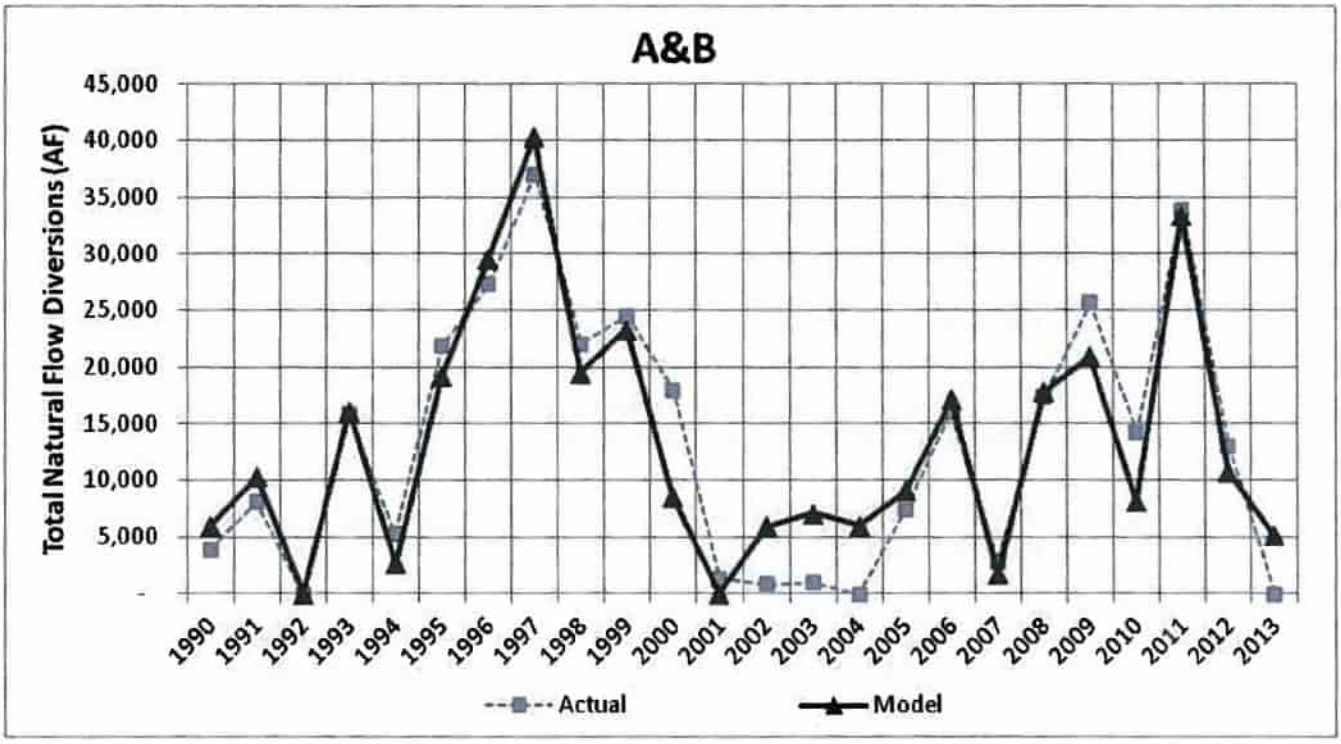
    b. Supplemental ground water use: There was insufficient time for the committee to evaluate this subject.

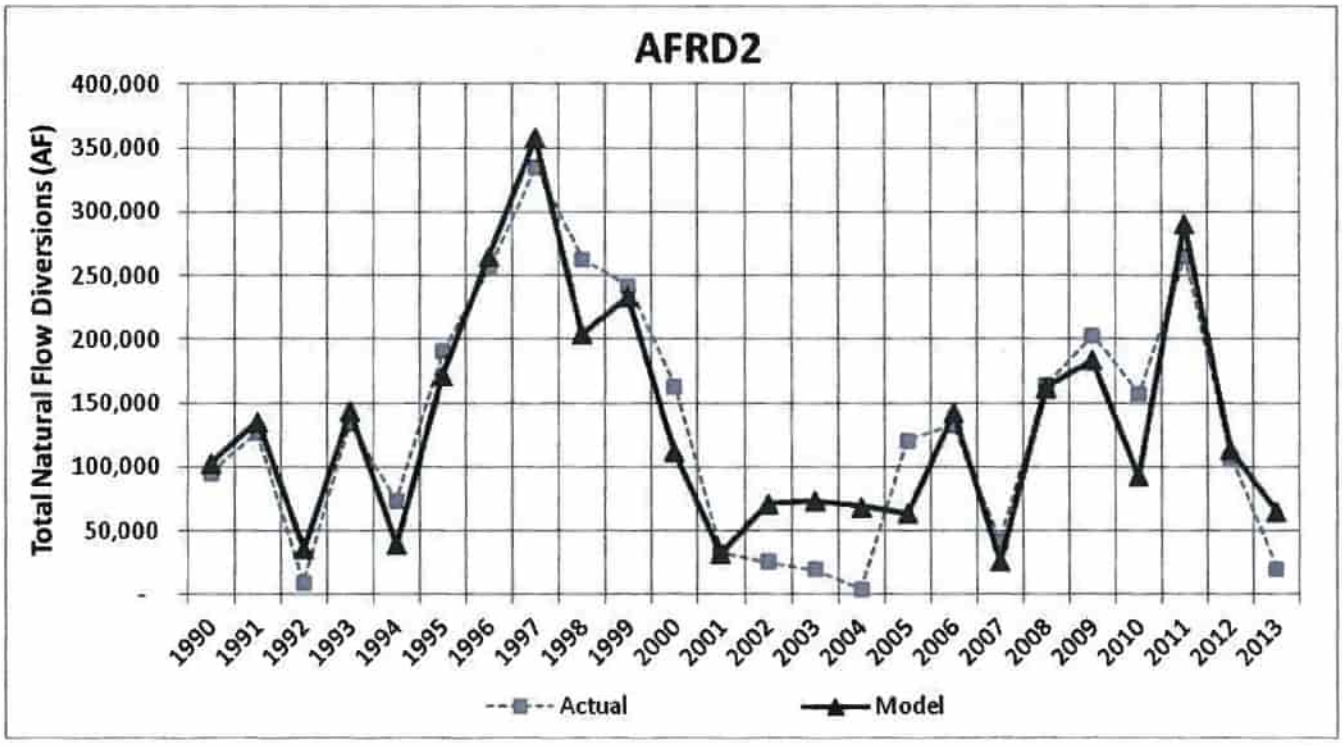
    c. Project efficiency: The project efficiency variable used in the RISD calculation has not been updated since the Methodology was originally developed. The committee had preliminary discussion about the need to update project efficiency and committee members expressed interest in providing input.

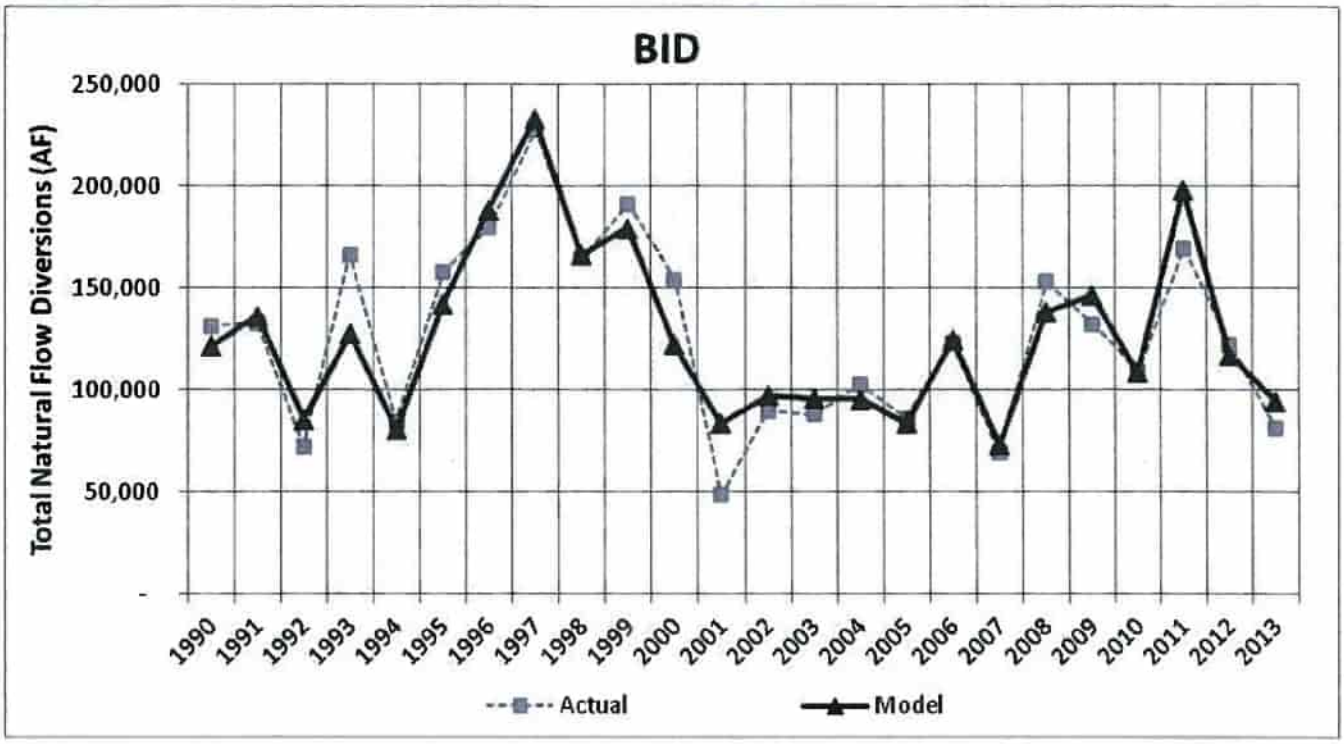
    d. Irrigated acres: Significant discussion focused on this topic and it was generally agreed that the process for determining irrigated acres for SWC members could be improved.

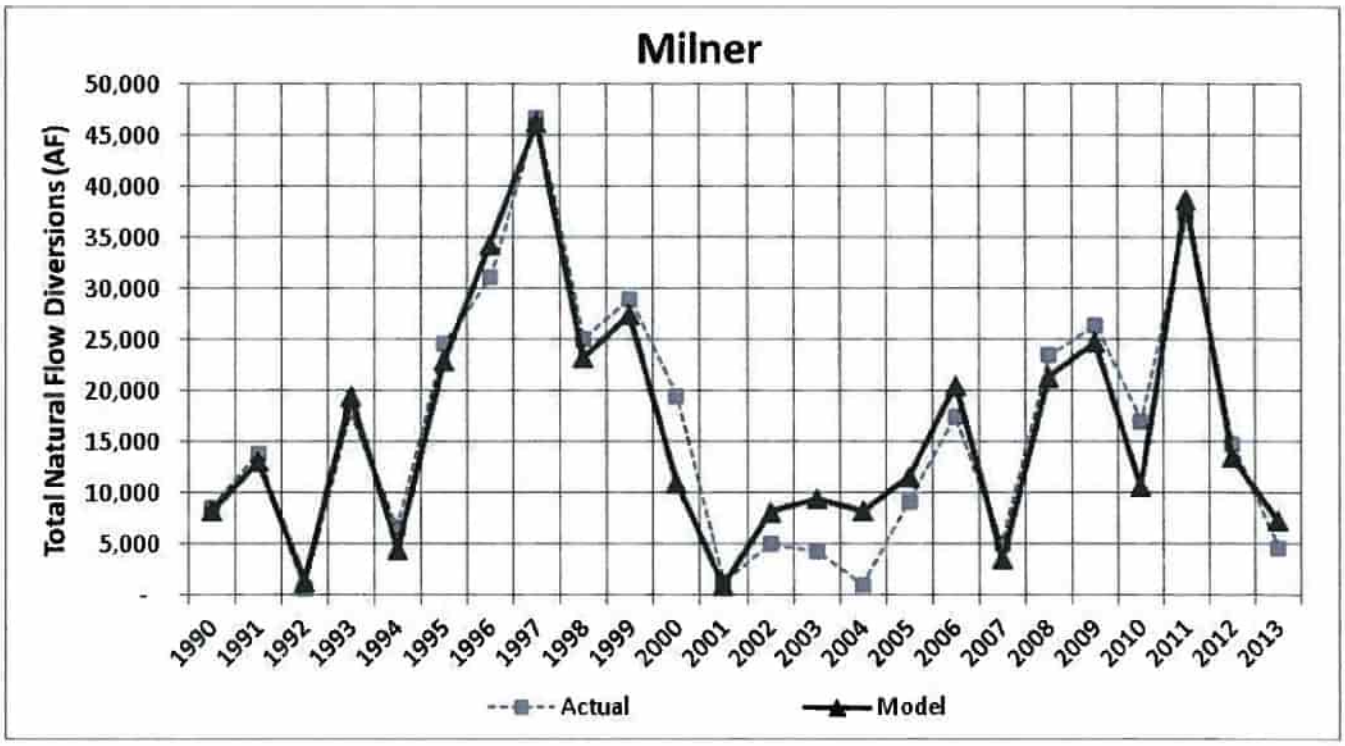
APPENDIX A

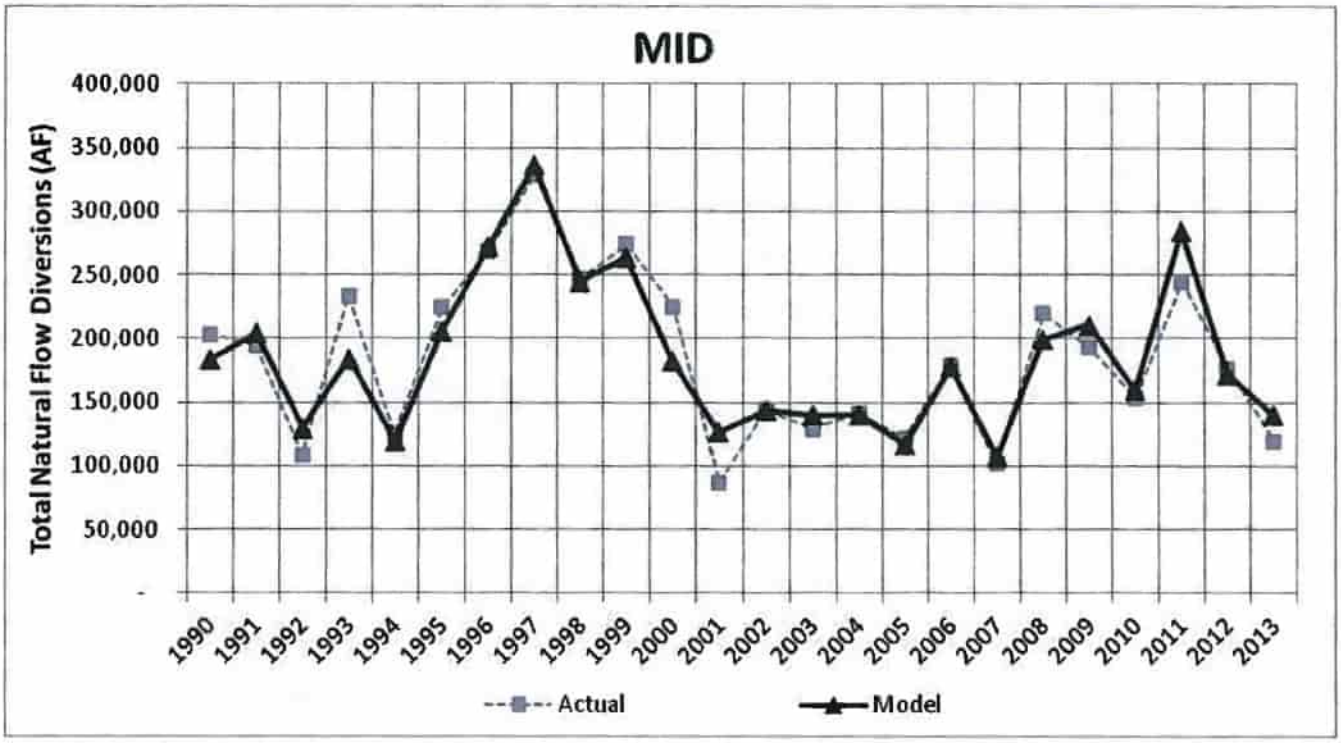
Recommended April Forecast Flow Predictor Models

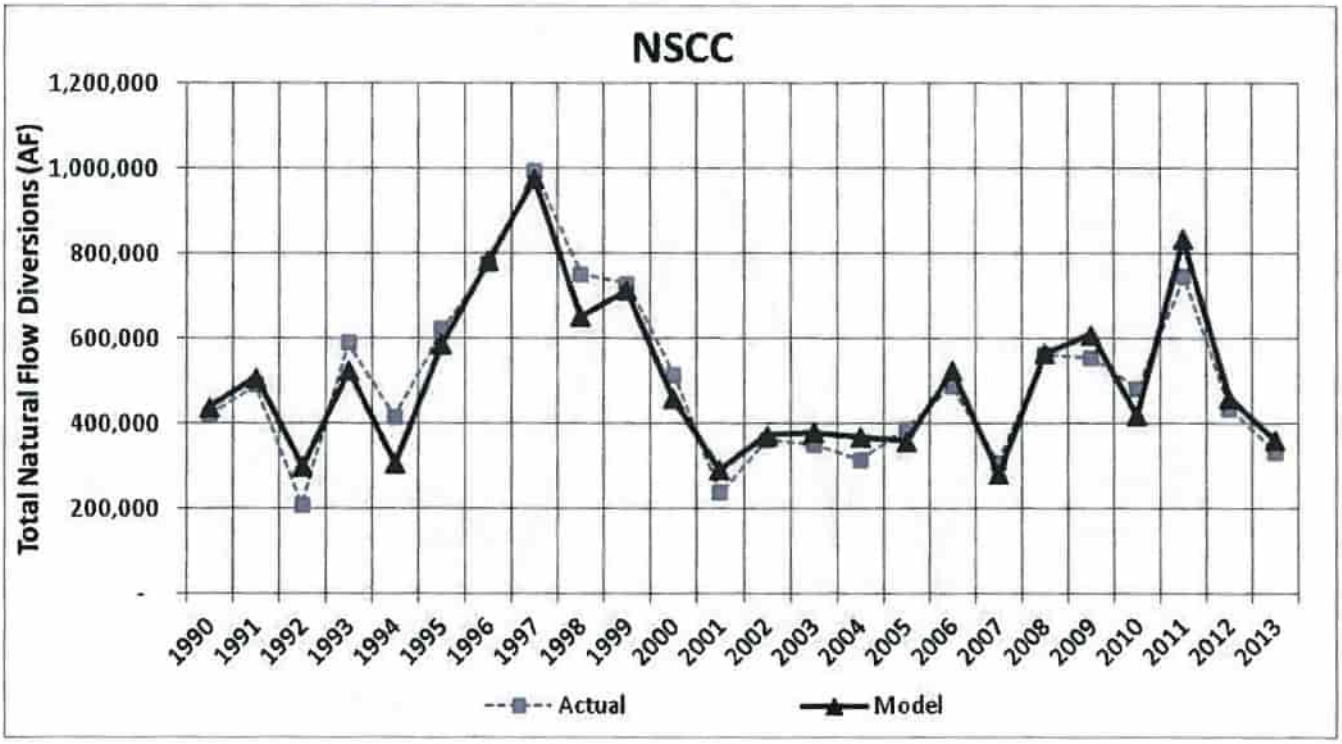


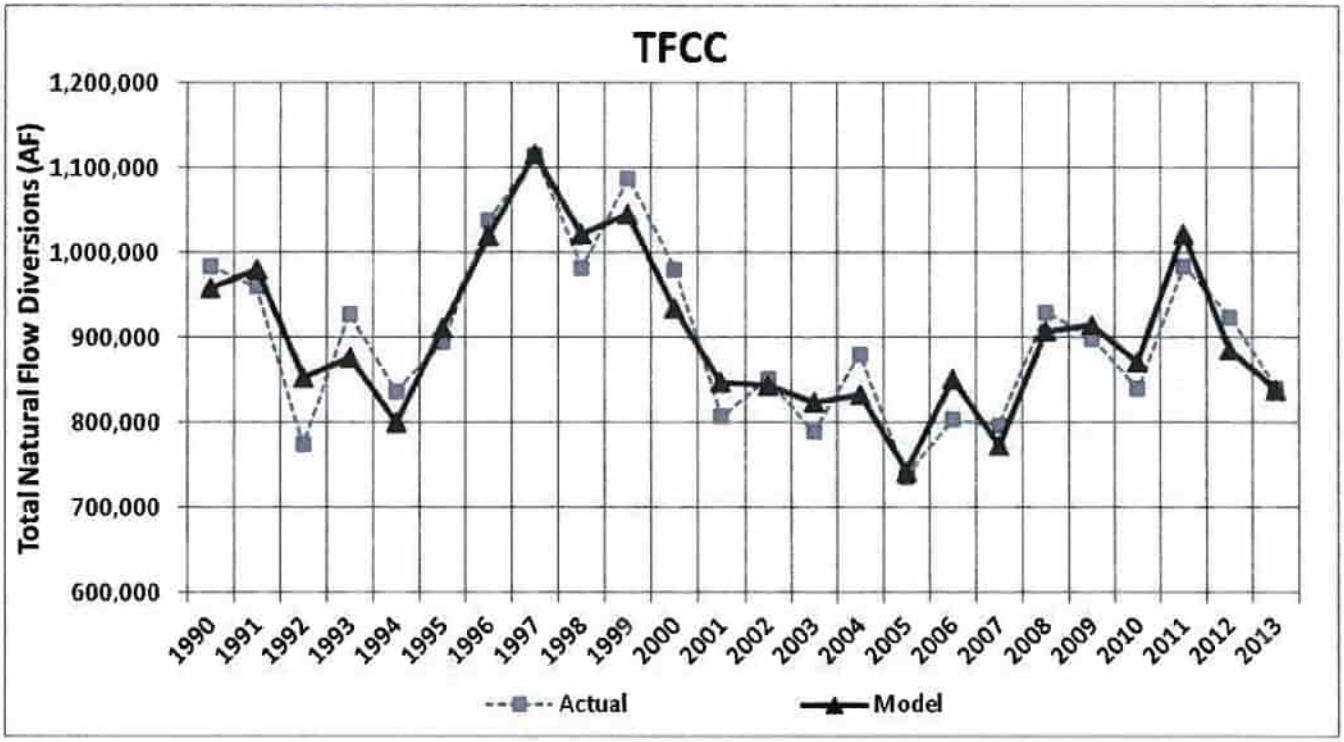



BID
Total Natural Flow Diversions (AF)
250,000
200,000
150,000
100,000
50,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

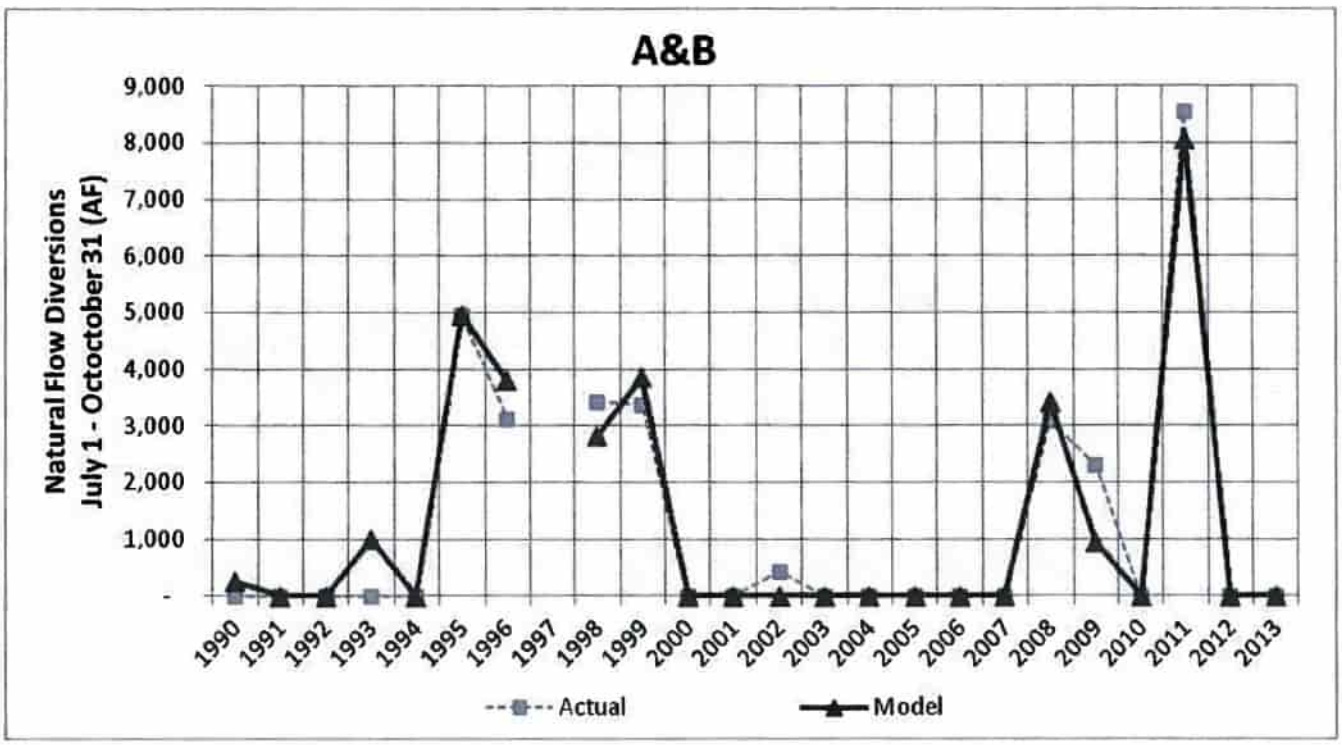

Milner
Total Natural Flow Diversions (AF)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

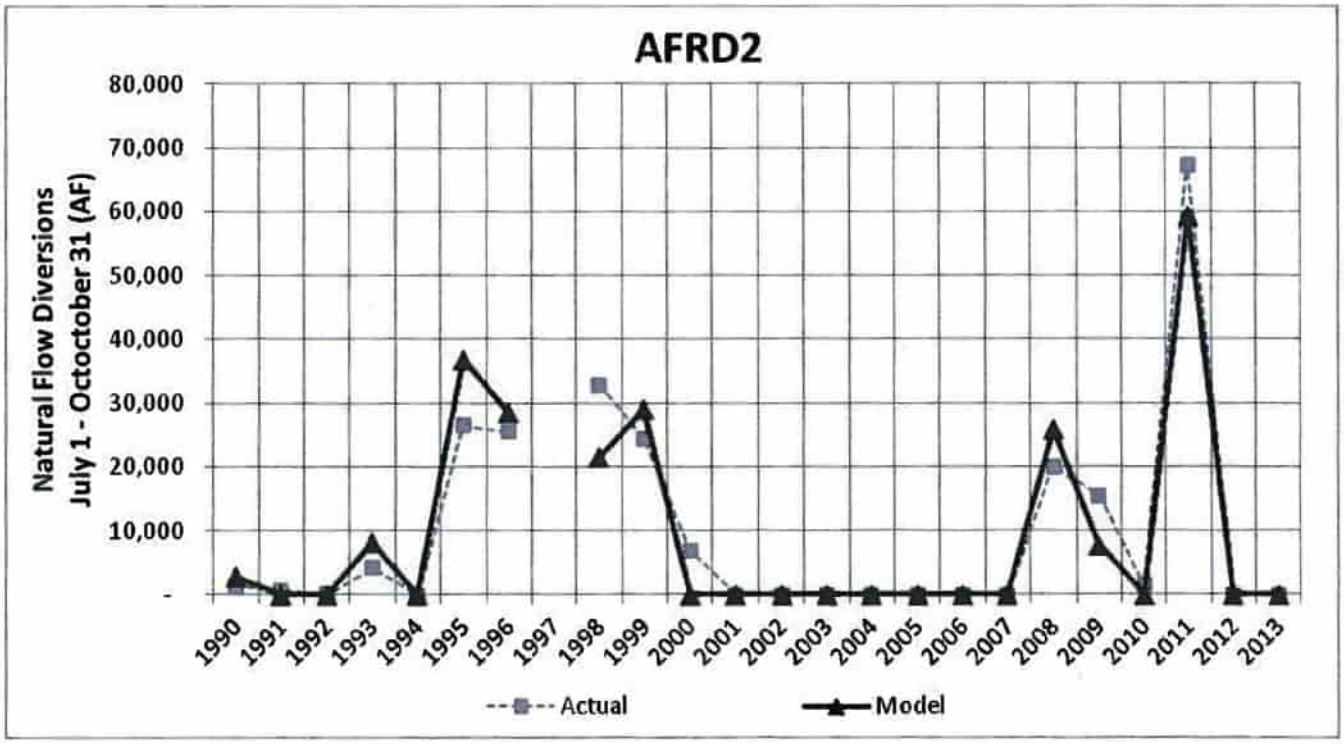

MID
Total Natural Flow Diversions (AF)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

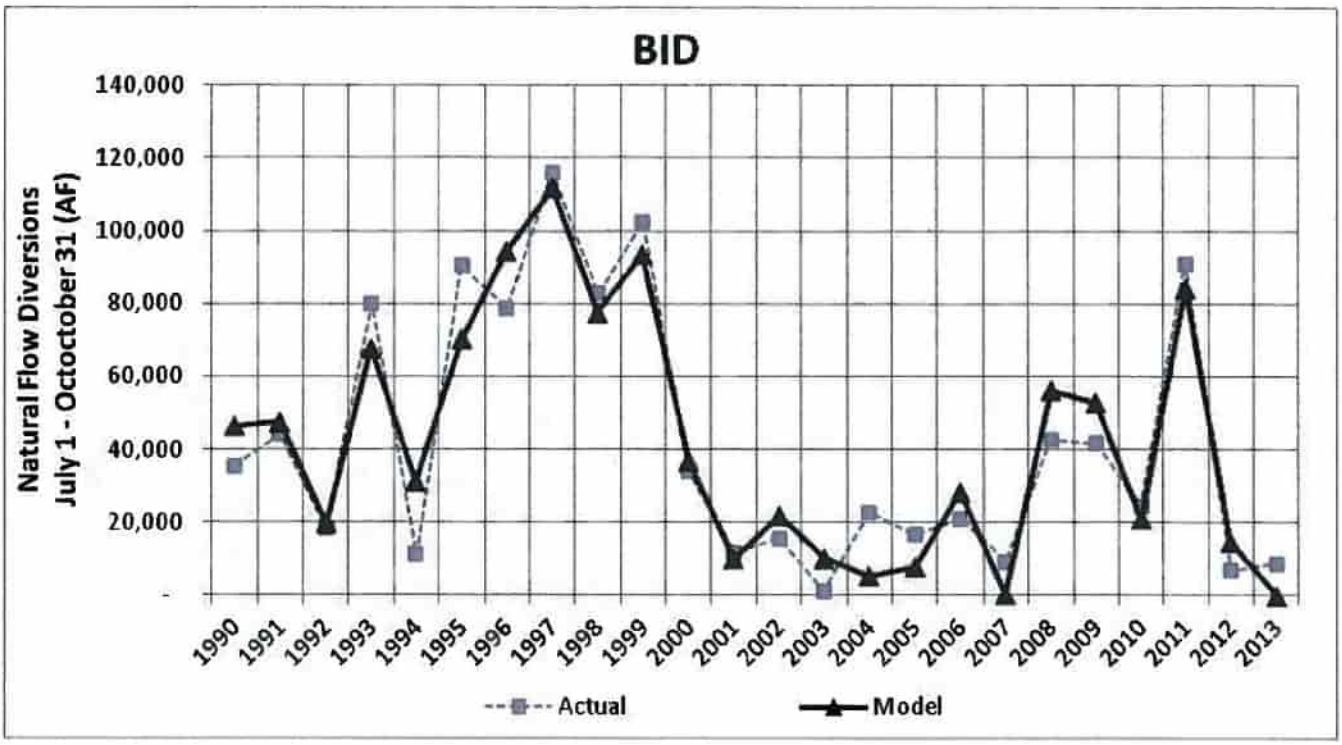

NSCC
Total Natural Flow Diversions (AF)
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

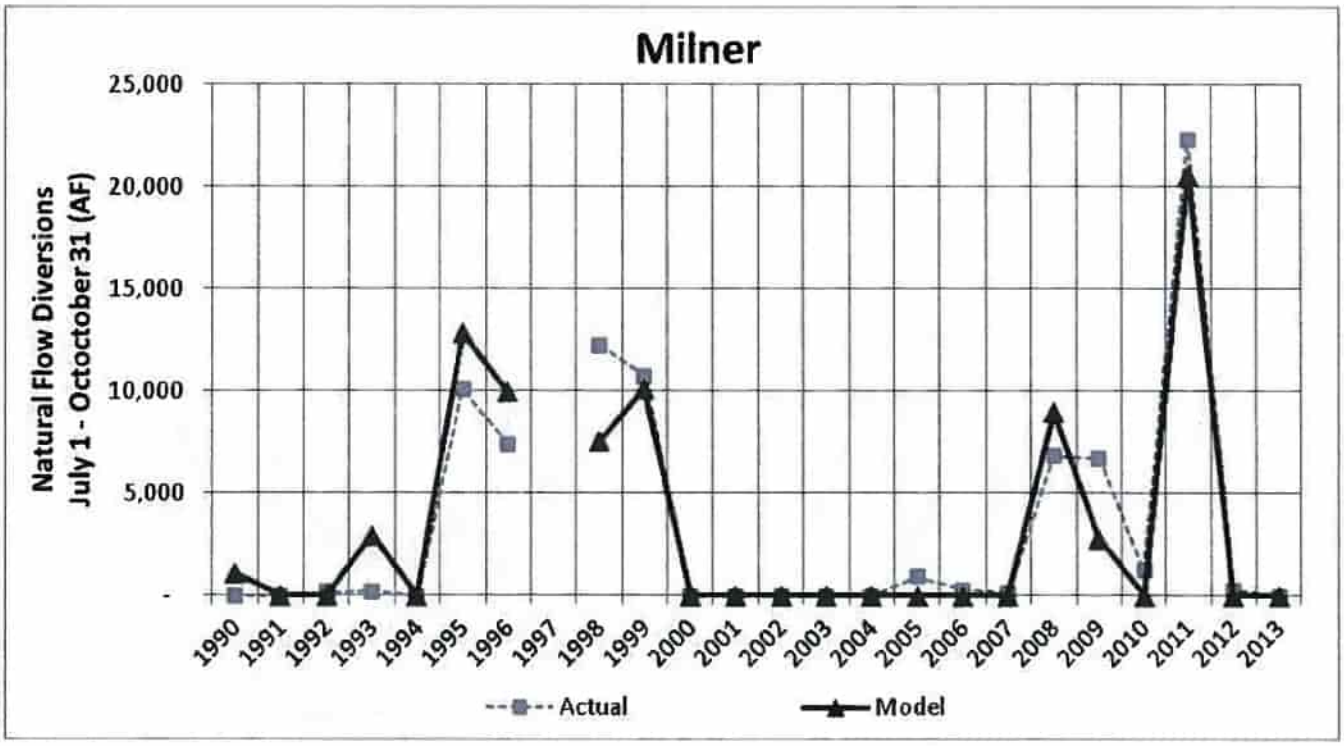

TFCC
Total Natural Flow Diversions (AF)
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model

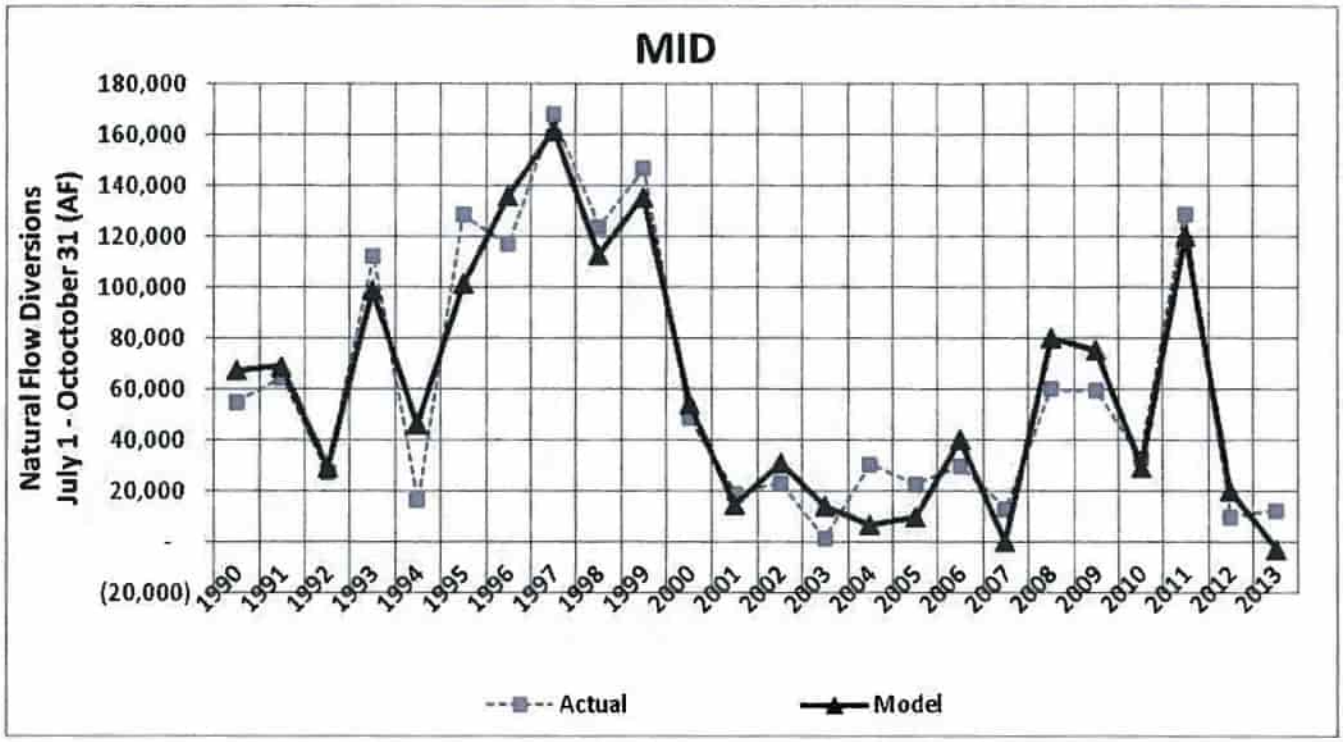
Recommended July Forecast Natural Flow Models

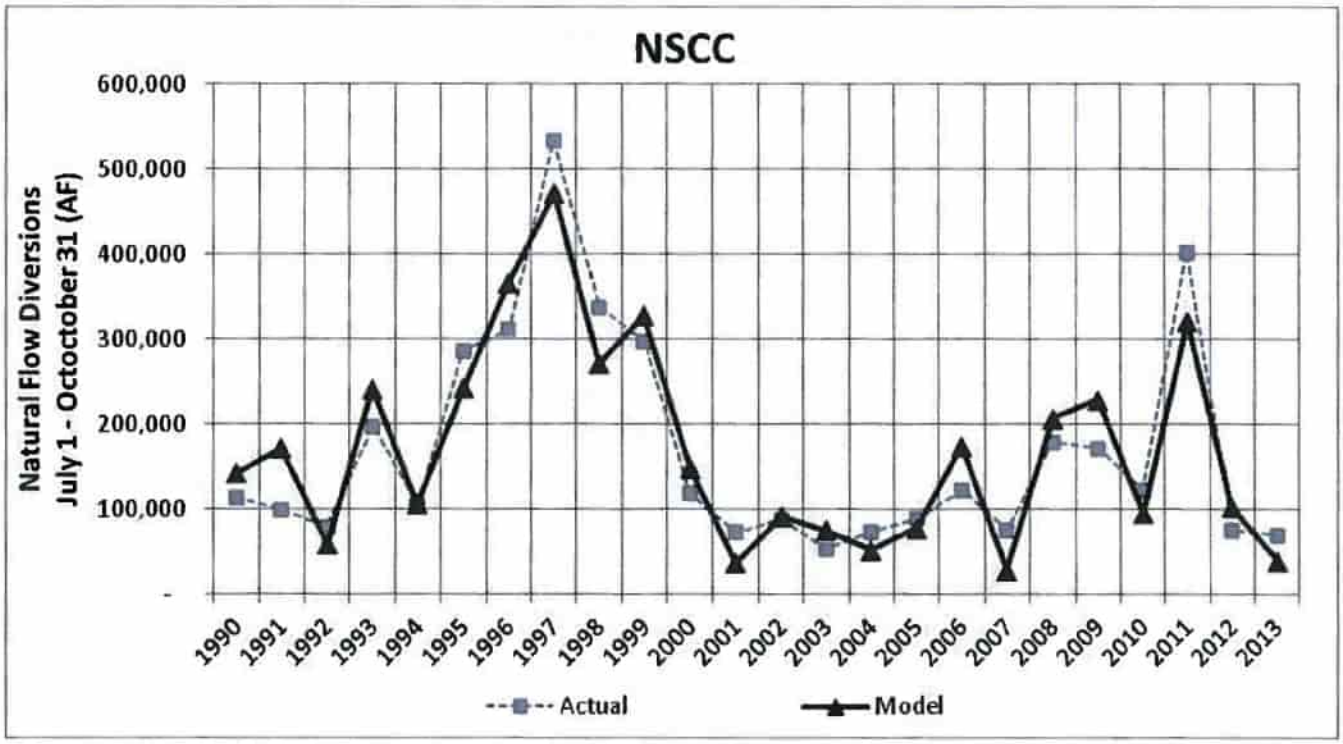


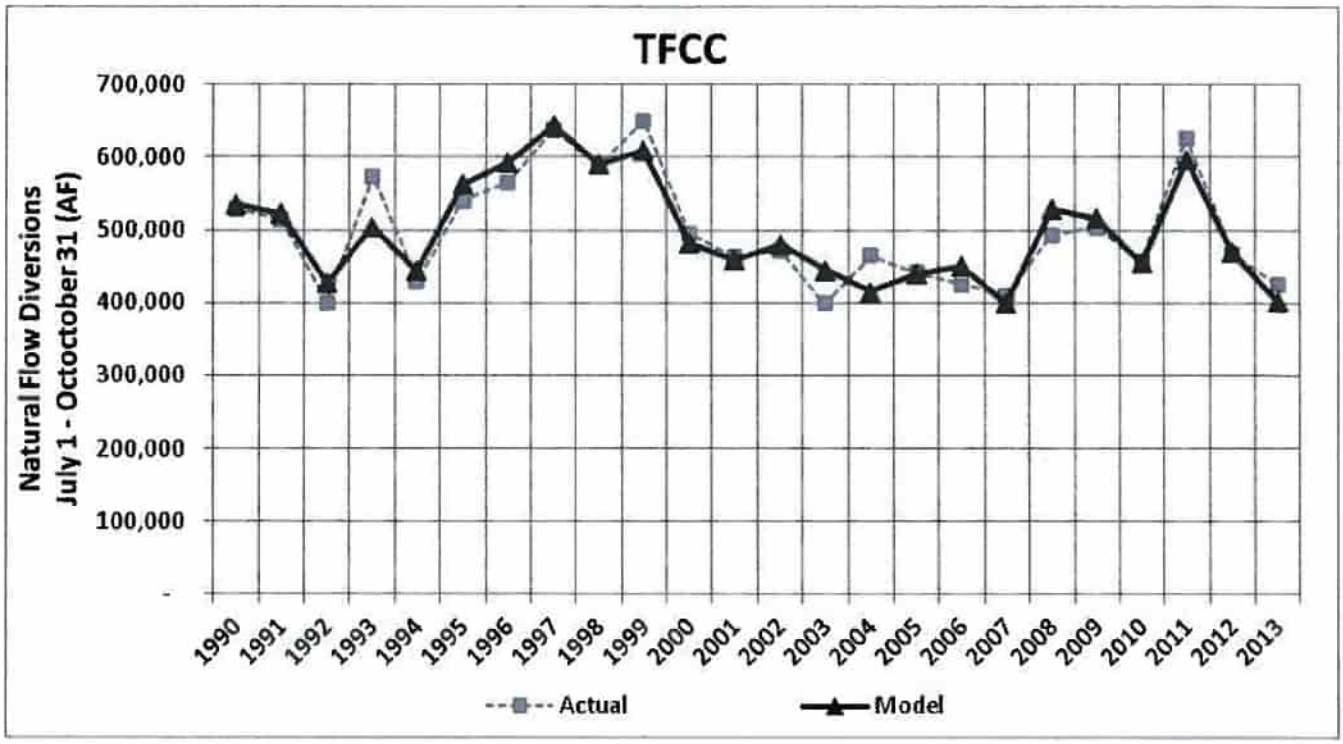



BID
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


Milner
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
25,000
20,000
15,000
10,000
5,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


MID
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
(20,000)
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


NSCC
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
600,000
500,000
400,000
300,000
200,000
100,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


TFCC
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model

APPENDIX B

Comments Received From Committee Members

LYNKER TECHNOLOGIES

MEMORANDUM
Settlement Document Subject to I.R.E 408

To: Liz Cresto

From: Charles Brendecke and Sophia Sigstedt

Subject: Comments on Staff Recommendations

Date: March 16, 2015

This memorandum addresses our comments on the analyses presented to the Technical Working Group related to revisions to the Methodology Order for determining injury to water rights held by members of the Surface Water Coalition. It serves as an addendum to the Idaho Department of Water Resources (IDWR or Department) staff memorandum regarding recommended revisions. Department staff were asked to provide recommendations to the Director on the following topics[1]:

1. Revised natural flow forecast methods for Twin Fall Canal Company (TFCC).
2. Identify more current and accurate crop data to determine crop water need.
3. Improvement of mid-season reasonable in-season demand forecast (RISD).

Topics 1 and 2 were assigned priority and due to time constraints are the only topics the Department staff make recommendations on in their memorandum.

Sections 1 and 2 below summarize our comments based on the proceedings of the committee regarding the recommendations to topics 1 and 2, respectively, in the staff memorandum. It is our understanding that Department staff recommendations on topics 1 and 2 are based on analyses that could be completed within the time constraints provided, and that while they are intended to provide guidance for administration of TFCC's water rights for the 2015 irrigation there will be opportunity for further analyses and recommendations concerning both topics for future irrigation seasons. It is also our understanding further work will be done on topic 3 prior to the need for the mid-season adjustment. Section 3 summarizes our preliminary comments regarding aspects of the mid-season RISD calculation.

The three topics identified above are not the only items in the Amended Methodology Order that were set aside or remanded by the District Court. The comments in our memorandum should not be considered a comprehensive summary of our opinion on all the technical aspects under consideration in the remand of the Amended Methodology Order.

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[1] Status Conference, January 28th 2015

Lynker Technologies
5485 Conestoga Court Suite 220
Boulder, Colorado 80301

Tel: 303.284.8627

Section 1

Part D. ofthe Memorandum Decision and Order on Petitions for Judicial Review of the Amended Methodology Order found that "The *Methodology Order's* reliance upon the Joint Forecast, and its use of the Heise Gage, to determine the available water supply for Twin Fall Canal Company is set aside and remanded for further proceedings as necessary." The issue was unopposed and the Department expressed that the Joint Forecast is "not the best evidence" for purposes of predicting TFCC's supply and that they would be willing to work with TFCC to improve the predictors for future application.

The Department staff's recommendations for revised natural flow forecast methods for TFCC began with the assumption that the need to predict TFCC's supply must occur prior to April 1. The comments provided here neither support nor reject that assumption. The Department staff' recommendations for revising TFCC's supply improves the current relationship used in the Methodology Order. However the analysis and committee review process was undertaken in a highly compressed timeframe and many things warrant additional consideration. We support the idea of treating the refinements to the Methodology Order as a "living document" that allows for continual improvement and to use the staff's recommendation as an interim solution for the upcoming 2015 irrigation season only.

We believe that one reason the Heise Gage forecast is not a good predictor for TFCC supply is that the predictor is physically based while the TFCC supply is considered to be the historical TFCC diversion record. TFCC diversions are not the same as the physical supply available to TFCC because the diversions reflect administrative and operational influences in addition to being a condition of the physical natural flow supply. For example, TFCC has the more senior water right relative to the other surface water diverters below Blackfoot and their diversions in early season are often capped by the water right amount rather than the physically available supply. The water right cap creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This difference is a probable reason the Heise forecast alone had such a low correlation to TFCC compared to the other entities. In light of this, an approach that we believe should be further investigated is creating a regression relationship or alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

The natural flow forecasts for TFCC and subsequently a selection of other entities were improved by moving from a single variable linear regression model to a multilinear regression. The improvement in the TFCC prediction supports the Department staff recommendation in the use of the additional Box Canyon data in April and the Snotel and Spring Creek discharge data in July. The Department Staff also recommended new models for some entities that showed improvement in the July forecast with the addition of Snotel and March groundwater level data. While these newly developed models can be tested over the upcoming irrigation season we believe they can be further improved.

Section 2

Our comments are limited on the succinct issue of the Department staff recommendation to use the digital Crop Data Layer (CDL) from the USDA National Agricultural Statistics Service (NASS) as a more current and accurate crop data source to determine crop water need. One concern here is how the data is post processed. We recommend sensitivity tests to different program settings when raster processing is applied. We also recommend further investigation into the method behind the development of the NASS dataset to determine how and to what extent the data set is field verified or if there are common misrepresentations that should be considered in the process of data quality assurance checks.

Section 3

As the Department memorandum stated there was not sufficient time for the staff to make a recommendation on the RISD forecast. There are multiple components to the RISD forecast calculation that are under review in the current Methodology Order. These include but may not be limited to:

- The mid-season calculation of RISD
- Project efficiency
- Irrigated acres
- Supplemental groundwater use

Regarding the mid-season calculation of RISD the sensitivity and appropriate use of crop coefficients and climate data behind the reference ET in the calculation should be investigated and analyzed for proper application to local conditions.

Regarding project effiencies we recommend investigation into trends among the entities related to each of the factors the Methodology Order considers in their determination.

Regarding irrigated acres it appears there is not a standard review process for the updates by the SWC or for the critique by IDWR of the submittal of the irrigated acres. With only a check against the total acres in the decreed place of use, there is little or no incentive to keep these shapefiles up to date. Based on the discussion in the technical working group the determination of irrigated acres will likely not be addressed in this review process. Updating irrigated acres by verification of claimed irrigated polygons by satellite and/or aerial imagery is a detailed, time consuming process. But it is essential to protect the valid water rights of juniors.

If SWC members are going to be responsible for this task a first step that the Department should take is to develop a standardized method for this update. This should include pointers to the preferred irrigated polygon base layer, satellite/aerial imagery, and a comprehensive list of items that need to be clipped out (i.e. roads, homesteads, brush land, fallow acres, water features, urban areas, sub-divisions), how alignment issues could be improved and recommendations for how to streamline as many of these processes as possible. This process will only be fair if each user does the analysis in the same way. Once a more accurate representation of the irrigated acres for each entity is created and approved updates in the future can be based more on accounting of the movement of water throughout the district as some of the entities already track. The 5% change standard should also be considered in light of large districts like TFCC where a 5% error

in irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation.

Regarding supplemental groundwater use there was not sufficient time for the working group or Department staff to address this issue. However, it was one of the specific technical items cited for revision by the District Court. Accordingly, we believe that the process that has been established for identifying Methodology revisions be continued until all the technical issues presented in the remand are addressed.

SPF WATER ENGINEERING

MEMORANDUM

DATE: March 16, 2015

TO: Liz Cresto, Technical Hydrologist

FROM: Scott King, P.E., SPF Water Engineering LLC on behalf of IGWA

RE: **Comments on Staff Recommendations**

Job: **535.0190**

Liz,

This memo provides comments to be included with your March 16, 2015 Settlement Document Memorandum.

1. The committee discussed the importance of methodology guidance being a living document and that the Technical Working Group (TWG) should continue meeting occasionally to improve the methodology and address items that were neglected due to limited time. I want to express my support for this approach.

2. Supplemental ground water use was a topic of importance to the Technical Working Group's (TWC), but was not evaluated sufficiently due to time constraints. Supplemental ground water use within much of the surface water coalition's delivery area is measured and reported to IDWR. However, we expect not all ground water use is measured due to the wells being located outside of the ground water measurement program area. Unmeasured supplemental ground water use should be addressed and may need to be measured.

3. The total area of lands receiving surface water irrigation deliveries has been updated for some but not all SWC members. The TWC discussed a methodology whereby irrigated acres would be updated if that area changed more than five percent from currently used values. A five percent change is significantly different when comparing between the smaller and larger delivery entities. For example, five percent approaches ten thousand acres for Twin Falls Canal Company. The committee may consider also including an acreage threshold in this decision point. For example: "the lesser of five percent or one thousand acres." This approach is supported by high quality aerial imagery currently available, limited land use changes within the SWC areas, and prior efforts in identifying and digitizing irrigated and non-irrigated areas.

300 E. Mallard Drive, Suite 350, Boise, Idaho 83706 Tel: 208-383-4140 Fax: 208-383-4156

4. Some delivery entities have reported that irrigated acres are unchanged from decreed values. There is not an incentive for SWC entities to identify and report reductions in irrigated acres. This deficiency should be addressed.

Thank you for the opportunity to participate in the committee and provide these comments.

Memorandum Subject to I.R.E. 408

To: Gary Spackman, Director IDWR

From: Charles G. Brockway, Brockway Engineering on behalf of the SWC
David Shaw, ERO Resources Corp. on behalf of the SWC

Date: March 16, 2015

Re: Recommended Revisions to the Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

The SWC generally supports the efforts of the Director, IDWR Staff and other members of the TWG for their efforts and the recommendations proposed in the staff memorandum to the Director dated March 16, 2015. The recommended natural flow forecasting methods and crop mix determination are improvements to the original methodology procedure and we urge the Director to implement those changes. We also support the annual review of the implementation of the Methodology.

In the second paragraph under the April 1 Forecast section the statement is made that A&B and Milner irrigation districts have relatively junior priority water rights and typically only divert natural flow during spring runoff events. We believe it would be worth noting that Milner's priority is good enough to sometimes divert natural flow at other times, particularly late in the irrigation season.

The SWC supports the use of the NASS CDL data to estimate crop mix for the current year based on the 3 previous years' data. We notice in the example on page 6 of the staff memo the average used is for 2011 – 2013. We assume this is the result of a timing issue since the 2014 CDL was not released until after January 1, 2015. We assume the intent is to use the most recent 3 years' data when used to calculate RISD in the Methodology process. We also want to ensure the SWC Managers can submit crop mix data that becomes available to them if they believe any particular year is an anomaly and would not be fairly represented by the previous 3 years' CDL data.

The SWC is concerned about the topics in the final recommendation for multiple meetings for the remainder of 2015. Most of the proposed topics are not part of the Court's remand order. In particular, project efficiency was fully supported by the court in spite of the ongoing efforts by others to attack that aspect of the methodology or the efficiencies themselves. On remand the Court simply said the Director should follow the order when considering irrigated acreage submitted by members of the SWC. We understand the need to change the water supply forecasting methods to make a mid-season determination and the July 1 methods in the staff memorandum address that need but there has not been a compelling reason given to change the method of estimating demand for the remainder of the year.

Again, thank you to everyone who participated and to the Director and his staff for the opportunity to participate in this effort.

Memorandum

To: Matt Anders (Idaho Department of Water Resources)

From: Dave Shaw (ERO Resources), Dave Colvin (LRE Water)

Date: January 16, 2022

Subject: **SWC Response to IDWR Recommended SWC Methodology Updates**

Introduction

On December 23, 2022, Idaho Department of Water Resources (IDWR) staff issued a document summarizing their recommendations for updating the Surface Water Coalition (SWC) Methodology. IDWR presented considerations and potential updates in Technical Working Group (TWG) meetings convened during November and December 2022. The current Methodology was established in the April 19, 2016 IDWR Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover (Fourth Amended Final Order)[1].

The Methodology is intended to protect the maximum reasonable diversion of SWC senior water rights from the in-season impacts caused by junior groundwater pumping. Decades of groundwater pumping effects have reduced the Snake River flows and reduced the water supply for senior water rights creating continuing but variable impacts. This variability creates inherent limitations for the Methodology and has particular significance on the potential updates IDWR presented during TWG meetings.

In addition, the Methodology strives to use predictions and observations to predict reasonable in-season demands (RISD) for SWC entities. Many steps of the Methodology transition from predictive tools early in the season to measured field data later in the season when hydrologic observation data are available. Many of the data, methods, and analyses are insufficient to account for changes in farming practices forced upon SWC entities as a result of economic conditions and water supplies being unreliable throughout the season and year to year.

Despite these fundamental limitations, many aspects of the SWC Methodology represent the best available science for estimating forecasted supply (FS), RISD, and Demand Shortfall (DS). Additional comments on specific IDWR update recommendations are provided below.

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[1] Fourth Amended Final Order https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-DC-2010-001/CM-DC-2010-001-20160419-Fourth-Amended-Final-Order-Regarding-Methodology-for-Determining-Material-Injury-to-Reasonable-In-Season-Demand-and-Reasonable-Carryover.pdf

1. IDWR Recommended Methodology Updates

a. Baseline Year Update for In-Season Demand and Carryover

IDWR is recommending that the Baseline Year (BLY) be updated to 2018. The process for selecting the BLY is described in the Fourth Amended Final Order and identifies both 2018 and 2020 as candidate baseline years. Based on the additional years of data considered since the Methodology was developed, both 2018 and 2020 are superior to the current baseline years (2006, 2008, 2012) which are no longer acceptable candidates. IDWR's rationale for only selecting 2018 is that 2020 had relatively high late-season diversions for the Twin Falls Canal Company (TFCC). Estimates of late-season project efficiency are higher in 2020 than in 2018, indicating that the late-season TFCC diversions, although higher, are reasonable. Changes in late season demands are being driven by economic conditions and the dairy industry's need for feed that has resulted in double cropping and changes in harvest methods. Double cropping is sometimes triticale followed by field corn resulting in later season water demands to finish the corn. Other examples are alfalfa harvested as green chop instead of baled hay so the crop water requirement is continual instead of allowing time for the crop to dry in the field so it can be baled. In the past hay crops were often 3 cuttings per year but now are 5 or more cuttings that create additional crop water needs, particularly late irrigation season demands. Additionally, late season irrigation is sometimes required for cover crops or late season ground working in preparation of fall seeding that is likely not reflected by AgriMet Et data.

A review of CWN data for the period 2000 – 2022 shows an increase over time that has, in part, resulted in the need to select a new BLY for determining an adequate water supply for the SWC. If the current methodology is continued, a regular review of the BLY is recommended as provided in Step 9 of the Methodology Order. Along with changes in CWN, a review of NASS crop data layers (CDL) should be completed to verify the crop mix present on the land served by the SWC if the use of METRIC is not implemented.

The selection of a new BLY is expected to increase the total reasonable carryover quantities for most of the SWC members. Step 8 in the Methodology Order needs to be reviewed to be certain the new reasonable carryover quantities can actually be replaced by the junior ground water users if the SWC members' reasonable carryover is used to finish the season at the Time of Need.

b. Update Project Efficiency Values

Central to proper determination of project efficiency is an accurate determination of CWN. As climate conditions and cropping patterns change, the determination of CWN needs to

be kept current with conditions in the field. AgriMet is a significant resource so long as the results are adapted to current cropping patterns and field conditions.

Using a 15 year rolling average for current year reasonable project efficiency instead of the present 8 year rolling average does not appear to change the current year efficiencies significantly. As the available record of Project Efficiencies continues to grow, using the longer 15 year rolling average may have advantages, but may need to be reviewed again in the future.

2. IDWR TWG Topics Not Being Recommended for Methodology Updates

In their December 23, 2022 letter, IDWR staff identified issues that were discussed during the TWG meetings that are not being recommended as updates to the SWC Methodology.

a. Real-time METRIC data for determining crop water need

IDWR staff presented information about the potential benefits of utilizing real-time METRIC and PRISM data for determining crop water need (CWN). These data sources are spatially variable estimates of evapotranspiration (ET) and precipitation, respectively. They would likely better represent the variability of ET and precipitation across SWC entities compared to the current methods which are based on ET and precipitation data observed at two AgriMet stations.

It is our opinion that IDWR should continue to evaluate the benefits of incorporating real-time METRIC and PRISM data into estimating actual CWN. Other available data, including OpenET, should be considered as well.

b. April and July Natural Flow Regressions

During the TWG meetings, IDWR presented information about the performance of variables originally selected to support April and July FS predictions. Additional data from 2016-2021 were added to evaluate the performance of the predictor variables as measured by the correlation coefficient comparing predictions to actual natural flow. In summary, no significant degradations in predictive capability were identified, so there is no recommendation to change this aspect of the Methodology. Other candidate predictor variables should continue to be assessed and considered for incorporation should their performance prove better than the current inputs.

c. Transient ESPAM Modeling

During the November 28, 2022 TWG meeting, IDWR staff presented an analysis comparing steady state and transient uses of the Eastern Snake Plain Aquifer Model Version 2.2 (ESPAM) for determining curtailment dates under the Methodology. No TWG meeting attendees stated that they remembered the original rationale for steady-state modeling, including IDWR staff.

Steady-state modeling of groundwater curtailment predicts the maximum impacts that would occur over infinite time. There is no time variable result that relates to the irrigation season. In reality, the impacts of curtailment take time to propagate through the aquifer and occur over months, years, or decades depending on variables such as the distance of a well from the river, and the aquifer transmissivity between the two.

Transient and steady-state versions of ESPAM were created to support various administration and planning efforts by IDWR and Eastern Snake Plain Aquifer (ESPA) stakeholders interested in evaluating the interaction between surface water and groundwater. Steady-state versions of the model are used when results showing ultimate impacts without regard to time are desired. Transient ESPAM versions are used when results require time variable inputs (e.g. pumping limited to the irrigation season) or outputs (e.g. reach gain impacts during a single irrigation season).

Because the Methodology is intended to address in-season injury, transient modeling analysis is the only appropriate way to determine curtailment dates that would protect SWC water rights and supplies. IDWR presented the steady state versus transient differences between ESPAM predicted in-season impacts of curtailment as increases in near Blackfoot to Minidoka reach gains during the 2021 and 2022 seasons. IDWR showed that the transient ESPAM model predicts an October 11, 1900 curtailment date would result in 97,700 acre-foot (AF) impact in the April to September period. Steady-state modeling of the same curtailment date predicts approximately 1,100,000 AF of impact accruing instantaneously as reach gain increases. The steady-state result is clearly erroneous and overpredicts the in-season benefits of curtailment by more than an order of magnitude.

IDWR staff also presented the impact of curtailment in future years beyond the in-season benefits. Future years with relatively low natural flow would provide SWC benefits from the increased reach gains. Years with higher natural flows, when storage fills, would not directly benefit SWC as reach gain increases. IDWR speculated that these wet years would possibly result in increased flow past Milner or provide additional water for managed aquifer recharge. Utilizing the current recharge sites would not significantly

increase near Blackfoot to Minidoka reach gains and therefore would provide limited benefit to SWC water supplies.

IDWR's modeling analysis conclusions stated that "*Short-term curtailments in response to in-season predictions of DS [Demand Shortfall] are inadequate to provide water during the time of need for several of the shortfall volumes predicted in 2021-2022*." This conclusion highlights the multi-year challenges that the Methodology is currently incapable of addressing.

Curtailment required by the Methodology is only applicable to junior groundwater users not covered in a settlement agreement or mitigation plan. The current agreements between SWC and ESPA groundwater users acknowledge the multi-year aspects of injury. IDWR's modeling results and the existing settlement agreements recognize the need for more effective protection of SWC's water supplies. Other Methodology steps are adjusted to create conservative results that protect senior surface water supplies, and the same approach should be taken with the modeling of curtailment dates.

Currently, the only aspect of the Methodology that has an impact year to year is the calculation of Reasonable Carryover. Although it is unlikely to be sufficient to protect SWC water supplies in all years, the Reasonable Carryover calculation could be increased to consider the inadequacies of curtailment for meeting in-season shortfalls. Ultimately, a comprehensive administration approach will need to fully address the multi-year nature of junior groundwater pumping on senior surface water supplies.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FIFTH AMENDED FINAL ORDER REGARDING METHODOLOGY FOR DETERMINING MATERIAL INJURY TO REASONABLE IN-SEASON DEMAND AND REASONABLE CARRYOVER**

BACKGROUND

On April 19, 2016, the Director ("Director") of the Idaho Department of Water Resources ("Department") issued his *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order"). The Fourth Methodology Order: (1) explained how the Director would determine material injury to storage and natural flow water rights of members of the Surface Water Coalition ("SWC")[1]; (2) established methods for quantifying material injury to SWC storage and natural flow water rights as predictive and actual demand shortfalls; (3) established methods for quantifying mitigation obligations by holders of junior priority ground water rights for shortfalls in predictive and actual SWC water demands; and (4) established a method for determining a priority date for curtailment if mitigation obligations are not satisfied.

The processes established in the Fourth Methodology Order for determining material injury are not carved in stone. Updates to the methodology order based on additional data and analyses were always anticipated:

> Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will review and refine the process of predicting and evaluating material injury. The methodology will be adjusted if the data supports a change.

[1] The SWC is comprised of A&B District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company. Each entity holds separate senior surface natural flow water rights and has separate storage contracts for storage water space in the reservoirs.

Fourth Methodology Order, Conclusion of Law 17; *see also In Matter of Distribution of Water to Various Water Rts. Held By or For Ben. of A & B Irrigation Dist.*, 155 Idaho 640, 645, 315 P.3d 828, 833 (2013) ("[t]he concept of a baseline is that it is adjustable . . . ."). The prediction and determination of rights and obligations of the holders of senior priority and junior priority water rights respectively must: (1) apply the best available science and underlying water data; (2) consider changing climatic and cropping patterns; and (3) adhere to the most recent decisions of the courts related to water administration.

Many of the data sets the Department relied upon in the Fourth Methodology Order have been expanded and now include additional years. Furthermore, the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling to determine a curtailment priority date that would supply adequate water to the senior water right holders. The first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling for calculating the response to curtailment of groundwater use. The purpose of this *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") is to update the Director's methodology for determining material injury to storage and natural flow water rights either held by or committed to members of the SWC consistent with the Director's ongoing obligation to use the best available science and information.

FINDINGS OF FACT

I. Overview of the Methodology for Determining Material Injury to Water Rights by Determining Reasonable In-Season Demand and Reasonable Carryover

1. The methodology for determining material injury to water rights by determining reasonable in-season demand ("RISD") and reasonable carryover should be based on updated data, the best available science, analytical methods, and the Director's professional judgment as manager of the state's water resources. In the future, climate may vary and conditions may change; therefore, the methodology may need to be adjusted to consider a different baseline year or years ("BLY") or changes to other components.

2. In-season demand shortfall ("IDS") will be computed by subtracting RISD from the forecast supply ("FS"). In-season demand shortfall is computed using the following equation:

$$IDS = FS - RISD$$

3. If the FS is greater than the RISD, there is no demand shortfall. If the FS is less that the RISD, the negative difference is the demand shortfall. Initially, RISD is equal to the historic demands associated with a BLY as selected by the Director, but will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

4. Reasonable carryover shortfall will be computed by subtracting reasonable carryover from actual carryover, where reasonable carryover is defined as the difference between a baseline year demand ("BD") and projected typical dry year supply. Reasonable carryover shortfall will be computed using the following equation:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

5. If actual carryover exceeds the reasonable carryover, there is no reasonable carryover shortfall. In contrast, if reasonable carryover exceeds the actual carryover, the negative difference is the reasonable carryover shortfall.

6. The concepts underlying the selection of the BLY, determination of in-season demand shortfall, and reasonable carryover shortfall will be discussed in detail below.

II. In-Season Demand Shortfall

A. Considerations for the Selection of a Baseline Year

7. A BLY is a year or average of years when irrigation demand represents conditions that can predict need in the current year of irrigation at the start of the irrigation season. The purpose of predicting need is to estimate material injury.

8. A BLY is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) irrigation practices. R. Vol. 37 at 7098.[2] To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. *Id*. at 7096.

9. The historic diversion volumes from the BLY and the predicted supply forecast at the start of the irrigation season are inputs to predict the initial ISD, where a demand shortfall is the difference between the BD and the FS. When the difference is a negative number, the ISD is zero. ISD increases with increases in BD, decreases in FS, or both. Assuming constant irrigation practices, crop distributions, and total irrigated acres, demand for irrigation water typically increases in years of higher temperature, higher reference evapotranspiration ("ET"), and lower precipitation. If water demand data is averaged for several years and these averages are the basis to predict demand shortfall at the start of the season, in a high-water demand year, these averages may often under-predict the demand shortfall. In a high-water demand year, under-prediction of IDS might be acceptable if the junior priority ground water right holders and the senior priority surface water right holders shared equally in the risk of water shortages. Equality in sharing the risk will not adequately protect the senior priority surface water right holder from injury. Actual demand shortfalls to a senior surface water right holder resulting from predictions at the start of the irrigation season based on average data unreasonably shifts the risk of shortage to the senior surface water right holder. Therefore, a BLY should represent a

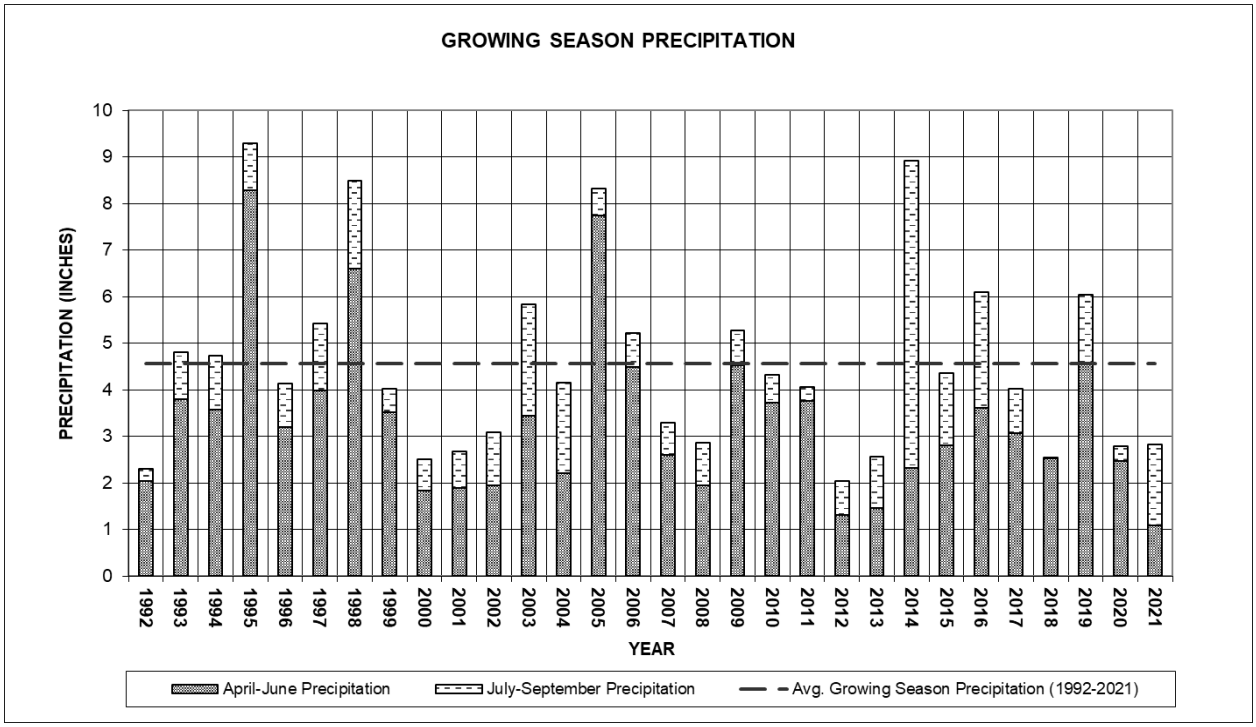
[2] All citations in this Order are to material that was admitted during the original hearing and is part of the final agency record on appeal in Gooding County Case No. CV-2008-551, which was lodged with the Fifth Judicial District Court on February 6, 2009.

year(s) of above average diversions and should not represent a year(s) of average or below average diversions. An above average diversion year(s) selected as the BLY should also represent a year(s) of above average temperatures and reference ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other factors. In addition, actual supply should be analyzed to assure that the BLY is not a year of limited supply.

i. Climate

10. For the methods outlined herein, climate is represented by precipitation, reference ET, and growing degree days.

11. Precipitation. Water, in all phases, introduced to Idaho from the atmosphere is termed precipitation. During the growing season, precipitation reduces the irrigation water needed for growing crops. Ex. 3024 at 19. The figure below shows the precipitation recorded during the growing season at the National Weather Service's Twin Falls weather station.



Growing Season Precipitation at National Weather Service's Twin Falls Weather Station 1992–2021.[3]

[3] The Fourth Methodology Order included data for the period 1990 through 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021. The chart is created from NOAA National Weather Service total precipitation data obtained from the NCDC's Climatological Data Annual Summary Idaho report series for the Twin Falls 6 E and Twin Falls Sun Valley Regional Airport weather stations.

12. Evapotranspiration. ET is a variable representing both the amount of water that transpires from vegetation and the amount of water that evaporates from the underlying soil. ET is an important factor for properly estimating RISD. In its water budget calculations, the SWC proposed the use of ET values from the USBR as part of their Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet. Ex. 8000, Vol. II, Chap. 9; Ex. 8000, Vol. IV, Appdx. AU. The ground water users proposed the use of ET values from Richard G. Allen and Clarence W. Robison 2007, Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, i.e. ETIdaho. Ex. 3007A at 21; Ex. 3024 at 1-58.

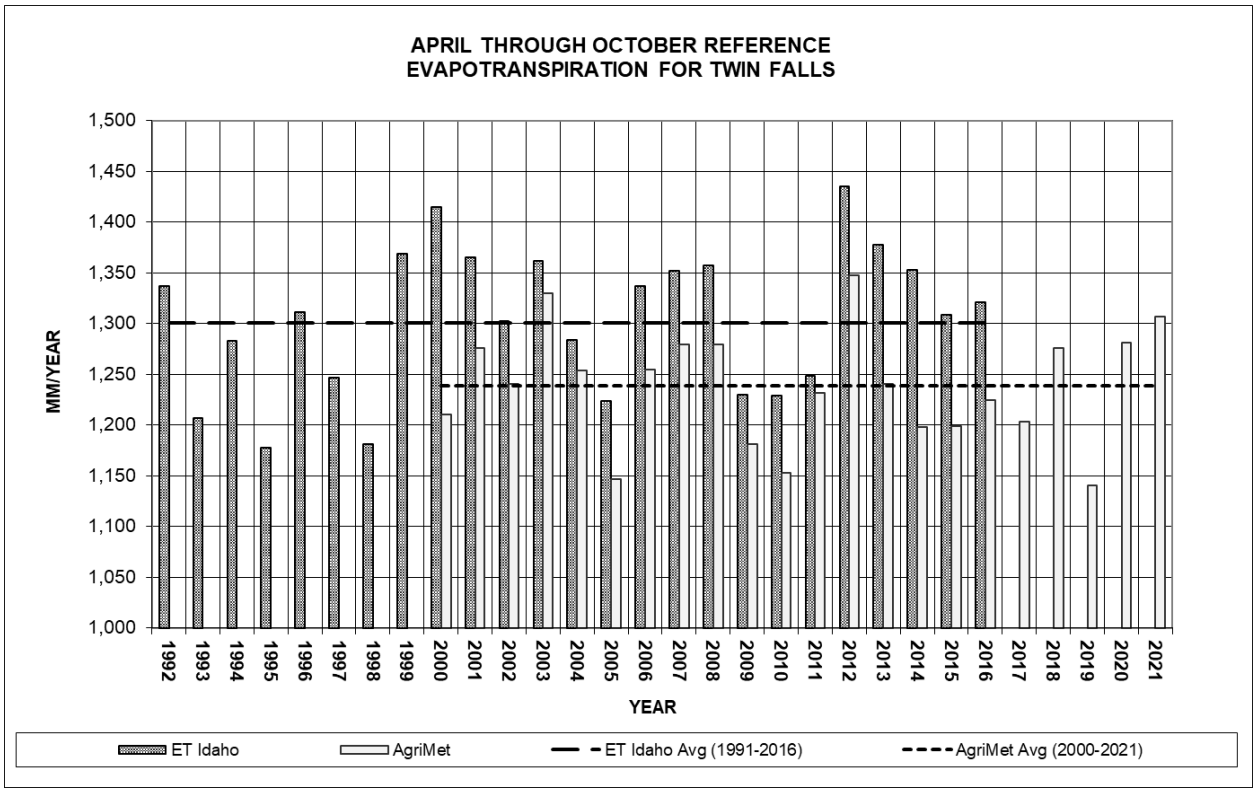
13. Reference ET is a standardized index that approximates the climatic demand for water vapor (i.e. ET). Both ETIdaho and AgriMet calculate and publish reference ET data. The Department will identify potential BLYs by consulting both ETIdaho reference ET and AgriMet reference ET.

14. Neither ETIdaho reference ET data nor AgriMet reference ET data span the entire period of analysis (1992-2021). ETIdaho reference ET data are currently available from 1990 through 2016.[4] AgriMet reference ET data are available from 2000 to 2021.[5] Ideal BLY candidates are years in which reference ET exceeds average reference ET values. The individual year is compared using both AgriMet and ETIdaho reference ET data for those years in which both data are available and only AgriMet data in those years where there is no ETIdaho data.

[4] The Fourth Methodology Order included ETIdaho reference ET data for the period 1991 to 2011. ETIdaho reference ET data is now available through 2016. This Fifth Methodology Order updates this chart with data for the period 1992 to 2016.

[5] The Fourth Methodology Order included AgriMet reference ET data for the period 2000 to 2014. . AgriMet reference ET data is now available through 2021. This Fifth Methodology Order updates this chart with data for the period 2000 to 2021.

15. Years of above average values of reference ET are appropriate BLY candidates.[6] Total April through October reference ET for the period of record from the Twin Falls (Kimberly) AgriMet site is shown below.

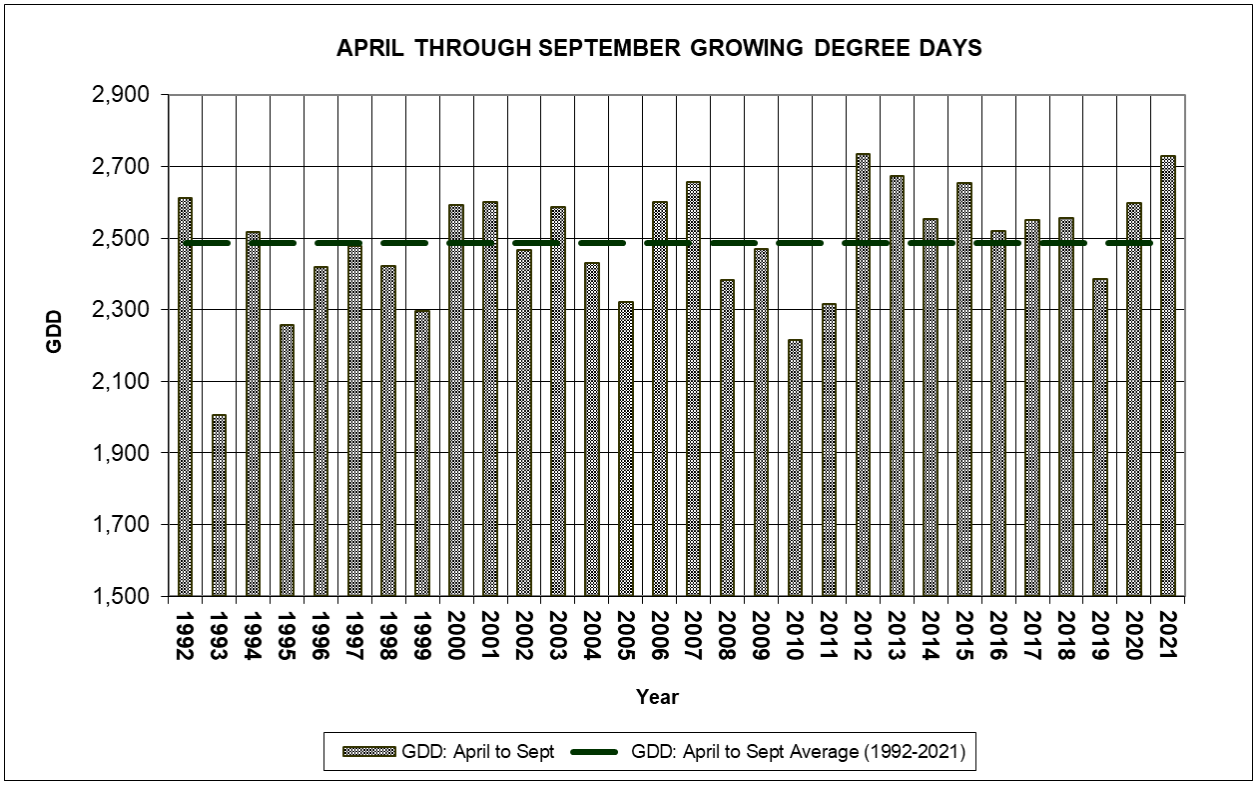


Reference ET for Twin Falls (Kimberly) with both AgriMet and ETIdaho data 1992-2021.[7]

[6] Values for reference ET between ETIdaho and AgriMet do not match because they are derived differently. The relevant information for identifying a potential BLY is the relationship between the year under consideration and the average for the data sets.

[7] The Fourth Methodology Order included data only through 2014. This Fifth Methodology Order updates this chart with combined data for the period 1992 to 2021, establishing a 30-year record which is the professional standard of practice for calculating climatic and hydrologic normals.

16. Growing Degree Days. Growing degree days define the length and type of growing season. Growing degree days are an arithmetic accumulation of daily mean temperature above a certain base temperature. Ex. 3024 at 10; 117-21. These growth units are a simple method of relating plant growth and development to air temperatures. Different plant species have different base temperatures below which they do not grow. At temperatures above this base, the amount of plant growth is approximately proportional to the amount of heat or temperature accumulated. A higher annual growing degree day value correlates to a higher potential rate of plant growth. The table below shows growing degree days accumulated for April through September for the Twin Falls (Kimberly) AgriMet site.

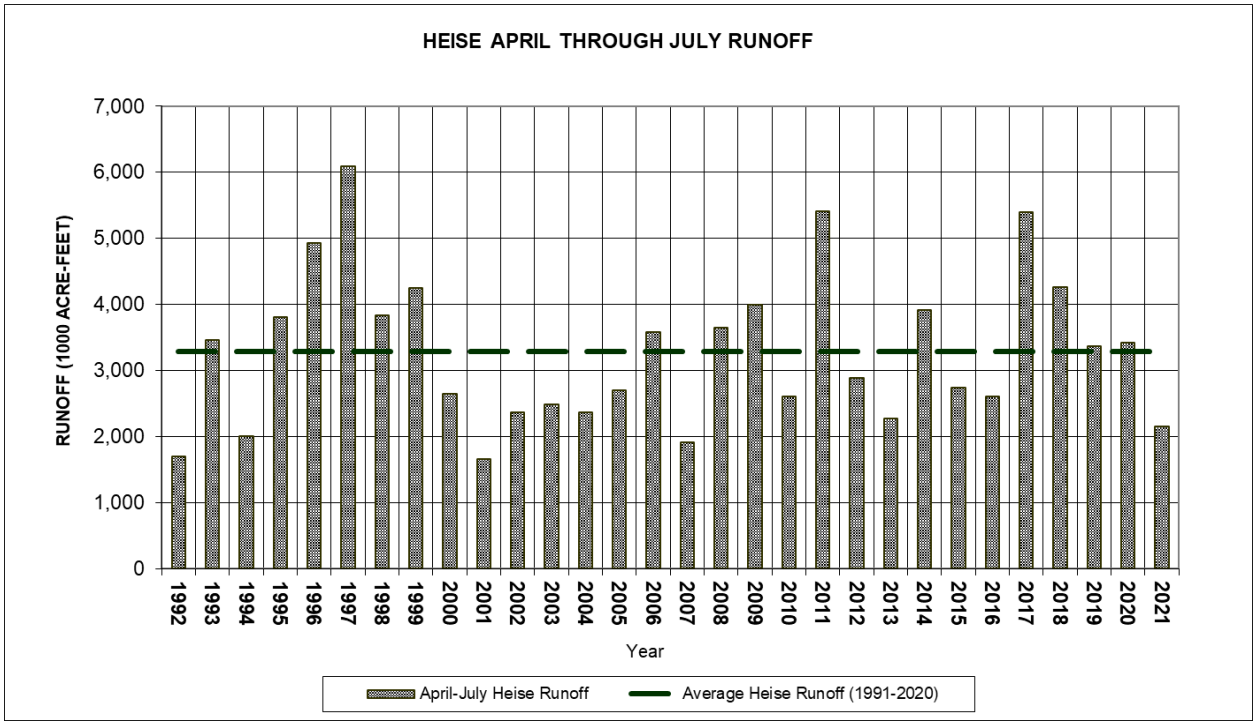


Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1992-2021.[8]

[8] The Fourth Methodology Order included data only through 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

ii. Available Water Supply

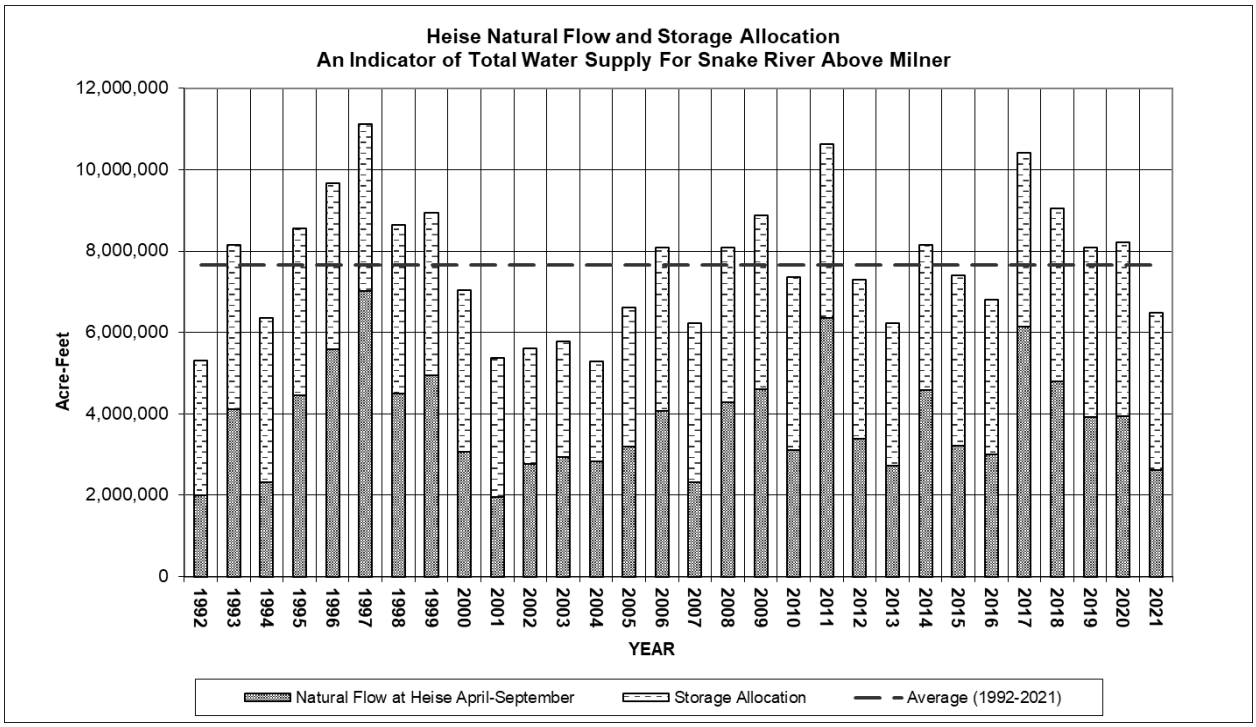
17. The April through July Heise runoff volume represents the volume of water available for diversion into storage reservoirs and is an indicator of natural flow supplies. The graph below shows actual unregulated flow volumes at Heise for 1992 through 2021. The 1992 to 2021 average (3,284,000 acre-feet) is displayed by the dashed line.



April through July Unregulated Flow Volume at Heise, 1992-2021.[9]

[9] The Fourth Methodology Order included data only through 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

18. The sum of the Heise natural flow and the reservoir storage allocations is an indicator of the total supply of the Snake River. The sum of the Heise natural flow and reservoir storage allocations for each year from 1992-2021 is represented in the graph below.



The sum of the Heise natural flow and the storage allocation for the Snake River above Milner 1992-2021.[10]

iii. Irrigation Practices

19. A baseline year ("BLY") must be recent enough to represent current irrigation practices. R. Vol. 37 at 7099-7100. Current conditions should be represented by: (a) the net area of the irrigated crops, (b) farm application methods (flood/furrow or sprinkler irrigation), and (c) the conveyance system from the river to the farm. The type of sprinkler systems should be similar between the BLY and the current year.

20. Sprinkler systems are currently the predominant application system. *Id*. at 7101-02. To ensure that current irrigation practices are captured, selection of a BLY for the SWC should be limited to years subsequent to 1999. *Id*. at 7096; 7099-7100.

[10] The Fourth Methodology Order included data for the period 1990 to 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

21. Estimates of irrigated acres from the hearing show a trend of decreasing irrigated acreage. R. Vol. 28, 5205-15; R. Vol. 37 at 7100. According to the Hearing Officer, beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated. R. Vol. 37 at 7100.

22. The following table summarizes: a) SWC entities; b) shapefile source of reported irrigated acres; c) year shapefile created; d) decreed irrigated acres; (e) number of reported acres in shapefile; and f) irrigated acres used in this methodology order for the 2023 irrigation season. The number of irrigated acres used in this methodology order is the number of reported acres unless that number is larger than the decreed irrigated acres, and if so, then the decreed acres were used. This table will be updated annually based on the reported number of irrigated acres by each SWC entity in Step 1 of the Methodology Order.

Entity	Shapefile Source	Shapefile Year	Partial Decree Acres	Shapefile Acres	Acres Used in Methodology
A&B	PPU[1]	2010	15,924	21,972	15,924
AFRD2	PPU	2010	62,361	69,077	62,361
BID	SWC	2013	47,643	46,035	46,035
Milner	PPU	2010	13,335	13,264	13,264
Minidoka	SWC	2023	75,093	77,176	75,093
NSCC	PPU	2010	154,067	224,463	154,067
TFCC	SWC	2013	196,162	194,732	194,732

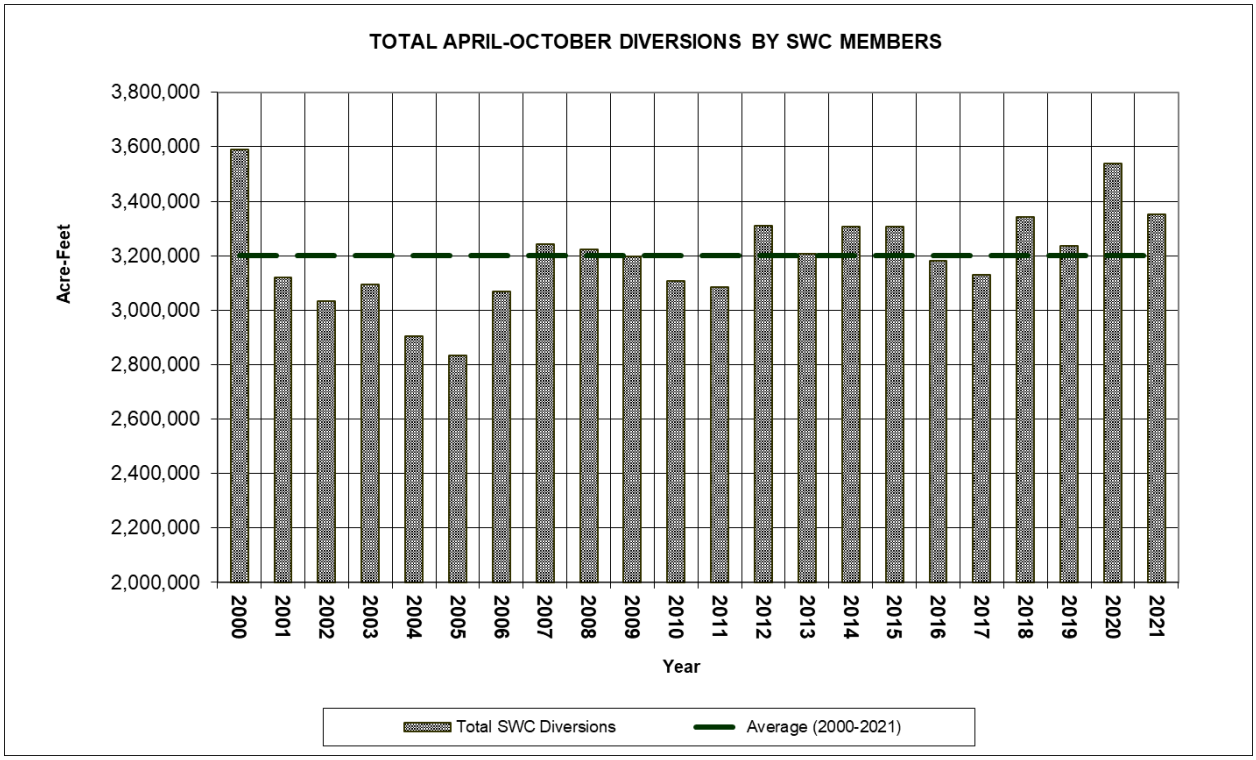
[1] IDWR permissible place of use.

Acres used in the methodology.

23. There are lands within the service areas of SWC entities that are irrigated with supplemental groundwater. Exhibit 3007. Supplemental groundwater is a factor the Director can consider in the context of a delivery call. *Memorandum Decision and Order on Petitions for Judicial Review* ("Methodology Remand Order") in Gooding County Consolidated Case No. CV-2010-382, at 18-19. At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities.

iv. Diversions

24. The following figure summarizes the annual measured diversions by the combined SWC members from 2000-2021. Diversions for a baseline year should exceed the average diversions.



Total April-October Diversions by SWC Members.[11]

B. Selection of the Initial Baseline Year

25. When selecting the BLY the Director must evaluate recent data to determine whether the BLY section criteria are satisfied.

26. In the Fourth Methodology Order, the Department considered the years 2000-2014 when deciding the BLY. Ultimately, the Department chose an average of the years 2006, 2008, and 2012 for the BLY ("BLY 06/08/12"). For this Fifth Methodology Order, the years 2000-2021 were considered for the BLY selection. With the addition of new data from 2014 to 2021, the total diversions by the SWC for the previous BLY 06/08/12 are 100% of the average SWC diversions for the years 2000-2021. As a result of adding the new data, BLY 06/08/12 no longer satisfies the presumption criteria that total diversions in the BLY should exceed the average annual diversions. Mem. Decision & Order on Pets. for Jud. Rev., at 34, *IGWA v. Idaho Dep't of Water Res.*, No. CV-2010-382 (Gooding Cnty. Dist. Ct. Idaho Sept. 26, 2014).

[11] The Fourth Methodology Order did not include this chart. It was added to demonstrate that the baseline year is a year of above average total diversions.

27. Years 2018 and 2020 satisfy all the BLY selection criteria discussed above. Each of these years had (1) total diversions above the average diversions for the years 2000-2021, (2) total growing degree days above the average for the years 1992-2021, and (3) reference ET values above the average for the years 1992-2021. The years 2018 and 2020 also had total precipitation values below the average precipitation for the years 1992-2021 and were not water supply limited years. The Department has reviewed the SWC's diversion data for the 2020 irrigation season. The Department finds that 2020 ranks as the second-highest year of total diversions for the SWC and is more than one standard deviation above the average for the years 2000-2021. In comparison, 2018 ranks as the fourth-highest year of total diversions for the SWC and is less than one standard deviation above the average for the years 2000-2021. Choosing a BLY with above average diversions but within one standard deviation, ensures that a conservative year is selected that protects the senior while excluding extreme years from consideration. The Director concludes that total diversions for 2018 adequately protect senior water rights when predicting the demand shortfall at the start of the irrigation season and selects 2018 as the BLY.

Entity	2000-2021 Avg. Total Diversions (Acre-Feet)	06/08/12 Avg. Total Diversions (Acre-Feet)	06/08/12 % of Avg.	2018 Total Diversions (Acre-Feet)	2018 % of Avg.
A&B	59,474	59,993	101%	64,192	108%
AFRD2	427,978	427,672	100%	453,890	106%
BID	247,049	251,531	102%	262,211	106%
Milner	53,343	47,135	88%	58,417	110%
Minidoka	354,181	369,492	104%	354,851	100%
NSCC	996,267	978,888	98%	1,026,661	103%
TFCC	1,062,098	1,060,011	100%	1,121,717	106%
Total	3,200,389	3,194,722	100%	3,341,939	104%

Average SWC Diversions (acre-feet) for 2000-2021, 2006/2008/2012 BLY, and 2018 BLY.

C. Calculation of Reasonable In-Season Demand

28. Reasonable in-season demand (RISD) is the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the beneficial use of growing crops within the service area of the entity. Given that climate and system operations for the year being evaluated will likely be different from the BLY, the BLY must be adjusted for those differences. As stated by the Hearing Officer, "The concept of a baseline is that it is adjustable as weather conditions or practices change, and that those adjustments will occur in an orderly, understood protocol." R. Vol. 37 at 7098.

i. Project Efficiency

29. Project efficiency ("E_p") is the ratio of total volumetric crop water needs within a SWC entity's boundary and the total volume of water diverted by that entity to satisfy its crop needs. It is the same concept as system efficiency, which was presented at hearing. Ex. 3007 at

28-29. Implicit in this relationship are the components of seepage loss (conveyance loss), on-farm application losses (deep percolation, field runoff), and system operational losses (return flows) for which data is not obtainable by the Department. By utilizing project efficiency and its input parameters of crop water need and total diversions, the influence of the unknown components for which data is not obtainable can be captured and described without quantifying each of the components. Project efficiency is derived by dividing crop water need by total diversions as depicted in the algorithm below:

$$E_p = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,
CWN = crop water need, and
Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

30. Monthly SWC entity diversions ("Q_D") will be obtained from Water District 01's diversion records. Ex. 8000, Vol. II, at 8-4, 8-5. Raw monthly diversion values will then be adjusted to remove any water diversions that can be identified to not directly support the beneficial use of crop development within the irrigation entity. Examples of adjustments include the removal of diversions associated with in-season recharge and diversion of irrigation water on the behalf of another irrigation entity. Adjustments are unique to each SWC member and each irrigation season and will be evaluated each year. Any natural flow or storage water deliveries to entities other than the SWC for purposes unrelated to the original right will not be included as a part of the SWC water supply or carryover volume. Water that is purchased or leased by a SWC member may become part of the shortfall obligation to the extent that member has been found to have been materially injured. *See e.g.* R. Vol. 38 at 7201, n. 11 (Eighth Supplemental Order). Conversely, water supplied to private leases or to the rental pool by a SWC member will be included as a part of the SWC supply for that member because non-inclusion would unjustifiably increase the shortfall obligation.

31. Monthly project efficiencies will be computed for the entire irrigation season. Project efficiency varies from month-to-month during the season and will typically be lower during the beginning and ending of the season. Monthly project efficiencies will be divided into actual monthly crop water need ("CWN") values to determine RISD during the year of evaluation.

32. In the Fourth Methodology Order, project efficiencies for each SWC member were initially averaged over an eight-year period (2007-2014) and project efficiency greater or less than two standard deviations were excluded from the calculation. By including only those values within two standard deviations, extreme values from the data set are removed. Under the Fourth Methodology Order, an updated 8-year rolling average of project efficiencies was calculated each year the methodology was implemented. The Director now finds that averaging over a rolling period of 15 years results in project efficiency values that are more consistent from year-to-year, reducing the impact of short-term trends. The Director finds that it is still

appropriate to remove project efficiencies greater or less than two standard deviations from the average.

The following is a table of efficiency values averaged over the most recent fifteen-year period of record.

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.98	0.33	0.45	0.87	0.43	0.24	0.31	0.51
5	0.47	0.22	0.32	0.39	0.35	0.24	0.30	0.33
6	0.66	0.40	0.49	0.60	0.56	0.41	0.51	0.52
7	0.74	0.44	0.52	0.67	0.63	0.48	0.58	0.58
8	0.58	0.41	0.42	0.55	0.52	0.43	0.46	0.48
9	0.45	0.27	0.32	0.45	0.38	0.32	0.27	0.35
10	0.18	0.16	0.09	0.14	0.11	0.06	0.04	0.11
Season Avg.	0.58	0.32	0.37	0.52	0.43	0.31	0.35	

SWC Member Average Monthly Project Efficiencies from 2007-2021.[12]

ii. Crop Water Need

33. CWN is the volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability. CWN only applies to crops irrigated with surface water. CWN is the difference between the fully realizable consumptive use associated with crop growth, or ET, and effective precipitation (W_e) and is synonymous with the terms irrigation water requirement and precipitation deficit. Ex. 3024. For the purposes of the methodology, CWN is calculated as set forth below:

$$CWN = \sum_{i=1}^{n} (ET_i - W_e) A_i$$

Where,

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = effective precipitation,
A_i = total irrigated area of specific crop type,
i = index variable representing the different specific crop types grown within the irrigation entity, and
n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

[12] In the Fourth Methodology Order, this table summarized average E_p data for the period 2007 to 2014. This Fifth Methodology Order updates this table with average E_p data for the period 2007 to 2021.

iii. Evapotranspiration

34. ET can be estimated with theoretically based equations that calculate ET for an individual crop, necessitating crop distribution maps for each year. Ex. 3007A at 21, Figure 3, Tables 6-12; Ex. 3024 at 1-58; Ex. 8000, Vol. II at Chapter 9; Ex. 8000, Vol. IV, Appdx. AU.

35. At hearing, values of ET were estimated by the SWC from AgriMet, Ex. 8000, Vol. IV, Appdx. AU-1, and by the ground water users from ETIdaho, Ex. 3007A at 21; Ex. 3024 at 1-58. At this time, the Director finds that the use of AgriMet is more appropriate for determining ET than ETIdaho because AgriMet is available to all parties in real-time without the need for advanced programming. Accordingly, the methodology will rely on AgriMet derived ET values in the calculations of project efficiency, CWN, and RISD. In the future, with the development of additional enhancements, ETIdaho may become a more appropriate analytical tool for determining ET.[13]

36. CWN is derived by multiplying crop specific ET values, adjusted for estimated effective precipitation, by the total irrigated area of individual crop types, and summing for all crop types. The areas for individual crop types will be derived from published crop distributions from the United States Department of Agriculture's National Agricultural Statistics Service ("NASS"). Ex. 1005 at 1. NASS annually creates a crop-specific land cover digital dataset from satellite imagery and field checks. The dataset is called the Cropland Data Layer ("CDL"). Each year, the Department will calculate acreage by crop type for each SWC entity using NASS CDL data. In the future, the NASS data may not be the most accurate source of data. The Department prefers to rely on data from the current season if and when it becomes usable.

37. AgriMet ET and precipitation data are gathered at the Rupert and Twin Falls (Kimberly) stations. Both stations are in the vicinity of the SWC entities. A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), and Minidoka Irrigation District ("Minidoka") are nearest to the Rupert AgriMet station. ET data gathered at the Rupert station reasonably represents the climate conditions for A&B, BID, and Minidoka. American Falls Reservoir District No. 2 ("AFRD2"), Milner Irrigation District ("Milner"), North Side Canal Company ("NSCC"), and Twin Falls Canal Company ("TFCC") are nearest to the Twin Falls (Kimberly) AgriMet station. ET data gathered at the Twin Falls (Kimberly) station reasonably represents the climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, Vol. IV at AU-2, AU-8.

iv. Effective Precipitation

38. Effective precipitation ("W_e") is the amount of total precipitation held in the soil horizon available for crop root uptake. Effective precipitation will be estimated from total precipitation (W) employing the methodology presented in the USDA Technical Bulletin 1275. Ex. 8000, Vol. IV, Appdx. AU3, AU8. Total precipitation (W) data is published by the USBR as

[13] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meetings, IDWR discussed alternative methods of determining ET values, such as METRIC. However, the Director finds that the methods considered are not yet ready for incorporation into the administration of the SWC Delivery Call and will continue to rely on AgriMet ET data.

part of its Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet.[14] Ex. 8000, Vol. IV, Appdx. AU3. W_e values derived from AgriMet based precipitation values are independent of crop type.

39. AgriMet precipitation (W) values are easy to understand and regularly used by the farming, water supply, and water management communities. Accordingly, the methodology will rely on AgriMet derived W values in the calculations of CWN and RISD.

40. As with ET data, AgriMet precipitation data are available from the Rupert and Twin Falls (Kimberly) stations. AgriMet data from the Rupert station reasonably represents climate conditions for A&B, BID, and Minidoka. AgriMet data from Twin Falls (Kimberly) reasonably represents climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, Vol. IV at AU-2, AU-8.

v. Summary of Reasonable In-Season Demand Calculation

41. At the start of the irrigation season, RISD is equal to the BD, or total season adjusted diversions for the BLY. When calculated in-season, RISD is calculated below.

$$RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p,j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month j,
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j = index variable, and
m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

42. April RISD Adjustment: In April, the calculated RISD, which is the quotient of CWN and Ep, can underestimate actual canal operation diversions. Under-estimation occurs when the actual CWN value for April is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. Often, CWN in April is small due to precipitation, cool temperatures, and/or the immaturity of the crop. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events in April, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. To account for the conditions affecting the

[14] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meeting, IDWR discussed alternative methods to determine W values, such as PRISM. However, the Director finds that the methods considered are not yet ready for incorporation into the administration of the SWC Delivery Call and will continue to rely on AgriMet precipitation data.

usability of the calculated RISD value for April, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

43. When the calculation of CWN/Ep results in a value for the month of April less than the average April diversion volume over a record of representative years in the recent past, the April RISD is set equal to the average April diversion volume. When the calculation of CWN/Ep results in a value greater than the average April diversion volume, the April RISD is equal to the calculated CWN/Ep volume.

44. October RISD Adjustment: In October, the calculated RISD, which is equal to the CWN divided by Ep, can both under-estimate and over-estimate actual canal operation diversions. The RISD may be underestimated when the actual CWN value for October is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events in October, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. Furthermore, RISD may be underestimated in October when a farmer diverts water at the field head gate for farming practices other than strictly satisfying CWN. Examples of water diversion practices at the field head gate that sometimes occur in October include diverting water for soil salt leaching, diverting water to build up the soil moisture profile for the following irrigation season, and/or diverting water to wet-up bare soil to prevent wind-driven topsoil erosion.

45. Unlike the month of April, RISD can be over-estimated in October. RISD may be over-estimated in years when actual CWN in October is much greater than typical CWN over a record of representative years in the recent past due to low precipitation and/or warm temperatures. To account for the conditions affecting the usability of the RISD value calculated for October, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

46. When the calculation of CWN/Ep results in a value for the month of October greater than the maximum October diversion volume from a record of recent representative years, or less than the minimum October diversion volume from the same record of recent representative years, the October RISD is set equal to the average October diversion volume over the same period of recent representative years. When the calculation of CWN/Ep results in a value between the maximum and minimum October diversion volumes from a record of recent representative years, the October RISD is equal to the calculated CWN/Ep volume.

D. Adjustment of Forecast Supply

47. As stated by the Hearing Officer, "There must be adjustments as conditions develop if any baseline supply concept is to be used." R. Vol. 37 at 7093. A prediction of the upcoming season's supply and demand is calculated at the beginning of the irrigation season and

adjusted at specified milestones during the irrigation season to address changes in water supply and demand conditions in response to actual climatic and water supply conditions.

i. April Forecast Supply

48. The FS is comprised of natural flow and stored water.

49. Typically, within the first week of April, the USBR and the USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage from April 1 to July 31 for the forthcoming year. The joint forecast ("Joint Forecast") issued by the United States Bureau of Reclamation ("USBR") and the United States Army Corp of Engineers ("USACE") for the period April 1 through July 31 "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." R. Vol. 8 at 1379, ¶ 98. Given current forecasting techniques, the earliest the Director can predict material injury "with reasonable certainty" is soon after the Joint Forecast is issued. R. Vol. 2 at 226. With data from 1990 through the irrigation year previous to the current year, a regression equation will be developed for each SWC member.[15] The regression equations for A&B and Milner will be developed by comparing the actual Heise natural flow to the natural flow diverted. *See e.g.* R. Vol. 8 at 1416-22. For AFRD2, BID, Minidoka, NSCC, and TFCC, multi-linear regression equations will be developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted. The regression equations will be used to predict the natural flow diverted for the upcoming irrigation season. *Id*. at 1380. The actual natural flow volume predicted in the Director's April FS for each SWC entity will be one standard error below the regression line, which underestimates the available supply. *Id*.; Tr. p. 65, lns. 6-25; p. 66, lns. 1-2. The purpose of the shift to one standard error below the regression line is to ensure senior water right holders do not bear the risk of under-prediction of supply. The forecasting techniques will be revised based on updated data and the forecasting techniques may be revised when improvements to the forecasting tools occur.

50. The storage allocation for each member of the SWC will be estimated by the Department following issuance of the Joint Forecast. The Department will forecast reservoir fill and storage allocation consistent with the methods established in the *Fifth Supplemental Order Amending Replacement Water Requirements Final 2006 & Estimated 2007.* R. Vol. 23 at 4294-97 as explained below. The Department will evaluate the current reservoir conditions and the current water supply outlook to determine a historical analogous year or years to predict reservoir fill. The Department may identify and use a combination of different analogous years to predict individual reservoir fill. Input variables for determining the individual storage water allocation for each SWC member are: (a) the analogous year's or years' total reservoir fill volume; (b) an estimated evaporation volume; and (c) the previous year's carryover volume. The FS (the combination of the forecast of natural flow supply and the storage allocation) for each SWC member will be determined by the Director shortly after the date of the Joint Forecast.

[15] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. During the meetings, IDWR discussed updating the regression models used to forecast the SWC's water supplies in April. However, the Director finds that the current models still adequately forecast water supplies in April and will continue to rely on the existing regression models.

51. Any time prior to the Director's final determination of the April FS, if the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected shortfall determination.

ii. July Forecast Supply

52. Approximately halfway through the irrigation season, the FS will be adjusted. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the year-to-date natural flow diverted by each member of the SWC. The natural flow diversion for the remainder of the irrigation season will be estimated based on the regression analyses.

53. The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains that occur in the Snake River between the Blackfoot to Milner reach. Many different predictor variables were considered when developing the models used to predict the natural flow supplies for the remainder of the season, including those variables used in the April FS.[16] A step-wise statistical analysis was employed to help select the variables for each model. The following variables were selected to forecast water supplies halfway through the irrigation season: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Ocean Plateau SNOTEL site; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The model predictors were optimized for each SWC member and are summarized in the sections below.

54. Linear regression equations for AFRD2, A&B, and Milner, will be developed by comparing the July 1 snow water equivalent (inches) at the Two Ocean Plateau SNOTEL site to the natural flow diversions. The regression equations for AFRD2, A&B, and Milner will be applied only in those years when the snow water equivalent at the Two Ocean Plateau SNOTEL site is greater than zero (0). Years when the snow water equivalent equals zero, the total natural flow prediction for the period July 1 to October 31 will be zero (0) AF.

55. Multiple linear regression equations for BID, Minidoka, and NSCC will be developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) March depth to water at well 05S 31E 27ABA1 and (3) the snow water equivalent at the Two Ocean Plateau SNOTEL site on June 15.

56. The multiple linear regression model for TFCC will be based on the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) Spring Creek total discharge (January – May) and (3) the snow water equivalent at the Two Ocean Plateau SNOTEL site on June 15.

[16] IDWR held a series of meetings in the winter of 2022-23 with the parties' technical consultants to discuss potential updates to the methodology order. IDWR discussed updating the regression models used to forecast the SWC's water supplies in July. However, the Director finds that the current models still adequately forecast water supplies in July and will continue to rely on the existing regression models.

57. When adjusting the storage component of the FS, the Department must consider whether stored water has been allocated. In normal to dry years, the reservoirs will typically have filled to their peak capacity for the season and the storage water will have been allocated. If the BOR and Water District 01 have allocated stored water to spaceholders, the Department will use the actual preliminary storage allocations to the SWC. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on the storage allocations from an analogous year or years.

iii. Time of Need

58. The FS will again be adjusted shortly before the Time of Need. The Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

59. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the natural flow diverted by each member of the SWC as of the new forecast date. The natural flow diversion for the remainder of the irrigation season will be estimated based on a historical year with similar reach gains in the Blackfoot to Milner reach. The following is an example of estimating reach gains from an analysis of historical years. Reach gains for the years 2000 – 2003 and a portion of year 2004 are graphed below. Considering 2004 as an example of a current year and comparing 2004 to the hydrographs for 2000 – 2003, year 2003 has similar reach gains and is appropriately conservative. Therefore, the natural flow diverted in 2003 would be used to predict the natural flow diversions for the remainder of the 2004 season.



Example Reach Gain Analysis for 2004.

60. When adjusting the storage component of the FS, the Department will use the actual preliminary storage allocations to the SWC.

61. The adjusted FS is the sum of the year-to-date natural flow diversions, the predicted natural flow diversions for the remainder of the season, and the storage allocation.

E. Calculation of In-Season Demand Shortfall

62. The equation below determines the amount of predicted demand shortfall during the irrigation season.

$$IDS = FS - RISD$$

Where:

IDS = demand shortfall for specified evaluation points throughout the season,
FS = forecasted supply adjusted for specified evaluation point during the season, and
RISD = reasonable in-season demand from above.

63. The amount calculated represents the volume that junior ground water users with approved mitigation plans for delivery of water will be required to have available for delivery to members of the SWC found to be materially injured by the Director to avoid curtailment. The amounts will be calculated in April, at the middle of the season, and at the Time of Need.

III. Methodology for Determining Material Injury to Reasonable Carryover

64. Conjunctive Management ("CM") Rule 42.01.g states the following guidance for determining reasonable carryover: "In determining a reasonable amount of carry-over storage water, the Director shall consider average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system." Carryover shortfall will be determined following the completion of the irrigation season.

A. Projected Water Supply

65. CM Rule 42.01.g states that the Director "shall consider . . . the projected water supply for the system." Because it is not possible to adequately forecast the irrigation supply or demand for the following irrigation season at the end of the current irrigation season, the Director must estimate the carryover water needed in future dry years when demand exceeds supply, creating a need for carryover storage. The Director projected the water supply using typical dry years and subtracted it from a projected future demand to determine a projected carryover need.

66. The Heise natural flow is a predictive indicator of total water supply. For the years 2002 and 2004, the Heise natural flows were well below the long term average (1992-2021), but were not the lowest years on record.[17] The average of the 2002 and 2004 supply will be the projected supply, representing a typical dry year. The 2002 and 2004 supply is computed as follows:

- 2002 supply = natural flow diverted + new storage fill
- 2004 supply = natural flow diverted + new storage fill
- Projected supply = average of 2002 supply and 2004 supply

Carryover from previous years is not included in the 2002 and 2004 new storage fill because it was not new water supplied during the 2002 or 2004 irrigation year.

	2002 Natural Flow Diverted	2002 New Storage Fill	2002 Total Supply	2004 Natural Flow Diverted	2004 New Storage Fill	2004 Total Supply	Projected Supply (Average 02/04)
	----------Acre-Feet----------						
A&B	853	45,603	46,456	1	36,535	36,536	41,496
AFRD2	25,749	381,451	407,200	4,562	309,698	314,260	360,730
BID	89,886	174,454	264,340	102,706	152,387	255,093	259,716
Milner	5,058	43,430	48,488	1,027	35,175	36,202	42,345
Minidoka	143,937	256,602	400,539	141,460	229,574	371,034	385,787
NSCC	363,960	667,799	1,031,759	315,942	479,068	795,010	913,385
TFCC	851,970	186,233	1,038,203	881,345	150,218	1,031,563	1,034,883

SWC water supplies 2002, 2004, and 2002/2004 average (acre-feet).

67. Similar to projecting supply, the Director must also project demand. Because it is not possible to adequately forecast the irrigation demand for the following irrigation season at the end of the current irrigation season, the Director must project demand. R. Vol. 37 at 7109. The 2018 BLY will be the projected demand.

[17] The Fourth Methodology Order included data for the period 1991 to 2014. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021.

68. The maximum projected carryover need is defined as the difference between a BLY demand and projected typical dry year supply. The following equation computes the maximum projected carryover need:

Maximum Projected Carryover Need = Projected Demand (2018 BLY) – Projected Supply (Average 02/04)

	Projected Demand (2018 BLY)	Projected Supply (average 02/04)	Maximum Projected Carryover Need
	----------Acre-Feet----------		
A&B	64,192	41,496	22,696
AFRD2	453,890	360,730	93,160
BID	262,211	259,716	2,495
Milner	58,417	42,345	16,072
Minidoka	354,851	385,787	0
NSCC	1,026,661	913,385	113,277
TFCC	1,121,717	1,034,883	86,834

SWC Projected Demand, Projected Supply and Maximum Projected Carryover Need (acre-feet).[18]

B. Average Annual Rate of Fill

69. CM Rule 42.01.g states that the Director "shall consider the average annual rate of fill of storage reservoirs . . . ." The average annual rate of fill of the storage reservoirs is the average of annual percentages of fill of each entity's reservoir space. The average annual reservoir storage fill is a benchmark that can be compared to projected carryover need. For purposes of the table below, any water contributed to the rental pool from the previous year was added to the next year's fill volume so that it does not artificially lower the percent fill. R. Vol. 37 at 7108. Water that is supplied to the rental pool lowers carryover and could impact the following year's fill. The percent fill does not include water deducted for reservoir evaporation.

[18] This Fifth Methodology Order updates this chart with the new baseline year and calculates new maximum projected carryover need values.

The annual percent fill of storage volume by SWC entity is shown below:

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
1992	96%	100%	98%	93%	75%	76%	86%
1993	100%	100%	100%	100%	100%	93%	92%
1994	100%	100%	100%	100%	99%	99%	99%
1995	100%	100%	100%	100%	100%	100%	100%
1996	100%	100%	100%	100%	100%	100%	100%
1997	100%	100%	100%	100%	100%	100%	100%
1998	100%	100%	100%	100%	100%	100%	100%
1999	100%	100%	100%	96%	98%	98%	99%
2000	100%	99%	99%	98%	100%	97%	97%
2001	100%	100%	100%	100%	100%	91%	87%
2002	41%	100%	100%	79%	92%	84%	88%
2003	43%	100%	99%	66%	92%	94%	99%
2004	34%	82%	97%	48%	94%	78%	63%
2005	58%	100%	100%	76%	98%	100%	100%
2006	98%	100%	99%	98%	100%	99%	99%
2007	89%	100%	97%	92%	94%	95%	97%
2008	100%	100%	100%	100%	100%	99%	100%
2009	100%	100%	100%	100%	100%	100%	100%
2010	100%	100%	100%	100%	100%	100%	100%
2011	100%	100%	100%	100%	100%	100%	100%
2012	88%	100%	97%	91%	94%	94%	96%
2013	80%	100%	97%	90%	90%	97%	100%
2014	93%	100%	100%	100%	95%	100%	100%
2015	100%	100%	100%	100%	100%	100%	100%
2016	100%	100%	100%	100%	95%	100%	100%
2017	100%	100%	100%	100%	100%	100%	100%
2018	100%	100%	100%	100%	100%	100%	100%
2019	96%	100%	99%	97%	98%	98%	99%
2020	100%	100%	100%	100%	100%	100%	100%
2021	100%	100%	100%	100%	98%	100%	100%
Average	91%	99%	99%	94%	97%	96%	97%
Std Dev	19%	3%	1%	12%	5%	6%	8%

Annual Percent Fill of Storage Volume by Entity (1992-2021).[19]

[19] The Fourth Methodology Order included data from 1995 through 2014. This Fifth Methodology Order updates this chart with data from 1992 through 2021.

C. Average Annual Carryover

70. CM Rule 42.01.g states that the Director "shall consider the . . . average annual carry-over for prior comparable water conditions . . .." Actual carryover volumes are from annual storage reports published by Water District 1. Actual carryover from 1992 through 2021 are sorted into two categories – below average (dry) and above average (wet). The categories are based on Heise natural flow volumes from April through September.

The 1992 to 2021 average natural flow volume is 3,827 thousand acre-feet ("KAF").

Cat.	Year	Heise Apr–Sept (KAF)	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
			----------	----------	----------	Acre-Feet	----------	----------	----------
	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1992	2,001	11,966	11,548	31,977	28,896	16,928	19,439	3,590
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	38,686
	2007	2,320	62,739	7,962	32,138	37,761	61,744	66,807	39,999
	2021	2,622	73,688	988	61,327	27,448	65,393	121,946	13,581
	2013	2,721	55,563	21,477	54,350	34,740	55,374	135,658	23,419
Below	2002	2,775	30,192	8,932	74,573	14,662	102,139	133,702	46,825
Avg	2004	2,833	0	18,617	48,809	8,735	99,199	54,141	58,813
(Dry)	2003	2,931	9,401	3,904	52,550	6,944	82,895	169,674	0
	2016	3,012	89,845	58,689	84,302	46,050	108,482	283,728	21,497
	2000	3,059	69,436	20,787	107,425	45,762	161,423	205,510	56,536
	2010	3,108	96,172	113,895	101,620	59,628	184,940	324,712	46,243
	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	68,352
	2015	3,208	88,616	57,344	73,449	47,322	130,942	208,274	44,957
	2012	3,385	68,109	41,395	88,526	42,214	119,361	198,853	72,267
	Avg.	**2,764**	**52,345**	**33,050**	**66,187**	**34,034**	**99,827**	**163,881**	**37,446**
	2019	3,930	88,506	106,833	113,278	48,393	203,434	406,865	94,193
	2020	3,962	95,105	99,782	110,640	52,750	168,213	360,234	66,609
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	78,562
	1993	4,116	102,493	123,508	154,461	60,332	264,713	300,942	104,424
	2008	4,288	91,835	104,219	124,128	62,359	182,722	414,171	70,192
	1995	4,447	103,295	167,451	159,214	75,451	258,028	476,312	68,576
Above	1998	4,498	100,817	144,057	157,265	69,384	227,726	494,385	156,433
Avg	2014	4,594	78,917	96,756	154,382	57,305	207,834	448,682	130,086
(Wet)	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
	2018	4,796	93,754	115,442	92,727	50,776	163,465	351,483	54,285
	1999	4,949	93,354	121,793	168,545	67,147	243,322	453,706	191,501
	1996	5,583	105,209	145,019	150,358	70,250	253,786	522,790	111,459
	2017	6,139	110,348	219,940	168,293	67,754	258,106	528,880	169,862
	2011	6,347	102,139	107,618	104,915	64,487	246,699	504,578	129,757
	1997	7,007	102,539	114,684	134,906	65,307	242,758	464,411	136,926
	Avg.	**4,890**	**97,453**	**128,021**	**134,778**	**62,492**	**220,533**	**434,659**	**110,560**

Actual Carryover Volumes by Entity, Sorted by Heise Natural Flow (1992-2021).[20]

[20] In the Fourth Methodology Order, this table summarized data for the period 1994 to 2014 and adjusted WD 01 carryover values to remove water received for mitigation or water rented by the SWC entity to augment their supplies. This Fifth Methodology Order updates this chart with data for the period 1992 to 2021 and uses raw

71. In considering the principles articulated in CM Rule 42.01.g, the Director will project reasonable carryover shortfalls for members of the SWC. The following table represents the 2018 BLY diversion volumes and total reservoir storage space by entity. By dividing the total reservoir space by the 2018 diversion volume, a metric is established that describes the total number of seasons the entity's reservoir space can supply water.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
	----------Acre-Feet----------						
Projected Demand (2018 BLY)	64,192	453,890	262,211	58,417	354,851	1,026,661	1,121,717
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930
Number of Seasons of Reservoir Space	2.1	0.9	0.9	1.6	1.0	0.8	0.2

Total Reservoir Space[21] in Comparison to Demand.[22]

D. Reasonable Carryover

i. A&B

72. A&B's reservoir space has the lowest average annual rate of fill with the highest variability in fill. *See* Finding of Fact 69. In dry years, the potential exists that A&B's actual carryover will be less than the maximum projected carryover need. *See* Finding of Fact 68 & 70. A&B has an approximate two-year water supply provided by its total available storage space. *See* Finding of Fact 71. Because of its lower rate of fill, it is likely A&B will experience carryover shortfalls in consecutive dry years. Based on the evaluation criteria in CM Rule 42.01.g, A&B's reasonable carryover should be the maximum projected carryover need of 22,700 AF. *See* Finding of Fact 78.

ii. AFRD2

73. AFRD2 has the highest and most consistent reservoir rate of fill of any member of the SWC. AFRD2's storage space fills 99% of the time and has a fill variability of 3%. As

carryover values reported by WD 01. Raw numbers were used because adjusted numbers reduced the SWC's potential entitlement to reasonable carryover.

[21] *See* R. Vol. 8 at 1373-74.

[22] This Fifth Methodology Order updates this chart with the new baseline year and calculates new number of seasons of reservoir space values.

shown in the Annual Percent Fill table in Finding of Fact 69 above, its space only failed to fill in 2004 (82%) and 2000 (99%). AFRD2 has a high likelihood of filling during multi-year droughts and after a dry year. *See* Finding of Fact 69. Therefore, any unfilled space in the fall will most likely fill. AFRD2 has an approximate one-year supply available in storage. *See* Finding of Fact 71. AFRD2's storage space only failed to fill in years when the natural flow volume at Heise was less than 3,100 KAF. In a dry year, AFRD2's historical carryover volume is often less than the maximum projected carryover need using the equation set forth in Finding of Fact 68 and 70. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the reasonable carryover can be adjusted from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The historical average carryover of 16,700 AF in years when the natural flow volume at Heise was less than 3,100 KAF is the reasonable carryover for AFRD2. *See* Finding of Fact 78.

iii. BID & Minidoka

74. Historically, in dry years, BID's and Minidoka's carryover volumes have been well above the maximum projected carryover need and it is unlikely that they will have reasonable carryover shortfalls in the future. *See* Finding of Fact 68 & 70; *see also* R. Vol. 37 at 7105. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the reasonable carryover can be adjusted downward from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The reasonable carryover for BID and Minidoka is 0 AF. *See* Finding of Fact 78; *see also* R. Vol. 37 at 7105.

iv. Milner

75. Similar to A&B, Milner's reservoir space has the second lowest average annual rate of fill of all entities and has a high degree of variability in fill. *See* Finding of Fact 69. In dry years, the potential exists that Milner's actual carryover will be less than the maximum projected carryover need. *See* Finding of Fact 68 & 70. Milner has an approximate one and one half water supply available in storage. *See* Finding of Fact 71. Because of its rate of fill, it is likely Milner will experience carryover shortfalls in consecutive dry years. Based on the evaluation criteria for reasonable carryover in CM Rule 42.01.g, the maximum projected carryover need of 16,100 AF is the reasonable carryover for Milner. *See* Finding of Fact 78.

v. NSCC

76. NSCC has a near-average annual rate of fill in comparison to all entities and an approximate one-year water supply available in storage. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its maximum projected carryover need will be less than its actual carryover. *See* Finding of Fact 68 & 70. Based on the evaluation criteria in CM Rule 42.01.g, the reasonable carryover for NSCC is 113,300 AF. *See* Finding of Fact 77.

vi. TFCC

77. TFCC has a near average annual rate of fill in comparison to all entities, but only 20% of a single year's water supply is available in storage. TFCC's storage space fills 97% of

the time and has a fill variability of 8%. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its maximum projected carryover need will be less than its actual carryover. *See* Finding of Fact 68 & 70. Based on the evaluation of the criteria in CM Rule 42.01.g, the reasonable carryover can be adjusted from the maximum projected carryover need without shifting the risk of shortage to the senior right holder. The historical average carryover in dry years of 37,400 AF is the reasonable carryover for TFCC. *See* Finding of Fact 78.

78. Reasonable carryover values for the SWC members are as follows:

	Reasonable Carryover (Acre-Feet)
A&B	22,700
AFRD2	16,700
BID	0
Milner	16,100
Minidoka	0
NSCC	113,300
TFCC	37,400

E. Reasonable Carryover Shortfall

79. Reasonable carryover shortfall is the numerical difference between reasonable carryover and actual carryover, calculated at the conclusion of the irrigation season. Actual carryover is defined as the storage allocation minus the total storage use plus or minus any adjustments. Examples of adjustments include SWC water placed in the rental pool and SWC private leases. Adjustments are unique to each irrigation season and will be evaluated each year. Any storage water deliveries to entities other than the SWC for purposes unrelated to the original right will be adjusted so that the water is not included as a part of the SWC carryover volume. Water that is purchased or leased by an SWC member may become part of the carryover shortfall obligation. *See e.g.* R. Vol. 38 at 7201, n. 11 (Eighth Supplemental Order). Conversely, actual carryover must be adjusted to assure that water supplied by a SWC member to private leases or to the rental pool will not increase the reasonable carryover shortfall obligation to the same SWC member.

80. Reasonable carryover shortfall is calculated as follows:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

F. Determination of Curtailment Date

81. The Eastern Snake Plain Aquifer Model ("ESPAM") is the best scientific tool available to simulate aquifer and Snake River responses to stresses applied to the aquifer, such as ground water pumping from a well. Curtailment of junior ground water pumpers in response to the SWC Delivery Call would result in a reduction in the withdrawal of groundwater and a corresponding reduction in aquifer stress. ESPAM simulates the effects of the reduction in

aquifer stress and calculates predicted increases in aquifer discharge to the Snake River resulting from the curtailment of ground water pumping from the ESPA.

82. ESPAM simulations can be either steady-state or transient.

83. Merriam-Webster's Dictionary defines steady-state as "a state or condition of a system or process … that does not change in time." *Steady state*, Merriam-Webster.com, https://www.merriam-webster.com/dictionary/steady-state (April 19, 2023). A steady-state ESPAM simulation can only model increases in aquifer discharge to the Snake River resulting from continuous curtailments of an identical magnitude and location until the impacts of curtailment are fully realized. For example, a steady-state analysis of the curtailment of 1,000 acres, assumes that irrigation of the same 1,000 acres is curtailed every year at the same rate of consumptive use, until the impacts of that curtailment reach a steady state, or no longer change from year to year.

84. Steady-state analysis does not calculate the time to reach steady-state conditions nor describe the seasonal timing of the impacts. For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved. The assumption of continuous curtailment does not reflect reality in the SWC Delivery Call. Curtailments ordered as prescribed in the methodology are neither continuous nor long-term. Irrigation with ground water does not occur at a constant rate throughout the year nor from year to year. It is important to predict what benefits to the river are realized during the irrigation season in which injury has been determined. A steady-state ESPAM simulation cannot predict what benefits are realized during the irrigation season. In contrast, a transient ESPAM simulation will predict the timing of changes in river reach gains.

85. ESPAM was calibrated using one-month stress periods and can simulate a single (or partial) irrigation season of curtailment and predict the resulting increase in aquifer discharge to the Snake River during the same irrigation season using a transient simulation. In the context of this proceeding, the transient approach identifies the junior ground water rights that must be curtailed to produce increases in Snake River flows sufficient to offset material injury in the current irrigation season.

86. Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year.[23] Fifty percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately four years. Ninety percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately 24 years.

87. A curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the full predicted IDS unless the shortfall exceeds the accruals to the near

[23] The near Blackfoot to Minidoka reach is the reach of the Snake River from which the SWC diverts.

Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights.

88. Steady-state simulations are appropriate for evaluating the average annual impact of aquifer stresses that have been, or will be, applied for decades (i.e., ground water pumping year after year, or continuous curtailment to the same date every year). The steady-state simulation of continuous curtailment applied in the Fourth Amended Methodology Order does not simulate the short-term curtailments prescribed in the methodology. The methodology prescribes curtailment only in years with a predicted IDS or carryover shortfall and prescribes the determination of a curtailment priority date that varies with the magnitude of the predicted shortfall.

89. Transient simulations are necessary to evaluate the impacts of aquifer stresses applied for short periods of time (i.e. short-term curtailments with varying priority dates). Transient simulations are necessary to simulate the short-term curtailments prescribed in the methodology.

CONCLUSIONS OF LAW

1. This order contains the methodology by which the Director will determine material injury to RISD and reasonable carryover to members of the SWC.

2. "The agency's experience, technical competence, and specialized knowledge may be utilized in the evaluation of the evidence." Idaho Code § 67-5251(5); IDAPA 37.01.01.600.

3. Idaho Code § 42-602 states that, "The director of the department of water resources shall have discretion and control of the distribution of water from all natural sources . . . . The director of the department of water resources shall distribute water . . . in accordance with the prior appropriation doctrine." According to the Hearing Officer, "It is clear that the Legislature did not intend to grant the Director broad powers to do whatever the Director might think right. However, it is clear also that the Legislature [in Idaho Code § 42-602] did not intend to sum up water law in a single sentence of the Director's authority." R. Vol. 37 at 7085. "Given the nature of the decisions which must be made in determining how to respond to a delivery call, there must be some exercise of discretion by the Director." *American Falls Res. Dist. No. 2 v. Idaho Dept. Water Resources*, 143 Idaho 862, 875, 154 P.3d 433, 446 (2007).

4. "The prior appropriation doctrine is comprised of two bedrock principles—that the first appropriator in time is the first in right and that water must be placed to a beneficial use." *In Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A & B Irrigation Dist.*, 155 Idaho 640, 650, 315 P.3d 828, 838 (2012). "The concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*; *American Falls*, 143 Idaho at 879, 154 P.3d at 450 (stating that while an appropriation for a beneficial use is "a valuable right entitled to protection . . . . Nevertheless, that property right is still subject to other requirements of the prior appropriation doctrine."); *Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 131, 369 P.3d 897, 909

(2016) (explaining the "policy of beneficial use" serves as a "limit on the prior appropriation doctrine.").

5. "Concurrent with the right to use water in Idaho 'first in time,' is the obligation to put that water to beneficial use." *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447) (referring to "'the constitutional requirement that priority over water be extended only to those using the water'"). "'It is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation, and the amount of water necessary for the purpose of irrigation of the lands in question and the condition of the land to be irrigated should be taken into account.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar v. Goodrich*, 27 Idaho 26, 44, 147 P. 1073, 1079 (1915)).

6. "[T]he policy of securing the maximum use and benefit, and least wasteful use of Idaho's water resources, has long been the policy in Idaho." *Idaho Ground Water Assoc.*, 160 Idaho at 131, 369 P.3d at 909 (citing *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 808, 252 P.3d 71, 89 (2011)). The Idaho Constitution enunciates a policy of promoting "optimum development of water resources in the public interest." Idaho Const. Art. XV, § 7; *Baker v. Ore-Ida Foods, Inc.,* 95 Idaho 575, 584, 513 P.2d 627, 636 (1973). "There is no difference between securing the maximum use and benefit and least wasteful use of this State's water resources and the optimum development of water resources in the public interest. Likewise, there is no material difference between 'full economic development' and the 'optimum development of water resources in the public interest.' They are two sides of the same coin. Full economic development is the result of the optimum development of water resources in the public interest." *Clear Springs*, 150 Idaho at 809, 252 P.3d at 90. "The policy of securing the maximum use and benefit, and least wasteful use, of the State's water resources applies to both surface and ground waters, and it requires that they be managed conjunctively." *Id.*

7. "Conjunctive administration 'requires knowledge by the [Department] of the relative priorities of the ground and surface water rights, how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts the water flows in that source and other sources.' . . . . That is precisely the reason for the CM Rules and the need for analysis and administration by the Director." *American Falls,* 143 Idaho at 877, 154 P.3d at 448.

8. The CM Rules incorporate all principles of the prior appropriation doctrine as established by Idaho law. *American Falls*, 143 Idaho at 873, 154 P.3d at 444; CM Rule 20.02, 10.12.

9. While the presumption under Idaho law is that an appropriator is entitled to his decreed water right and the CM Rules may not be applied to require a senior appropriator to demonstrate an entitlement to the water in the first place, there may be post-adjudication factors relevant to the determination of how much water is actually needed in responding to a delivery call. *American Falls*, 143 Idaho at 877-78, 154 P.3d at 448-49. Under the CM Rules and Idaho law, the Director has the "authority and responsibility to investigate claims when delivery calls

are made," and the "authority to evaluate the issue of beneficial use in the administration context." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840. As the Idaho Supreme Court stated, "'[w]hile the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception . . . the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost.'" *Idaho Ground Water Assoc.*, 160 Idaho at 131, 369 P.3d at 909 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 433). "[T]he Director must have some discretion to balance these countervailing considerations in a delivery call." *Id*. "'If this Court were to rule the Director lacks the power in a delivery call to evaluate whether the senior is putting the water to beneficial use, we would be ignoring the constitutional requirement that priority over water be extended only to those using the water.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447).

10. In responding to a delivery call under the CM Rules, the Director "may employ a baseline methodology as a starting point for considering material injury," provided the baseline methodology otherwise comports with the prior appropriation doctrine as established by Idaho law. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841; *see Methodology Remand Order* at 17.

11. Once the Director determines "that material injury is occurring or will occur," junior appropriators subject to the delivery call bear "the burden of proving that the call would be futile or to challenge, in some other constitutionally permissible way, the senior's call." *American Falls*, 143 Idaho at 878, 154 P.3d at 449; *Methodology Remand Order* at 31. Junior appropriators have the burden of proving by clear and convincing evidence that the delivery call is futile or otherwise unfounded. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841.

12. "This case illustrates the tension between the first in time and beneficial use aspects of the prior appropriation doctrine." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838. The Idaho Supreme Court has in this case "recognized the critical role of the Director in managing the water resources to accommodate both first in time and beneficial use aspects: 'Somewhere between the absolute right to use a decreed water right and an obligation not to waste it and to protect the public's interest in this valuable commodity, lies an area for the exercise of discretion by the Director.'" *Id.* at 651, 315 P.3d at 839 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 451). Thus, in this case the Director may use "a baseline methodology, both as a starting point for consideration of the Coalition's call and in determining the issue of material injury." *Id.* at 650-51, 315 P.3d at 838-39. However, "[i]f changing conditions establish that material injury is greater than originally determined pursuant to the baseline analysis, then adjustments to the mitigation obligation of the juniors must be made when the Director undertakes his mid-season calculations." *Methodology Remand Order* at 18.

13. In the context of conjunctive administration, the Director's methodology for projecting material injury does not impose an obligation upon members of the SWC to reprove

their water rights. To the extent water is available, members of the SWC are authorized to divert and store water in accordance with the terms of their licenses or decrees. Nothing established herein reduces that authorization. The question that the CM Rules require the Director to answer in this proceeding is, when water is not available to fill the water rights of the SWC, how much water is reasonably necessary for the SWC to accomplish the beneficial purpose of raising crops; because what is needed to irrigate crops may be less than the decreed or licensed quantities. *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar*, 27 Idaho at 44, 147 P. at 1079) ("'[i]t is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation"). Again, "[t]he concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*

14. Holders of senior-priority water rights may receive less than their licensed or decreed quantities and not suffer material injury within the meaning of the CM Rules. As a result, in-season demand should be viewed in light of reasonableness and optimum development of water resources in the public interest. CM Rules 20 and 42; *American Falls*, 143 Idaho at 876-80, 154 P.3d at 447-51; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650-652, 315 P.3d at 838-40.

15. Here, the Director has established a methodology for determining material injury to members of the SWC. The methodology predicts material injury to RISD by taking the difference between RISD and the FS. The years 2000 through 2021 were analyzed to select the BLY because the period of years captured current irrigation practices in a dry climate. Based upon evaluation of the record, members of the SWC were exercising more reasonable efficiencies during this time period than during the 1990s when supplies were more plentiful. During periods of drought when junior ground water users are subject to curtailment, members of the SWC should exercise reasonable efficiencies to promote the optimum utilization of the State's water resources. CM Rules 20 and 42; *American Falls,* 143 Idaho at 876-80, 154 P.3d at 447-51; *Clear Springs*, 150 Idaho at 807-10; 252 P.3d at 88-91; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650-652, 315 P.3d at 838-40.

16. At this time, with the recognition that the methodology is subject to adjustment and refinement, RISD will be equal to the historic demands associated with the BLY (2018) and will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

17. Recognizing that climate and surface water supplies (natural flow and storage) are inherently variable, the Director's predictions of material injury to RISD and reasonable carryover are based upon the best available information and the best available science, in conjunction with the Director's professional judgment as the manager of the State's water resources. Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will continue to

review and refine the process of predicting and evaluating material injury. The methodology will continue to be adjusted if the data supports a change.

18. If the Director predicts that the SWC will be materially injured because of a demand shortfall prediction, either in the preseason or in the midseason, the demand shortfall represents a mitigation obligation that must be borne by junior ground water users. If mitigation water in the amount of the projected RISD shortfall cannot be secured or optioned by junior ground water users to the satisfaction of the Director, the Director will curtail junior ground water users to make up any deficit. *See* Order on Pet. for Jud. Rev., at 19, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009),

19. In previous years, the Director used steady-state modeling when determining the curtailment priority date. The Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling to determine a curtailment priority date that would supply adequate water to the senior water right holders. While the first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling, the current version was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling for calculating the response to curtailment of groundwater use. As part of the Director's ongoing obligation to evaluate the methodology, the Director must evaluate whether the use of steady-state continues to be supportable.

20. In surface water administration, uses by holders of junior priority surface water rights are curtailed until the senior surface water rights are fully satisfied, absent a futile call and if the senior surface water users need the water to accomplish a beneficial use. In other words, under surface water administration, junior surface water rights are generally curtailed unless the senior gets water in the quantity and at the time and place required.

21. Rule 43 of the CM Rules mandates that when the Director evaluates a mitigation plan, the mitigation plan must ensure that water is delivered to holders of senior priority surface water rights in both the quantity and at the time and place required by the senior. In considering a proposed mitigation plan pursuant to Rule 43, the Director must evaluate:

> **b.** Whether the mitigation plan will provide replacement water, *at the time and place required by the senior-priority water right*, sufficient to offset the depletive effect of ground water withdrawal on the water available in the surface or ground water source *at such time and place as necessary* to satisfy the rights of diversion from the surface or ground water source. Consideration will be given to the history and seasonal availability of water for diversion so as not to require replacement water at times when the surface right historically has not received a full supply, such as during annual low-flow periods and extended drought periods.
> **c.** Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right *when needed during a time of shortage* even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for

> multi-season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior-priority right in the event the mitigation water source becomes unavailable.

IDAPA 37.01.03.11.043.b-c (emphasis added). In other words, there is an assumption that senior water right holders calling for delivery of water under the CM Rules will receive, by curtailment or by mitigation, "replacement water at the time and place required by the senior-priority water right, sufficient to offset the depletive effect of ground water withdrawal . . . ." Only in a mitigation plan can "multi-season accounting of ground water withdrawals" be employed, and even then, the plan must "assure protection of the senior-priority right in the event the mitigation water source becomes unavailable."

22. The Director has an obligation to address a mitigation deficiency in the year it occurs. Mem. Decision & Order on Pet. for Jud. Rev., at 10, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-2446 (Twin Falls Cnty. Dist. Ct. Idaho Dec. 3, 2014); Mem. Decision & Order, at 8–9, *Rangen, Inc. v. Idaho Dep't of Water Res.*, No. CV-2014-4970 (Twin Falls Cnty. Dist. Ct. Idaho June 1, 2015).

23. As described in Finding of Fact 87, curtailment to a priority date calculated by the steady state analysis method used in the Fourth Methodology Order will only offset 9% to 15% of the predicted IDS. In contrast, curtailment to a priority date calculated with a transient simulation of a single season curtailment will offset the *full* predicted IDS unless the shortfall exceeds the accruals to the near Blackfoot to Minidoka reach by the end of the irrigation season with curtailment of all junior ground water rights. This methodology order depends on an annual evaluation of material injury and should also employ curtailment and or mitigation that supplies replacement water at the time and place required by the senior-priority water right in a quantity sufficient to offset the depletive effect of ground water withdrawal and to assure protection of the senior-priority right. Curtailment dates, periodically determined at time of recalculating in-season demand shortfall (IDS), should be calculated by a transient model simulation that will return the full quantity of water to the senior priority rights at the time and place required.

24. As described in Conclusion of Law 18, junior ground water users with approved mitigation plans to deliver storage water as mitigation must, to the satisfaction of the Director, secure or option mitigation water to avoid curtailment. By requiring that junior ground water users secure mitigation water or have options to acquire water in place during the season of need, the Director ensures that the SWC does not carry the risk of shortage to their supply. By not requiring junior ground water users to deliver or assign mitigation water until the Time of Need, the Director ensures that junior ground water users supply only the amount of mitigation water necessary to satisfy the RISD. All approved methods of mitigation shall be considered in the Director's review of projected RISD shortfall.

25. Unless there is reasonable certainty that junior ground water users can secure the predicted volume of water and provide that water at the Time of Need, the protection afforded to the senior water right holders is compromised. The risk of shortage is then impermissibly shouldered by the SWC. Members of the SWC should have certainty entering the irrigation

season and at midseason that mitigation water will be delivered or assigned at the Time of Need, or curtailment of junior ground water rights will be ordered.

26. Because climate and the supply that the SWC appropriated (natural flow and storage) are inherently variable, the Director cannot and should not insulate the SWC against all shortages. The Director can, however, protect the SWC against reasonably predicted shortages to RISD.

27. Currently, the USBR and USACE's Joint Forecast is an indispensable predictive tool at the Director's disposal for predicting material injury to RISD. Given current forecasting techniques, the earliest the Director can predict material injury to RISD with reasonable certainty is soon after the Joint Forecast is issued in early April. The pre-irrigation season supply forecast for A&B and Milner can be predicted solely from the Joint Forecast. To improve the accuracy of prediction, the pre-irrigation season supply forecast for AFRD2, BID, Minidoka, NSCC, and TFCC will currently be predicted from both the Joint Forecast and from flow data at Box Canyon.[24]

28. By shifting the April Forecast Supply prediction curve down one standard error of estimate, the Director purposely underestimates the water supply that is predicted. The Director further guards against RISD shortage by using the 2018 BLY, which has above average diversions, above average ET, below average in-season precipitation, and above average growing degree days. The 2018 BLY represents a year in which water supply did not limit diversions. The Director's prediction of material injury to RISD is purposely conservative. While it may ultimately be determined after final accounting that less mitigation water was owed than was provided, this is an appropriate burden for junior appropriators to carry. Idaho Cost. Art. XV, § 3; Idaho Code § 42-106. Shifting the prediction curve down one standard error of estimate and adoption of a BLY that uses above average diversions, above average temperatures and ET and below average precipitation is necessary to protect senior rights if the Director administers to an amount less than the full decreed quantity of the SWC's rights. *Methodology Remand Order* at 33, 35.

29. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water provided by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

30. "Storage water is water held in a reservoir and is intended to assist the holder of the water right in meeting their decreed needs." *American Falls*, 143 Idaho at 878, 154 P.3d at 449. "Carryover is the unused water in a reservoir at the end of the irrigation year which is retained or stored for future use in years of drought or low-water." *Id.* Under Idaho Code, "[o]ne may acquire storage water rights and receive a vested priority date and quantity, just as with any other water right," but "[t]here is no statutory provision for obtaining a decreed right to 'carryover' water." *Id.* Rather, carryover is a "component of the storage right." Order on Pet. for Jud. Rev., at 20, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-

[24] The method for predicting the natural flow supply may be subject change based upon improved predictive models.

0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009). Storage carryover is "permissible . . . absent abuse." *American Falls*, 143 Idaho at 880, 154 P.3d at 451.

31. The storage reservoirs implicated in this proceeding were intended to provide supplemental supplies of water "to create a buffer against the uncertainty of the weather." *Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation* (April 29, 2008) at 6. "The history of the development of the reservoir system, most recently Palisades, makes it clear that storage of water was a primary purpose to prevent disaster during periods of shortage as have been experienced in the recent past." *Id*. at 60. The purpose of carryover also is "insurance against the risk of future shortage." Order on Pet. for Jud. Rev., at 20, *A&B Irrigation District v. Idaho Dairymen's Association, Inc.*, No. 2008-0000551 (Gooding Cnty. Dist. Ct. Idaho July 24, 2009).

32. CM Rule 42.01 sets forth factors the Director "may consider in determining whether the holders of water rights are suffering material injury and using water efficiently and without waste." CM Rule 42.01 does not limit the Director's determination of reasonable carryover to consideration of the factors enumerated in CM Rule 42.01g, but only requires that the Director consider those enumerated factors. One such factor is "[t]he extent to which the requirements of the holder of a senior priority water right could be met with the user's existing facilities and water supplies." CM Rule 42.01g. This factor is qualified, however, by the provision that "the holder of a surface water storage right shall be entitled to maintain a reasonable amount of carry-over storage to assure water supplies for future dry years." CM Rule 42.01g. Thus, CM Rule 42.01g does not require water right holders to exhaust their storage water supplies prior to making a delivery call under the CM Rules. This is consistent with the purposes of the storage reservoirs and the carryover components of the storage water rights.

33. In considering CM Rule 42.01g in *American Falls*, the Idaho Supreme Court framed the SWC's challenge to the "reasonable carryover" provision as presenting the question of whether the holders of storage water rights are "entitled to insist on all available water to carryover for future years in order to assure that their full storage water is met (regardless of need)," *American Falls,* 143 Idaho at 879, 154 P.3d at 450, and answered this question in the negative:

> At oral argument, one of the irrigation district attorneys candidly admitted that their position was that they should be permitted to fill their entire storage water right, regardless of whether there was any indication that it was necessary to fulfill current or future needs and even though the irrigation districts routinely sell or lease the water for uses unrelated to the original rights. This is simply not the law of Idaho. While the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception. As previously discussed, the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost. Supra, paragraph 11.

Id. at 880, 154 P.3d at 451.

34. As discussed in the Findings of Fact, reasonable carryover is determined by projecting the water supply for the system. This is accomplished by projecting the 2002/2004 natural flow and average annual storage fill and the 2018 demand. Next, the Director examines the average annual rate of fill of each SWC entity's reservoir space to determine each entity's relative probability of fill. Finally, the Director examines the average annual carryover for prior comparable water conditions by reviewing Heise natural flow.

35. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of the SWC. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

36. Recognizing that reservoir space held by members of the SWC may fill, and to prevent the waste of water, junior ground water users are not required to deliver or assign the volume of reasonable carryover until after the Day of Allocation (defined in footnote 27, *infra*). Junior ground water users are obligated to hold the secured or optioned mitigation water until reservoir space held by the SWC fills. If the reservoir space does not fill, junior ground water right holders must deliver or assign the secured or optioned mitigation water to the senior water right holders up to the amount of storage space that did not fill.

ORDER

Consistent with the forgoing, the Director HEREBY ORDERS that, for purposes of determining material injury to RISD and reasonable carryover, the following steps will be taken:

1. Step 1: By April 1, members of the SWC will submit electronic shape files to the Department delineating the total anticipated irrigated acres for the upcoming year within their water delivery boundary or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent. Department staff will review submitted shapefiles and modify them as necessary to ensure that: (1) the total acreage count does not exceed the decreed number of acres; (2) all of the irrigated land is located within the decreed place of use; and (3) acres are not counted more than once due to overlapping polygons within a shape file or between shape files submitted by different SWC members. Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department. If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery. If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season. The Department will electronically post

electronic shape files for each member of the SWC for the current water year for review by the parties. In determining the total irrigated acreage, the Department may account for supplemental ground water use. The Department currently does not have sufficient information to accurately determine the contribution of supplemental ground water to lands irrigated with surface water by the SWC. If and when reliable data is available to the Department, the methodology will be amended to account for the supplemental ground water use.

2. If the acreage count is under reported by more than five percent of the irrigated acreage limit of the water right, then the Department will assess the impact of this reduction in use of the water right on any mitigation requirement.

3. Step 2: Typically within the first two weeks of April, the USBR and USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage for the period April 1 through July 31. Within fourteen (14) days after issuance of the Joint Forecast, the Director will issue a final order predicting the April FS for the water year for each SWC entity. The Director will compare the April FS for each SWC entity to the BD for each SWC entity to determine if an in-season demand shortfall ("IDS") is anticipated for the upcoming irrigation season. The April FS for each SWC entity is the sum of the forecasted natural flow supply and the forecasted storage allocation for each SWC entity. The forecasted natural flow supply will be computed with regression algorithms. The forecasted storage allocation will be determined by comparing storage accruals in an analogous year(s). A transient ESPAM simulation will be run to calculate the curtailment priority date predicted to produce a volume of water equal to the IDS in the near Blackfoot to Minidoka reach between May 1 and September 30 of the current year. Curtailment will be simulated within the area of common ground water supply as described by CM Rule 50.01.

4. Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April IDS unless the April IDS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

5. Step 4: As soon as practical after the deadline for junior ground water users with approved mitigation plans to provide notice of secured water, the Director will issue an order curtailing junior ground water users who: (1) do not have approved mitigation plans; (2) fail to secure the required water consistent with their approved mitigation plans; or (3) otherwise fail to comply with their approved mitigation plans.[25]

[25] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

6. If, at any time prior to the Director's final determination of the April FS, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected demand shortfall determination.

7. Step 5: If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall. If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report, which typically occurs soon after the Day of Allocation,[26] the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC. The amount of reasonable carryover to be provided shall not exceed the empty storage space on the Day of Allocation for that entity. If water is owed in addition to the reasonable carryover shortfall volume, this water shall be delivered or assigned to members of the SWC at the Time of Need, described below. The Time of Need will be no earlier than the Day of Allocation.

8. Step 6: Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS and (3) estimate the Time of Need date.[27]

9. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The cumulative CWN volume will be calculated for all land irrigated with surface water within the boundaries of each member of the SWC. Volumetric values of CWN will be calculated using ET and precipitation values from the USBR's AgriMet program, irrigated areas provided by each entity, and crop distributions based on NASS data.

10. The FS for each SWC is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on regression analysis. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on an analogous year(s).

11. The calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

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[26] The Day of Allocation is the time in the irrigation season when the Water District 01 watermaster can issue allocations to storage space holders after the reservoir system has achieved its maximum physical fill, maximum water right accrual, and any excess spill past Milner Dam has ceased. Tr. p. 902, lns. 7-25; p. 903, lns. 1-10.

[27] At the earliest established Time of Need for any member of the SWC, junior ground water users are required to provide remaining mitigation to all materially injured members of the SWC.

12. This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. The Director will then issue revised RISD and DS values. Any increase to the projected IDS for each SWC entity is an additional mitigation obligation of the junior ground water users.

13. Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water or to conduct other approved activities pursuant to an approved mitigation plan that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users.[28] A transient ESPAM simulation will be run to determine the priority date to produce the necessary additional mitigation obligation volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

14. Step 7: Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS; and (3) establish the Time of Need. The revised FS for each SWC entity is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on analogous year(s) with similar Blackfoot to Milner reach gains. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01.

15. This information will be used to recalculate RISD and adjust the projected IDS for each member of the SWC. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The Director will then issue revised RISD and IDS values.

16. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the demand shortfall volume by September 30 of the same year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

17. Step 8: At the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised IDS calculated at the Time of Need. Alternatively, any additional mitigation obligation calculated in Step 6 and Step 7 can be satisfied from each SWC member's reasonable carryover if (a) the reasonable carryover exceeds the additional mitigation obligation, and (b) the junior ground water users secure sufficient water to replace the reasonable carryover pursuant to an approved mitigation plan.

[28] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

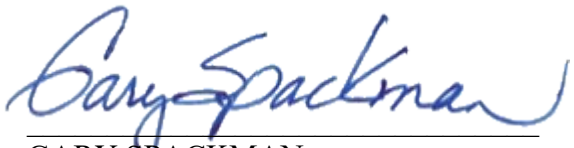
18. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water delivered by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

19. Step 9: Following the end of the irrigation season (on or before November 30), the Department will determine the total actual volumetric demand and total actual CWN for the entire irrigation season. This information will be used for the analysis of reasonable carryover shortfall, selection of future BLY, and for the refinement and continuing improvement of the method for future use.

20. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of SWC. These estimates will be based on, but not limited to, the consideration of the best available water diversion and storage data from Water District 01, return flow monitoring, comparative years, and RISD. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights. A transient ESPAM simulation will be run to determine the priority date of water rights that must be curtailed to produce the reasonable carryover shortfall volume by September 30 of the following year. Curtailment will be simulated within the area of common ground water supply, as described by CM Rule 50.01.

IT IS FURTHER ORDERED that this Fifth Methodology Order supersedes all previously issued methodology orders in this matter.

Dated this _21st_ day of April 2023.



GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of April 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email

Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

Megan Jenkins
Administrative Assistant II

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER REGARDING APRIL 2023 FORECAST SUPPLY** **(METHODOLOGY STEPS 1–3)**

FINDINGS OF FACT

1. On April 21, 2023, the Director of the Idaho Department of Water Resources ("Department") issued his *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"). The Methodology Order established nine steps for determining material injury to members of the Surface Water Coalition ("SWC"). This order applies steps 1, 2, and 3 of the Methodology Order.

A. Step 1

2. By April 1 of each year, Step 1 requires members of the SWC to submit to the Department electronic shapefiles delineating the total anticipated irrigated acres for the upcoming year "or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent." *Methodology Order* ¶ 1 at 39.

3. On February 6, 2023, the Department received a letter from American Falls Reservoir District #2 ("AFRD2"), stating that its total number of irrigated acres has not varied by more than five percent.

4. On March 2, 2023, Minidoka Irrigation District ("Minidoka") submitted its electronic shapefile delineating its total irrigated acres to the Department.

5. On March 10, 2023, the Department received a letter from A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), Milner Irrigation District ("Milner"), North Side Canal Company ("NSCC") and Twin Falls Canal Company ("TFCC"), stating that their total number of irrigated acres for 2023 will not vary by more than five percent from the electronic shapefiles submitted in prior years.

6. Based on the information submitted by the SWC, the Department will use the following total irrigated acres:

	Total Irrigated Acres[1]	Data Source
A&B	15,924	SRBA Partial Decree
AFRD2	62,361	SRBA Partial Decree
BID	46,035	2013 shapefile submitted by BID, reduced by Department for overlapping acres and acres outside of service area.
Milner	13,264	2010 service area shapefile, reduced by Department for overlapping acres and acres outside of service area.
Minidoka	75,093	SRBA Partial Decree
NSCC	154,067	SRBA Partial Decree
TFCC	194,732	2013 shapefile submitted by TFCC, reduced by Department for overlapping acres and acres outside of service area.

B. Step 2

7. Step 2 states that, within fourteen days of the issuance of the joint forecast prepared by the United States Bureau of Reclamation and the United States Army Corp of Engineers, the Director "will issue a final order predicting the April [Forecast Supply] for the water year for each SWC entity. The Director will compare the April [Forecast Supply] for each SWC entity to the [Baseline Demand] for each SWC entity to determine if a in-season demand shortfall ("IDS") is anticipated for the upcoming irrigation season." *Methodology Order* ¶ 3 at 40.

8. On April 7, 2023, the joint forecast ("Joint Forecast") was announced, predicting an unregulated inflow 3,700,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 112% percent of average.[2] The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Id.* ¶ 49 at 18 (citation omitted).

9. The Heise natural flow data from years 1990–2022 were data inputs for development of regression equations for A&B and Milner to predict the natural flow supply.[3] Data greater or less than two standard deviations from average were excluded from the regression development.

10. The April–July Heise natural flow data from the years 1990–2022 and Box Canyon November–March total discharge data for the period 1989–2022, were data inputs for development of multiple linear regression equations to predict the natural flow supplies for

[1] The number of irrigated acres used in this methodology order is the number of reported acres unless that number is larger than the decreed irrigated acres, and if so, then the decreed acres were used.

[2] The average is based on the years 1991-2020. The Joint Forecast relies on a "30-Year Climate Normal" to calculate an Average April through July runoff volume.

[3] Attached hereto, as Attachment A, are the regression analyses for each SWC entity used to predict natural flow supply.

AFRD2, BID, Minidoka, NSCC, and TFCC. *Methodology Order* ¶ 49 at 18. The U.S. Geological Survey measures and monitors the flow at the Box Canyon stream flow measurement gage. The Box Canyon November–March total discharge used by the Director in the regression models for 2023 totaled 91,898 acre-feet.

11. The storage allocations were predicted for each SWC member. As of April 11, 2023, preliminary water right accounting for the 2023 irrigation year had not been completed. Storage allocations were calculated using an average of actual storage allocations of analogous years. The Surface Water Supply Index (SWSI)[4], produced by the Natural Resources Conservation Service (NRCS), is calculated by summing reservoir carryover and the forecasted spring and summer streamflow runoff. The April 1 SWSI indicates the water supply in 1993 and 2016 are analogous to the water supply in 2023. Based on the analogous years, the Director anticipates SWC members will receive 95–100% of their allocation. The storage allocations are based on the anticipated allocations minus evaporation charges.

12. Based on the above, the Director projects as follows:

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	BLY 2018	Shortfall
A&B	14,833	135,411		150,244	64,192	0
AFRD2	115,223	387,853	1,000	504,076	453,890	0
BID	109,313	221,713	5,130	336,156	262,211	0
Milner	18,347	88,047		106,393	58,417	0
Minidoka	156,468	342,620	8,370	507,458	354,851	0
NSCC	457,802	819,773	-7,750	1,269,825	1,026,661	0
TFCC	820,663	232,606	-6,750	1,046,519	1,121,717	75,200
				Total Projected Demand Shortfall (AF)		75,200

C. Step 3

13. Step 3 requires the following:

> Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April IDS unless the April IDS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the

[4] SWSI is a predictive indicator of the surface water available in a basin compared to historic supply. The SWSI is produced monthly by the Natural Resources Conservation Service (NRCS). *See* Nat. Res. Conserv'n Serv., U.S. Dep't of Agric., *Surface Water Supply Index (SWSI)*, https://www.nrcs.usda.gov/wps/portal/nrcs/detail/id/snow/waterproducts/?cid=stelprdb1240689 (last visited Apr. 20, 2022).

individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

Methodology Order ¶ 4 at 40.

14. The predicted April DS for TFCC is 75,200 acre-feet. The total predicted DS is 75,200 acre-feet.

15. The Eastern Snake Plain Aquifer Model ("ESPAM") is used to predict the junior priority water rights that must be curtailed to produce the volume of water equal to the predicted April DS in the near Blackfoot to Minidoka reach. The ESPAM is updated periodically as new field measurements and advancements in modeling technology become available. ESPAM Version 2.2 ("ESPAM2.2") is the current version. ESPAM2.2 model documentation reports (including a model calibration report, a predictive uncertainty analysis, a superposition model scenario, and a curtailment scenario) were finalized on May 27, 2021. *See* Idaho Dep't of Water Res., *ESPAM2.2 Reports* (2021), https:// research.idwr.idaho.gov/files/projects/espam/ browse/ESPAM22_Reports/.

16. The Department ran ESPAM2.2 to predict the junior priority water rights within the area of common ground water supply that must be curtailed to produce the volume of water equal to the predicted April DS between the May 1 and September 30 of this irrigation season pursuant to the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*. Ground water rights bearing priority dates later than December 30, 1953, must be curtailed to produce the volume of water equal to the predicted April DS in the near Blackfoot to Minidoka reach.

CONCLUSIONS OF LAW

1. The Fifth Judicial District Court, in and for the County of Minidoka, held that the evidentiary standard of proof to apply in conjunctive administration of hydraulically connected water rights is clear and convincing. *See* Mem. Decision & Order on Pets. for Jud. Rev., *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho May 4, 2010); Mem. Decision & Order on Pets. for Reh'g, *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho Nov. 2, 2010).

2. "Clear and convincing evidence refers to a degree of proof greater than a mere preponderance." *Idaho State Bar v. Topp*, 129 Idaho 414, 416, 925 P.2d 1113, 1115 (1996) (internal quotations removed). "Clear and convincing evidence is generally understood to be '[e]vidence indicating that the thing to be proved is highly probable or reasonably certain.'" *State v. Kimball*, 145 Idaho 542, 546, 181 P.3d 468, 472 (2008) (citing *In re Adoption of Doe*, 143 Idaho 188, 191, 141 P.3d 1057, 1060 (2006)); *see also Idaho Dep't of Health & Welfare v. Doe*, 150 Idaho 36, 41, 244 P.3d 180, 185 (2010).

3. The Director must utilize the best available technology for determining the impact of junior ground water diversions. *See Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 814,

252 P.3d 71, 95 (2011). ESPAM 1.1 and 2.1 are the model versions utilized previously in SWC delivery call proceedings. The Director determined that ESPAM 2.1 is the best available scientific tool for predicting the effects of ground water pumping. *See Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 124, 369 P.3d 897, 902 (2016). ESPAM 2.2 is the latest version of the ESPAM model. The improvements incorporated into ESPAM 2.2, as discussed in Finding of Fact 15, make it the best available scientific tool for predicting the effects of ground water pumping in this proceeding.

4. In 2023, the Director has sufficient information to quantify irrigated areas for each of the SWC members as required by Step 1.

5. The Joint Forecast predicts an unregulated inflow of 3,700,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 112% of average.

6. The April predicted DS is 75,200 acre-feet. Junior ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply must mitigate for their proportionate share of the predicted DS in accordance with an approved mitigation plan.[5] Junior ground water users mitigating for their proportionate share of the predicted DS with a secured volume of water pursuant to an approved mitigation plan must, to the satisfaction of the Director, secure their proportionate share for delivery to the injured members of the SWC on or before May 5, 2023. There was a reasonable carryover shortfall of 49,309 acre-feet in the fall of 2022. However, because junior ground water users did not secure any mitigation water for a carryover shortfall, there is no adjustment to the mitigation obligation.

7. If, on or before May 5 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply fail to establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user. Junior ground water users who are mitigating with a secured volume of water are not required to assign the secured volume of water until after the Director issues a subsequent order requiring assignment of the water.

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[5] There are seven approved mitigation plans in place responding to the SWC delivery call filed by: 1) A&B Irrigation District, 2) Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID"), 3) the Idaho Ground Water Appropriators, Inc. ("IGWA"), 4) certain cities commonly referred to as the "Coalition of Cities", and 5) certain entities commonly referred to as the "Water Mitigation Coalition." A&B Irrigation District's proportionate share of the predicted DS of 75,200 acre-feet is 458 acre-feet. Due to the nature of the mitigation plans for SWID, the Coalition of Cities and the Water Mitigation Coalition, these entities do not need to establish that they can mitigate for their proportionate share of the predicted DS. IGWA has two approved mitigation plans. If IGWA is in compliance with mitigation plan CM-MP-2016-001, IGWA does not need to establish that it can mitigate for its proportionate share of the predicted DS. If IGWA seeks to provide mitigation by delivery of storage water as approved in mitigation plan CM-MP-2009-007, IGWA's proportionate share of the predicted DS of 75,198 acre-feet is 63,645 acre-feet.

8. If, at any time prior to the Director's final determination of the April Forecast Supply, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, predicted DS determination.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED as follows:

The Director predicts an in-season DS of 75,200 acre-feet. On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

Dated this 21st day of April 2023.

GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of April 2023, the above and foregoing, was served by the method indicated below, and addressed to the following:

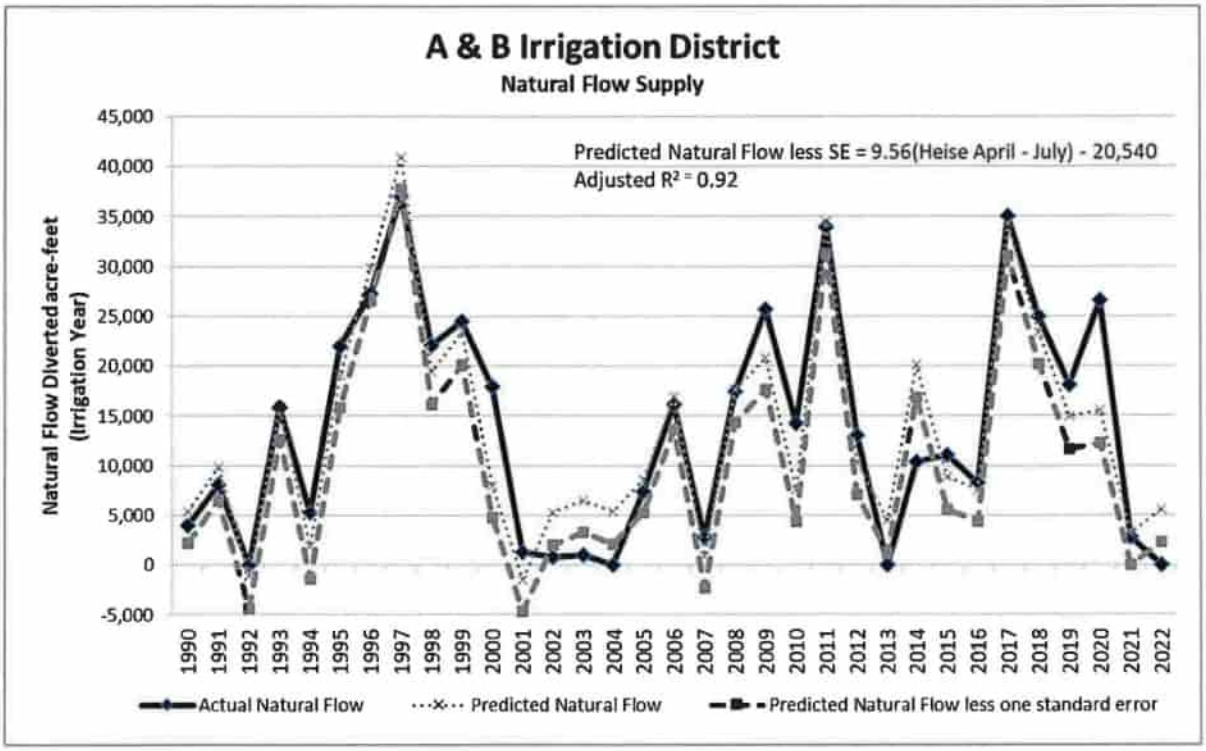
John K. Simpson MARTEN LAW LLP P.O. Box 2139 Boise, ID 83701-2139 jsimpson@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Travis L. Thompson MARTEN LAW LLP P.O. Box 63 Twin Falls, ID 83303-0063 tthompson@martenlaw.com jnielsen@martenlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Thomas J. Budge Elisheva M. Patterson RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 tj@racineolson.com elisheva@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email

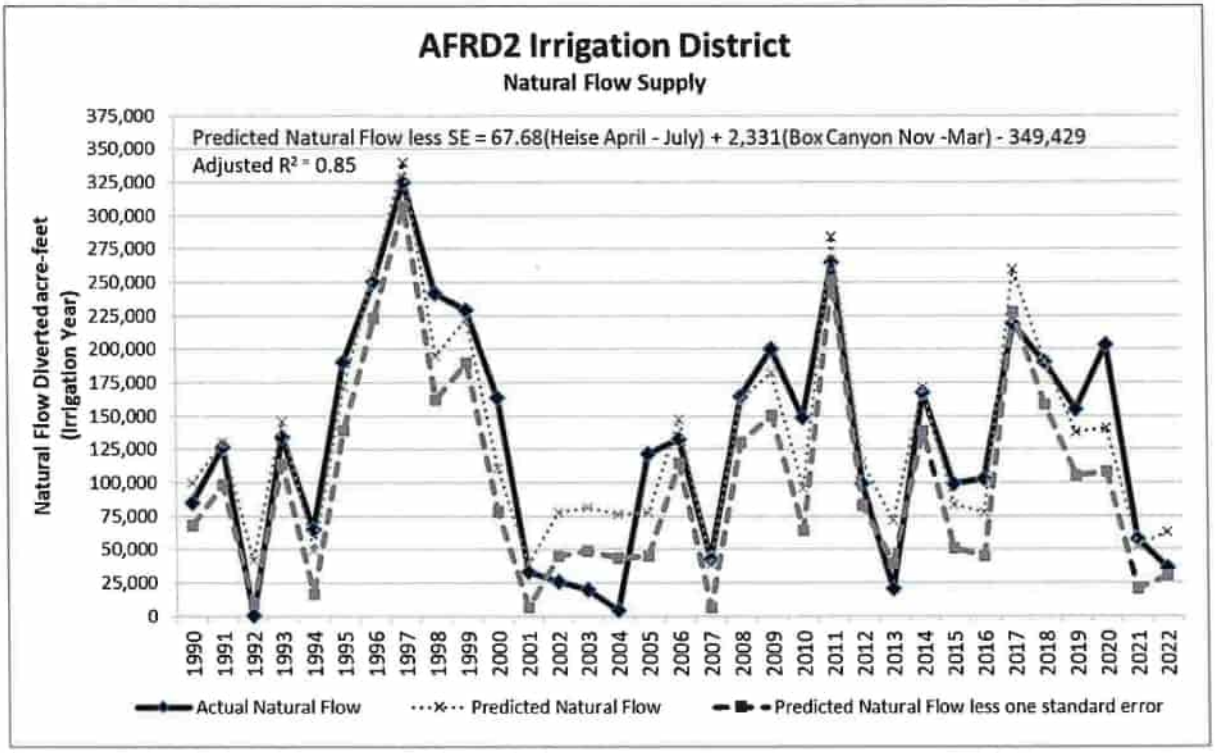
Sarah A Klahn Somach Simmons & Dunn 1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403 sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email

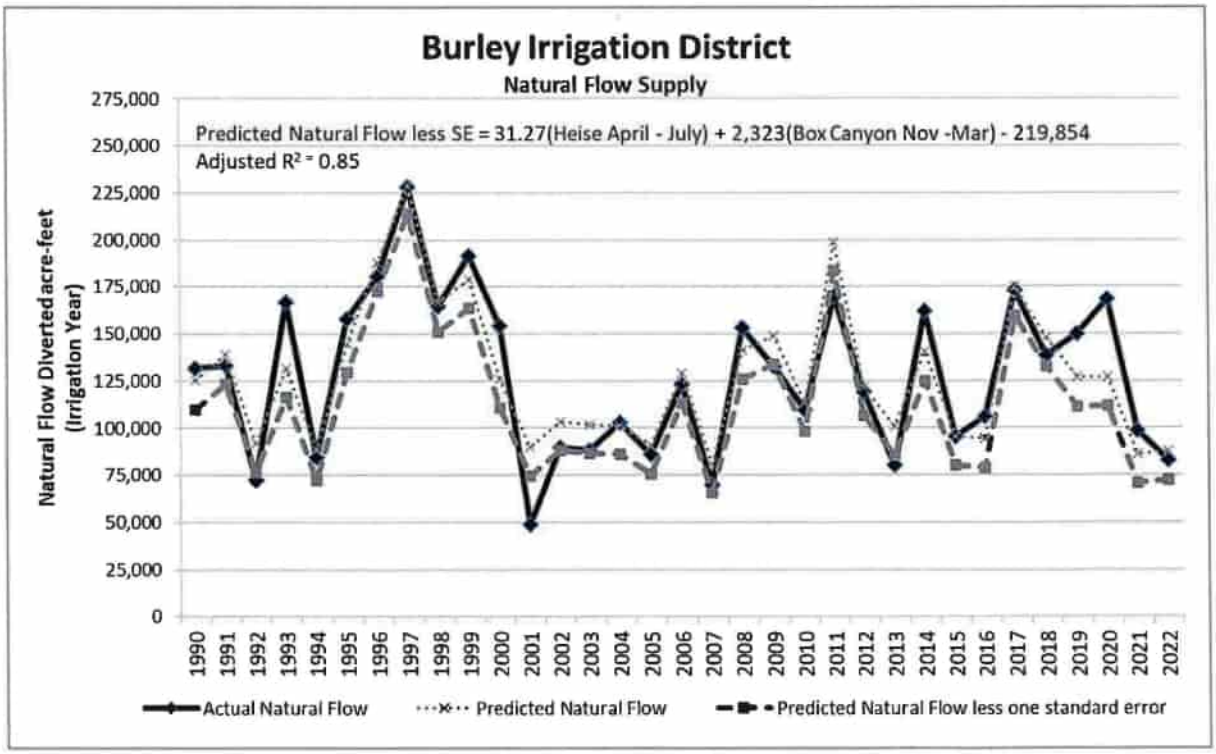
Corey Skinner IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

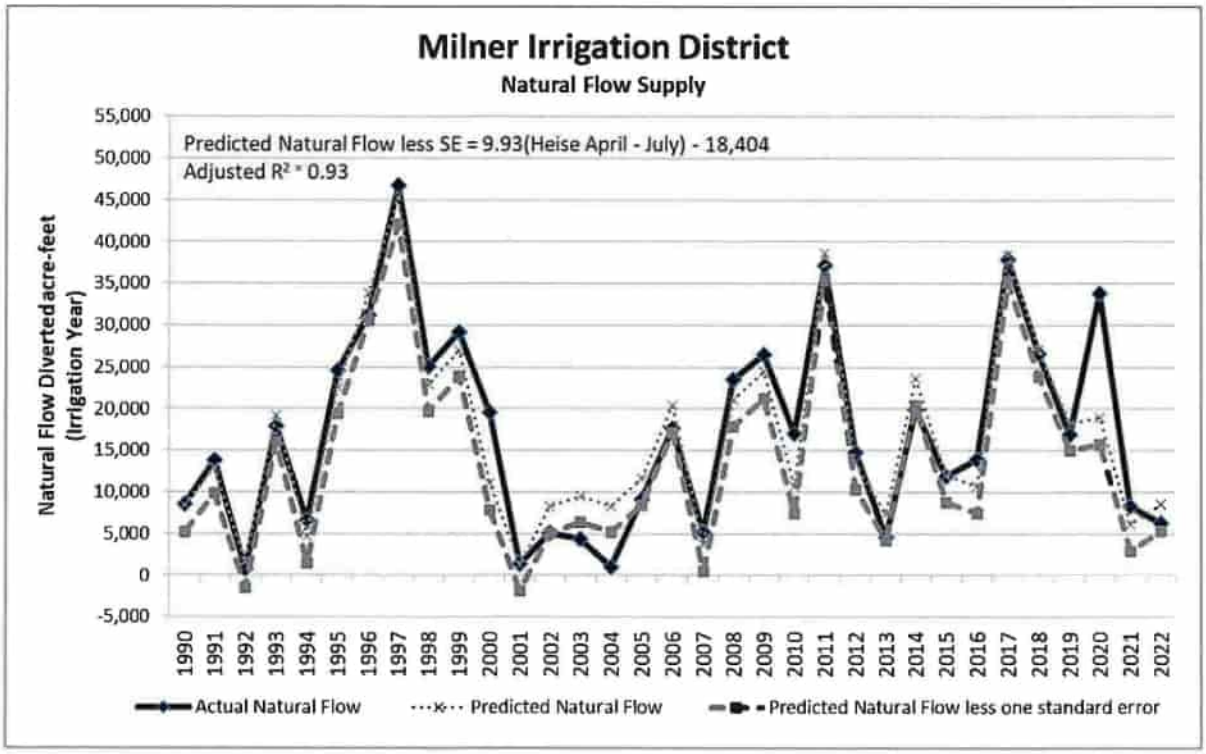
Megan Jenkins
Administrative Assistant II

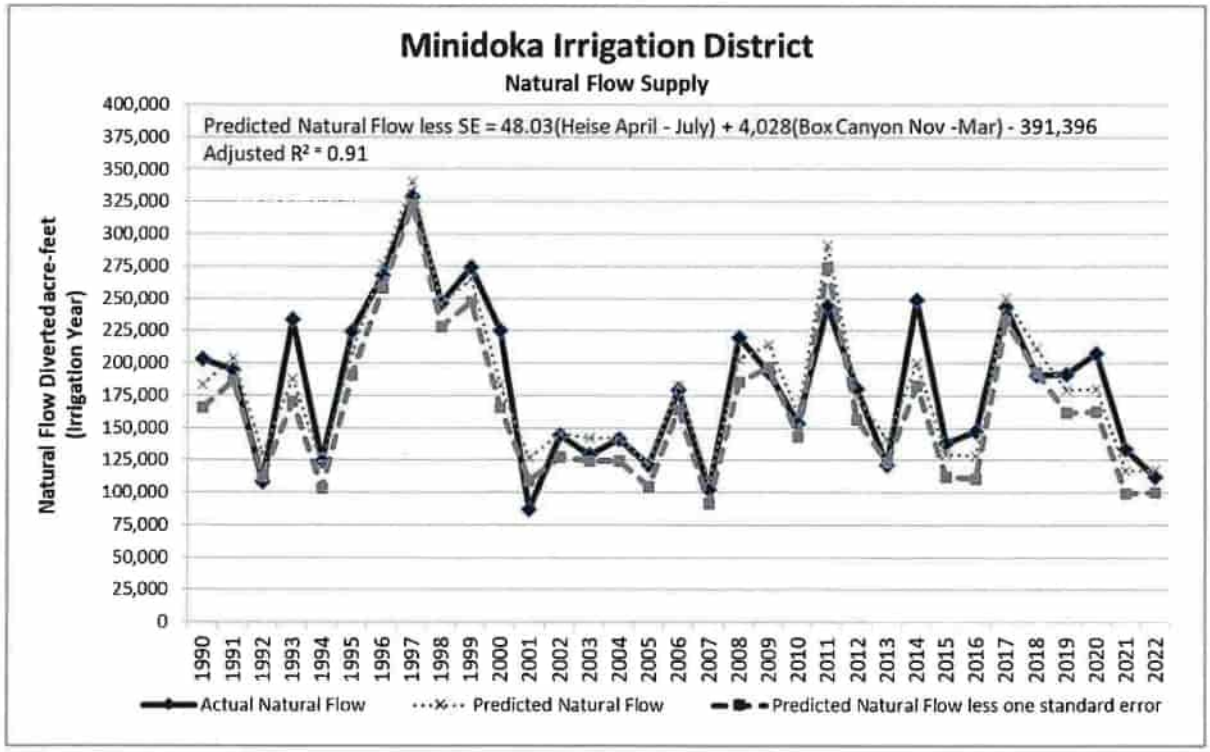
ATTACHMENT A

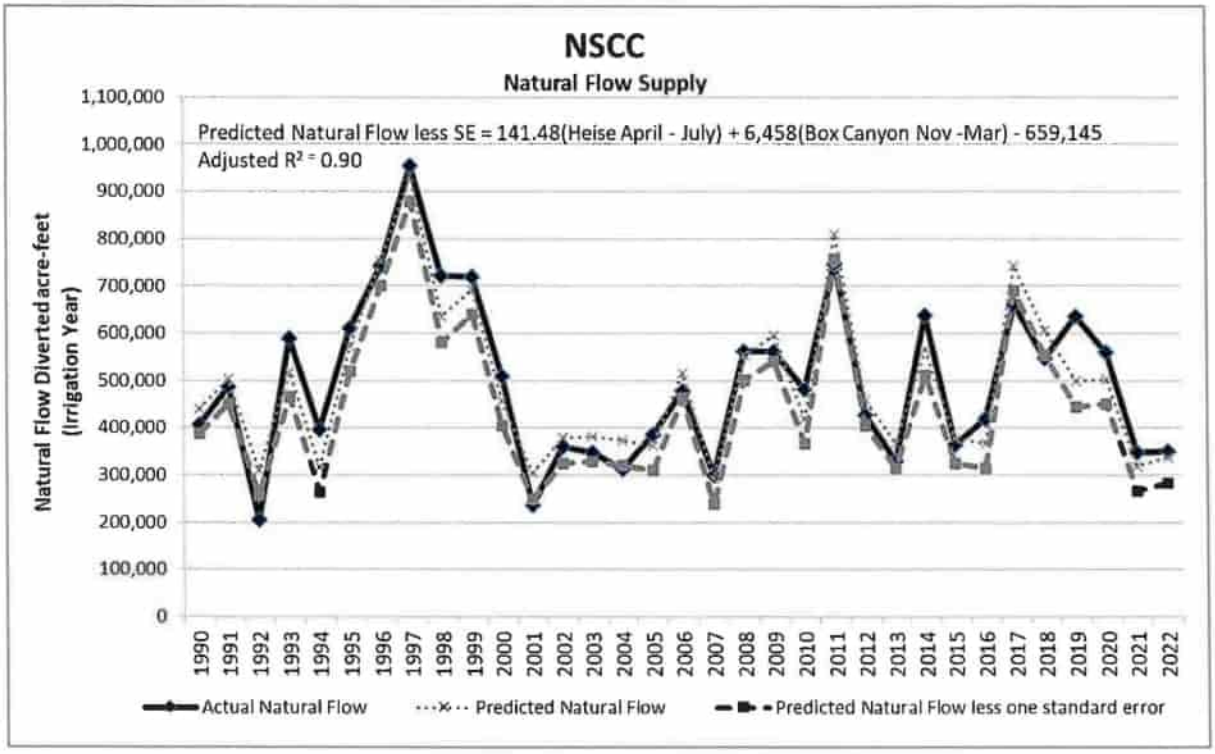


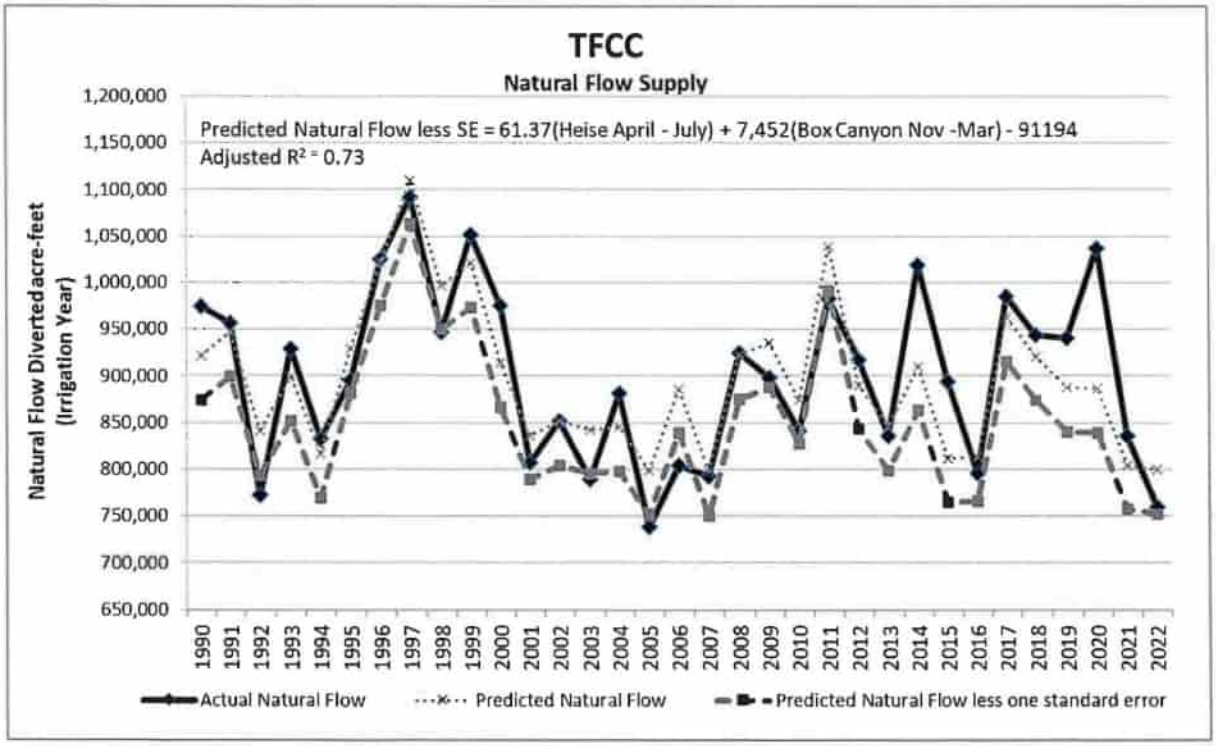

AFRD2 Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 67.68(Heise April - July) + 2,331(Box Canyon Nov -Mar) - 349,429
Adjusted R² = 0.85
Natural Flow Diverted acre-feet (Irrigation Year)
375,000
350,000
325,000
300,000
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Burley Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 31.27(Heise April - July) + 2,323(Box Canyon Nov -Mar) - 219,854
Adjusted R² = 0.85
Natural Flow Diverted acre-feet (Irrigation Year)
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Milner Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 9.93(Heise April - July) - 18,404
Adjusted R² = 0.93
Natural Flow Diverted acre-feet (Irrigation Year)
55,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Minidoka Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 48.03(Heise April - July) + 4,028(Box Canyon Nov -Mar) - 391,396
Adjusted R² = 0.91
Natural Flow Diverted acre-feet (Irrigation Year)
400,000
375,000
350,000
325,000
300,000
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


NSCC
Natural Flow Supply
Predicted Natural Flow less SE = 141.48(Heise April - July) + 6,458(Box Canyon Nov -Mar) - 659,145
Adjusted R² = 0.90
Natural Flow Diverted acre-feet (Irrigation Year)
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


TFCC
Natural Flow Supply
Predicted Natural Flow less SE = 61.37(Heise April - July) + 7,452(Box Canyon Nov -Mar) - 91194
Adjusted R² = 0.73
Natural Flow Diverted acre-feet (Irrigation Year)
1,200,000
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
750,000
700,000
650,000
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a **"Final Order"** issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

Electronically Filed
1/5/2026 8:14 PM
Seventh Judicial District, Bingham County
Pamela W. Eckhardt, Clerk of the Court
By: Brandee Cammack, Deputy Clerk

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

CV06-26-1801

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **FINAL ORDER REGARDING APRIL 2022 FORECAST SUPPLY** **(METHODOLOGY STEPS 1–3)**

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A. Step 1

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4. On March 9, 2022, the Department received a letter from American Falls Reservoir District #2 ("AFRD2"), stating that its total number of irrigated acres has not varied by more than five percent.

5. On April 1, 2022, Minidoka Irrigation District ("Minidoka") submitted its electronic shapefile delineating its total irrigated acres to the Department.

6. Based on the information submitted by the SWC, the Department will use the following total irrigated acres:

	Total Irrigated Acres	Data Source
A&B	15,924	SRBA Partial Decree
AFRD2	62,361	SRBA Partial Decree
BID	46,035	2013 shapefile submitted by BID, reduced by Department for overlapping acres and acres outside of service area.
Milner	13,335	SRBA Partial Decree
Minidoka	75,340	2022 shapefile submitted by Minidoka, reduced by Department for overlapping acres and acres outside of service area.
NSCC	154,067	SRBA Partial Decree
TFCC	194,732	2013 shapefile submitted by TFCC, reduced by Department for overlapping acres and acres outside of service area.

B. Step 2

7. Step 2 states that, within fourteen days of the issuance of the joint forecast ("Joint Forecast") prepared by the United States Bureau of Reclamation and the United States Army Corp of Engineers, the Director "will issue a final order predicting the April [Forecast Supply] for the water year for each SWC entity. The Director will compare the April [Forecast Supply] for each SWC entity to the [Baseline Demand] for each SWC entity to determine if a demand shortfall ("DS") is anticipated for the upcoming irrigation season." *Methodology Order* ¶ 3 at 36.

8. On April 6, 2022, the Joint Forecast was announced, predicting an unregulated inflow 2,150,000 acre-feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 65% percent of average.[1] The Joint Forecast "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." *Id.* ¶ 49 at 17 (citation omitted).

9. The Heise natural flow data from years 1990–2021 were data inputs for development of regression equations for A&B and Milner to predict the natural flow supply.[2] Data greater or less than two standard deviations from average were excluded from the regression development.

10. The April-July Heise natural flow data from the years 1990–2021 and Box Canyon November-March total discharge data for the period 1989–2021, were data inputs for development of multiple linear regression equations to predict the natural flow supplies for AFRD2, BID, Minidoka, NSCC, and TFCC. *Methodology Order* ¶ 49 at 17–18. The U.S.

[1] The average is based on the years1991-2020. The Joint Forecast relies on a "30-Year Climate Normal" to calculate an Average April through July runoff volume.

[2] Attached hereto, as Attachment A, are the regression analyses for each SWC entity used to predict natural flow supply.

Geological Survey measures and monitors the flow at the Box Canyon stream flow measurement gage. The Box Canyon November-March total discharge used by the Director in the regression models for 2022 totaled 93,524 acre-feet.

11. The storage allocations were predicted for each SWC member. As of April 1, 2022, preliminary water right accounting indicates the water rights for Lake Walcott, Jackson Lake 1910, Palisades Winter Water Savings, Island Park 1921, American Falls Winter Water Savings, and Henry's Lake 1965 space are satisfied. The remaining reservoir rights are 1,603,003 acre-feet from satisfaction. The Surface Water Supply Index (SWSI)[3] indicates the water supply in 2001, 2002, and 2004 are analogous to the water supply in 2022. Based on the analogous years, the Director anticipates the remaining reservoir rights for Jackson Lake, Palisades and American Falls will be 45-95% satisfied and each SWC member will receive 83-96% of their allocation. The storage allocations are based on the anticipated allocations minus evaporation charges.

12. Based on the above, the Director projects as follows:

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	BLY 06/08/12	Shortfall
A&B	467	122,306		122,773	59,992	0
AFRD2	16,941	364,890	1,000	382,831	427,672	44,800
BID	64,881	213,484	5,130	283,494	251,531	0
Milner	3,050	72,450		75,500	47,135	0
Minidoka	88,905	301,293	8,370	398,568	369,492	0
NSCC	246,664	744,164	-7,750	983,078	978,888	0
TFCC	741,869	207,120	-6,750	942,239	1,060,011	117,800
				Total Projected Demand Shortfall (AF)		162,600

C. Step 3

13. Step 3 requires the following:

> Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April DS unless the April DS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the individual SWC member will be reduced by the quantity of water secured for the

[3] SWSI is a predictive indicator of the surface water available in a basin compared to historic supply. The SWSI is produced monthly by the Natural Resources Conservation Service (NRCS). *See* Nat. Res. Conserv'n Serv., U.S. Dep't of Agric., *Surface Water Supply Index (SWSI)*, https://www.nrcs.usda.gov/wps/portal/nrcs/detail/id/snow/waterproducts/?cid=stelprdb1240689 (last visited Apr. 20, 2022).

reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

Methodology Order ¶ 4 at 36.

14. The predicted April DS for AFRD2 is 44,800 acre-feet and TFCC is 117,800 acre-feet. The total predicted DS is 162,600 acre-feet.

15. The Eastern Snake Plain Aquifer Model ("ESPAM") is used to predict the junior priority water rights that must be curtailed to produce the volume of water equal to the predicted April DS in the near Blackfoot to Minidoka reach. The ESPAM is updated periodically as new field measurements and advancements in modeling technology become available. ESPAM Version 2.2 ("ESPAM2.2") superseded Version 2.1. Improvements to the ground water flow model in ESPAM2.2 were identified and prioritized in collaboration with the Eastern Snake Hydrologic Modeling Committee (ESHMC). Significant improvements incorporated into ESPAM2.2 included extension of the calibration period to include water years 2009 through 2018, improved representation of aquifer recharge in the vicinity of the Big and Little Wood Rivers, improved representation of aquifer interaction with the Heise to Shelley reach of the Snake River, and improved representation of aquifer interaction with the near Blackfoot to Minidoka reach of the Snake River. *See* Jennifer Sukow, Idaho Dep't of Water Res., *Model Calibration Report: Eastern Snake Plain Aquifer Model Version 2.2* (2021), https://research.idwr.idaho.gov/files/projects/espam/browse/ESPAM22_Reports/ModelCalibrationRpt/ModelCalibration22_Final.pdf. The latter included improved spatial representation of aquifer discharge to the lower Portneuf River and numerous spring-fed creeks in the vicinity of American Falls Reservoir. The calibrated ESPAM2.2 was provided to ESHMC members for review on August 25, 2020, and was discussed in committee meetings on September 9, 2020, and October 28, 2020. The ESHMC adopted Version 2.2 of the ground water flow model during the October 28, 2020, meeting. ESPAM2.2 model documentation reports (including a model calibration report, a predictive uncertainty analysis, a superposition model scenario, and a curtailment scenario) were finalized on May 27, 2021. *See* Idaho Dep't of Water Res., *ESPAM2.2 Reports* (2021), https://research.idwr.idaho.gov/files/projects/espam/ browse/ESPAM22_Reports/.

16. The Department ran ESPAM2.2 to predict the junior priority water rights within the area of common ground water supply that must be curtailed to produce the volume of water equal to the predicted April DS at steady state. Ground water rights bearing priority dates later than December 25, 1979, must be curtailed to produce the volume of water equal to the predicted April DS in the near Blackfoot to Minidoka reach.

CONCLUSIONS OF LAW

1. The Fifth Judicial District Court, in and for the County of Minidoka, held that the evidentiary standard of proof to apply in conjunctive administration of hydraulically connected water rights is clear and convincing. *See* Mem. Decision & Order on Pets. for Jud. Rev., *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho May 4, 2010); Mem. Decision & Order on Pets. for Reh'g, *A&B Irr. Dist., Inc. v. Idaho Dep't of Water Res.*, No. CV-2009-647 (Minidoka Cnty. Dist. Ct. Idaho Nov. 2, 2010).

2. "Clear and convincing evidence refers to a degree of proof greater than a mere preponderance." *Idaho State Bar v. Topp*, 129 Idaho 414, 416, 925 P.2d 1113, 1115 (1996) (internal quotations removed). "Clear and convincing evidence is generally understood to be '[e]vidence indicating that the thing to be proved is highly probable or reasonably certain.'" *State v. Kimball*, 145 Idaho 542, 546, 181 P.3d 468, 472 (2008) (citing *In re Adoption of Doe*, 143 Idaho 188, 191, 141 P.3d 1057, 1060 (2006)); *see also Idaho Dep't of Health & Welfare v. Doe*, 150 Idaho 36, 41, 244 P.3d 180, 185 (2010).

3. The Director must utilize the best available technology for determining the impact of junior ground water diversions. *See Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 816, 252 P.3d 71, 97 (2011). ESPAM 1.1 and 2.1 are the model versions utilized previously in SWC delivery call proceedings. The Director determined that ESPAM 2.1 is the best available scientific tool for predicting the effects of ground water pumping. *See Idaho Ground Water Assoc. v. Idaho Dep't of Water Res.*, 160 Idaho 119, 124, 369 P.3d 897, 902 (2016). ESPAM 2.2 is the latest version of the ESPAM model. The improvements incorporated into ESPAM 2.2, as discussed in Finding of Fact 15, make it the best available scientific tool for predicting the effects of ground water pumping in this proceeding.

4. In 2022, the Director has sufficient information to quantify irrigated areas for each of the SWC members as required by Step 1.

5. The Joint Forecast predicts an unregulated inflow of 2,150,000 acre feet at the Snake River near Heise gage for the period of April through July. The forecasted flow volume equates to 65% of average.

6. The April predicted DS is 162,600 acre-feet. Junior ground water users holding consumptive water rights bearing priority dates junior to December 25, 1979, within the Eastern Snake Plain Aquifer area of common ground water supply must mitigate for their proportionate share of the predicted DS in accordance with an approved mitigation plan.[4] Junior ground water users mitigating for their proportionate share of the predicted DS with a secured volume of water pursuant to an approved mitigation plan must, to the satisfaction of the Director, secure their proportionate share for delivery to the injured members of the SWC on or before May 1, 2022. There was a reasonable carryover shortfall of 64,647 acre-feet in the fall of 2021. However, because junior ground water users did not secure any mitigation water for a carryover shortfall, there is no adjustment to the mitigation obligation.

7. If, on or before May 1, 2022, ground water users holding consumptive water rights bearing priority dates junior to December 25, 1979, within the Eastern Snake Plain Aquifer area of common ground water supply fail to establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 162,600 acre-feet in accordance with

[4] There are seven approved mitigation plans in place responding to the SWC delivery call filed by: 1) A&B Irrigation District, 2) Southwest Irrigation District and Goose Creek Irrigation District (collectively, "SWID"), 3) the Idaho Ground Water Appropriators, Inc. ("IGWA"), 4) certain cities commonly referred to as the "Coalition of Cities", and 5) certain entities commonly referred to as the "Water Mitigation Coalition." A&B Irrigation District's proportionate share of the predicted DS of 162,600 acre-feet is 2,542 acre-feet. Due to the nature of the mitigation plans for SWID, IGWA, the Coalition of Cities and the Water Mitigation Coalition, these entities do not need to establish that they can mitigate for their proportionate share of the predicted DS.

an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user. Junior ground water users who are mitigating with a secured volume of water are not required to assign the secured volume of water until after the Director issues a subsequent order requiring assignment of the water.

8. If, at any time prior to the Director's final determination of the April Forecast Supply, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, predicted DS determination.

ORDER

Based upon and consistent with the foregoing, IT IS HEREBY ORDERED as follows:

The Director predicts an in-season DS of 162,600 acre-feet. On or before May 1, 2022, ground water users holding consumptive water rights bearing priority dates junior to December 25, 1979, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 162,600 acre-feet in accordance with an approved mitigation plan. If a junior ground water user cannot establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 162,600 acre-feet in accordance with an approved mitigation plan, the Director will issue an order curtailing the junior-priority ground water user.

Dated this 20th day of April 2022.



GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

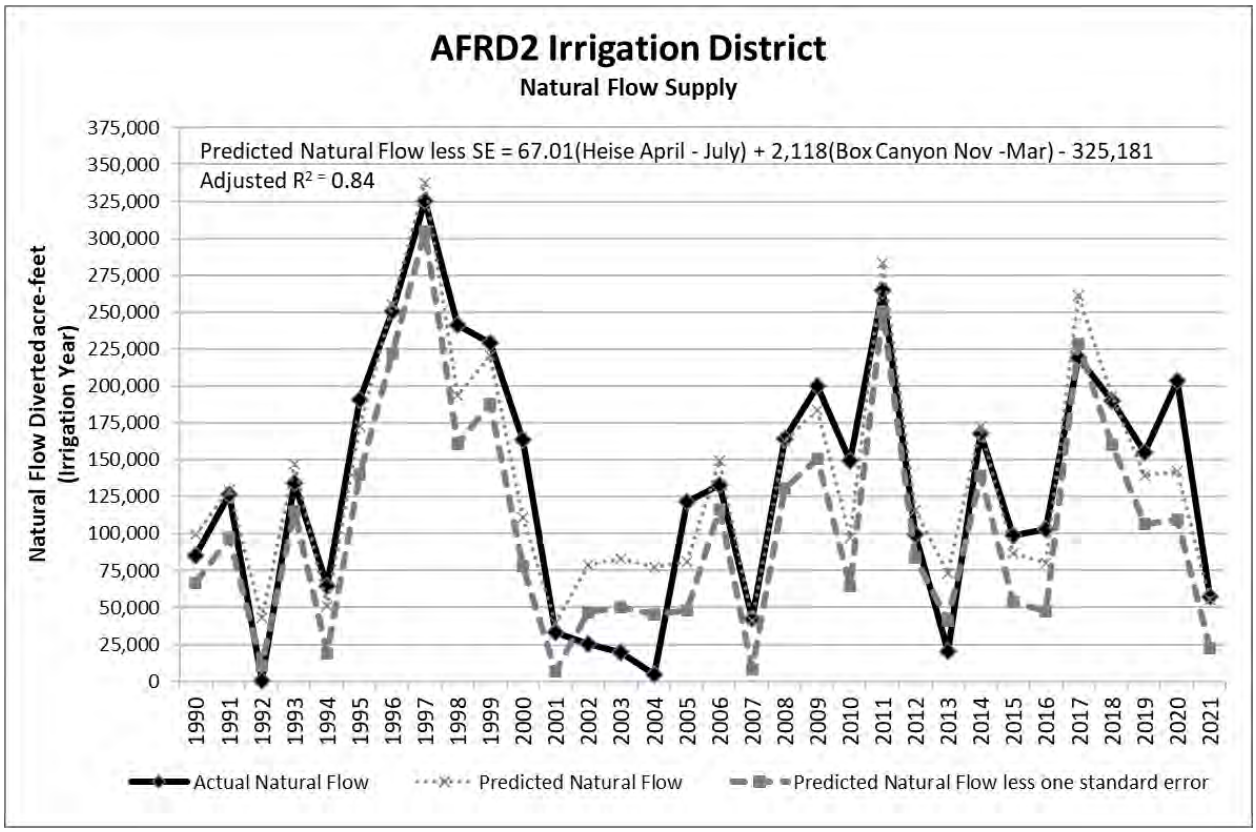
I HEREBY CERTIFY that on this 20th day of April 2022, the above and foregoing, was served by the method indicated below, and addressed to the following:

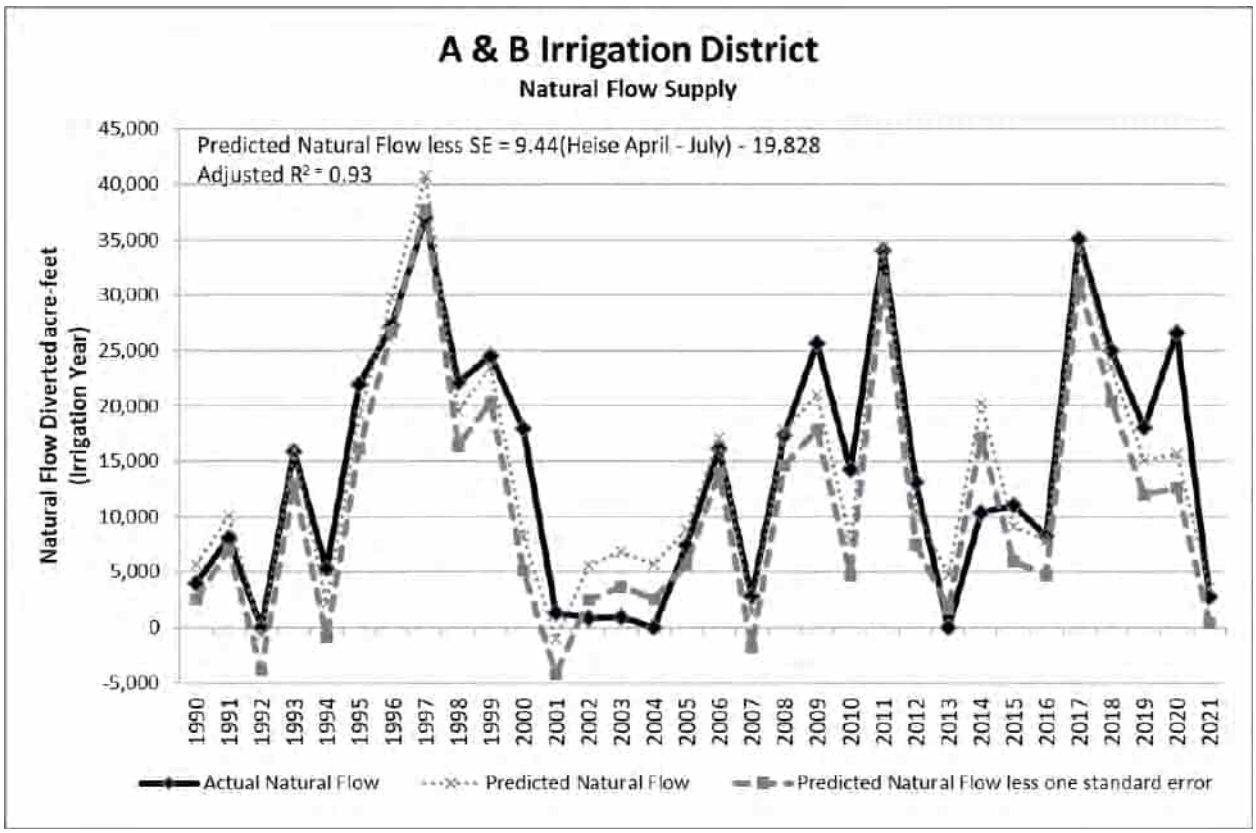
John K. Simpson Travis L. Thompson BARKER ROSHOLT & SIMPSON, LLP P. O. Box 63 Twin Falls, ID 83303-0063 jks@idahowaters.com tlt@idahowaters.com nls@idahowaters.com jf@idahowaters.com	☒ U.S. Mail, postage prepaid ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☒ Email
Randall C. Budge Thomas J. Budge RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 randy@racineolson.com tj@racineolson.com	☒ U.S. Mail, postage prepaid ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St., South Terrace, Suite 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@usbr.gov	☒ U.S. Mail, postage prepaid ☒ Email
Sarah A Klahn Somach Simmons & Dunn 2033 11th Street, Ste 5 Boulder, Co 80302 sklahn@somachlaw.com dthompson@somachlaw.com	☒ U.S. Mail, postage prepaid ☒ Email

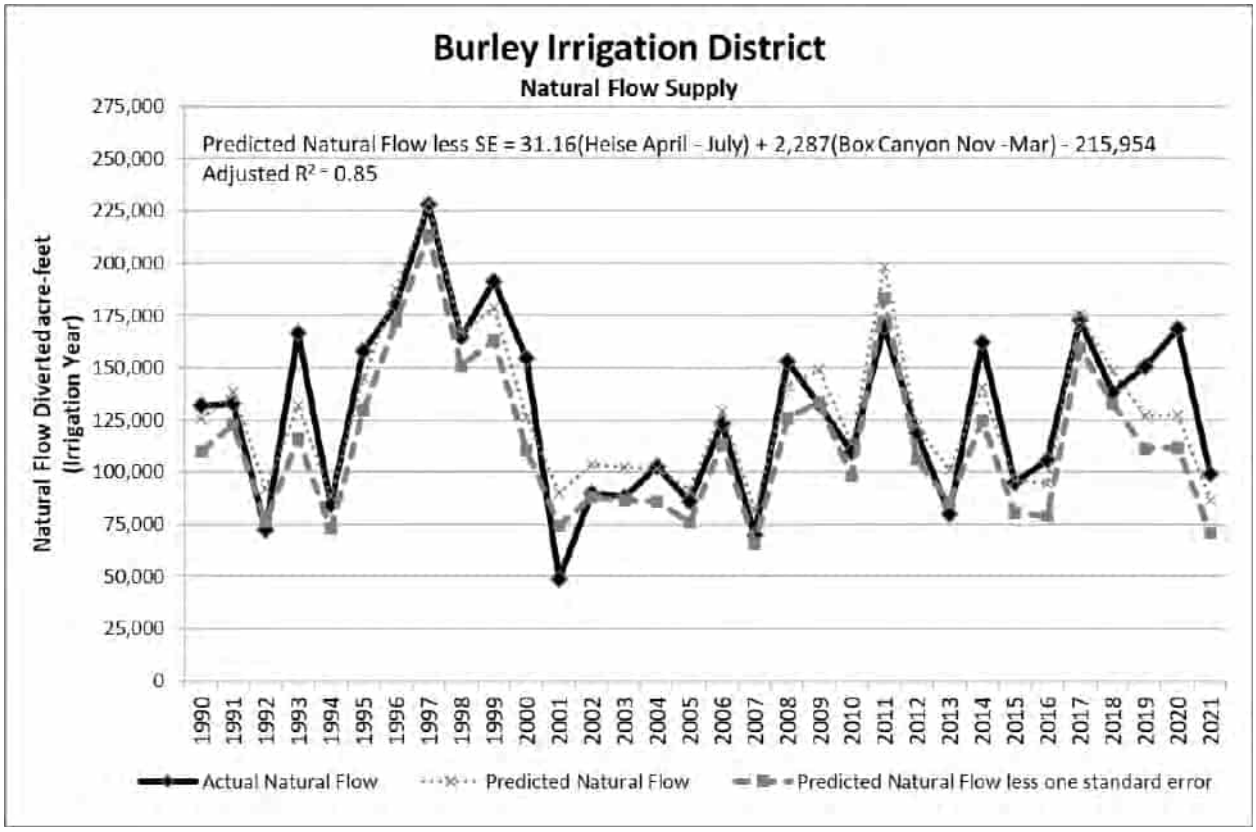
Rich Diehl City of Pocatello P.O. Box 4169 Pocatello, ID 83205 rdiehl@pocatello.us	☒ U.S. Mail, postage prepaid ☒ Email
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com cmchugh@mchughbromley.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338 rewilliams@wmlattys.com	☒ U.S. Mail, postage prepaid ☒ Email
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405 rharris@holdenlegal.com	☒ U.S. Mail, postage prepaid ☒ Email
Randall D. Fife City Attorney, City of Idaho Falls P.O. Box 50220 Idaho Falls, ID 83405 rfife@idahofallsidaho.gov	☒ U.S. Mail, postage prepaid ☒ Email
Tony Olenichak IDWR—Eastern Region 900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402 Tony.Olenichak@idwr.idaho.gov	☒ Email
Corey Skinner Nathan Erickson IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 corey.skinner@idwr.idaho.gov nathan.erickson@idwr.idaho.gov	☒ Email
COURTESY COPY TO: William A. Parsons PARSONS SMITH & STONE P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ Email

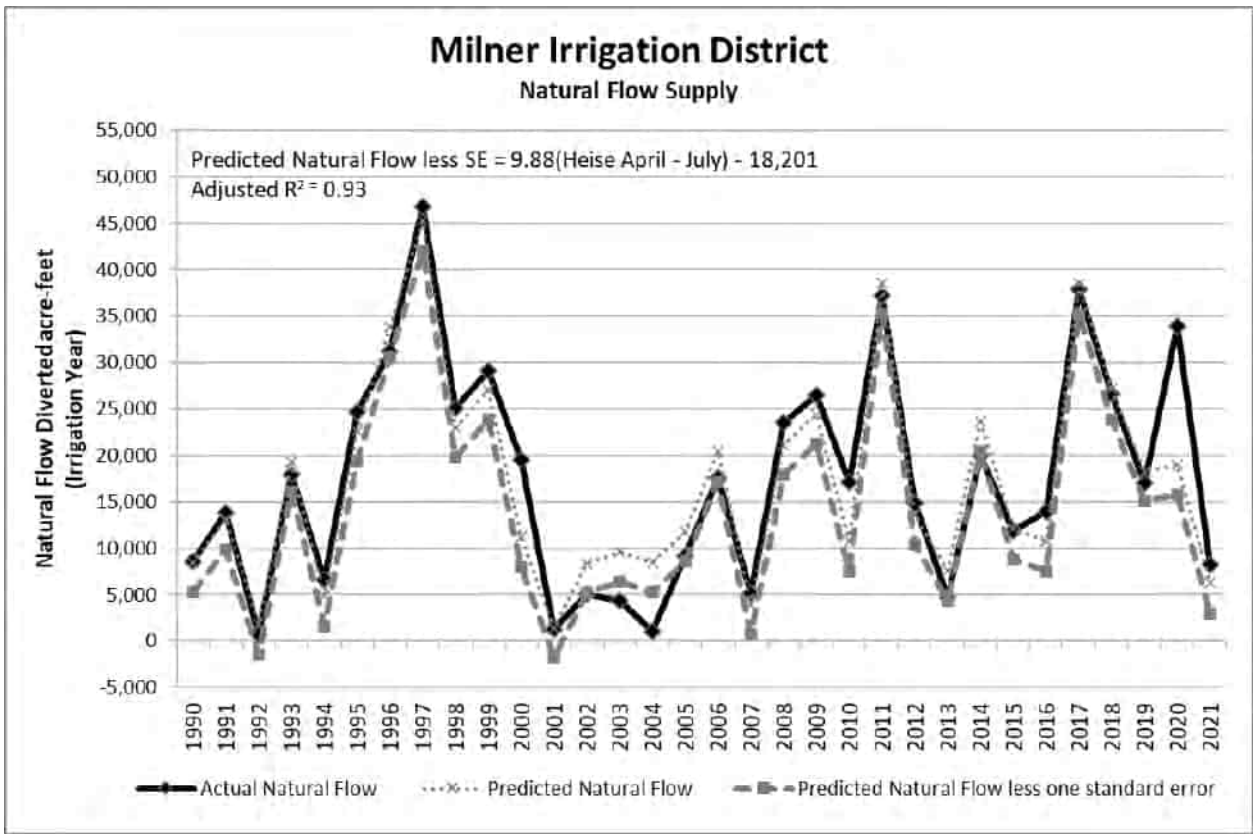
Sarah Tschohl

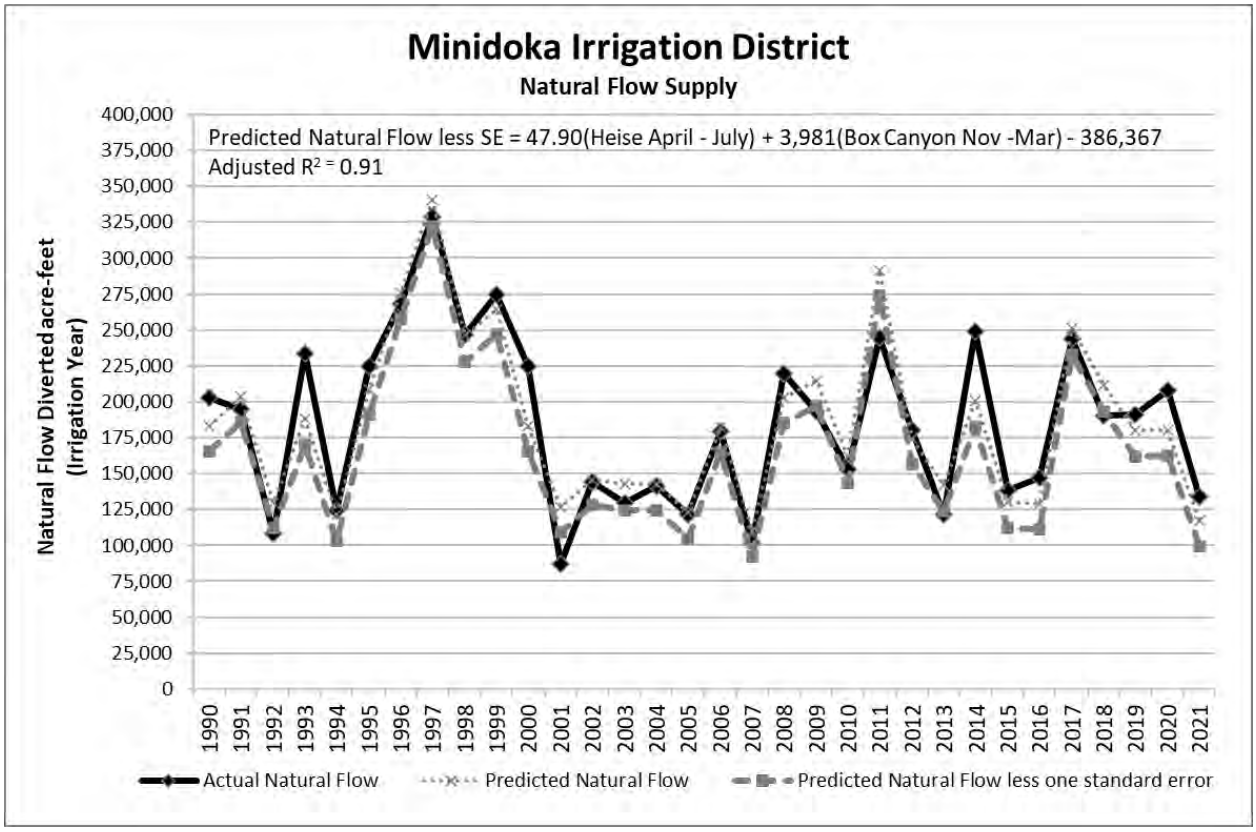
ATTACHMENT A

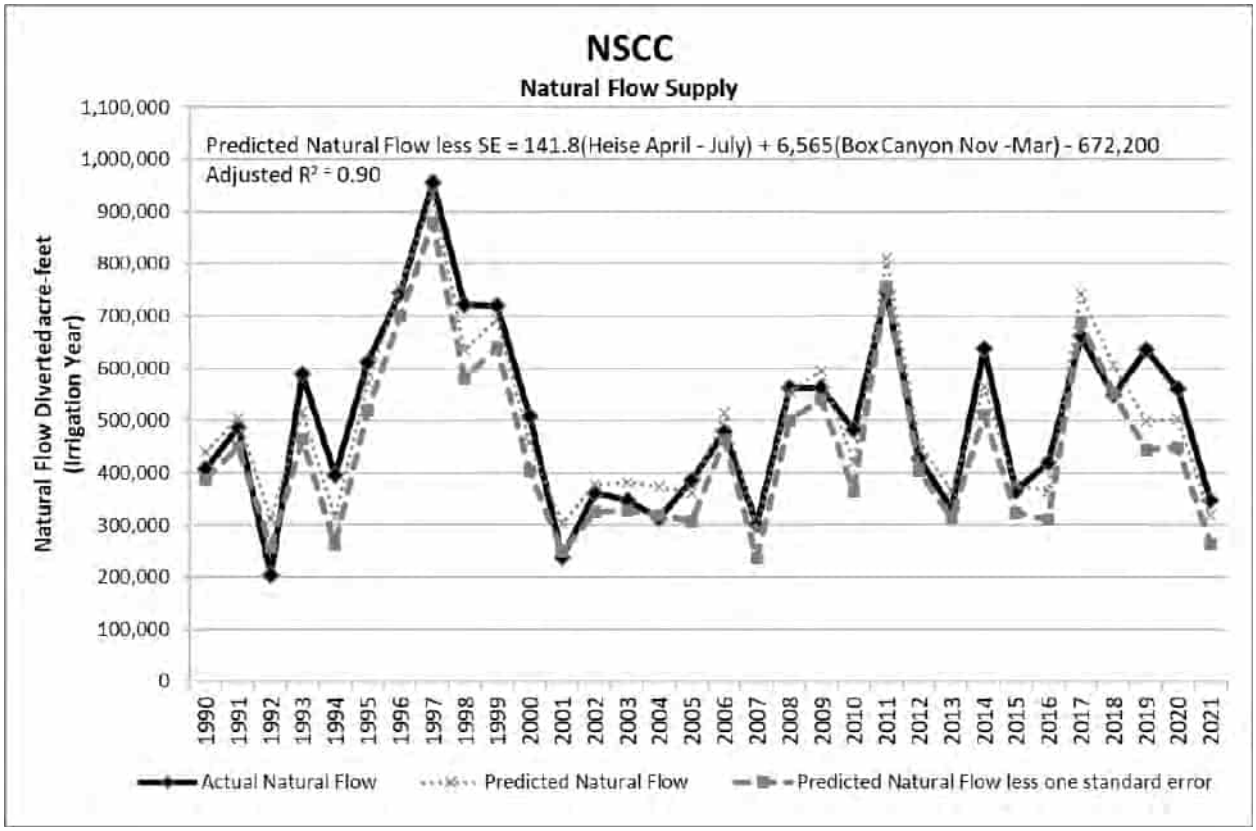


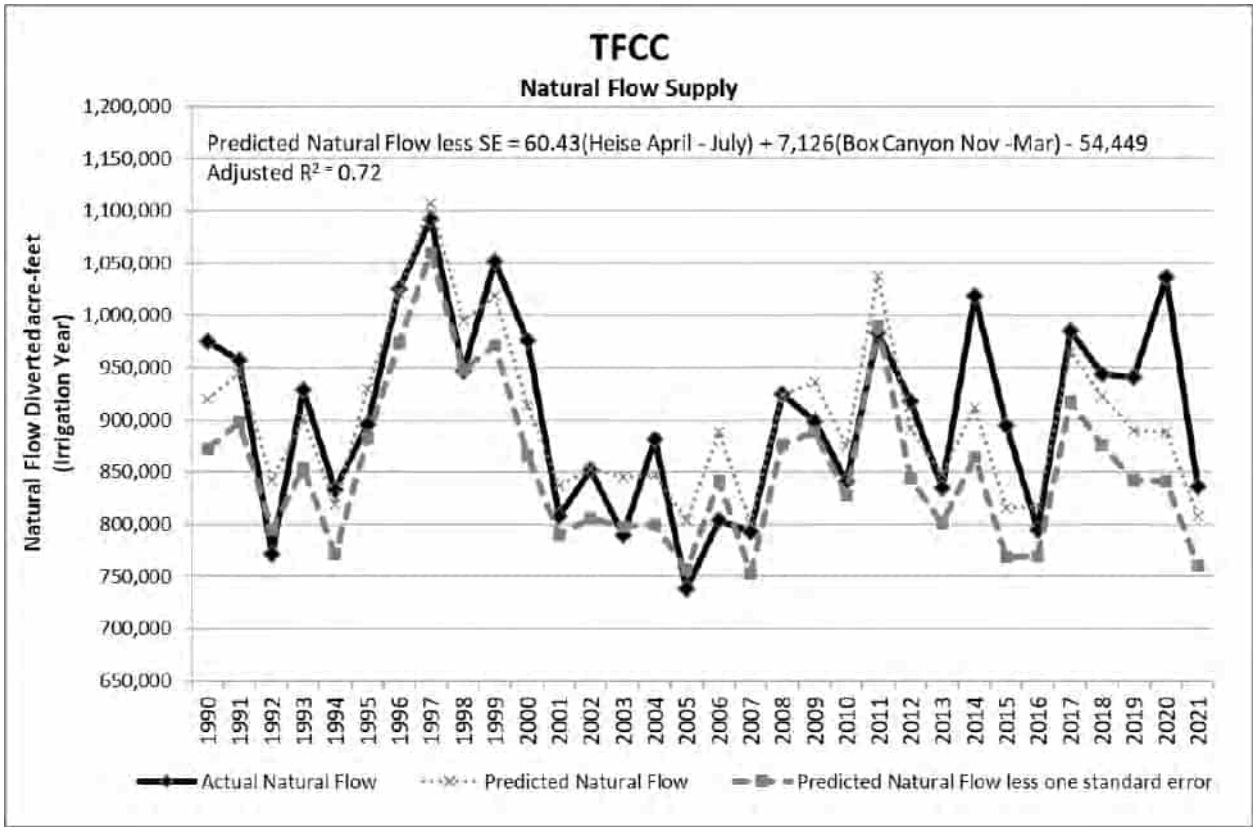



Burley Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 31.16(Heise April - July) + 2,287(Box Canyon Nov -Mar) - 215,954
Adjusted R² = 0.85
Natural Flow Diverted acre-feet (Irrigation Year)
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Milner Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 9.88(Heise April - July) - 18,201
Adjusted R² = 0.93
Natural Flow Diverted acre-feet (Irrigation Year)
55,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
-5,000
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


Minidoka Irrigation District
Natural Flow Supply
Predicted Natural Flow less SE = 47.90(Heise April - July) + 3,981(Box Canyon Nov -Mar) - 386,367
Adjusted R² = 0.91
Natural Flow Diverted acre-feet (Irrigation Year)
400,000
375,000
350,000
325,000
300,000
275,000
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


NSCC
Natural Flow Supply
Predicted Natural Flow less SE = 141.8(Heise April - July) + 6,565(Box Canyon Nov -Mar) - 672,200
Adjusted R² = 0.90
Natural Flow Diverted acre-feet (Irrigation Year)
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error


TFCC
Natural Flow Supply
Predicted Natural Flow less SE = 60.43(Heise April - July) + 7,126(Box Canyon Nov -Mar) - 54,449
Adjusted R² = 0.72
Natural Flow Diverted acre-feet (Irrigation Year)
1,200,000
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
750,000
700,000
650,000
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Actual Natural Flow
Predicted Natural Flow
Predicted Natural Flow less one standard error

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was **not** held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

EXHIBIT 306

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 ***FOURTH AMENDED* FINAL ORDER REGARDING METHODOLOGY FOR DETERMINING MATERIAL INJURY TO REASONABLE IN-SEASON DEMAND AND REASONABLE CARRYOVER**

BACKGROUND

On June 23, 2010, the Director ("Director") of the Idaho Department of Water Resources ("Department") issued his *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Second Methodology Order"). The Second Methodology Order explained how the Director would determine material injury to storage and natural flow water rights of members of the Surface Water Coalition ("SWC").[1] The SWC, the Idaho Ground Water Appropriators, Inc. ("IGWA"), and the City of Pocatello filed petitions seeking judicial review of the Second Methodology Order and its subsequent application. The petitions were consolidated with Gooding County Case No. CV-2010-382.[2]

On September 26, 2014, District Court Judge Eric Wildman issued his *Memorandum Decision and Order on Petitions for Judicial Review* ("Methodology Remand Order") in Gooding County Consolidated Case No. CV-2010-382. The Court "affirmed in part and set aside in part" the Second Methodology Order. *Methodology Remand Order* at 48. The Court remanded the Second Methodology Order to the Director for further proceedings as necessary. *Id.* The Court identified six general topics on remand. The six topics are margin headings in the following text and are discussed below.

[1] The SWC is comprised of A&B District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company. Each entity holds separate senior surface natural flow water rights and has separate storage contracts for storage water space in the reservoirs.

[2] The following cases were consolidated with Gooding County Case No. CV-2010-382: Gooding County Cases CV-2010-383, CV-2010-384, CV-2010-387, CV-2010-388, Twin Falls County Cases CV-2010-3403, CV-2010-5520, CV-2010-5946, CV-2012-2096, CV-2013-2305, CV-2013-4417, and Lincoln County Case CV-2013-155.

Remedy for Material Injury to SWC Irrigation Season Natural Flow and Storage Water Rights

The Court held the Second Methodology Order failed to "provide a proper remedy for material injury to reasonable in-season demand when taking into account changing conditions." *Methodology Remand Order* at 10. If material injury to the SWC's irrigation season water rights is greater than originally determined by the Director in April, the injury must be remedied through either curtailment or mitigation at the time of the additional determination of injury. *Id.*

The Court also stated that, when taking into account changing conditions, the Director must "apply his established procedure as written or further define and/or refine the procedure so that [SWC] members relying on the procedure know when to anticipate its application and are able to plan accordingly." *Id.* at 40.

The Court held "[t]he Director may require use of reasonable carryover pursuant to a properly enacted mitigation plan that contains appropriate contingency provisions to protect senior rights." *Id.* at 16. In conjunction with a mitigation plan, the Director can require the SWC "rely on its reasonable carryover provided that: 1) existing carryover storage allocations meet or exceed the additional shortfall to the revised reasonable in-season demand; and 2) junior users secure a commitment at that time for a volume of water equal to the shortfall to the revised reasonable in-season demand to be provided the following season if necessary." *Id.*

Supplemental Ground Water Adjustment

The Court affirmed that supplemental ground water is a factor the Director has the authority to consider in the context of a delivery call. *Id.* at 18. However, administration "to less than the full amount of acres set forth on the face of the [SWC's] Partial Decrees. . . must be supported by clear and convincing evidence." *Id.* at 19. The Director's "assignment of an entity wide split for each member of the [SWC] of the ground water fraction to the surface water fraction is not supported by substantial evidence in the record." *Id.*

Predictors for Twin Falls Canal Company

The Court held the Joint Forecast prediction does not accurately predict water supply for the Twin Falls Canal Company ("TFCC"), and remanded the issue back to the Department for further proceedings as necessary. *Id.* at 20.

Crop Distribution Data

The Court affirmed the Director's use of the U.S. Department of Agriculture's 1990-2008 National Agricultural Statistics Service data for determining crop distributions but also encouraged the Director to "take into account available data reflecting current cropping patterns." *Id.* at 21.

ESPA Model Boundary

The Court concluded the Second Methodology Order "wrongly uses the ESPA Model boundary, instead of the boundary of the area of common water supply, to determine a curtailment priority date." *Id.* at 24.

Mitigation for Reasonable Carryover Shortfall

Step 10 of the Second Methodology Order offered an alternative to supplying the full volume of reasonable carryover shortfall established in Step 9. Under Step 10, junior ground water users could request that the Department model the transient impacts of the proposed curtailment. Junior water right holders could alternatively mitigate modeled transient depletions over a period of years. The Court remanded Step 10 to the Department, concluding that when the Director determines a shortfall to reasonable carryover and a corresponding mitigation obligation, the alternative of mitigating for transient future simulated reach gains resulting from modeled curtailment needs to be further justified. *Id.* at 28. The Court questioned the "viability of phased curtailment as a justification" for Step 10. *Id.*

ADDITIONAL BACKGROUND AND SUMMARY

On April 17, 2015, the Director issued the *Third Amended Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Third Methodology Order").

On April 30, 2015, the City of Pocatello filed the *City of Pocatello's Request for Hearing, Motion to Authorize Discovery and Request for Stay* requesting the Director hold a status conference to schedule a hearing for the Third Methodology Order, issue an order authorizing discovery, and stay the hearing for six months. On April 30, 2015, IGWA filed a *Petition for Reconsideration and Clarification of the Third Methodology Order.*

On May 8, 2015, the SWC and IGWA filed the *Surface Water Coalition and IGWA Stipulation and Joint Motion Regarding April As Applied Order and Third Methodology Order* requesting the Director withdraw the Third Methodology Order. On May 8, 2015, the Director issued the *Order Approving Stipulation and Granting Joint Motion* withdrawing the Third Methodology Order.

On March 9, 2016, the SWC and IGWA filed the *Surface Water Coalition's and IGWA's Stipulated Motion to Reinstate the Third Amended Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Stipulated Motion"). The SWC and IGWA requested the Director reinstate the Third Methodology Order and "[p]roceed with conjunctive administration for 2016 under the SWC delivery call." *Stipulated Motion* at 3. On March 18, 2016, Pocatello filed the *City of Pocatello's Response to SWC's and IGWA's Stipulated Motion to Reinstate the Third Methodology Order, and Motion* ("Response"). Pocatello did "not object to reinstating for the 2016 irrigation season" the Third Methodology Order. *Response* at 2.

On April 19, 2016, the Director issued an *Order on Motions Re: Third Methodology Order*. The Director granted the SWC and IGWA's request to reinstate the Third Methodology Order, but explained the order would be issued as the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Fourth Methodology Order").

The purpose of the Fourth Methodology Order is to establish the Director's methodology for determining material injury to storage and natural flow water rights either held by or committed to members of the SWC consistent with the Court's holding in the Methodology Remand Order.

FINDINGS OF FACT

I. Overview of the Methodology for Determining Material Injury to Water Rights by Determining Reasonable In-Season Demand and Reasonable Carryover

1. The methodology for determining material injury to water rights by determining reasonable in-season demand ("RISD") and reasonable carryover should be based on updated data, the best available science, analytical methods, and the Director's professional judgment as manager of the state's water resources. In the future, climate may vary and conditions may change; therefore, the methodology may need to be adjusted to consider a different baseline year or years ("BLY").

2. In-season demand shortfall will be computed by subtracting RISD from the forecast supply ("FS"). In-season demand shortfall is computed using the following equation:

- In-Season Demand Shortfall = FS – RISD

3. If the FS is greater than the RISD, there is no demand shortfall. If the FS is less that the RISD, the negative difference is the demand shortfall. Initially, RISD will be equal to the historic demands associated with a BLY as selected by the Director, but will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

4. Reasonable carryover shortfall will be computed by subtracting reasonable carryover from actual carryover, where reasonable carryover is defined as the difference between a baseline year demand ("BD") and projected typical dry year supply. Reasonable carryover shortfall will be computed using the following equation:

- Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

5. If actual carryover exceeds the reasonable carryover, there is no reasonable carryover shortfall. In contrast, if reasonable carryover exceeds the actual carryover, the negative difference is the reasonable carryover shortfall.

6. The concepts underlying the selection of the BLY, determination of in-season demand shortfall, and reasonable carryover shortfall will be discussed in detail below.

II. In-Season Demand Shortfall

A. Considerations for the Selection of a Baseline Year

7. A BLY is a year or average of years when irrigation demand represents conditions that can be utilized to predict need in the current year of irrigation at the start of the irrigation season. The purpose in predicting need is to project material injury at the start of the season.

8. A BLY is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) irrigation practices. R. Vol. 37 at 7098.[3] To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. *Id.* at 7096.

9. The historic diversion volumes from the BLY, along with the predicted supply forecast at the start of the irrigation season, are inputs to predict the initial in-season demand shortfall, where demand shortfall is the difference between the BD and the FS. Demand shortfall increases in magnitude as the difference between BD and FS increases. Demand shortfall increases with increases in BD, decreases in FS, or both. Assuming constant irrigation practices, crop distributions, and total irrigated acres, demand for irrigation water typically increases in years of higher temperature, higher evapotranspiration ("ET"), and lower precipitation. If water demand data is averaged for several years and these averages are the basis to predict demand shortfall at the start of the season, in a high water demand year, these averages may often under-predict the demand shortfall. In a high water demand year, under-prediction of demand shortfall might be acceptable if the junior priority ground water right holders and the senior priority surface water right holders shared equally in the risk of water shortages. Equality in sharing the risk will not adequately protect the senior priority surface water right holder from injury. Actual demand shortfalls to a senior surface water right holder resulting from predictions at the start of the irrigation season based on average data unreasonably shifts the risk of shortage to the senior surface water right holder. Therefore, a BLY should represent a year(s) of above average diversions, and should avoid years of below average diversions. An above average diversion year(s) selected as the BLY should also represent a year(s) of above average temperatures and ET, and below average precipitation to ensure that increased diversions were a function of crop water need and not other factors. In addition, actual supply should be analyzed to assure that the BLY is not a year of limited supply.

i. Climate

10. For the methods outlined herein, climate is represented by precipitation, ET, and growing degree days.

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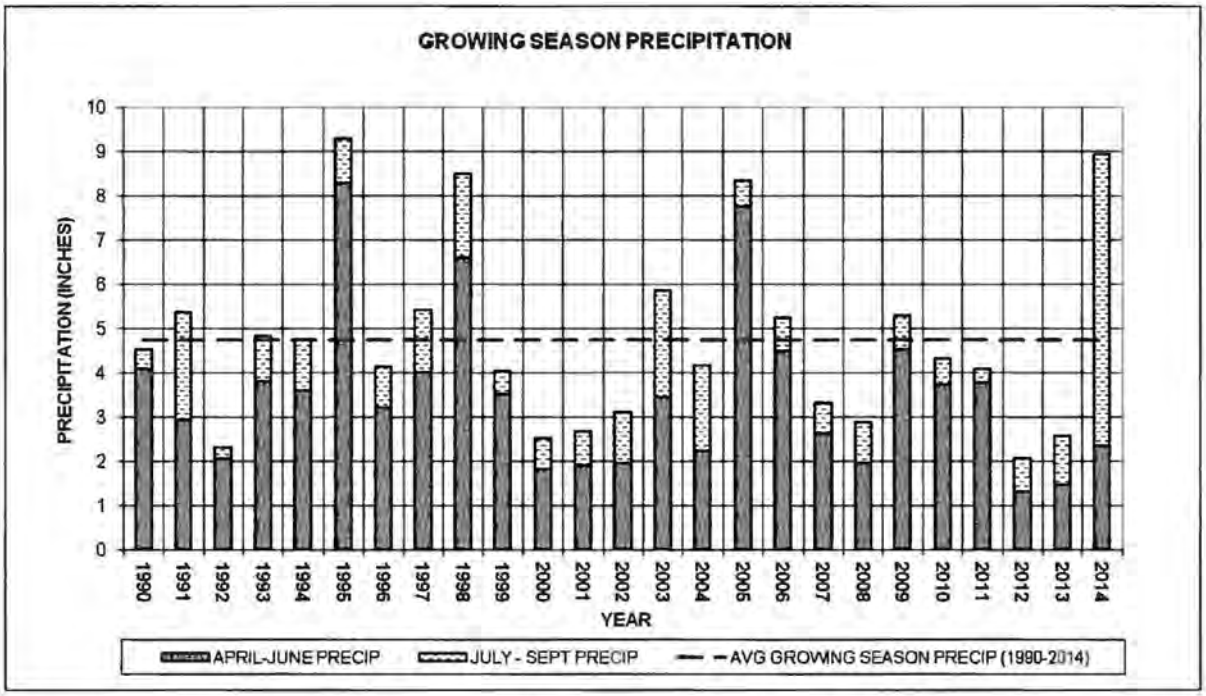
[3] All citations in this Order are to material that was admitted during the original hearing and is part of the final agency record on appeal in Gooding County Case No. CV-2008-551, which was lodged with the Fifth Judicial District Court on February 6, 2009.

11. Precipitation. Water, in all phases, introduced to Idaho from the atmosphere is termed precipitation. During the growing season, precipitation reduces the irrigation water needed for growing crops. Ex. 3024 at 19. The figure below shows the precipitation recorded during the growing season at the National Weather Service's Twin Falls weather station.



Growing Season Precipitation at National Weather Service's Twin Falls Weather Station 1990–2014.[4]

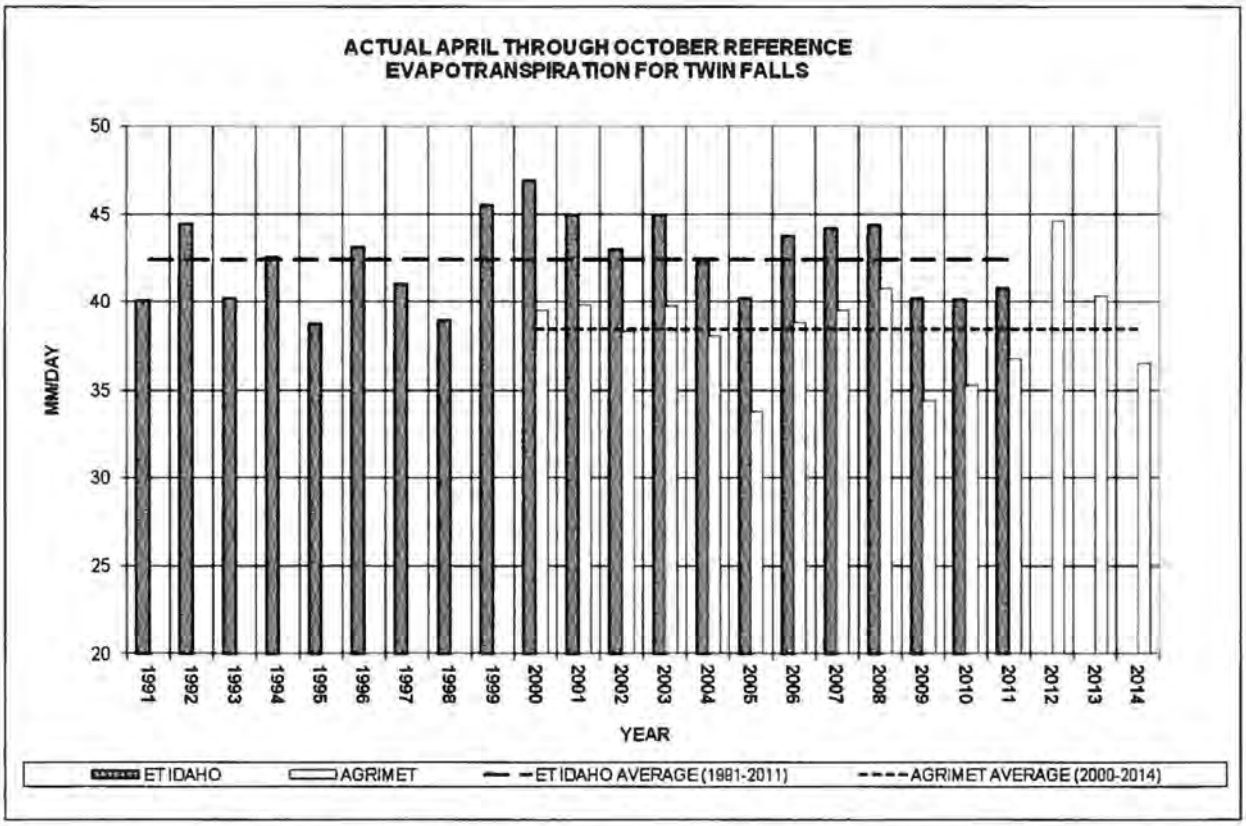
12. Evapotranspiration. ET is a variable representing both the amount of water that transpires from vegetation and the amount of water that evaporates from the underlying soil. ET is an important factor for properly estimating RISD. In its water budget calculations, the SWC proposed the use of ET values from the USBR as part of their Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet. Ex. 8000, Vol. II, Chap. 9; Ex. 8000, Vol. IV, Appdx. AU. The ground water users proposed the use of ET values from Richard G. Allen and Clarence W. Robison 2007, Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, i.e. ETIdaho. Ex. 3007A at 21; Ex. 3024 at 1-58.

13. Reference ET is a standardized index that approximates the climatic demand for water vapor (i.e. ET). Both ETIdaho data and AgriMet data are Reference ET data sets. The Department will identify potential BLYs by consulting both ETIdaho Reference ET and AgriMet Reference ET.

[4] Chart created from raw NOAA National Weather Service total precipitation data obtained from the NCDC's Climatological Data Annual Summary Idaho report series for the Twin Falls 6 E and Twin Falls Sun Valley Regional Airport weather stations.

14. Neither ETIdaho Reference ET data nor AgriMet Reference ET data span the entire period of analysis (1990-2014). ETIdaho Reference ET data are currently available from 1990 through 2011. AgriMet Reference ET data are available from 2000 to 2014. Ideal BLY candidates are years in which Reference ET exceeds average Reference ET values. The individual year is compared using both AgriMet and ETIdaho Reference ET data for those years in which both data are available and only AgriMet data in those years where there is no ETIdaho data.

15. Years of above average values of Reference ET are appropriate BLY candidates.[5] Total April through October Reference ET for the period of record from the Twin Falls (Kimberly) AgriMet site is shown below.



Actual Reference ET for Twin Falls (Kimberly) with both AgriMet and ETIdaho data 1991-2014.

[5] Values for Reference ET between ETIdaho and AgriMet do not match because they are derived differently. The relevant information for identifying a potential BLY is the relationship between the year under consideration and the average for the data sets.

16. Growing Degree Days. Growing degree days define the length and type of growing season. Growing degree days are an arithmetic accumulation of daily mean temperature above a certain base temperature. Ex. 3024 at 10; 117-21. These growth units are a simple method of relating plant growth and development to air temperatures. Different plant species have different base temperatures below which they do not grow. At temperatures above this base, the amount of plant growth is approximately proportional to the amount of heat or temperature accumulated. A higher annual growing degree day value correlates to a higher potential rate of plant growth. The table below shows growing degree days accumulated for April through September for the Twin Falls (Kimberly) AgriMet site.

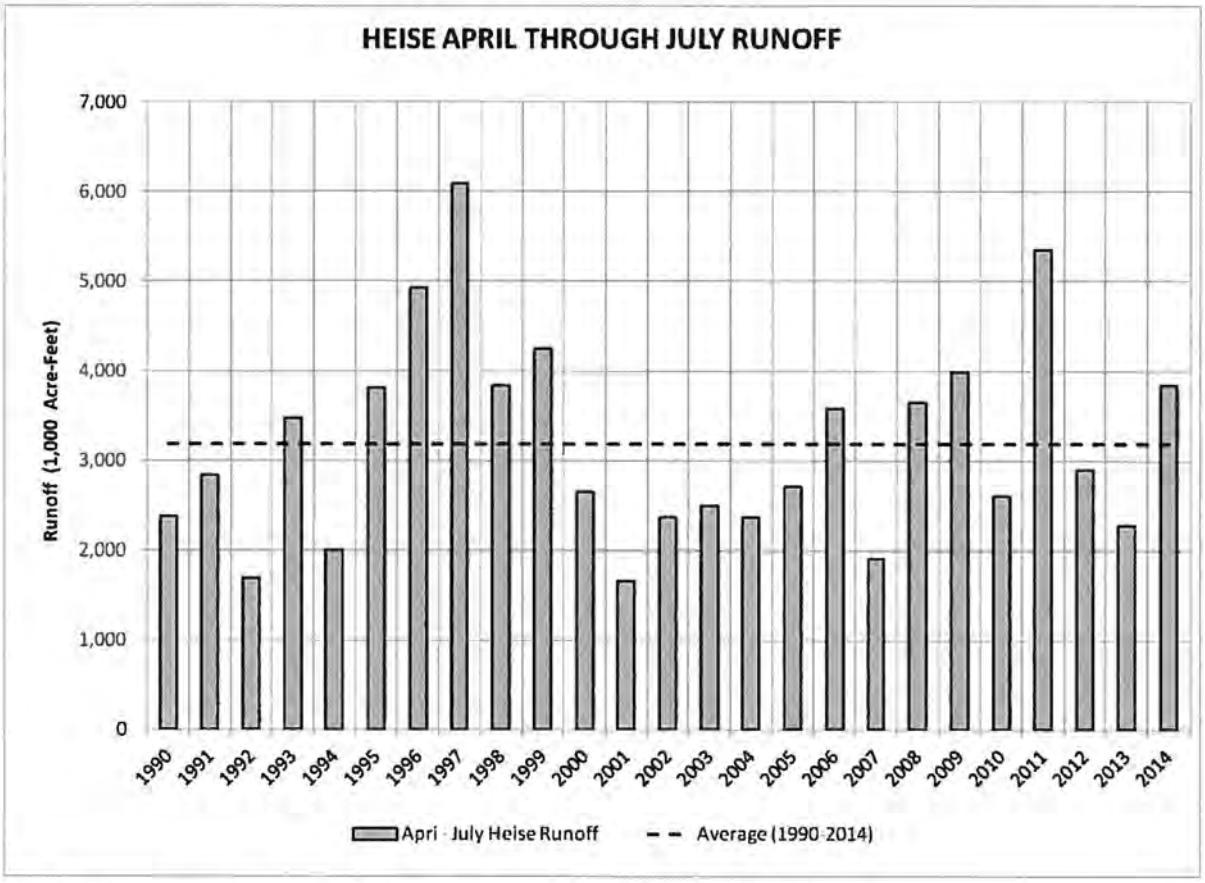
Year	GDD: April-Sept	% of Average	Year	GDD: April-Sept	% of Average
1991	2,095.4	86%	2003	2,585.4	106%
1992	2,610.7	107%	2004	2,428.9	99%
1993	2,004.7	82%	2005	2,320.1	95%
1994	2,516.8	103%	2006	2,601.9	106%
1995	2,257.8	92%	2007	2,657.7	109%
1996	2,418.6	99%	2008	2,382.9	97%
1997	2,478.4	101%	2009	2,469.7	101%
1998	2,422.2	99%	2010	2,215.0	91%
1999	2,294.9	94%	2011	2,314.6	95%
2000	2,591.3	106%	2012	2,735.3	112%
2001	2,600.8	106%	2013	2,672.8	109%
2002	2,465.6	101%	2014	2,553.0	104%

Average GDD (1991-2014): 2,445.6

Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1991-2014.

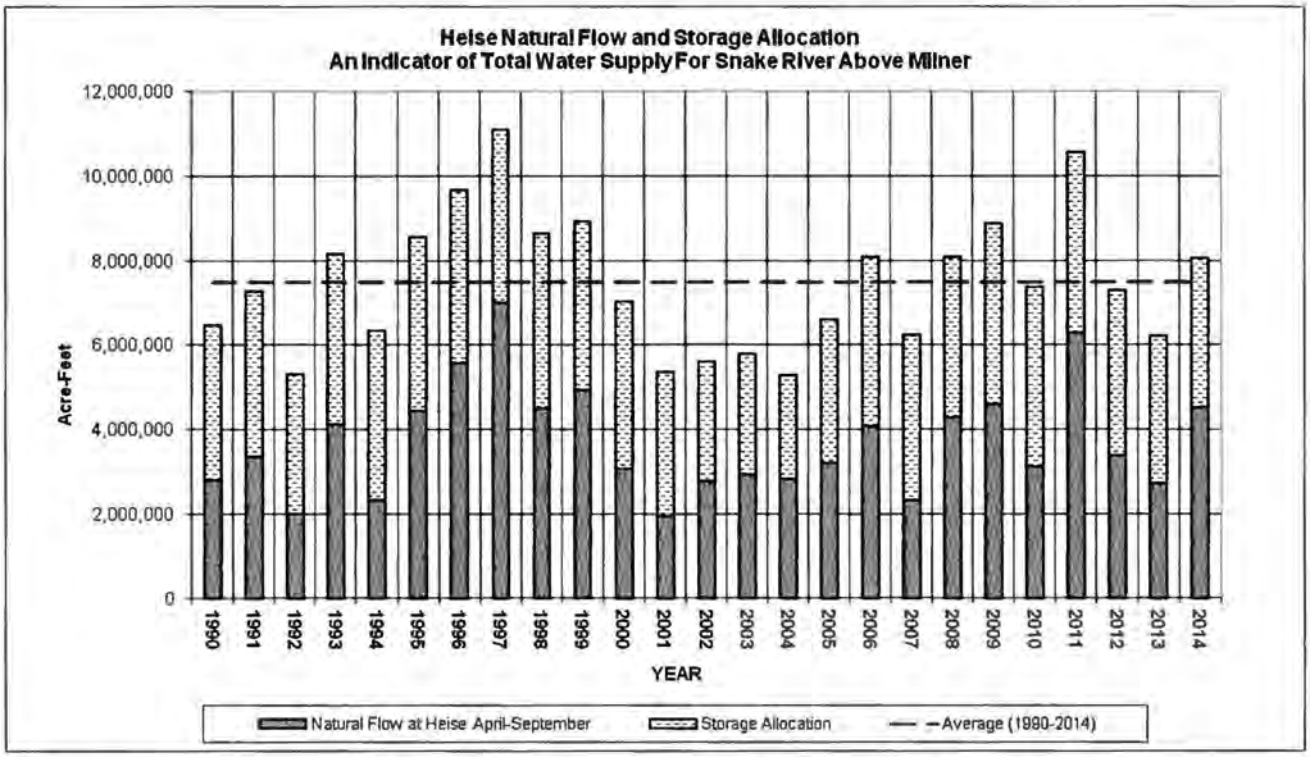
ii. Available Water Supply

17. The April through July Heise runoff volume represents the volume of water available for diversion into storage reservoirs and also is an indicator of natural flow supplies. The graph below shows actual unregulated flow volumes at Heise for 1990 through 2014. The 1990 to 2014 average (3,186,000 acre-feet) is displayed by the dashed line.



April through July Unregulated Flow Volume at Heise, 1990-2014.

18. The sum of the Heise natural flow and the reservoir storage allocations is an indicator of the total supply of the Snake River. The sum of the Heise natural flow and reservoir storage allocations for each year from 1990-2014 is represented in the graph below.



The sum of the Heise natural flow and the storage allocation for the Snake River above Milner 1990-2014.

iii. Irrigation Practices

19. A BLY must be recent enough to represent current irrigation practices. R. Vol. 37 at 7099-7100. Conditions that should be consistent are: (a) the net area of the irrigated crops, (b) farm application methods (flood/furrow or sprinkler irrigation), and (c) the conveyance system from the river to the farm. The type of sprinkler systems should be similar between the BLY and the current year.

20. Sprinkler systems are currently the predominant application system. *Id.* at 7101-02. To ensure that current irrigation practices are captured, selection of a BLY for the SWC should be limited to years subsequent to 1999. *Id.* at 7096; 7099-7100.

21. Estimates of irrigated acres from the hearing show a trend of decreasing irrigated acreage. R. Vol. 28, 5205-15; R. Vol. 37 at 7100. According to the Hearing Officer, beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated. R. Vol. 37 at 7100.

22. There are lands within the service areas of SWC entities that are irrigated with supplemental groundwater. Exhibit 3007. Supplemental groundwater is a factor the Director can consider in the context of a delivery call. *Methodology Remand Order* at 18-19. At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities.

B. Selection of the Initial Baseline Year

23. The selection of a single BLY for all entities is challenging, with individual years satisfying some of the BLY requirements but not all. By selecting a BLY that is comprised of the average of multiple years, a BLY can be selected that better represents the required conditions for all entities. The years 2000-2014 were considered for the BLY selection. Finalized 2015 data were not available in sufficient time to be considered for BLY selection.

24. When selecting the BLY the Director must evaluate recent data to determine whether the standards of selection of a BLY are satisfied.

25. In the Second Methodology Order the Director used an average of 2006 and 2008 (06/08) for the BLY. The 06/08 BLY no longer satisfies the BLY selection criteria. In particular, when compared to the average of the annual diversions from 2000-2014, the 06/08 diversions are no longer above average.

26. The Director reviewed the years since issuance of the Second Methodology Order and finds that 2012 satisfies the selection criteria for a BLY. However, 2012 had the lowest growing season precipitation, highest ET, and most growing degree days during the BLY selection period (1991-2014). Because 2012 represents the maximum values for these criteria during the period of analysis, 2012 is not an appropriate single-year BLY candidate.

27. Individually no one year during the period of analysis satisfied all the BLY requirements; 2006 had below average diversions, 2008 had below average growing degree days, and 2012 had record high ET, record high growing degree days, and record low precipitation. The Director finds that using the values from 2006, 2008, and 2012 (06/08/12) for an average BLY fits the selection criteria. When compared to the period 1991-2014, the 06/08/12 average has below average growing season precipitation, above average ET, above average growing degree days, and represents years in which diversions were not limited by availability of water supply. The 06/08/12 average diversions are greater than the average of the combined annual diversions from 2000-2014.

	2000-2014 Avg. Diversions (Acre-Feet)	06/08/12 Avg. Total Diversions (Acre-Feet)	06/08/12 % of Avg.
A&B	57,906	59,993	104%
AFRD2	420,863	427,672	102%
BID	242,646	251,531	104%
Milner	50,430	47,135	94%
Minidoka	354,277	369,492	104%
NSCC	982,567	978,888	100%
TFCC	1,045,120	1,060,011	101%
			Average 101%

Average SWC Diversions (acre-feet) for 2000-2014 and 2006/2008/2012 BLY.

28. The sum of the Heise natural flow and the storage allocation is an indicator of total water supply. As depicted in Finding of Fact 18, the values for 2006 and 2008 were greater than the average value for 1990-2014, while the value for 2012 was slightly below the average. The average value for 06/08/12 is greater than the average value for 1990-2014. Because the 06/08/12 average value exceeds the 1990-2014 average value, the BLY is not a year in which diversions were limited by water supply.

C. Calculation of Reasonable In-Season Demand

29. RISD is the projected annual diversion volume for each SWC entity during the year of evaluation that is attributable to the beneficial use of growing crops within the service area of the entity. Given that climate and system operations for the year being evaluated will likely be different from the BLY, the BLY must be adjusted for those differences. As stated by the Hearing Officer, "The concept of a baseline is that it is adjustable as weather conditions or practices change, and that those adjustments will occur in an orderly, understood protocol." R. Vol. 37 at 7098.

i. Project Efficiency

30. Project efficiency ("E_p") is the ratio of total volumetric crop water need within a SWC entity's boundary and the total volume of water diverted by that entity to satisfy its crop needs. It is the same concept as system efficiency, which was presented at hearing. Ex. 3007 at 28-29. Implicit in this relationship are the components of seepage loss (conveyance loss), on-farm application losses (deep percolation, field runoff), and system operational losses (return flows) for which data is not obtainable by the Department. By utilizing project efficiency and its input parameters of crop water need and total diversions, the influence of the unknown components for which data is not obtainable can be captured and described without quantifying each of the components. Project efficiency is derived by dividing crop water need by total diversions as depicted in the algorithm below:

$$E_p = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,
CWN = crop water need, and
Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

31. Monthly SWC entity diversions ("Q_D") will be obtained from Water District 01's diversion records. Ex. 8000, Vol. II, at 8-4, 8-5. Raw monthly diversion values will then be adjusted to remove any water diversions that can be identified to not directly support the beneficial use of crop development within the irrigation entity. Examples of adjustments include the removal of diversions associated with in-season recharge and diversion of irrigation water on the behalf of another irrigation entity. Adjustments are unique to each SWC member and each irrigation season and will be evaluated each year. Any natural flow or storage water deliveries to entities other than the SWC for purposes unrelated to the original right will not be included as a part of the SWC water supply or carryover volume. Water that is purchased or leased by a SWC member may become part of the shortfall obligation to the extent that member has been found to have been materially injured. *See e.g.* R. Vol. 38 at 7201, fn. 11 (Eighth Supplemental Order). Conversely, water supplied to private leases or to the rental pool by a SWC member will be included as a part of the SWC supply for that member because non-inclusion would unjustifiably increase the shortfall obligation.

32. Monthly project efficiencies will be computed for the entire irrigation season. Project efficiency varies from month-to-month during the season, and will typically be lower during the beginning and ending of the season. Monthly project efficiencies will be divided into actual monthly crop water need ("CWN") values to determine RISD during the year of evaluation. The table below presents average project efficiencies for each SWC member (2007-2014). Project efficiencies from 2007-2014 greater or less than two standard deviations from the average are excluded from the calculation. By including only those values within two standard deviations, extreme values from the data set are removed.

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	1.67	0.39	0.43	0.77	0.47	0.16	0.30	0.60
5	0.61	0.29	0.28	0.41	0.37	0.29	0.31	0.37
6	0.73	0.43	0.44	0.63	0.54	0.47	0.51	0.54
7	0.68	0.45	0.56	0.74	0.61	0.50	0.58	0.59
8	0.50	0.39	0.60	0.66	0.53	0.32	0.44	0.49
9	0.41	0.26	0.48	0.56	0.44	0.21	0.26	0.38
10	0.14	0.26	0.14	0.15	0.14	0.05	0.04	0.13
Season Avg.	0.68	0.35	0.42	0.56	0.44	0.29	0.35	0.44

SWC Member Average Monthly Project Efficiencies from 2007-2014.

ii. Crop Water Need

33. CWN is the volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability. CWN only applies to crops irrigated with surface water. CWN is the difference between the fully realizable consumptive use associated with crop growth, or ET, and effective precipitation (W_e) and is synonymous with the terms irrigation water requirement and precipitation deficit. Ex. 3024. For the purposes of the methodology, CWN is calculated as set forth below:

$$CWN = \sum_{i=1}^{n} (ET_i - W_e) A_i$$

Where,

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = effective precipitation,
A_i = total irrigated area of specific crop type,
i = index variable representing the different specific crop types grown within the irrigation entity, and
n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

iii. Evapotranspiration

34. ET can be calculated with theoretically based equations that calculate ET for an individual crop, necessitating crop distribution maps for each year. Ex. 3007A at 21, Figure 3, Tables 6-12; Ex. 3024 at 1-58; Ex. 8000, Vol. II at Chapter 9; Ex. 8000, Vol. IV, Appdx. AU.

35. At hearing, values of ET were estimated by the SWC from AgriMet, Ex. 8000, Vol. IV, Appdx. AU-1, and by the ground water users from ETIdaho, Ex. 3007A at 21; Ex. 3024 at 1-58. At this time, the Director finds that the use of AgriMet is more appropriate for determining ET than ETIdaho because AgriMet is available to all parties in real-time without the need for advanced programming. Accordingly, the methodology will rely on AgriMet derived ET values in the calculations of project efficiency, CWN, and RISD. In the future, with the development of additional enhancements, ETIdaho may become a more appropriate analytical tool for determining ET.

36. CWN is derived by multiplying crop specific ET values, adjusted for estimated effective precipitation, by the total irrigated area of individual crop types, and summing for all crop types. The areas for individual crop types will be derived from published crop distributions from the United States Department of Agriculture's National Agricultural Statistics Service ("NASS"). Ex. 1005 at 1. NASS annually creates a crop-specific land cover digital dataset from satellite imagery and field checks. The dataset is called the Cropland Data Layer (CDL). Each year, the Department will calculate acreage by crop type for each SWC entity using NASS CDL data. In the future, the NASS data may not be the most accurate source of data. The Department prefers to rely on data from the current season if and when it becomes usable.

37. AgriMet ET and precipitation data are gathered at the Rupert and Twin Falls (Kimberly) stations. Both stations are located in the vicinity of the SWC entities. A&B Irrigation District ("A&B"), Burley Irrigation District ("BID"), and Minidoka Irrigation District ("Minidoka") are nearest to the Rupert AgriMet station. ET data gathered at the Rupert station reasonably represents the climate conditions for A&B, BID, and Minidoka. American Falls Reservoir District No. 2 ("AFRD2"), Milner Irrigation District ("Milner"), North Side Canal Company ("NSCC"), and Twin Falls Canal Company ("TFCC") are nearest to the Twin Falls (Kimberly) AgriMet station. ET data gathered at the Twin Falls (Kimberly) station reasonably represents the climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, Vol. IV at AU-2, AU-8.

iv. Effective Precipitation

38. Effective precipitation ("W_e") is the amount of total precipitation held in the soil horizon available for crop root uptake. Effective precipitation will be estimated from total precipitation (W) employing the methodology presented in the USDA Technical Bulletin 1275. Ex. 8000, Vol. IV, Appdx. AU3, AU8. Total precipitation (W) data is published by the USBR as part of its Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet. Ex. 8000, Vol. IV, Appdx. AU3. W_e values derived from AgriMet based precipitation values are independent of crop type.

39. AgriMet precipitation (W) values are easy to understand and regularly used by the farming, water supply, and water management communities. Accordingly, the methodology will rely on AgriMet derived W values in the calculations of CWN and RISD.

40. As with ET data, AgriMet precipitation data are available from the Rupert and Twin Falls (Kimberly) stations. AgriMet data from the Rupert station reasonably represents climate conditions for A&B, BID, and Minidoka. AgriMet data from Twin Falls (Kimberly) reasonably represents climate conditions for AFRD2, Milner, NSCC, and TFCC. Ex. 8000, Vol. IV at AU-2, AU-8.

v. Summary of Reasonable In-Season Demand Calculation

41. At the start of the irrigation season, RISD is equal to the BD, or total season adjusted diversions for the BLY. When calculated in-season, RISD is calculated below.

$$RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p,j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month j,
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j = index variable, and
m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

42. April RISD Adjustment: In April, the calculated RISD, which is the quotient of CWN and Ep, can under estimate actual canal operation diversions. This occurs when the actual CWN value for April is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. Often, CWN in April is small due to precipitation, cool temperatures, and/or the immaturity of the crop. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events that occur in April, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. To account for the conditions affecting the usability of the calculated RISD value for April, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

43. When the calculation of CWN/Ep results in a value for the month of April less than the average April diversion volume over a record of representative years in the recent past, the April RISD is set equal to the average April diversion volume. When the calculation of CWN/Ep results in a value greater than the average April diversion volume, the April RISD is equal to the calculated CWN/Ep volume.

44. October RISD Adjustment: In October, the calculated RISD, which is the quotient of CWN and Ep, can both under estimate and over estimate actual canal operation diversions. The RISD may be underestimated when the actual CWN value for October is much smaller than the diversion of water into the canal system necessary to effectively operate the irrigation delivery system. The diversion rate at the head gate necessary to push water into all laterals and field head gates throughout the delivery system often dwarfs the water necessary to strictly satisfy CWN. In addition, it is difficult for canal systems to be dynamically operated to match the frequent precipitation events that occur in October, which also contributes to a diversion of water at the canal head gate that exceeds the diversion of water necessary to strictly satisfy CWN. Furthermore, RISD may be under-estimated in October when a farmer diverts water at the field head gate for farming practices other than strictly satisfying CWN. Examples of water diversion practices at the field head gate that sometimes occur in October include diverting water for soil salt leaching, diverting water to build up the soil moisture profile for the following irrigation season, and/or diverting water to wet-up bare soil to prevent wind-driven top soil erosion.

45. Unlike the month of April, RISD can be over-estimated in October. RISD may be over-estimated in years when actual CWN in October is much greater than typical CWN over a record of representative years in the recent past due to low precipitation and/or warm temperatures. To account for the conditions affecting the usability of the RISD value calculated for October, the values may be adjusted for each individual irrigation delivery entity in the SWC as described below.

46. When the calculation of CWN/Ep results in a value for the month of October greater than the maximum October diversion volume from a record of recent representative years, or less than the minimum October diversion volume from the same record of recent representative years, the October RISD is set equal to the average October diversion volume over the same period of recent representative years. When the calculation of CWN/Ep results in a value between the maximum and minimum October diversion volumes from a record of recent representative years, the October RISD is equal to the calculated CWN/Ep volume.

D. Adjustment of Forecast Supply

47. As stated by the Hearing Officer, "There must be adjustments as conditions develop if any baseline supply concept is to be used." R. Vol. 37 at 7093.

i. April Forecast Supply

48. The FS is comprised of natural flow and stored water.

49. Typically within the first week of April, the USBR and the USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage from April 1 to July 31 for the forthcoming year. The joint forecast ("Joint Forecast") issued by the United States Bureau of Reclamation ("USBR") and the United States Army Corp of Engineers ("USACE") for the period April 1 through July 31 "is generally as accurate a forecast as is possible using current data gathering and forecasting techniques." R. Vol. 8 at 1379, ¶ 98. Given current

forecasting techniques, the earliest the Director can predict material injury "with reasonable certainty" is soon after the Joint Forecast is issued. R. Vol. 2 at 226. With data from 1990 through the irrigation year previous to the current year, a regression equation will be developed for each SWC member. The regression equations for A&B and Milner were developed by comparing the actual Heise natural flow to the natural flow diverted. *See e.g.* R. Vol. 8 at 1416-22. For AFRD2, BID, Minidoka, NSCC, and TFCC, multi-linear regression equations were developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted. The regression equations will be used to predict the natural flow diverted for the upcoming irrigation season. *Id.* at 1380. The actual natural flow volume predicted in the Director's April FS for each SWC entity will be one standard error below the regression line, which underestimates the available supply. *Id.*; Tr. p. 65, lns. 6-25; p. 66, lns. 1-2. The purpose of the shift to one standard error below the regression line is to ensure senior water right holders do not bear the risk of under-prediction of supply. The forecasting techniques will be revised based on updated data and the forecasting techniques may be revised when improvements to the forecasting tools occur.

50. The storage allocation for each member of the SWC will be estimated by the Department following issuance of the Joint Forecast. The Department will forecast reservoir fill and storage allocation consistent with the methods established in the *Fifth Supplemental Order Amending Replacement Water Requirements Final 2006 & Estimated 2007.* R. Vol. 23 at 4294-97 as explained below. The Department will evaluate the current reservoir conditions and the current water supply outlook to determine a historical analogous year or years to predict reservoir fill. The Department may identify and use a combination of different analogous years to predict individual reservoir fill. Input variables for determining the individual storage water allocation for each SWC member are: (a) the analogous year's or years' total reservoir fill volume; (b) an estimated evaporation volume; and (c) the previous year's carryover volume. The FS (the combination of the forecast of natural flow supply and the storage allocation) for each SWC member will be determined by the Director shortly after the date of the Joint Forecast.

51. If, at any time prior to the Director's final determination of the April FS, the Director can determine with certainty that any member of the SWC has diverted more natural flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected shortfall determination.

ii. July Forecast Supply

52. Approximately halfway through the irrigation season, the FS will be adjusted. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the year-to-date natural flow diverted by each member of the SWC. The natural flow diversion for the remainder of the irrigation season will be estimated based on the regression analyses.

53. The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains which occur in the Snake River between the Blackfoot to Milner reach. Many different predictor variables were considered when developing the models used to predict the natural flow supplies for the remainder of the

season, including those variables used in the April FS. A step-wise statistical analysis was employed to help select the variables for each model. The following variables were selected to forecast water supplies halfway through the irrigation season: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Oceans Plateau SNOTEL site; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The model predictors were optimized for each SWC member and are summarized in the sections below.

54. Linear regression equations for AFRD2, A&B, and Milner, were developed by comparing the July 1 snow water equivalent (inches) at the Two Oceans Plateau SNOTEL site to the natural flow diversions. The regression equations for AFRD2, A&B, and Milner would be applied only in those years when the snow water equivalent at the Two Oceans Plateau SNOTEL site is greater than zero (0). Years when the snow water equivalent equals zero, the total natural flow prediction for the period July 1 to October 31 will be zero (0) AF.

55. Multiple linear regression equations for BID, Minidoka, and NSCC were developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) March depth to water at well 05S2E27ABA1 and (3) the snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15.

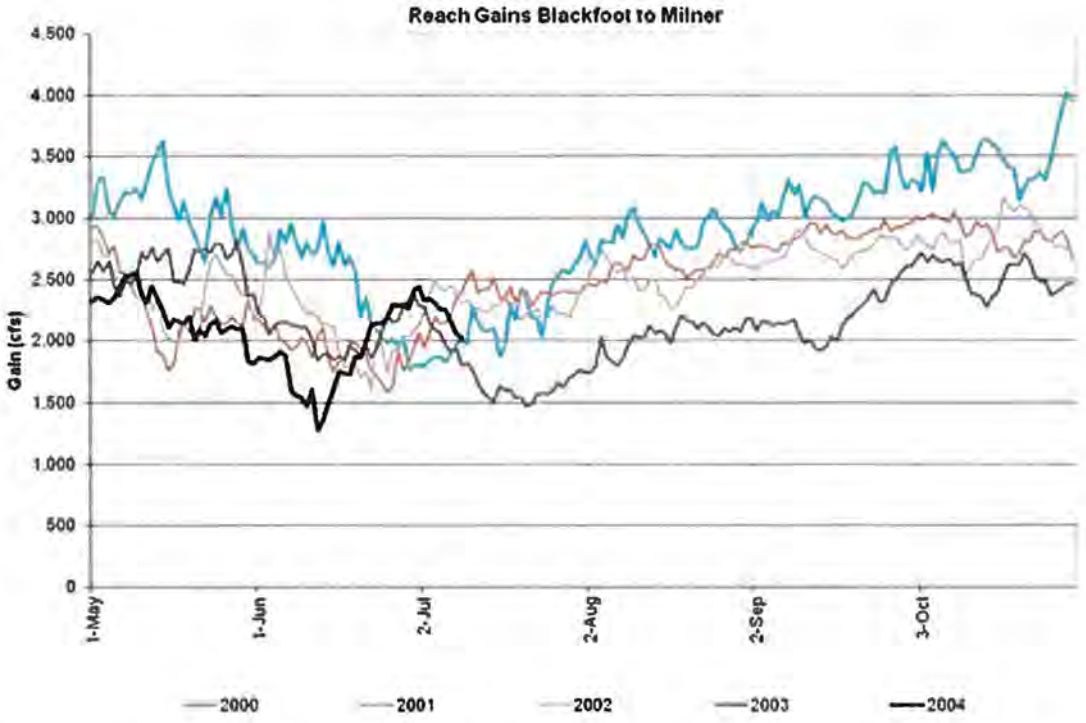
56. The multiple linear regression model for TFCC will be based on the following predictor variables: (1) Snake River near Heise natural flow (April – June), (2) Spring Creek total discharge (January – May) and (3) the snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15.

57. When adjusting the storage component of the FS, the Department must consider whether stored water has been allocated. In normal to dry years, the reservoirs will typically have filled to their peak capacity for the season and the storage water will have been allocated. If the BOR and Water District 01 have allocated stored water to spaceholders, the Department will use the actual preliminary storage allocations to the SWC. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on the storage allocations from an analogous year.

iii. Time of Need

58. The FS will again be adjusted shortly before the Time of Need. The Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover. The Time of Need will not be earlier than the Day of Allocation.

59. When adjusting the natural flow component of the FS, the Department's water rights accounting program will compute the natural flow diverted by each member of the SWC as of the new forecast date. The natural flow diversion for the remainder of the irrigation season will be estimated based on a historical year with similar reach gains in the Blackfoot to Milner reach. The following is an example of estimating reach gains from an analysis of historical years. Reach gains for the years 2000 – 2003 and a portion of year 2004 are graphed below. Considering 2004 as an example of a current year, and comparing 2004 to the hydrographs for 2000 – 2003, year 2003 has similar reach gains and is appropriately conservative. Therefore, the natural flow diverted in 2003 would be used to predict the natural flow diversions for the remainder of the 2004 season.



Example Reach Gain Analysis for 2004.

60. When adjusting the storage component of the FS, the Department will use the actual preliminary storage allocations to the SWC.

61. The adjusted FS is the sum of the year-to-date natural flow diversions, the predicted natural flow diversions for the remainder of the season, and the storage allocation.

E. Calculation of Demand Shortfall

62. The equation below determines the amount of predicted demand shortfall during the irrigation season.

$$DS = FS - RISD$$

Where:

DS = demand shortfall for specified evaluation points throughout the season,
FS = forecasted supply for remainder of season after specified evaluation point during the season, and
RISD = Reasonable in-season demand from above.

63. The amount calculated represents the volume that junior ground water users with approved mitigation plans for delivery of water will be required to have available for delivery to members of the SWC found to be materially injured by the Director to avoid curtailment. The amounts will be calculated in April, at the middle of the season, and at the Time of Need.

III. Methodology for Determining Material Injury to Reasonable Carryover

64. Conjunctive Management ("CM") Rule 42.01.g states the following guidance for determining reasonable carryover: "In determining a reasonable amount of carry-over storage water, the Director shall consider average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system." Carryover shortfall will be determined following the completion of the irrigation season.

A. Projected Water Supply

65. CM Rule 42.01.g states that the Director "shall consider . . . the projected water supply for the system." Because it is not possible to adequately forecast the irrigation supply or demand for the following irrigation season at the end of the current irrigation season, the Director must estimate the carryover water needed in future dry years when demand exceeds supply, creating a need for carryover storage. The Director projected the water supply using typical dry years and subtracted it from a projected future demand to determine a projected carryover need.

66. The Heise natural flow is a predictive indicator of total water supply. For the years 2002 and 2004 the Heise natural flows were well below the long term average (1991-2014), but were not the lowest years on record. The average of the 2002 and 2004 supply will be the projected supply, representing a typical dry year. The 2002 and 2004 supply is computed as follows:

- 2002 supply = natural flow diverted + new storage fill
- 2004 supply = natural flow diverted + new storage fill
- Projected supply = average of 2002 supply and 2004 supply

Carryover from previous years is not included in the 2002 and 2004 new storage fill because it was not new water supplied during the 2002 or 2004 irrigation year.

	2002 Natural Flow Diverted	2002 New Storage Fill	2002 Total Supply	2004 Natural Flow Diverted	2004 New Storage Fill	2004 Total Supply	Projected Supply (Average 02/04)
	----------Acre-Feet----------						
A&B	853	45,603	46,456	1	36,535	36,536	41,496
AFRD2	25,749	381,451	407,200	4,562	309,698	314,260	360,730
BID	89,886	174,454	264,340	102,706	152,387	255,093	259,716
Milner	5,058	43,430	48,488	1,027	35,175	36,202	42,345
Minidoka	143,937	256,602	400,539	141,460	229,574	371,034	385,787
NSCC	363,960	667,799	1,031,759	315,942	479,068	795,010	913,385
TFCC	851,970	186,233	1,038,203	881,345	150,218	1,031,563	1,034,883

SWC water supplies 2002, 2004, and 2002/2004 average (acre-feet).

67. Similar to projecting supply, the Director must also project demand. Because it is not possible to adequately forecast the irrigation demand for the following irrigation season at the end of the current irrigation season, the Director must project demand. R. Vol. 37 at 7109. The average of 2006/2008/2012 BLY will be the projected demand.

68. The projected carryover need is defined as the difference between a BLY demand and projected typical dry year supply. The following equation computes the projected carryover need:

Projected Carryover Need = Projected Demand (06/08/12 BLY) – Projected Supply (Average 02/04)

	Projected Demand (06/08/12 BLY)	Projected Supply (Average 02/04)	Projected Carryover Need
	----------Acre-Feet----------		
A&B	59,992	41,496	18,496
AFRD2	427,672	360,730	66,942
BID	251,531	259,716	0
Milner	47,135	42,345	4,790
Minidoka	369,492	385,787	0
NSCC	978,888	913,385	65,503
TFCC	1,060,011	1,034,883	25,128

SWC Projected Demand, Projected Supply and Projected Carryover Need (acre-feet).

B. Average Annual Rate of Fill

69. CM Rule 42.01.g states that the Director "shall consider the average annual rate of fill of storage reservoirs . . . ." The average annual rate of fill of the storage reservoirs is the average of annual percentages of fill of each entity's reservoir space. The average annual reservoir fill is a benchmark that can be compared to projected carryover need. For purposes of the table below, any water contributed to the rental pool from the previous year was added to the next year's fill volume so that it does not artificially lower the percent fill. R. Vol. 37 at 7108. Water that is supplied to the rental pool lowers carryover and could impact the following year's fill. The percent fill does not include water deducted for reservoir evaporation. The annual percent fill of storage volume by SWC entity is shown below:

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
1995	100%	100%	100%	100%	100%	100%	100%
1996	100%	100%	100%	100%	100%	100%	100%
1997	100%	100%	100%	100%	100%	100%	100%
1998	100%	100%	100%	100%	100%	100%	100%
1999	100%	100%	100%	96%	100%	98%	99%
2000	100%	99%	99%	98%	100%	97%	97%
2001	100%	100%	100%	100%	100%	91%	87%
2002	41%	100%	100%	90%	92%	84%	88%
2003	43%	100%	99%	66%	92%	94%	99%
2004	34%	82%	98%	48%	95%	82%	63%
2005	58%	100%	100%	77%	98%	100%	100%
2006	98%	100%	99%	98%	100%	99%	99%
2007	89%	100%	83%	92%	77%	95%	97%
2008	100%	100%	85%	100%	80%	99%	100%
2009	100%	100%	100%	100%	100%	100%	100%
2010	100%	100%	100%	100%	100%	100%	100%
2011	100%	100%	100%	100%	100%	100%	100%
2012	88%	100%	97%	91%	94%	94%	96%
2013	80%	100%	97%	90%	86%	97%	100%
2014	93%	100%	100%	100%	93%	100%	100%
Average	87%	99%	99%	92%	96%	96%	96%
Std Dev	22%	4%	2%	14%	4%	6%	8%

Annual Percent Fill of Storage Volume by Entity (1995-2014).[6]

[6] *See e.g.* Ex. 4125. Exhibit 4125 accounts for water deducted for evaporation, but does not take into account water supplied to the rental pool.

C. Average Annual Carryover

70. CM Rule 42.01.g states that the Director "shall consider the . . . average annual carry-over for prior comparable water conditions . . . ." Actual carryover volumes were adjusted from values reported in the storage reports so that they did not include water received for mitigation purposes or water rental by the canal company for use within the irrigation district. R. Vol. 37 at 7108. Actual carryover from 1995 through 2014 was sorted into categories ranging from very dry to wet. The categories are based on the Heise natural flow volumes from April through September.

Heise April - Sept. Natural Flow (1000's Acre-Feet)	Year	Heise Natural Flow April – Sept (1000's Acre-Feet)	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
						Acre-Feet			
Very Dry	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	18,687
<3000	2007	2,320	62,739	7,962	34,639	36,520	61,744	68,947	-21,811
	2013	2,721	55,245	10,647	50,107	34,342	68,405	132,899	23,949
	2002	2,775	30,192	8,570	72,835	14,531	99,488	128,572	32,635
	2004	2,833	-3,771	18,537	47,845	8,735	97,905	19,145	21,551
	2003	2,931	9,401	3,649	51,686	6,906	81,673	166,217	-18,169
	Avg.	**2,552**	**35,228**	**11,496**	**49,811**	**24,827**	**81,024**	**98,080**	**11,966**
	2000	3,059	66,915	20,787	107,425	43,173	160,183	205,510	52,536
Dry	2010	3,108	95,604	103,272	113,262	58,754	174,009	313,341	30,989
3000 - 4000	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	64,452
	2012	3,385	68,356	38,682	86,178	45,124	139,426	194,255	76,578
	Avg.	**3,187**	**66,885**	**65,460**	**99,264**	**46,161**	**156,060**	**269,527**	**56,139**
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	51,187
	1993	4,116	102,493	123,508	154,461	50,332	264,713	300,942	104,424
Average	2008	4,288	92,193	102,753	130,762	63,342	182,531	413,408	65,648
4000 - 4500	1995	4,447	82,567	167,451	134,340	75,451	237,300	441,729	58,675
	1998	4,498	87,250	144,057	109,014	67,777	193,810	494,664	156,433
	Avg.	**4,286**	**90,763**	**129,090**	**126,290**	**63,131**	**212,193**	**403,283**	**87,274**
	2014	4,510	78,065	92,232	144,930	56,202	208,714	441,951	133,411
	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
>4500	1999	4,949	78,312	121,793	168,545	67,147	205,716	454,338	191,501
	1996	5,583	85,209	145,019	127,123	70,250	228,786	472,790	111,459
	2011	6,347	116,495	231,938	170,150	65,072	294,967	563,360	151,678
	1997	7,007	89,811	114,324	87,073	65,307	202,475	464,715	136,926
	Avg.	**5,502**	**92,011**	**141,806**	**137,251**	**65,152**	**224,206**	**470,655**	**136,751**

Actual Carryover Volumes by Entity, Sorted by Heise Natural Flow (1995-2014).

71. In considering the principles articulated in CM Rule 42.01.g, the Director will project reasonable carryover shortfalls for members of the SWC. The following table represents the 2006/2008/2012 BLY diversion volumes and total reservoir storage space by entity. By dividing the total reservoir space by the 2006/2008/2012 diversion volume, a metric is established that describes the total number of seasons the entity's reservoir space can supply water.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
	----------Acre-Feet----------						
06/08/12 BLY	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930
Number of Seasons of Reservoir Space	2.3	0.9	0.9	1.9	1.0	0.9	0.2

Total Reservoir Space[7] in Comparison to Demand.

D. Reasonable Carryover

i. A&B

72. A&B's reservoir space has the lowest average annual rate of fill with the highest variability in fill. *See* Finding of Fact 69. In very dry years, the potential exists that A&B's actual carryover will be less than the projected carryover need. *See* Finding of Fact 68 & 70. A&B has an approximate two-year water supply provided by its total available storage space. *See* Finding of Fact 71. Because of its lower rate of fill, it is likely A&B will experience carryover shortfalls in consecutive dry years. Because of these factors, the projected carryover need of 18,500 AF is the reasonable carryover for A&B. *See* Finding of Fact 78.

ii. AFRD2

73. AFRD2 has the highest and most consistent reservoir rate of fill of any member of the SWC. *See* Finding of Fact 69. Therefore, any unfilled space in the fall will most likely fill. AFRD2 has an approximate one-year supply available in storage. *See* Finding of Fact 71. In a very dry year, AFRD2's historical carryover volume is often less than the projected carryover need using the equation set forth in Finding of Fact 68 & 70. Given the high likelihood of filling during a multi-year drought and after a very dry year, the reasonable carryover can be adjusted downward from the calculated projected carryover need without shifting the risk of shortage to the senior right holder. Because of these factors, the historical average carryover in very dry years of 11,500 AF is the reasonable carryover for AFRD2. *See* Finding of Fact 78.

[7] *See* R. Vol. 8 at 1373-74.

iii. BID & Minidoka

74. In an average demand year, BID and Minidoka will have enough water to meet demands given a low water supply. *See* Finding of Fact 70. *See also* R. Vol. 37 at 7105. Historically, even in very dry years, BID's and Minidoka's carryover have been well above the projected carryover need and it is unlikely that they will have reasonable carryover shortfalls in the future. *See* Finding of Fact 68 & 70. *See also* R. Vol. 37 at 7105. Because of these factors, the projected carryover need of 0 AF is the reasonable carryover for BID and Minidoka. *See* Finding of Fact 78. *See also* R. Vol. 37 at 7105.

iv. Milner

75. Similar to A&B, Milner's reservoir space has the second lowest average annual rate of fill of all entities with a high degree of variability in fill. *See* Finding of Fact 69. In very dry years, the potential exists that Milner's actual carryover will be less than the projected carryover need. *See* Finding of Fact 68 & 70. Milner has an approximate two-year water supply available in storage. *See* Finding of Fact 71. Because of its rate of fill, it is likely Milner will experience carryover shortfalls in consecutive dry years. Because of these factors, the projected carryover need of 4,800 AF is the reasonable carryover for Milner. *See* Finding of Fact 78.

v. NSCC

76. NSCC has a near average annual rate of fill in comparison to all entities and an approximate one-year water supply available in storage. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its projected carryover need will be less than its actual carryover. *See* Finding of Fact 68 & 70. Because of these factors, the projected carryover need of 65,500 AF is the reasonable carryover for NSCC. *See* Finding of Fact 78.

vi. TFCC

77. TFCC has a near average annual rate of fill in comparison to all entities, but only a one-quarter of a year's water supply available in storage. *See* Findings of Fact 69 & 71. In dry years, the potential exists that its projected carryover need will be less than its actual carryover. *See* Finding of Fact 68 & 70. Because of these factors, the projected carryover need of 25,200 AF is the reasonable carryover for TFCC. *See* Finding of Fact 78.

78. Reasonable carryover values for the SWC members are as follows:

	Reasonable Carryover (Acre-Feet)
A&B	18,500
AFRD2	11,500
BID	0
Milner	4,800
Minidoka	0
NSCC	65,500
TFCC	25,200

E. Reasonable Carryover Shortfall

79. Reasonable carryover shortfall is the numerical difference between reasonable carryover and actual carryover, calculated at the conclusion of the irrigation season. Actual carryover is defined as the storage allocation minus the total storage use plus or minus any adjustments. Examples of adjustments include SWC water placed in the rental pool and SWC private leases. Adjustments are unique to each irrigation season and will be evaluated each year. Any storage water deliveries to entities other than the SWC for purposes unrelated to the original right will be adjusted so that the water is not included as a part of the SWC carryover volume. Water that is purchased or leased by an SWC member may become part of the carryover shortfall obligation. *See e.g.* R. Vol. 38 at 7201, fn. 11 (Eighth Supplemental Order). Conversely, actual carryover must be adjusted to assure that water supplied by a SWC member to private leases or to the rental pool will not increase the reasonable carryover shortfall obligation to the same SWC member.

80. Reasonable carryover shortfall is calculated as follows:

Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

CONCLUSIONS OF LAW

1. This order contains the methodology by which the Director will determine material injury to RISD and reasonable carryover to members of the SWC.

2. "The agency's experience, technical competence, and specialized knowledge may be utilized in the evaluation of the evidence." Idaho Code § 67-5251(5); IDAPA 37.01.01.600.

3. Idaho Code § 42-602 states that, "The director of the department of water resources shall have discretion and control of the distribution of water from all natural sources . . . . The director of the department of water resources shall distribute water . . . in accordance with

the prior appropriation doctrine." According to the Hearing Officer, "It is clear that the Legislature did not intend to grant the Director broad powers to do whatever the Director might think right. However, it is clear also that the Legislature [in Idaho Code § 42-602] did not intend to sum up water law in a single sentence of the Director's authority." R. Vol. 37 at 7085. "Given the nature of the decisions which must be made in determining how to respond to a delivery call, there must be some exercise of discretion by the Director." *American Falls Res. Dist. No. 2 v. Idaho Dept. Water Resources*, 143 Idaho 862, 875, 154 P.3d 433, 446 (2007).

4. "The prior appropriation doctrine is comprised of two bedrock principles—that the first appropriator in time is the first in right and that water must be placed to a beneficial use." *In Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A & B Irrigation Dist.*, 155 Idaho 640, 650, 315 P.3d 828, 838 (2012). "The concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*; *American Falls*, 143 Idaho at 879, 154 P.3d at 450 (stating that while an appropriation for a beneficial use is "a valuable right entitled to protection . . . . Nevertheless, that property right is still subject to other requirements of the prior appropriation doctrine."); *In re Water to Water Right Nos. 36-02551 & 36-07694 (Rangen, Inc.) IDWR Docket CM-DC-2011-004* at *18, Nos. 42775/42836, 2016 WL 1130276 (Idaho Mar. 23, 2016) (explaining the "policy of beneficial use" serves as a "limit on the prior appropriation doctrine."). [8]

5. "Concurrent with the right to use water in Idaho 'first in time,' is the obligation to put that water to beneficial use." *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (referring to "'the constitutional requirement that priority over water be extended only to those using the water'") (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447). "'It is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation, and the amount of water necessary for the purpose of irrigation of the lands in question and the condition of the land to be irrigated should be taken into account.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 (quoting *Washington State Sugar v. Goodrich*, 27 Idaho 26, 44, 147 P. 1073, 1079 (1915)).

6. "[T]he policy of securing the maximum use and benefit, and least wasteful use of Idaho's water resources, has long been the policy in Idaho." *In re Water to Water Right Nos. 36-02551 & 36-07694 (Rangen, Inc.) IDWR Docket CM-DC-2011-004* at * 18 (citing *Clear Springs Foods, Inc. v. Spackman*, 150 Idaho 790, 808, 252 P.3d 71, 89 (2011)). The Idaho Constitution enunciates a policy of promoting "optimum development of water resources in the public interest." Idaho Const. Art. XV, § 7; *Baker v. Ore-Ida Foods, Inc.*, 95 Idaho 575, 584, 513 P.2d 627, 636 (1973). "There is no difference between securing the maximum use and benefit and least wasteful use of this State's water resources and the optimum development of water resources in the public interest. Likewise, there is no material difference between 'full economic development' and the 'optimum development of water resources in the public interest.' They are two sides of the same coin. Full economic development is the result of the optimum development of water resources in the public interest." *Clear Springs*, 150 Idaho at 809, 252

[8] As of the date of this Fourth Methodology Order, the Idaho Supreme Court has not issued a remittitur in *In re Water to Water Right Nos. 36-02551 & 36-07694 (Rangen, Inc.) IDWR Docket CM-DC-2011-004.*

P.3d at 90. "The policy of securing the maximum use and benefit, and least wasteful use, of the State's water resources applies to both surface and ground waters, and it requires that they be managed conjunctively." *Id.*

7. "Conjunctive administration 'requires knowledge by the [Department] of the relative priorities of the ground and surface water rights, how the various ground and surface water sources are interconnected, and how, when, where and to what extent the diversion and use of water from one source impacts the water flows in that source and other sources.' . . . . That is precisely the reason for the CM Rules and the need for analysis and administration by the Director." *American Falls,* 143 Idaho at 877, 154 P.3d at 448.

8. The CM Rules incorporate all principles of the prior appropriation doctrine as established by Idaho law. *American Falls*, 143 Idaho at 873, 154 P.3d at 444; CM Rule 20.02, 10.12.

9. While the presumption under Idaho law is that an appropriator is entitled to his decreed water right and the CM Rules may not be applied so as to require a senior appropriator to demonstrate an entitlement to the water in the first place, there may be post-adjudication factors relevant to the determination of how much water is actually needed in responding to a delivery call. *American Falls*, 143 Idaho at 877-78, 154 P.3d at 448-49. Under the CM Rules and Idaho law, the Director has the "authority and responsibility to investigate claims when delivery calls are made," and the "authority to evaluate the issue of beneficial use in the administration context." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840. As the Idaho Supreme Court recently stated, "'[w]hile the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception . . . the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost.'" *In re Water to Water Right Nos. 36-02551 & 36-07694 (Rangen, Inc.) IDWR Docket CM-DC-2011-004* at *17 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 433). "[T]he Director must have some discretion to balance these countervailing considerations in a delivery call." *Id.* "'If this Court were to rule the Director lacks the power in a delivery call to evaluate whether the senior is putting the water to beneficial use, we would be ignoring the constitutional requirement that priority over water be extended only to those using the water.'" *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 652, 315 P.3d at 840 (quoting *American Falls*, 143 Idaho at 876, 154 P.3d at 447).

10. In responding to a delivery call under the CM Rules, the Director "may employ a baseline methodology as a starting point for considering material injury," provided the baseline methodology otherwise comports with the prior appropriation doctrine as established by Idaho law. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841; *see Methodology Remand Order* at 17.

11. Once the Director determines "that material injury is occurring or will occur," junior appropriators subject to the delivery call bear "the burden of proving that the call would be futile or to challenge, in some other constitutionally permissible way, the senior's call." *American Falls*, 143 Idaho at 878, 154 P.3d at 449; *Methodology Remand Order* at 31. Junior appropriators have the burden of proving by clear and convincing evidence that the delivery call

is futile or otherwise unfounded. *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 653, 315 P.3d at 841.

12. "This case illustrates the tension between the first in time and beneficial use aspects of the prior appropriation doctrine." *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838. The Idaho Supreme Court has in this case "recognized the critical role of the Director in managing the water resources to accommodate both first in time and beneficial use aspects: 'Somewhere between the absolute right to use a decreed water right and an obligation not to waste it and to protect the public's interest in this valuable commodity, lies an area for the exercise of discretion by the Director.'" *Id.* at 651, 315 P.3d at 839 (quoting *American Falls*, 143 Idaho at 880, 154 P.3d at 451). Thus, in this case the Director may use "a baseline methodology, both as a starting point for consideration of the Coalition's call and in determining the issue of material injury." *Id.* at 650-51, 315 P.3d at 838-39. However, "[i]f changing conditions establish that material injury is greater than originally determined pursuant to the baseline analysis, then adjustments to the mitigation obligation of the juniors must be made when the Director undertakes his mid-season calculations." *Methodology Remand Order* at 18.

13. In the context of conjunctive administration, the Director's methodology for projecting material injury does not impose an obligation upon members of the SWC to reprove their water rights. To the extent water is available, members of the SWC are authorized to divert and store water in accordance with the terms of their licenses or decrees. Nothing established herein reduces that authorization. The question that the CM Rules require the Director to answer in this proceeding is, when water is not available to fill the water rights of the SWC, how much water is reasonably necessary for the SWC to accomplish the beneficial purpose of raising crops; because what is needed to irrigate crops may be less than the decreed or licensed quantities. *American Falls*, 143 Idaho at 880, 154 P.3d at 451; *see In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650, 315 P.3d at 838 ("'[i]t is the settled law of this state that no person can, by virtue of a prior appropriation, claim or hold more water than is necessary for the purpose of the appropriation") (quoting *Washington State Sugar*, 27 Idaho at 44, 147 P. at 1079). Again, "t]he concept that beneficial use acts as a measure and limit upon the extent of a water right is a consistent theme in Idaho water law." *Id.*

14. Holders of senior-priority water rights may receive less than their licensed or decreed quantities and not suffer material injury within the meaning of the CM Rules. As a result, in-season demand should be viewed in light of reasonableness and optimum development of water resources in the public interest. CM Rules 20 and 42; *American Falls*, 143 Idaho at 876-80, 154 P.3d at 447-51; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650-652, 315 P.3d at 838-40.

15. Here, the Director has established a methodology for determining material injury to members of the SWC. The methodology predicts material injury to RISD by taking the difference between RISD and the FS. The years 2000 through 2014 were analyzed to select the initial BLY because the period of years captured current irrigation practices in a dry climate. Based upon evaluation of the record, members of the SWC were exercising more reasonable efficiencies during this time period than during the 1990s when supplies were more plentiful. During periods of drought when junior ground water users are subject to curtailment, members

of the SWC should exercise reasonable efficiencies to promote the optimum utilization of the State's water resources. CM Rules 20 and 42; *American Falls,* 143 Idaho at 876-80, 154 P.3d at 447-51; *Clear Springs*, 150 Idaho at 807-10; 252 P.3d at 88-91; *In re Distribution of Water to Various Water Rights Held by or for the Ben. of A&B Irr. Dist.*, 155 Idaho at 650-652, 315 P.3d at 838-40.

16. At this time, with the recognition that the methodology is subject to adjustment and refinement, RISD will be equal to the historic demands associated with the BLY (2006/2008/2012), and will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

17. Recognizing that climate and surface water supplies (natural flow and storage) are inherently variable, the Director's predictions of material injury to RISD and reasonable carryover are based upon the best available information and the best available science, in conjunction with the Director's professional judgment as the manager of the State's water resources. Recognizing his ongoing duty to administer the State's water resources, the Director should use available data, and consider new analytical methods or modeling concepts, to evaluate the methodology. As more data is gathered and analyzed, the Director will review and refine the process of predicting and evaluating material injury. The methodology will be adjusted, if the data supports a change.

18. If the Director predicts that the SWC will be materially injured because of a demand shortfall prediction, either in the preseason or in the midseason, the demand shortfall represents a mitigation obligation that must be borne by junior ground water users. If mitigation water in the amount of the projected RISD shortfall cannot be secured or optioned by junior ground water users to the satisfaction of the Director (*see Order on Petition for Judicial Review* (Jul. 24, 2009) at 19), the Director will curtail junior ground water users to make up any deficit.

19. By requiring that junior ground water users secure mitigation water or have options to acquire water in place during the season of need, the Director ensures that the SWC does not carry the risk of shortage to their supply. By not requiring junior ground water users to deliver or assign mitigation water until the Time of Need, the Director ensures that junior ground water users supply only the amount of mitigation water necessary to satisfy the RISD. All approved methods of mitigation shall be considered in the Director's review of projected RISD shortfall.

20. Unless there is reasonable certainty that junior ground water users can secure the predicted volume of water and provide that water at the Time of Need, the protection afforded to the senior water right holders is compromised. The risk of shortage is then impermissibly shouldered by the SWC. Members of the SWC should have certainty entering the irrigation season and at midseason that mitigation water will be delivered or assigned at the Time of Need, or curtailment of junior ground water rights will be ordered.

21. Because climate and the supply that the SWC appropriated (natural flow and storage) are inherently variable, the Director cannot and should not insulate the SWC against all shortages. The Director can, however, protect the SWC against reasonably predicted shortages to RISD.

22. Currently, the USBR and USACE's Joint Forecast is an indispensible predictive tool at the Director's disposal for predicting material injury to RISD. Given current forecasting techniques, the earliest the Director can predict material injury to RISD with reasonable certainty is soon after the Joint Forecast is issued in early April. The pre-irrigation season supply forecast for A&B and Milner can be predicted solely from the Joint Forecast. To improve the accuracy of prediction, the pre-irrigation season supply forecast for AFRD2, BID, Minidoka, NSCC, and TFCC will currently be predicted from both the Joint Forecast and from flow data at Box Canyon.[9]

23. By shifting the April Forecast Supply prediction curve down one standard error of estimate, the Director purposely underestimates the water supply that is predicted. The Director further guards against RISD shortage by using the 06/08/12 BLY, which has above average diversions, above average ET, below average in-season precipitation, and above average growing degree days. The 06/08/12 average represents years in which water supply did not limit diversions. The Director's prediction of material injury to RISD is purposely conservative. While it may ultimately be determined after final accounting that less mitigation water was owed than was provided, this is an appropriate burden for junior appropriators to carry. Idaho Cost. Art. XV, § 3; Idaho Code § 42-106. Shifting the prediction curve down one standard error of estimate and adoption of a BLY that uses above average diversions, above average temperatures and ET and below average precipitation is necessary to protect senior rights if the Director administers to an amount less than the full decreed quantity of the SWC's rights. *Methodology Remand Order* at 33, 35.

24. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water provided by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

25. "Storage water is water held in a reservoir and is intended to assist the holder of the water right in meeting their decreed needs." *American Falls*, 143 Idaho at 878, 154 P.3d at 449. "Carryover is the unused water in a reservoir at the end of the irrigation year which is retained or stored for future use in years of drought or low-water." *Id.* Under Idaho Code, "[o]ne may acquire storage water rights and receive a vested priority date and quantity, just as with any other water right," but "[t]here is no statutory provision for obtaining a decreed right to 'carryover' water." *Id.* Rather, carryover is a "component of the storage right." *Order on Petition for Judicial Review* (Jul. 24, 2009) at 20. Storage carryover is "permissible . . . absent abuse." *American Falls*, 143 Idaho at 880, 154 P.3d at 451.

26. The storage reservoirs implicated in this proceeding were intended to provide supplemental supplies of water "to create a buffer against the uncertainty of the weather." *Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation* (April 29, 2008) at 6. "The history of the development of the reservoir system, most recently Palisades, makes it clear that storage of water was a primary purpose to prevent disaster during periods of shortage as have been experienced in the recent past." *Id.* at 60. The purpose of carryover also

[9] The method for predicting the natural flow supply may be subject change based upon improved predictive models.

is "insurance against the risk of future shortage." *Order on Petition for Judicial Review* (Jul. 24, 2009) at 20.

27. CM Rule 42.01 sets forth factors the Director "may consider in determining whether the holders of water rights are suffering material injury and using water efficiently and without waste." CM Rule 42.01 does not limit the Director's determination of reasonable carryover to consideration of the factors enumerated in CM Rule 42.01g, but only requires that the Director consider those enumerated factors. One such factor is "[t]he extent to which the requirements of the holder of a senior priority water right could be met with the user's existing facilities and water supplies." CM Rule 42.01g. This factor is qualified, however, by the provision that "the holder of a surface water storage right shall be entitled to maintain a reasonable amount of carry-over storage to assure water supplies for future dry years." CM Rule 42.01g. Thus, CM Rule 42.01g does not require water right holders to exhaust their storage water supplies prior to making a delivery call under the CM Rules. This is consistent with the purposes of the storage reservoirs and the carryover components of the storage water rights.

28. In considering CM Rule 42.01g in *American Falls*, the Idaho Supreme Court framed the SWC's challenge to the "reasonable carryover" provision as presenting the question of whether the holders of storage water rights are "entitled to insist on all available water to carryover for future years in order to assure that their full storage water is met (regardless of need)," *American Falls,* 143 Idaho at 879, 154 P.3d at 450, and answered this question in the negative:

> At oral argument, one of the irrigation district attorneys candidly admitted that their position was that they should be permitted to fill their entire storage water right, regardless of whether there was any indication that it was necessary to fulfill current or future needs and even though the irrigation districts routinely sell or lease the water for uses unrelated to the original rights. This is simply not the law of Idaho. While the prior appropriation doctrine certainly gives pre-eminent rights to those who put water to beneficial use first in time, this is not an absolute rule without exception. As previously discussed, the Idaho Constitution and statutes do not permit waste and require water to be put to beneficial use or be lost. Supra, paragraph 11.

Id. at 880, 154 P.3d at 451.

29. As discussed in the Findings of Fact, reasonable carryover is determined by projecting the water supply for the system. This is accomplished by projecting the 2002/2004 supply and the 2006/2008/2012 demand. Next, the Director examines the average annual rate of fill of each SWC entity's reservoir space to determine each entity's relative probability of fill. Finally, the Director examines the average annual carryover for prior comparable water conditions by reviewing Heise natural flow.

30. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of the SWC. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the

Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

31. Recognizing that reservoir space held by members of the SWC may fill, and to prevent the waste of water, junior ground water users are not required to deliver or assign the volume of reasonable carryover until after the Day of Allocation (defined in footnote 11, *infra*). Junior ground water users are obligated to hold the secured or optioned mitigation water until reservoir space held by the SWC fills. If the reservoir space does not fill, junior ground water right holders must deliver or assign the secured or optioned mitigation water to the senior water right holders up to the amount of storage space that did not fill.

32. The Director recognizes that his analysis of the obligation for reasonable carryover differs from his analysis for RISD obligations. In predicting RISD shortages, the Director is able to premise his determination on the Joint Forecast. The Director requires junior ground water users to provide the entire RISD shortage because the Joint Forecast allows determination of material injury with reasonable certainty.

33. In the fall of the subsequent irrigation season, the Director cannot, with reasonable certainty, predict material injury to reasonable carryover. As found by the Hearing Officer, "Anticipating the next season of need is closer to faith than science." R. Vol. 37 at 7109.

ORDER

Consistent with the forgoing, the Director HEREBY ORDERS that, for purposes of determining material injury to RISD and reasonable carryover, the following steps will be taken:

1. Step 1: By April 1, members of the SWC will submit electronic shape files to the Department delineating the total anticipated irrigated acres for the upcoming year within their water delivery boundary or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent. Department staff will review submitted shapefiles and modify them as necessary to ensure that: (1) the total acreage count does not exceed the decreed number of acres; (2) all of the irrigated land is located within the decreed place of use; and (3) acres are not counted more than once due to overlapping polygons within a shape file or between shape files submitted by different SWC members. Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department. If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery. If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season. The Department will electronically post electronic shape files for each member of the SWC for the current water year for review by the

parties. In determining the total irrigated acreage, the Department may account for supplemental ground water use. The Department currently does not have sufficient information to accurately determine the contribution of supplemental ground water to lands irrigated with surface water by the SWC. If and when reliable data is available to the Department, the methodology will be amended to account for the supplemental ground water use.

2. If the acreage count is under reported by more than five percent of the irrigated acreage limit of the water right, then the Department will assess the impact of this reduction in use of the water right on any mitigation requirement.

3. Step 2: Typically within the first two weeks of April, the USBR and USACE issue their Joint Forecast that predicts an unregulated inflow volume at the Heise Gage for the period April 1 through July 31. Within fourteen (14) days after issuance of the Joint Forecast, the Director will issue a final order predicting the April FS for the water year for each SWC entity. The Director will compare the April FS for each SWC entity to the BD for each SWC entity to determine if a demand shortfall ("DS") is anticipated for the upcoming irrigation season. The April FS for each SWC entity is the sum of the forecasted natural flow supply and the forecasted storage allocation for each SWC entity. The forecasted natural flow supply will be computed with regression algorithms. The forecasted storage allocation will be determined by comparing storage accruals in an analogous year(s). The ESPA Model will be run to determine the curtailment date which will produce a volume of water equal to the DS in the near Blackfoot to Minidoka reach. The model simulation will be run at steady state within the area of common ground water supply as described by CM Rule 50.01.

4. Step 3: By May 1, or within fourteen (14) days from issuance of the final order predicting the April FS, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April DS unless the April DS is revised as explained below in paragraph 6. If junior ground water users secured water for a reasonable carryover shortfall to an individual SWC member in the previous year, the current-year mitigation obligation to the individual SWC member will be reduced by the quantity of water secured for the reasonable carryover shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

5. Step 4: As soon as practical after the deadline for junior ground water users with approved mitigation plans to provide notice of secured water, the Director will issue an order curtailing junior ground water users who: (1) do not have approved mitigation plans; (2) fail to secure the required water consistent with their approved mitigation plans; or (3) otherwise fail to comply with their approved mitigation plans.[10]

6. If, at any time prior to the Director's final determination of the April FS, the Director can determine with certainty that any member of the SWC has diverted more natural

[10] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

flow than predicted, or has accrued more storage than predicted, the Director will revise his initial, projected demand shortfall determination.

7. Step 5: If the storage allocations held by members of the SWC fill, there is no reasonable carryover shortfall. If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report, which typically occurs soon after the Day of Allocation,[11] the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC. The amount of reasonable carryover to be provided shall not exceed the empty storage space on the Day of Allocation for that entity. If water is owed in addition to the reasonable carryover shortfall volume, this water shall be delivered or assigned to members of the SWC at the Time of Need, described below. The Time of Need will be no earlier than the Day of Allocation.

8. Step 6: Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS and (3) estimate the Time of Need date.[12]

9. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The cumulative CWN volume will be calculated for all land irrigated with surface water within the boundaries of each member of the SWC. Volumetric values of CWN will be calculated using ET and precipitation values from the USBR's AgriMet program, irrigated areas provided by each entity, and crop distributions based on NASS data

10. The FS for each SWC is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on regression analysis. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01. If the BOR and Water District 01 have not yet allocated stored water to spaceholders, the Department will predict the storage allocations based on an analogous year(s).

11. The calendar day determined to be the Time of Need is established by predicting the day in which the remaining storage allocation will be equal to reasonable carryover, or the difference between the 06/08/12 average demand and the 02/04 supply. The Time of Need will not be earlier than the Day of Allocation.

12. This information will be used to recalculate RISD and adjust the projected DS for each member of the SWC. The Director will then issue revised RISD and DS values. Any

[11] The Day of Allocation is the time in the irrigation season when the Water District 01 watermaster is able to issue allocations to storage space holders after the reservoir system has achieved its maximum physical fill, maximum water right accrual, and any excess spill past Milner Dam has ceased. Tr. p. 902, lns. 7-25; p. 903, lns. 1-10.

[12] At the earliest established Time of Need for any member of the SWC, junior ground water users are required to provide remaining mitigation to all materially injured members of the SWC.

increase to the projected DS for each SWC entity is an additional mitigation obligation of the junior ground water users.

13. Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water pursuant to an approved mitigation plan or to conduct other approved mitigation activities that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users.[13] The ESPA Model will be run to determine the priority date to produce the necessary additional mitigation obligation volume within the area of common ground water supply, as described by CM Rule 50.01.

14. Step 7: Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) recalculate RISD; (2) issue a revised FS; and (3) establish the Time of Need. The revised FS for each SWC entity is the sum of the year-to-date actual natural flow diversions, the forecasted natural flow supply for the remainder of the season, and the storage allocation for each member of the SWC. The forecasted natural flow supply for the remainder of the season will be based on analogous year(s) with similar Blackfoot to Milner reach gains. The storage allocation will be based on the actual preliminary storage allocations issued by the BOR and Water District 01.

15. This information will be used to recalculate RISD and adjust the projected DS for each member of the SWC. RISD will be calculated utilizing the project efficiency, BD, and the cumulative actual CWN determined up to that point in the irrigation season. The Director will then issue revised RISD and DS values.

16. Step 8: At the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised DS calculated at the Time of Need. Alternatively, any additional mitigation obligation calculated in Step 6 and Step 7 can be satisfied from the each SWC member's reasonable carryover if (a) the reasonable carryover exceeds the additional mitigation obligation, and (b) the junior ground water users secure sufficient water to replace the reasonable carryover pursuant to an approved mitigation plan.

17. The Director will review, at the end of the season, the volume and efficiencies of application of surface water, the amount of mitigation water delivered by junior ground water users, and may, in the exercise of his professional judgment, readjust the reasonable carryover shortfalls to reflect these considerations.

18. Step 9: Following the end of the irrigation season (on or before November 30), the Department will determine the total actual volumetric demand and total actual CWN for the entire irrigation season. This information will be used for the analysis of reasonable carryover

[13] This presumes that any reasonable carryover obligation has been met, and that junior ground water users are not already under prior curtailment from deficiencies in meeting the previous year's obligation.

shortfall, selection of future BLY, and for the refinement and continuing improvement of the method for future use.

19. On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of SWC. These estimates will be based on, but not limited to, the consideration of the best available water diversion and storage data from Water District 01, return flow monitoring, comparative years, and RISD. These estimates will establish the obligation of junior ground water users in providing water to the SWC for reasonable carryover shortfall. Fourteen (14) days following the issuance by the Department of reasonable carryover short fall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

IT IS FURTHER ORDERED that this Fourth Methodology Order supersedes all previously issued methodology orders in this matter.

Dated this 19th day of April 2016.



GARY SPACKMAN
Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 19th day of April 2016, the above and foregoing, was served by the method indicated below, and addressed to the following:

John K. Simpson Travis L. Thompson Paul L. Arrington BARKER ROSHOLT & SIMPSON, LLP P.O. Box 485 Twin Falls, ID 83303 jks@idahowaters.com tlt@idahowaters.com pla@idahowaters.com	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318 wkf@pmt.org	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
Randall C. Budge Thomas J. Budge RACINE OLSON P.O. Box 1391 Pocatello, ID 83204-1391 rcb@racinelaw.net tjb@racinelaw.net	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
Kathleen Marion Carr US Dept. Interior 960 Broadway Ste 400 Boise, ID 83706 kathleenmarion.carr@sol.doi.gov	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice 999 18th St, South Terrace, Ste 370 Denver, CO 80202 david.gehlert@usdoj.gov	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
Matt Howard US Bureau of Reclamation 1150 N Curtis Road Boise, ID 83706-1234 mhoward@pn.usbr.gov	☐ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email

Sarah A. Klahn Mitra Pemberton WHITE JANKOWSKI 511 16th St., Ste. 500 Denver, CO 80202 sarahk@white-jankowski.com	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
A. Dean Tranmer City of Pocatello P.O. Box 4169 Pocatello, ID 83205 dtranmer@pocatello.us	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
William A. Parsons Parsons, Smith & Stone, LLP P.O. Box 910 Burley, ID 83318 wparsons@pmt.org	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
Lyle Swank IDWR—Eastern Region 900 N. Skyline Drive Idaho Falls, ID 83402-6105 lyle.swank@idwr.idaho.gov	☐ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
Allen Merritt Cindy Yenter IDWR—Southern Region 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033 allen.merritt@idwr.idaho.gov cindy.yenter@idwr.idaho.gov	☐ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email

Deborah J. Gibson

Deborah Gibson
Administrative Assistant to the Director

EXPLANATORY INFORMATION TO ACCOMPANY A FINAL ORDER

(To be used in connection with actions when a hearing was not held)

(Required by Rule of Procedure 740.02)

The accompanying order is a "**Final Order**" issued by the department pursuant to section 67-5246, Idaho Code.

PETITION FOR RECONSIDERATION

Any party may file a petition for reconsideration of a final order within fourteen (14) days of the service date of this order as shown on the certificate of service. **Note: The petition must be received by the Department within this fourteen (14) day period.** The department will act on a petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law. See section 67-5246(4), Idaho Code.

REQUEST FOR HEARING

Unless the right to a hearing before the director or the water resource board is otherwise provided by statute, any person who is aggrieved by the action of the director, and who has not previously been afforded an opportunity for a hearing on the matter shall be entitled to a hearing before the director to contest the action. The person shall file with the director, within fifteen (15) days after receipt of written notice of the action issued by the director, or receipt of actual notice, a written petition stating the grounds for contesting the action by the director and requesting a hearing. See section 42-1701A(3), Idaho Code. **Note: The request must be received by the Department within this fifteen (15) day period.**

APPEAL OF FINAL ORDER TO DISTRICT COURT

Pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by a final order or orders previously issued in a matter before the department may appeal the final order and all previously issued orders in the matter to district court by filing a petition in the district court of the county in which:

i. A hearing was held,
ii. The final agency action was taken,
iii. The party seeking review of the order resides, or
iv. The real property or personal property that was the subject of the agency action is located.

The appeal must be filed within twenty-eight (28) days of: a) the service date of the final order, b) the service date of an order denying petition for reconsideration, or c) the failure within twenty-one (21) days to grant or deny a petition for reconsideration, whichever is later. See section 67-5273, Idaho Code. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Revised July 1, 2010

EXHIBIT 317

Surface Water Coalition Delivery Call, Amended 5th Methodology and April 2023 As-Applied Orders

FAQs

- Why did IDWR change the Methodology?

  IDWR is obligated to update the Methodology to incorporate new climate and hydrologic data and to ensure adequate protection for senior water users from injury. The new Methodology revises important elements used to determine in-season injury to water supplies and end-of-season injury to storage reservoir carryover. It also revises the method used to calculate curtailment dates, relying on what is referred to as "transient" model analysis, in a manner that may result in earlier curtailment dates than previously predicted.

- What changes did IDWR make to the Methodology?

  IDWR made the following changes to its Methodology: (1) updated climate, hydrologic, and demand data used by the Methodology to determine injury, (2) updated "base line year," (3) updated "reasonable carryover" volumes for the Surface Water Coalition (SWC), and (4) changed how the Eastern Snake Plain Aquifer Model (ESPAM 2.2) is deployed to calculate a priority curtailment date from "steady state" to transient analysis.

- Why did IDWR change the methodology to a transient model?

  The Director has concluded that using the ESPA model in steady-state mode is no longer legally supportable because steady state does not provide water at the time, place, and quantity needed by the senior water user.

- Does this mean that 940,000 acres will be curtailed along the East Snake Plain Aquifer?

  No, many irrigated acres are covered by approved mitigation plans and are not subject to curtailment.

- How many acres will be curtailed that IDWR estimates are NOT part of an approved mitigation plan?

  IDWR will not have an estimate for this number until it works through curtailment with individual water right holders.

- How can there be curtailment in a year when we have so much snow in the hills?

  The As-Applied order is an early season prediction of what the water supply for the SWC will be for the upcoming year. The courts have been clear that the Director's predictions must favor the senior water users. And while there is a good snowpack in the hills above the ESPA, that is only part of the water supply for the SWC. Additional supply comes from recharge from the aquifer and that is at a record low. Plus, we are coming out of two years of drought and the existing storage supply was low.

- Are water users immediately subject to curtailment with the issuance of the Methodology and As-Applied orders?



No. The Director has scheduled a contested case hearing (June 6 – 10, 2023) to allow parties to submit testimony and evidence regarding the changes to the Methodology implemented by the Director. Because of the pending hearing, the Director will delay issuing a curtailment notice to Snake River junior water users until after the hearing. This means junior ground water pumpers who do not have approved mitigation plans in place will have a reprieve from curtailment until late June. Junior water users should wait for specific notice and direction from IDWR as to how their individual water rights are affected by this decision. However, water right holders who are junior to 1953 should work with IDWR to understand how their water right could be impacted in the case they are not in compliance and a party to an approved mitigation plan.

The following questions all assume that the Director issues a curtailment order and the water rights at issue are junior to the curtailment date in the order:

- What happens if I am participating in an approved mitigation plan?

  If you are participating in an approved mitigation plan and the mitigation plan is being complied with, you will not be subject to curtailment.

- What happens if I am participating in an approved mitigation plan but the plan is not being complied with?

  You will be subject to curtailment.

- What happens if I am NOT part of an approved mitigation plan?

  You will be subject to curtailment. However, you do have the option to join an approved mitigation plan. This is based on the parties in the approved mitigation plan agreeing to add additional members.

- What happens if I am a party to, and meet the criteria of IGWA's 2009 Storage Water Delivery Mitigation Plan?

  If IGWA delivers storage water to the SWC in a volume equal to the injury determination, participating members are not subject to curtailment. However, this mitigation plan does not provide safe harbor for future injury determination and IGWA must always secure storage water commensurate with the injury determination regardless of the size of injury (e.g., in July of 2021, the injury determination was ~170 KAF). For example, at the mid-season adjustment, if IDWR determines the injury is greater than its April determination, IGWA will have to secure additional storage water or be subject to curtailment during the season after crops are planted.

- What if I am a party to, and meet the criteria of the SWC-IGWA 2015 settlement agreement?

  The 2015 settlement agreement was approved as a mitigation plan by IDWR. So long as the ground water districts comply with the mitigation plan, members of the ground water districts are not subject to curtailment.

- What if I am a city participating in a mitigation plan?

  If you are a city participating in an approved mitigation plan and the mitigation plan is being complied with, you are not subject to curtailment.

- What if I am a city NOT participating in a mitigation plan?

  You will be subject to curtailment. However, you do have the option to join an approved mitigation plan. This is based on the parties in the approved mitigation plan to agree to add additional members.

- What if I am a processor participating in an approved mitigation plan?

  If you are a processor participating in an approved mitigation plan and the mitigation plan is being complied with, you are not subject to curtailment.

- What if I am a processor NOT participating in an approved mitigation plan?

  You are subject to curtailment. However, you do have the option to join an approved mitigation plan. This is based on the parties in the approved mitigation plan to agree to add additional members.

- Can I submit a mitigation plan now and get it approved in time for this coming irrigation season?

  It is unlikely that a mitigation plan can be approved before a potential curtailment order is issued. Once a plan is submitted, the plan must be advertised and is then subject to a protest deadline. The plan is subject to hearing if protested or if the Director determines a hearing is necessary. This process can take many months.

EXHIBIT 318

IDAHO DEPARTMENT OF WATER RESOURCES

SWC methodology – calculation of priority dates for curtailment of junior groundwater users

Presented to the SWC Methodology Technical Working Group

Jennifer Sukow, P.E., P.G.

November 28, 2022

Exh. No. 6
Date 5-10-23
Name Jennifer Sukow
M & M Court Reporting

Methodology reference

- Curtailment date calculation (Step 2) (Page 36 of Methodology)
  - The ESPA Model will be run to determine the curtailment date which will produce a volume of water equal to the DS in the near Blackfoot to Minidoka reach. The model simulation will be run at steady state within the area of common ground water supply as described by CM Rule 50.01.
- Curtailment date calculation (Step 6) (Page 38 of Methodology)
  - Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water pursuant to an approved mitigation plan or to conduct other approved mitigation activities that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users.[13] The ESPA Model will be run to determine the priority date to produce the necessary additional mitigation obligation volume within the area of common ground water supply, as described by CM Rule 50.01.

Methodology reference

- Curtailment for carryover shortfall (Step 9) (Page 39 of Methodology)
  - Fourteen (14) days following the issuance by the Department of reasonable carryover shortfall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

Presentation outline

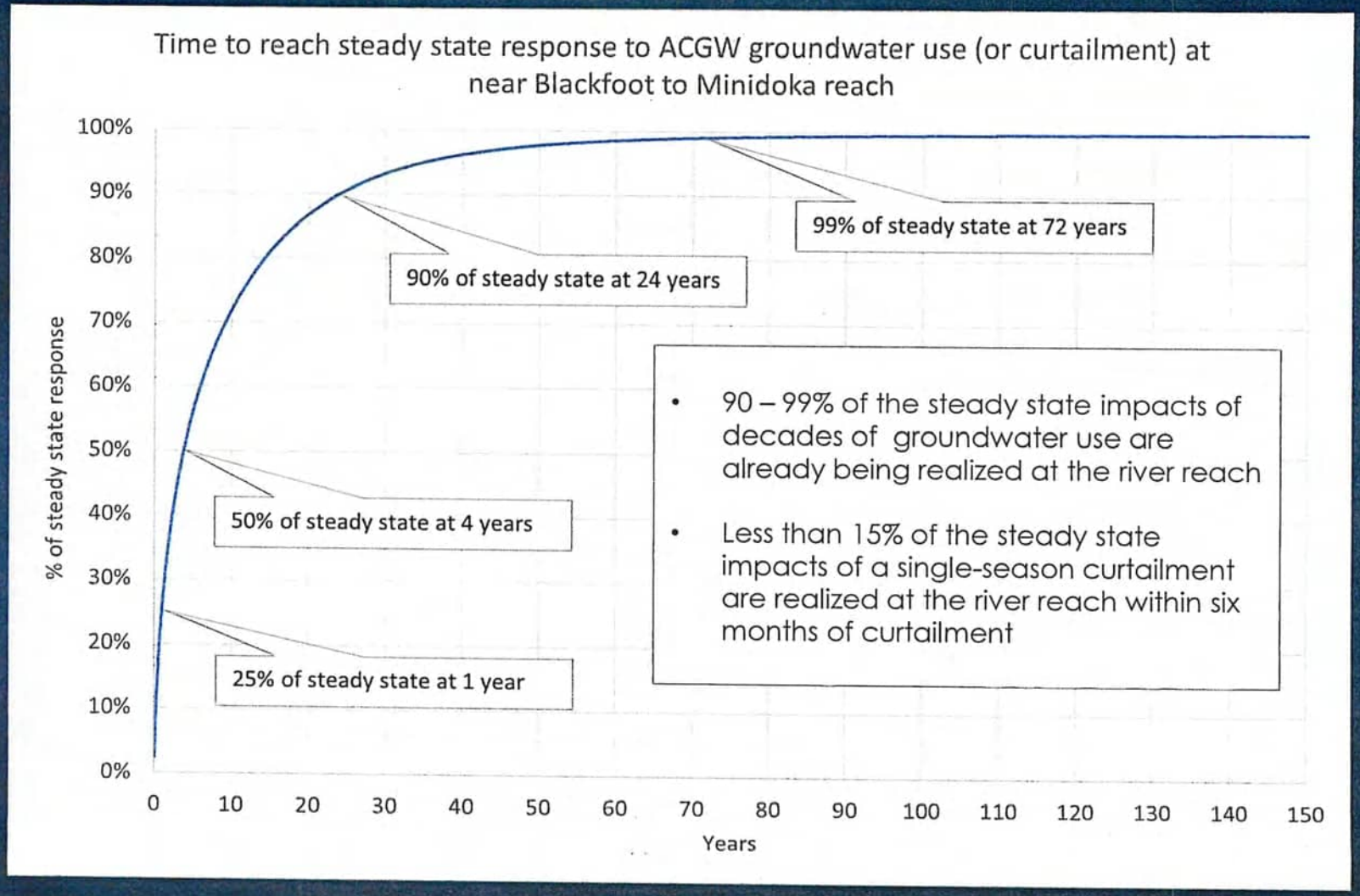
- Steady state vs. transient model simulations
- Transient model results for curtailment priority dates in 2022 orders
- Examples of transient model simulations for calculation of curtailment priority dates
  - Assumptions for transient model simulations
  - Comparison of priority dates and acres curtailed for various shortfall volumes
  - Transient analyses for water years 2021-2022

Steady state vs. transient model simulations

- Merriam-Webster definition of *steady state*
  - a state or condition of a system or process that does not change in time

- Steady state ESPAM simulation for calculation of curtailment priority date
  - Predicts long-term response to continuous curtailment of groundwater use at a constant rate for an infinite number of years
  - Result is a prediction of the long-term average annual impact of curtailment on the near Blackfoot to Minidoka reach
  - Curtailments ordered as prescribed in methodology order are not continuous or long-term
  - Groundwater use does not occur at a constant rate throughout the year

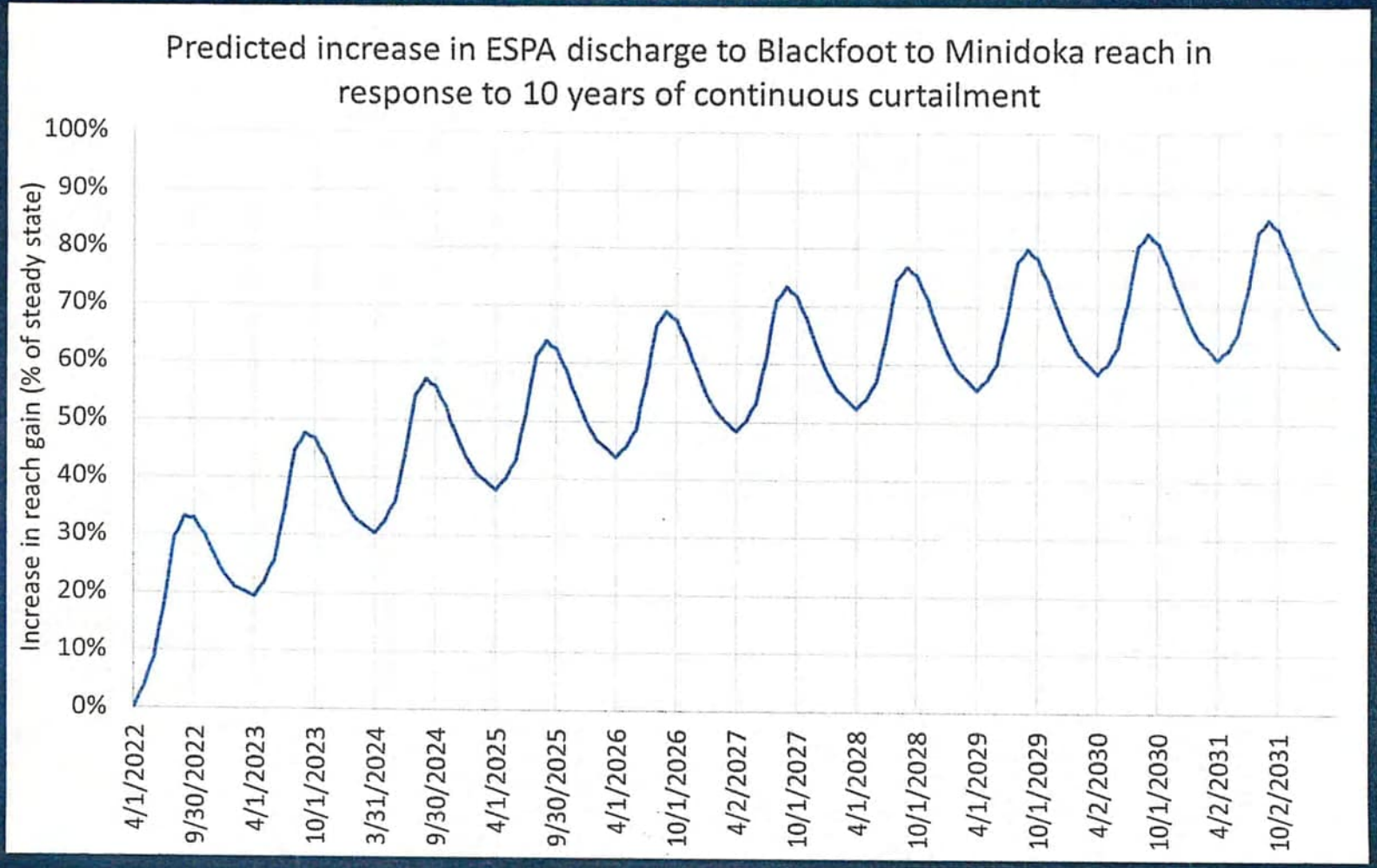
How long does it take to approach steady state conditions?



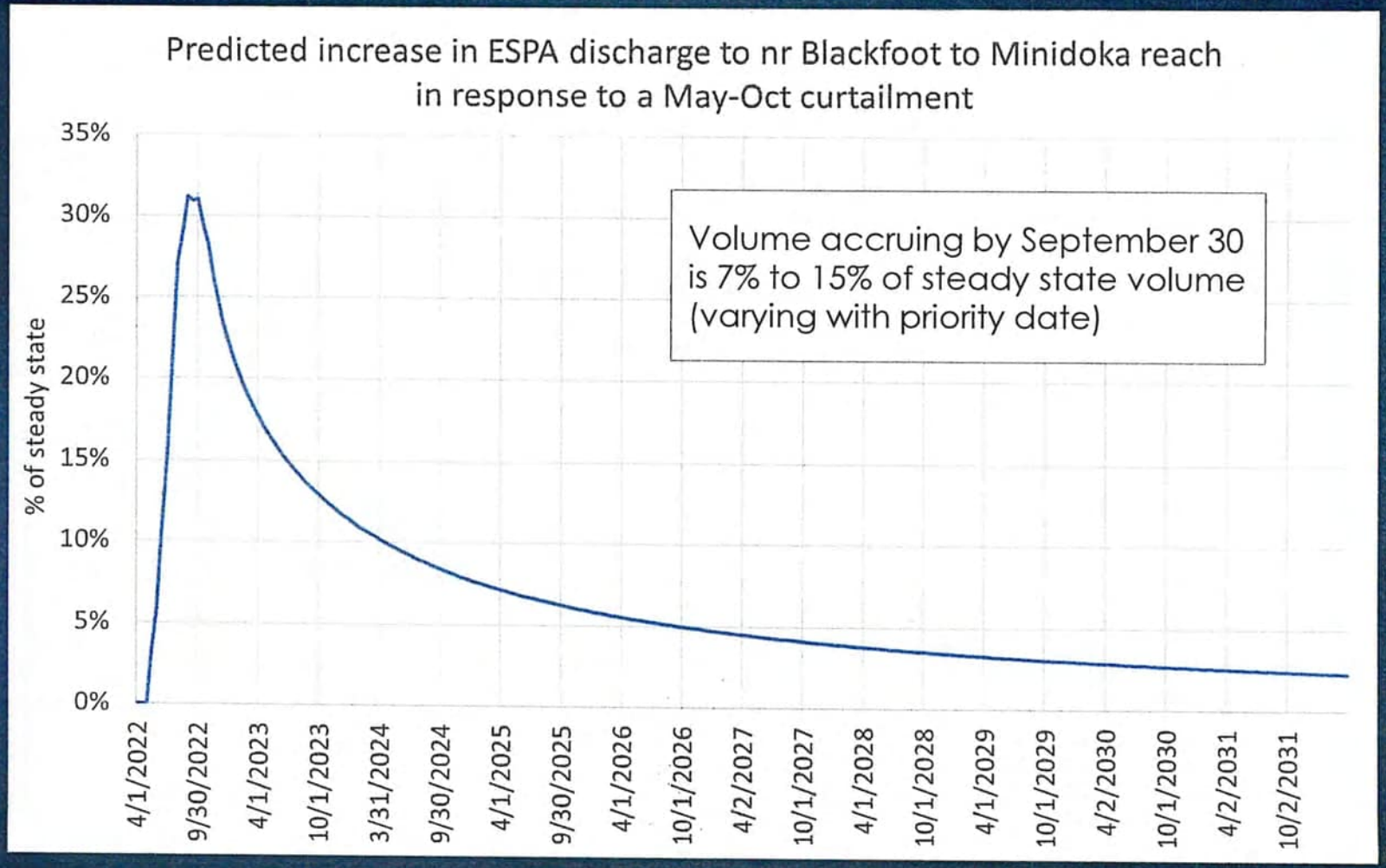
Steady state vs. transient model simulations

- Merriam-Webster definition of *transient*
  - passing especially quickly into and out of existence
- Transient ESPAM simulation for calculation of curtailment priority date
  - Predicts timing and magnitude of response to time-varying changes in aquifer stress resulting from short-term curtailment of groundwater use to address a predicted shortfall
  - Result is a prediction of the timing and magnitude of the response to time-varying curtailment of groundwater use

Steady state vs. transient model simulations



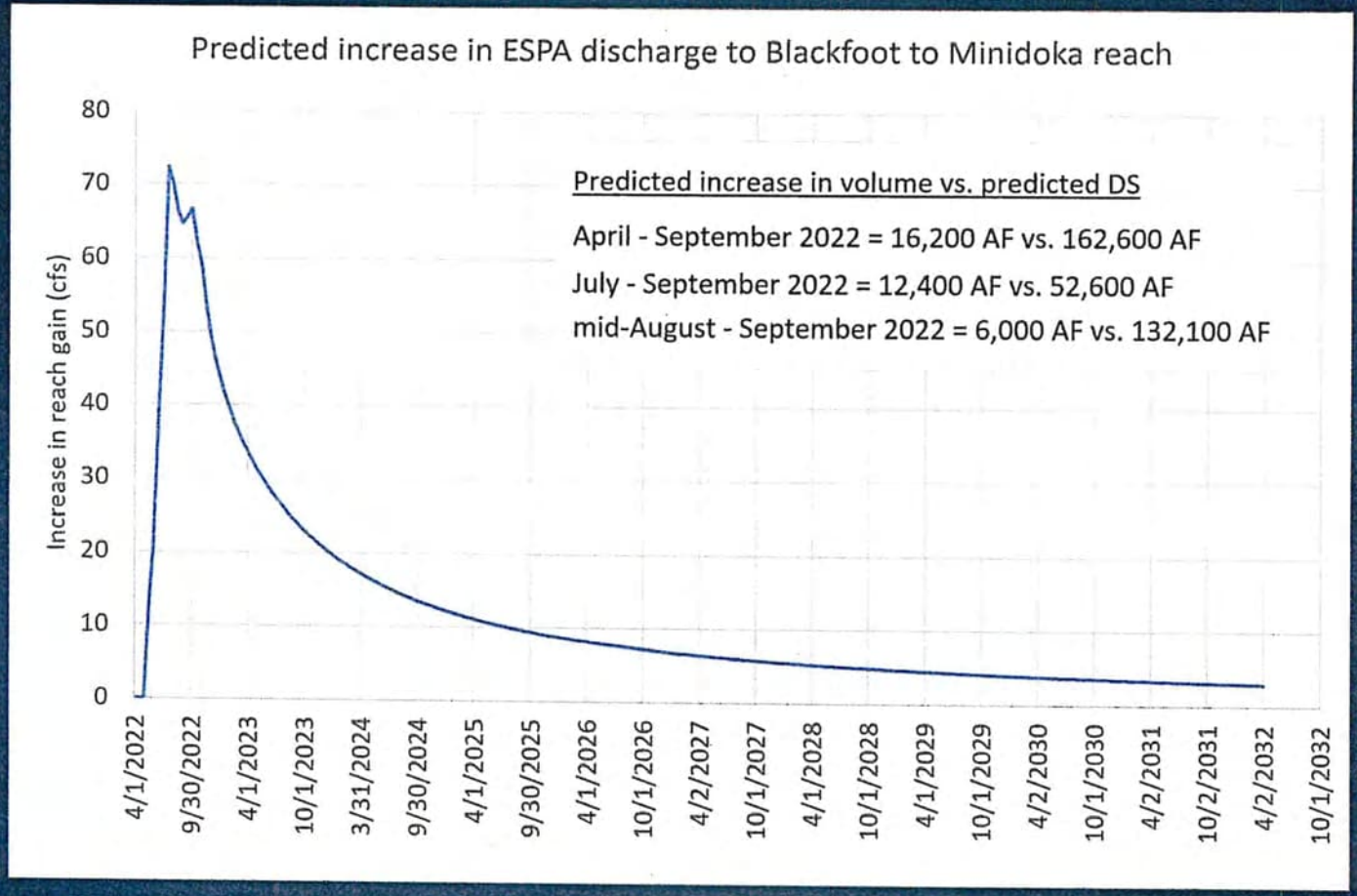
Steady state vs. transient model simulations



Transient simulation of curtailments ordered in 2022

- 2022 curtailments ordered
  - Curtailment priority dates were calculated based on steady state response at near Blackfoot to Minidoka
  - April 1 DS forecast of 162,600 AF → curtailment junior to December 25, 1979 beginning May
  - July 1 DS Forecast of 52,600 AF → curtailment reduced to junior to March 12, 1989 in July
  - Time of Need Forecast of 132,100 AF → curtailment increased to junior to March 25, 1981 in August
- Transient simulation of these curtailment dates was performed to compare volumes predicted to accrue to near Blackfoot to Minidoka during this season with the predicted DS volumes

Transient simulation of curtailments ordered in 2022

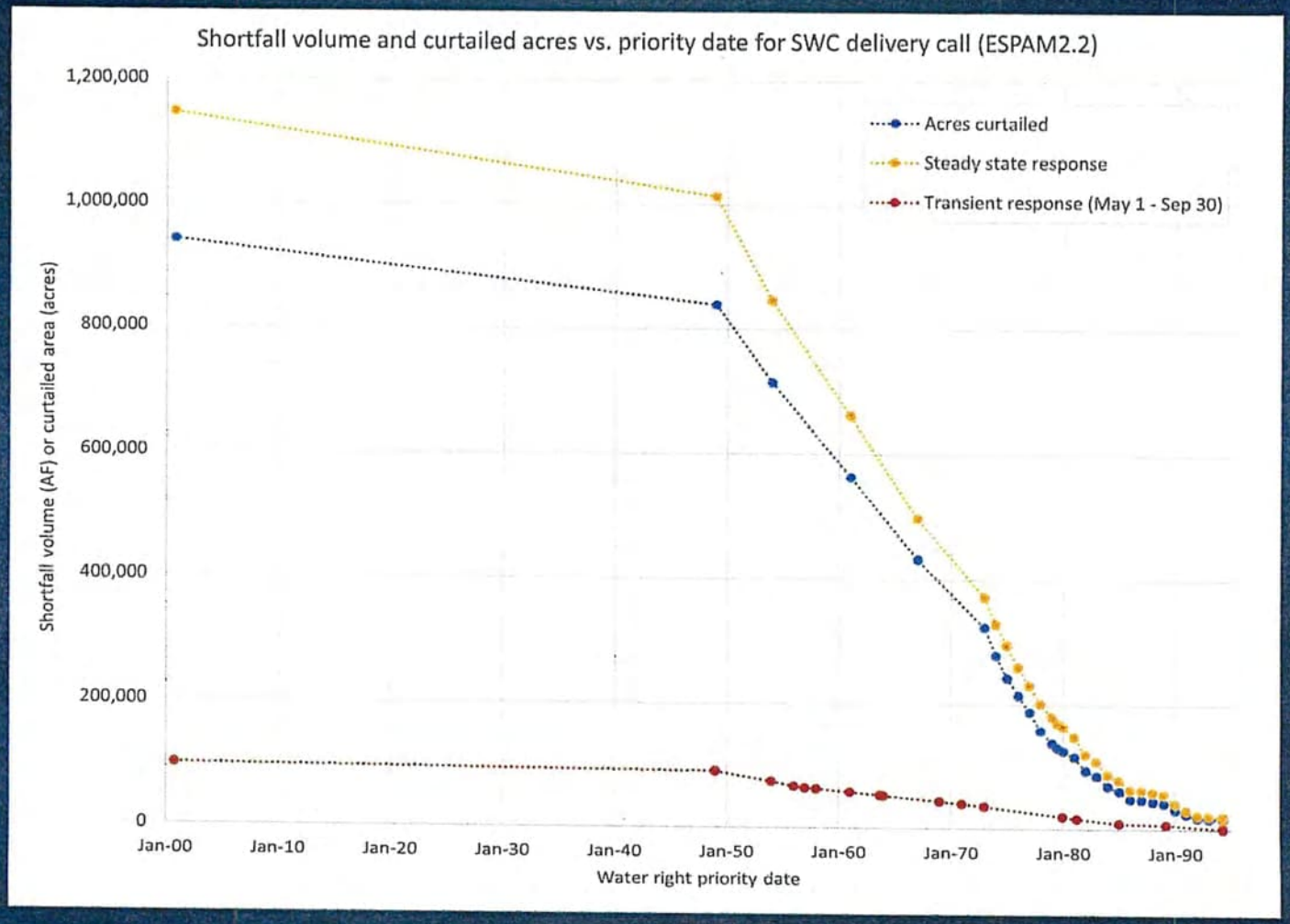


- Volume that would accrue from the ordered curtailments during the period of each shortfall is much less than the predicted shortfall
- Increases in reach gain would continue to accrue in future water years

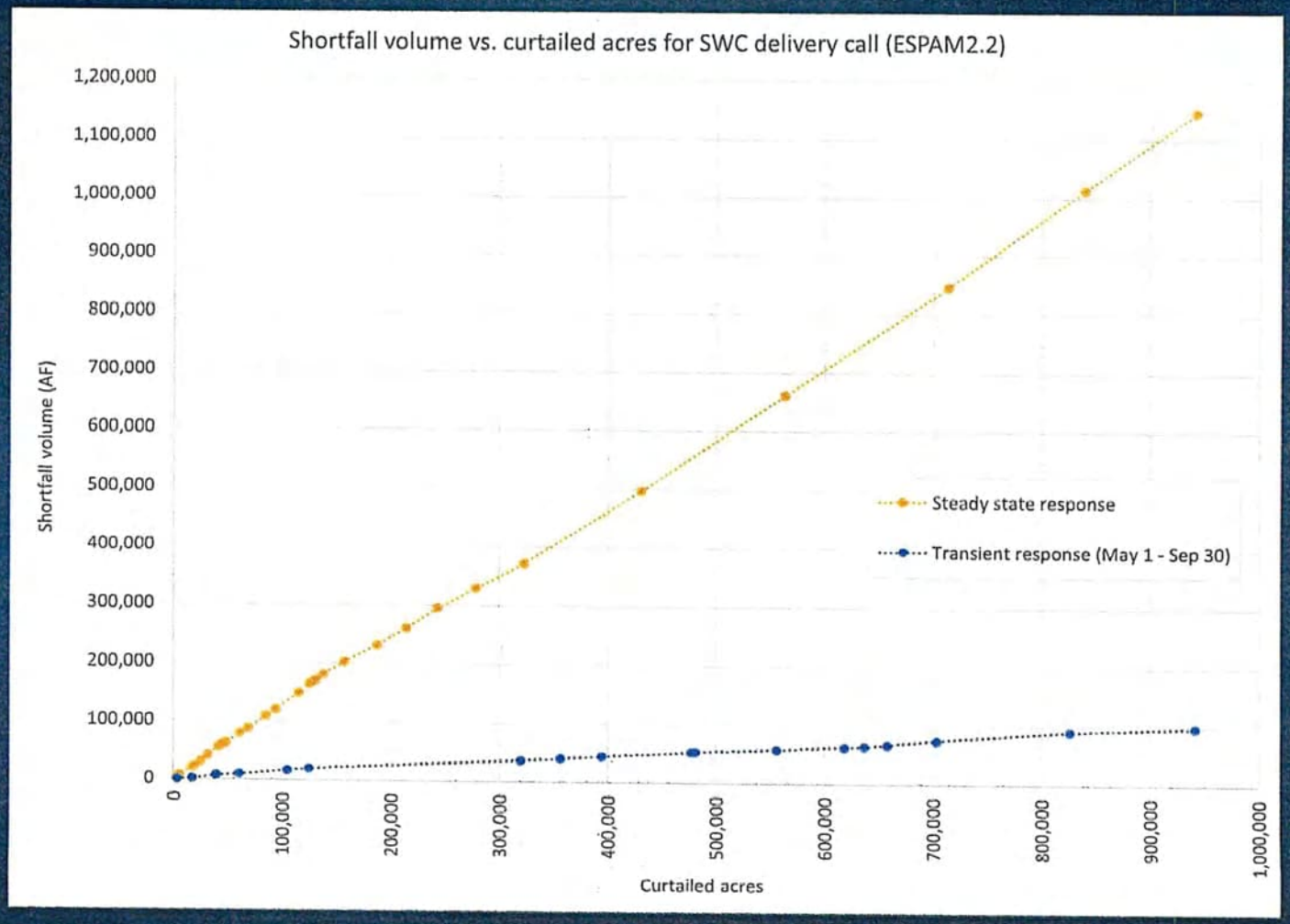
Assumptions for example transient model simulations

- Continue to use methods documented in "Curtailment Scenario" report (Sukow, 2021)
  https://research.idwr.idaho.gov/files/projects/espam/browse/ESPAM22_Reports/Scenarios/CurtScen22_FinalwApp.pdf
  - Use average monthly ET and precipitation from WY2009-WY2018 instead of average annual values
- Analysis of municipal curtailment continues to use methods described in 2015 IDWR staff memo for Rangen delivery call (Sukow, 2015)
  https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-MP-2014-007/CM-MP-2014-007-20150123-Staff-Memo-Cities-2nd.pdf
  - Five-year average pumping rates within ACGW are updated each year based on reported annual pumping volumes
- Curtailment for April forecast begins ~ May 1
- Curtailment priority date revision for July forecast goes into effect ~ July 16 if April DS > July DS
- Curtailment priority date revision for July forecast goes into effect ~ August 1 if April DS < July DS
- Curtailment priority date revision for Time of Need (mid-August) forecast goes into effect ~ September 1
- Target for transient calculation is a modeled benefit at near Blackfoot to Minidoka equal to DS volume accruing between DS forecast date and September 30
- Earliest curtailment priority date is junior to October 11, 1900 (TFCC and NSCC natural flow water rights)

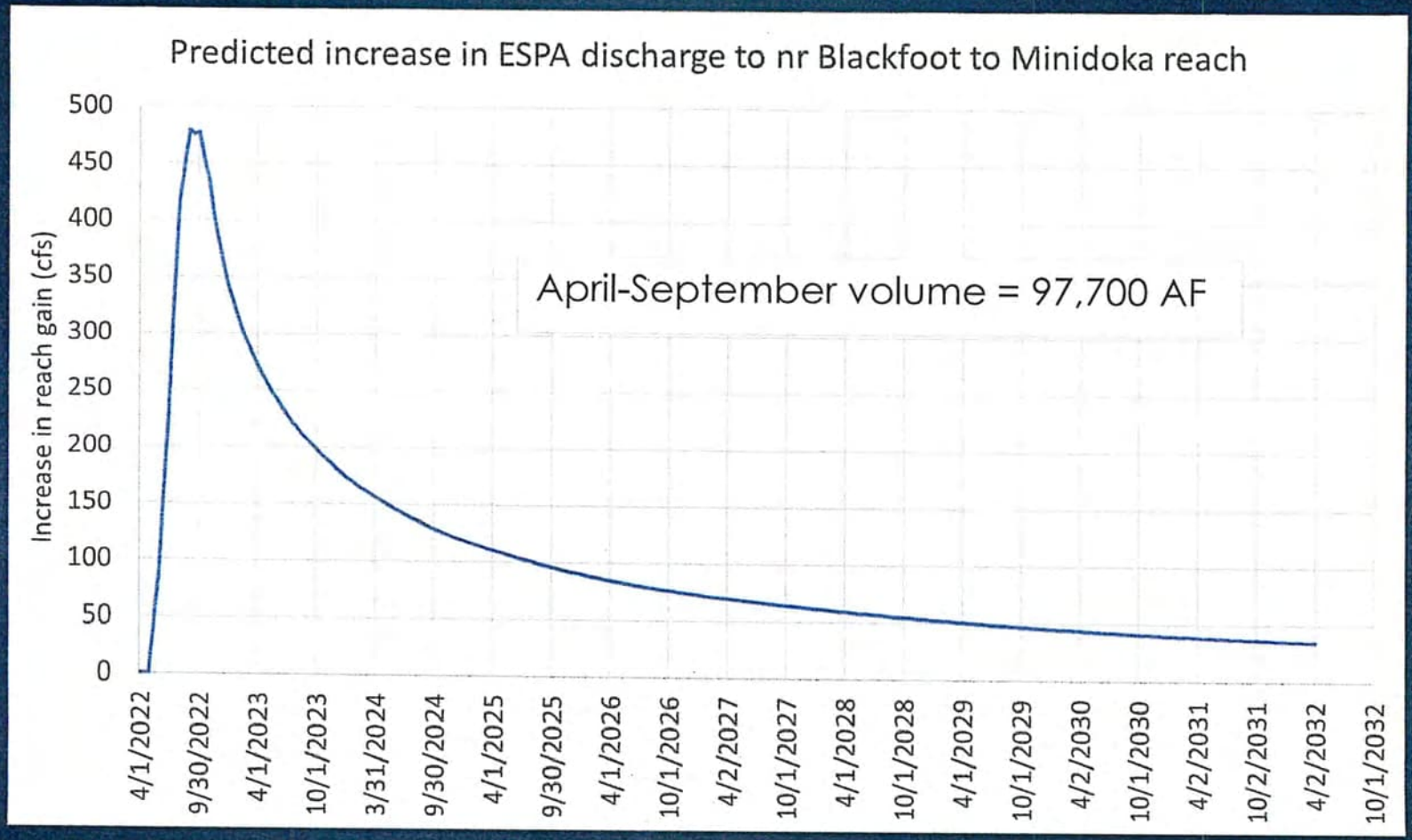
Comparison of priority dates calculated for April DS forecasts (May 1 curtailment)



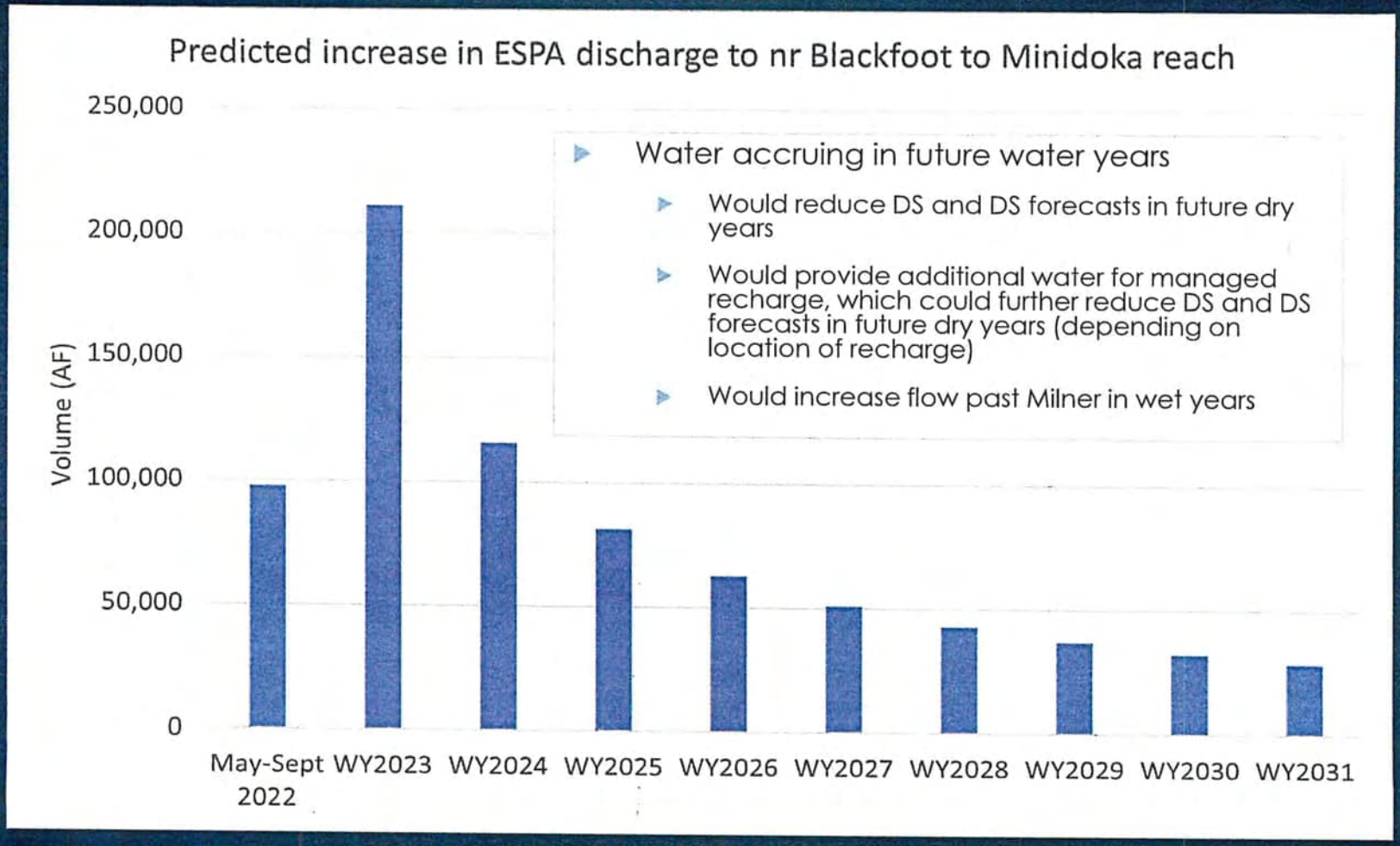
Comparison of priority dates calculated for April DS forecasts (May 1 curtailment)



Predicted response to May 1 curtailment of water rights junior to October 11, 1900



Predicted response to May 1 curtailment of water rights junior to October 11, 1900



Transient analyses for 2021 shortfall volumes

- April DS forecast = 40,500 AF
  - Curtail junior to **January 11, 1971** starting May 1
    - May 1 – Sep 30 predicted response = 40,500 AF
- July DS forecast = 170,000 AF
  - Increase curtailment to junior to **October 11, 1900** starting August 1
    - Jul 1 – Sep 30 predicted response = 44,400 AF
- Time of Need DS forecast = 142,700 AF
  - Maintain curtailment junior to **October 11, 1900**
    - Aug 16 – Sep 30 predicted response = 27,400 AF
- Carryover shortfall forecast = 64,600 AF
  - Curtail junior to **April 19, 1961** starting January 1
    - Jan 1 – Sep 30 predicted response = 64,700 AF

Transient analysis for 2021 carryover shortfall

- Calculation target is volume accruing between date of curtailment and September 30 of the next irrigation season
- Carryover shortfall forecast = 64,600 AF
  - Curtail junior to **April 19, 1961** starting January 1
    - Jan 1 – Sep 30 predicted response = 64,700 AF

Transient analyses for 2022 shortfall volumes

- April DS forecast = 162,600 AF
  - Curtail junior to **October 11, 1900** starting May 1
    - May 1 – Sep 30 predicted response = 97,700 AF
- July DS forecast = 52,600 AF
  - Decrease curtailment to junior to **March 13, 1981** starting July 16
    - Jul 1 – Sep 30 predicted response = 52,600 AF
- Time of Need DS forecast = 132,100 AF
  - Increase curtailment to junior to **October 11, 1900** starting September 1
    - Aug 16 – Sep 30 predicted response = 27,200 AF

Comparison of priority dates calculated using transient and steady state analyses

Forecast	Steady state date	Transient date	Steady state acres	Transient acres
April 1, 2021	1990	1/11/1971	~30,000	357,000
July 1, 2021	7/18/1979	10/11/1900	130,300	941,400
August 15, 2021	1981	10/11/1900	~110,000	941,400
Final net DS	1976	10/11/1900	~200,000	941,400
Carryover 2021	6/29/1985	4/19/1961	55,300	539,700
April 1, 2022	12/25/1979	10/11/1900	124,700	941,400
July 1, 2022	3/12/1989	3/31/1981	39,300	104,700
August 15, 2022	3/25/1981	10/11/1900	105,000	941,400

Range of priority dates using steady state simulations:
1976 – 1990 (30,000 to 200,000 acres)

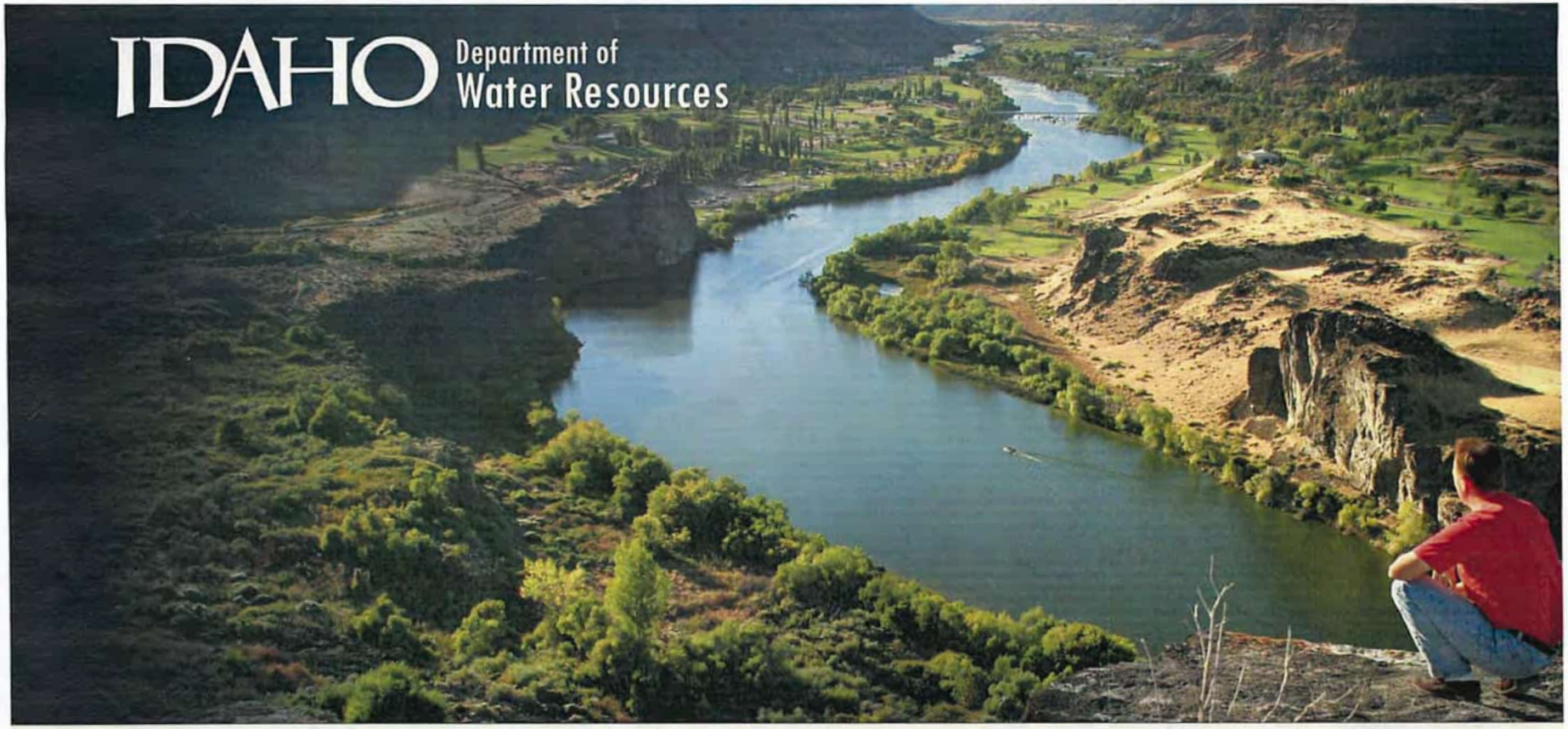
Range of priority dates using transient simulations:
1900 – 1981 (105,000 to 940,000 acres)

Conclusions

- Steady state simulations are appropriate for evaluating the impact of aquifer stresses that have been applied for decades (i.e. groundwater pumping, continuous curtailment to same date every year)
- Transient simulations are appropriate to evaluate the impacts of aquifer stresses applied for short periods of time (i.e. short-term curtailments with varying priority dates)
- Steady state simulations of continuous curtailment do not simulate the short-term curtailments prescribed in the SWC methodology
- Transient simulations better simulate the short-term curtailments prescribed in the SWC methodology

Conclusions

- Short-term curtailments in response to in-season predictions of DS are inadequate to provide water during the time of need for several of the shortfall volumes predicted in 2021-2022
- Curtailments sufficient to provide water during the time of need would also provide water to reduce shortfalls in future dry years, but would result in additional flow past Milner in future wet years



Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition:

Irrigated Acres For SWC Members

EXHIBIT 13
Matthew Anders, P.G.
5/12/23
M&M Court Reporting Service
Reported by: Andrea Check

Presented to the SWC Methodology Technical Working Group by Matt Anders

February 19, 2015

Settlement Document Subject to I.R.E. 408

Irrigated Acres



- Goal: Calculate injury based on the number of acres irrigated by the SWC.



- Water Right
  - "This right is limited to the irrigation of 56,392 acres within the place of use described above in a single irrigation season."
  - Permissible Place of Use (PPU) allows irrigation companies flexibility to move water around and remove acres from irrigation and add them back later.

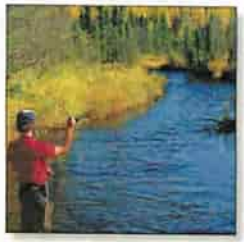




- In any given year, there is the potential for irrigation of less than the decreed acres.

Irrigated Acres









- Summary of irrigated acres:

SWC Member	2005-2007 SPF	2012 Partial Decrees	2013 SWC Submitted Shapefiles	2013 RISD
A&B		14,637 (2006 PD = 15,924)		15,924
AFRD2		62,361		62,361
Burley	44,715	47,643	46,084	44,715
Milner		13,335		13,335
Minidoka	70,144	75,093	74,112	70,144
NSCC		154,067		154,067
TFCC	183,589	196,162	194,778	183,589

Wildman Decision 2014









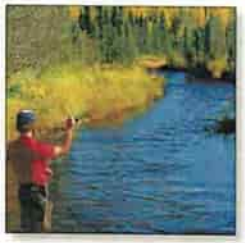
- http://idwr.idaho.gov/files/legal/CV-2010-382/CV-2010-382_20140926_Judgment.pdf
- Pg. 41: "if the Department is going to administer to less than the full amount of acres set forth on the face of the Coalition's Partial Decrees, such a determination must be supported by clear and convincing evidence".

IDAHO Department of Water Resources

IDWR

Shapefiles Submitted by SWC in 2013









- Non-irrigated urban areas, farmsteads, and subdivisions
- Overlaps and gaps
- Registration
- Land irrigated with supplemental GW is not segregated
- Examples in ArcMap…

Questions?

(208) 287-4932
matthew.anders@idwr.idaho.gov

EXHIBIT 325

IDAHO Department of Water Resources



Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC

Presented by Ethan Geisler, Kara Ferguson, & Matt Anders

December 1, 2022

IDAHO DEPARTMENT OF WATER RESOURCES

EXHIBIT 14
Matthew Anders, P.G.
5/12/23
M&M Court Reporting Service
Reported by: Andrea Check

IDWR SWC Website

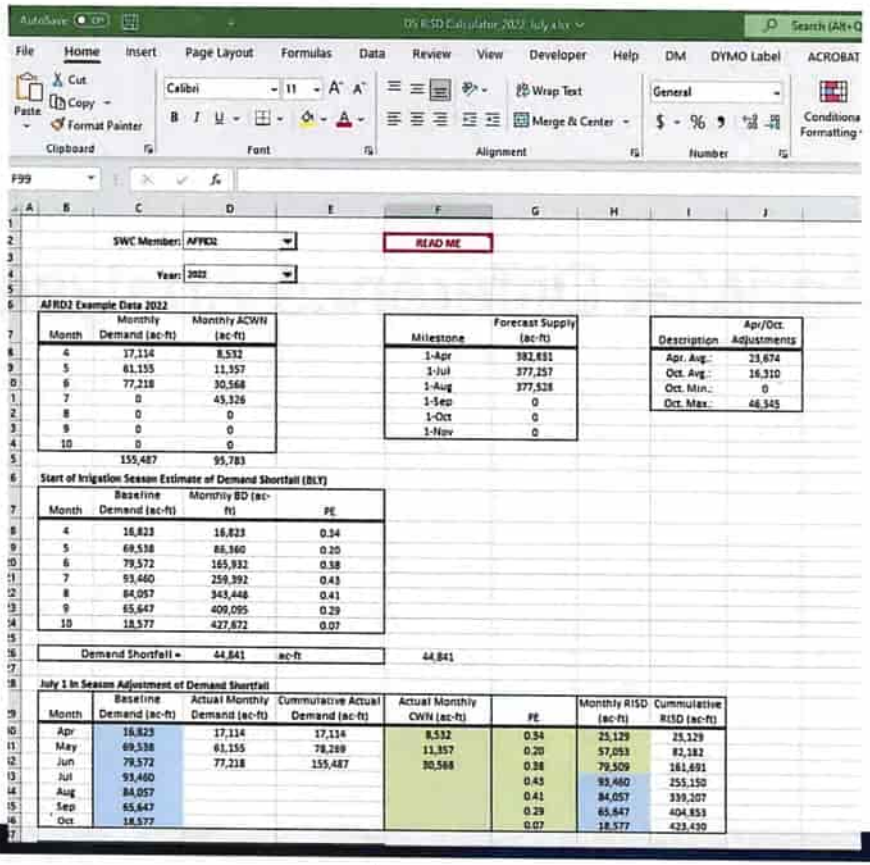
- SWC Delivery Call Related Documents
  - https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/

- 4th Amended Methodology Order
  - https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-DC-2010-001/CM-DC-2010-001-20160419-Fourth-Amended-Final-Order-Regarding-Methodology-for-Determining-Material-Injury-to-Reasonable-In-Season-Demand-and-Reasonable-Carryover.pdf

IDAHO Department of Water Resources

IDAHO WATER RESOURCES

SWC Demand Shortfall Calculator



SWC Member: AFRD2

Year: 2022

READ ME

AFRD2 Example Data 2022

Month	Monthly Demand (ac-ft)	Monthly ACWN (ac-ft)
4	17,114	8,532
5	61,155	11,357
6	77,218	30,568
7	0	45,326
8	0	0
9	0	0
10	0	0
	155,487	95,783

Milestone	Forecast Supply (ac-ft)
1-Apr	382,631
1-Jul	377,257
1-Aug	377,528
1-Sep	0
1-Oct	0
1-Nov	0

Description	Apr/Oct. Adjustments
Apr. Avg.:	23,674
Oct. Avg.:	16,310
Oct. Min.:	0
Oct. Max.:	46,345

Start of Irrigation Season Estimate of Demand Shortfall (BLY)

Month	Baseline Demand (ac-ft)	Monthly BD (ac-ft)	PE
4	16,823	16,823	0.34
5	69,538	86,360	0.20
6	79,572	165,932	0.38
7	93,460	259,392	0.43
8	84,057	343,448	0.41
9	65,647	409,095	0.29
10	18,577	427,672	0.07

Demand Shortfall = 44,841 ac-ft 44,841

July 1 In Season Adjustment of Demand Shortfall

Month	Baseline Demand (ac-ft)	Actual Monthly Demand (ac-ft)	Cummulative Actual Demand (ac-ft)	Actual Monthly CWN (ac-ft)	PE	Monthly RISD (ac-ft)	Cummulative RISD (ac-ft)
Apr	16,823	17,114	17,114	8,532	0.34	25,129	25,129
May	69,538	61,155	78,269	11,357	0.20	57,053	82,182
Jun	79,572	77,218	155,487	30,568	0.38	79,509	161,691
Jul	93,460				0.43	93,460	255,150
Aug	84,057				0.41	84,057	339,207
Sep	65,647				0.29	65,647	404,853
Oct	18,577				0.07	18,577	423,430

IDAHO Department of Water Resources

WATER RESOURCES

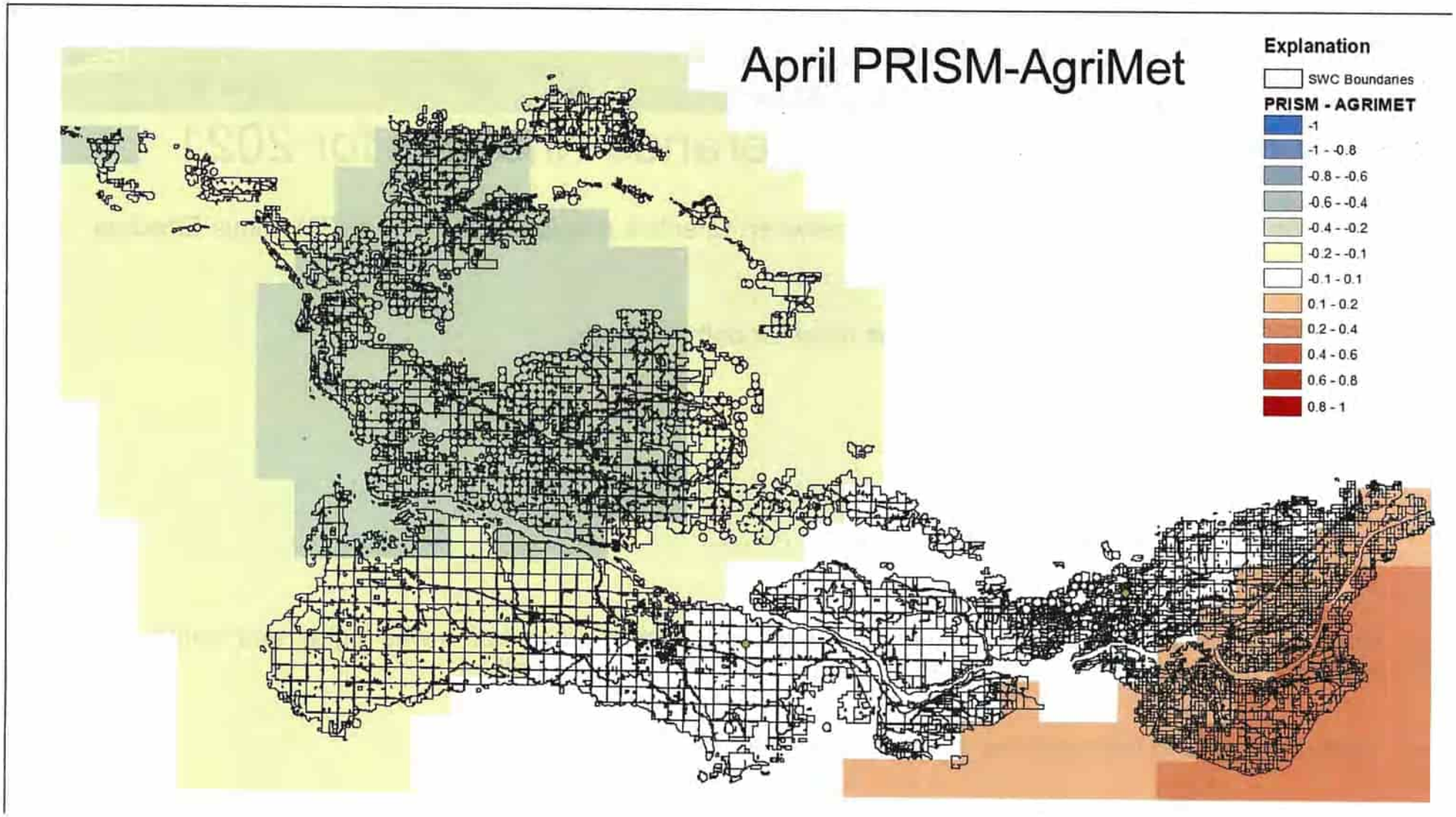
PRISM – AgriMet Difference Analysis for 2021

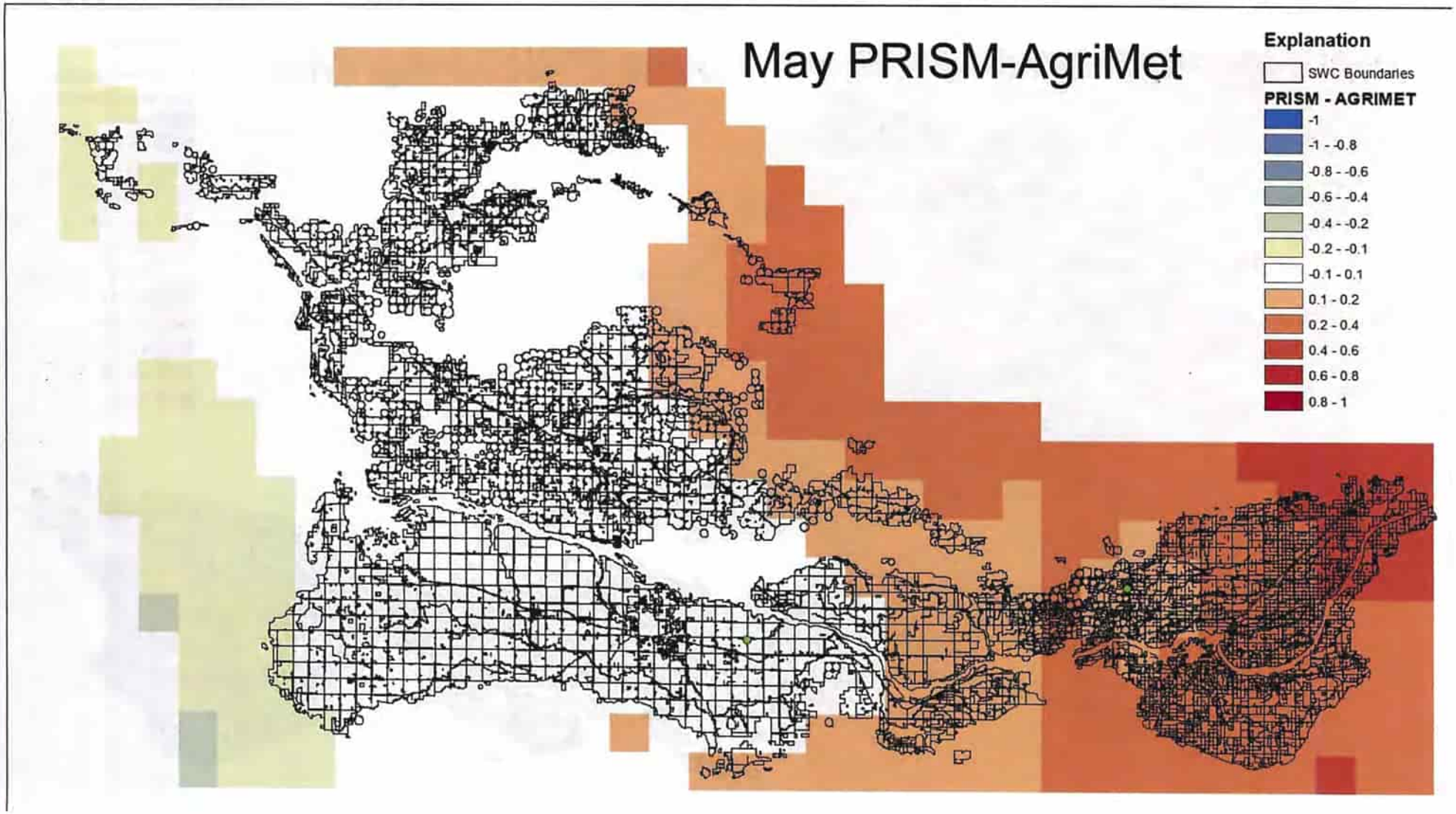
IDAHO Department of Water Resources

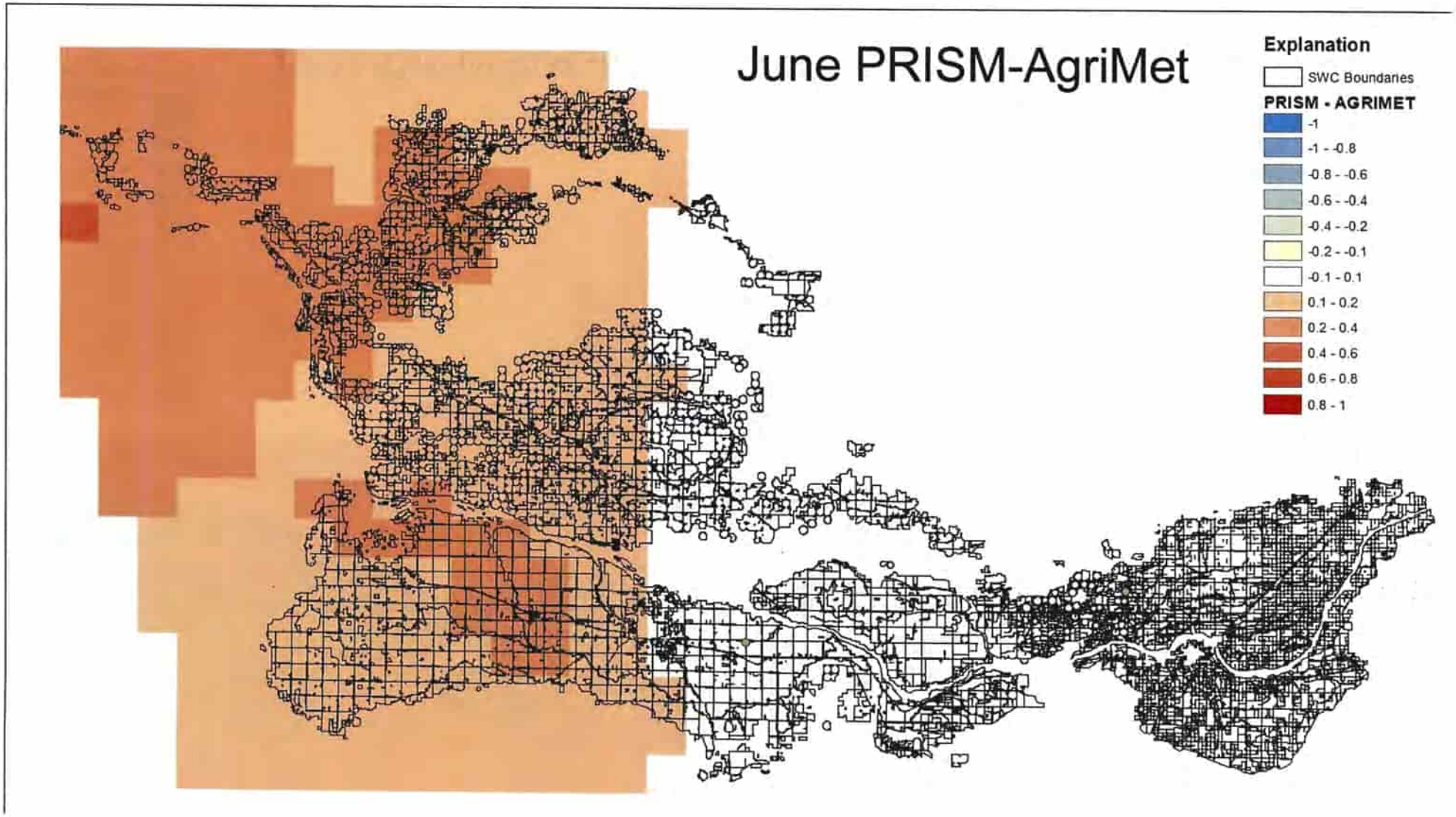
WATER RESOURCES

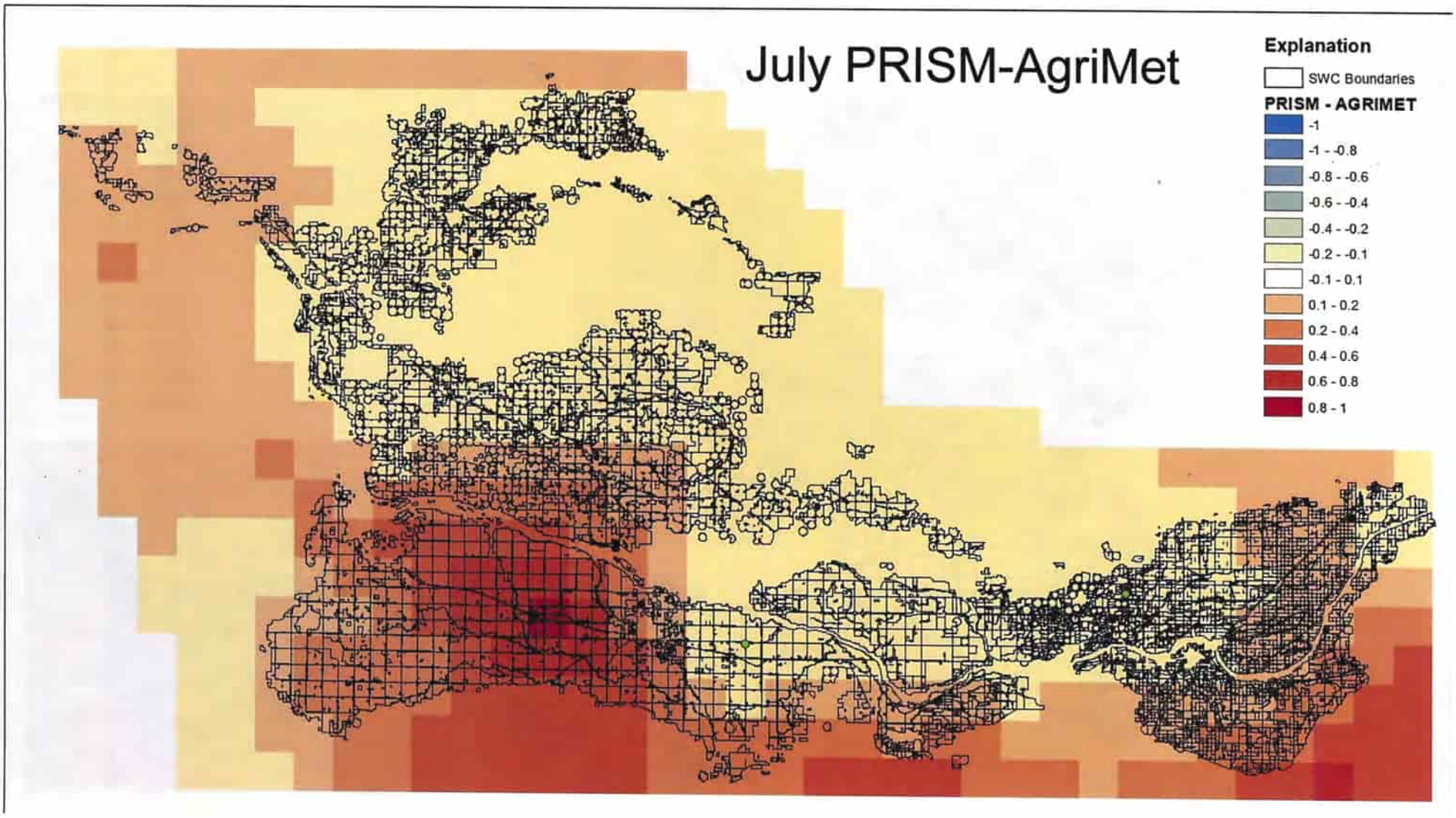
PRISM – AgriMet Difference Analysis for 2021

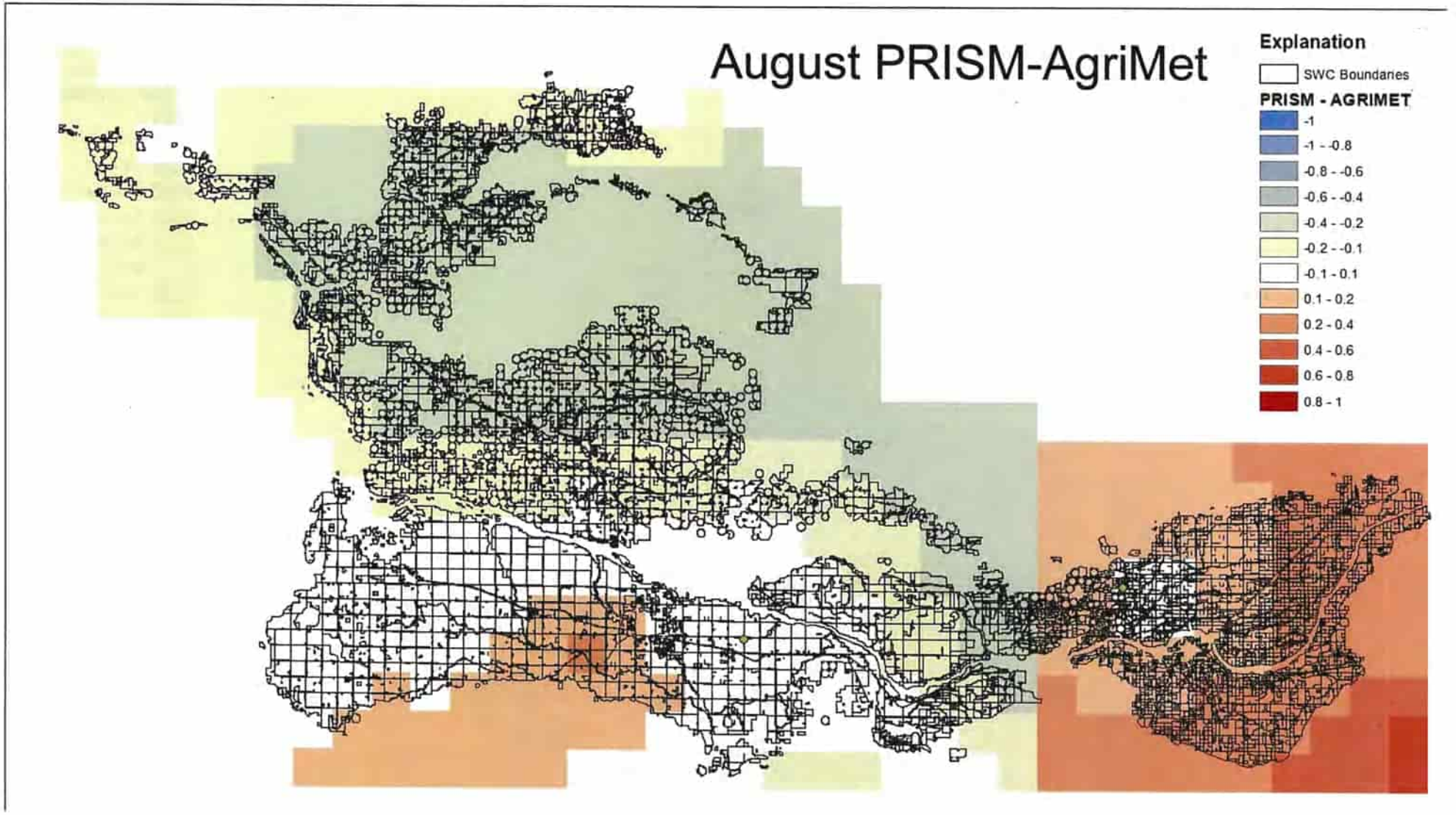
- Value (in inches) represent the difference between Effective precipitation from PRISM minus Effective Precipitation from AgriMet
- Same Effective precipitation method was used for both methods
- Twin Falls AgriMet was included for:
  - TFCC, AFRD2, NSCC, Milner
- Rupert AgriMet was included for:
  - A&B, Burley, MID
- Negative value in the graph below indicates Agrimet Effective precipitation was higher and would therefore decrease Crop Water Need more than PRISM for that month
- White background indicates the difference was between -0.1 and 0.1 inches

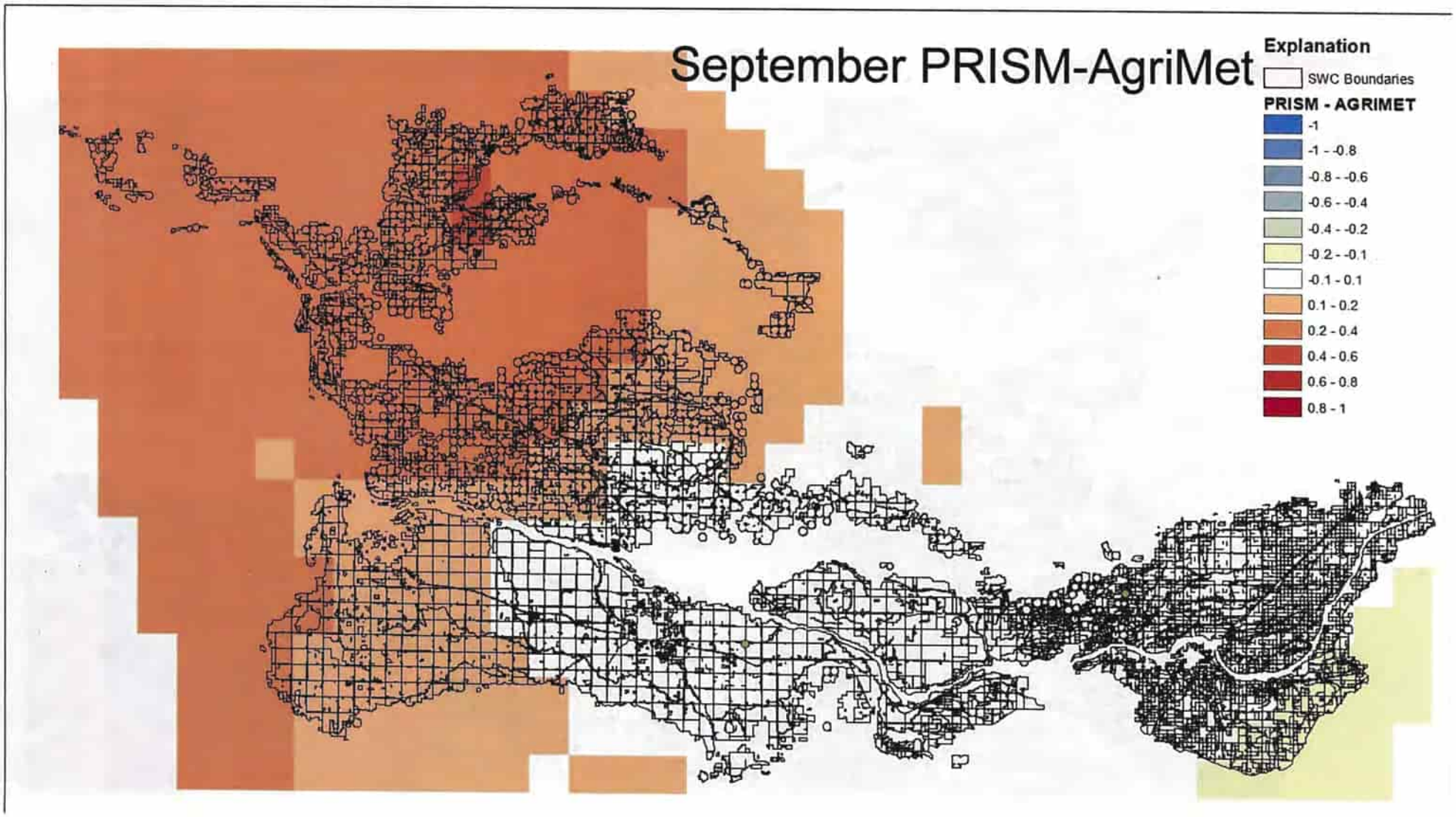

April PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1

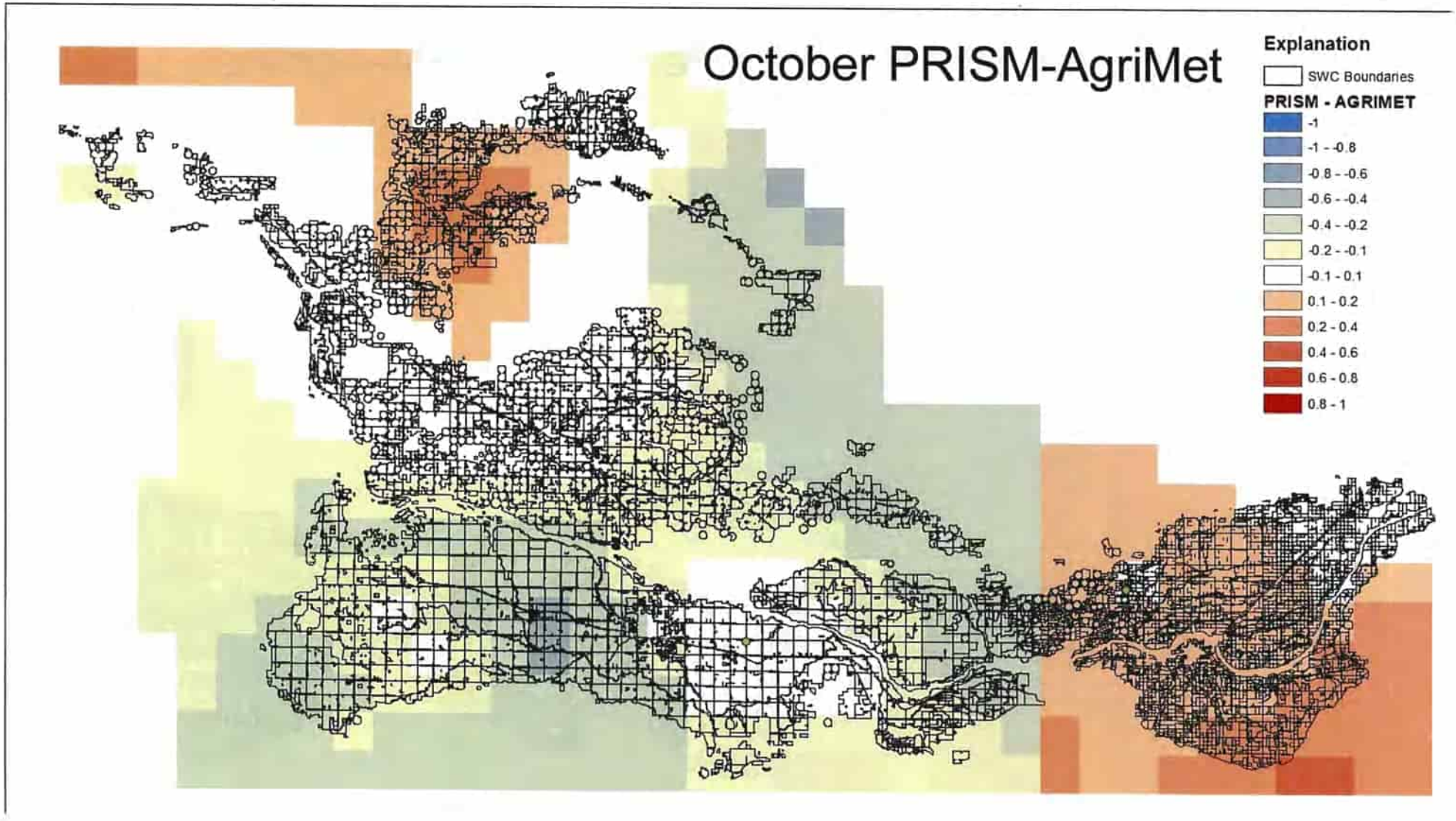

May PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


June PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


July PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


August PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


September PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


October PRISM-AgriMet
Explanation
SWC Boundaries
PRISM - AGRIMET
-1
-1 - -0.8
-0.8 - -0.6
-0.6 - -0.4
-0.4 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1

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WATER RESOURCES

SWC Irrigated Acres

Current Method Crop Water Need

$CWN_{crop} = (ET_{crop}$ - Effective Precipitation) * $Acres_{crop}$

- AgriMet ET
- Daily data from Rupert & Twin Falls stations.

- AgriMet Precipitation
- Daily data from Rupert & Twin Falls stations.
- Calculate monthly effective precipitation.

- USDA Crop Data Layer (CDL)
- Remove data speckling and assign the majority crop in each polygon.
- Remove non-irrigated land from CDL using the IDWR Irrigated Lands Dataset.
- Clip CDL to SWC service areas.
- Determine the 3-year average crop mix percentage
- Acres of Each Crop = Crop Mix % * Acres From Methodology

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WATER RESOURCES

Proposed Method NRT METRIC Crop Water Need

CWN = (ET - Effective Precipitation) * Acres

- NRT METRIC
- Remove non-irrigated land
- Normalize "ET – Effective Precipitation" to AF/Acre for each SWC member

- Irrigated acres from methodology

- Oregon State University Prism Precipitation
- Calculate monthly effective precipitation

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SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	CDL Processing Acres (2021)	NRT METRIC Processing Acres (2021)	Methodology Acres
A&B	PPU	2010	21,972	22,025	21,625	15,924
AFRD2	PPU	2010	69,077	69,105	68,384	62,361
Burley	SWC	2013	46,035	46,167	44,139	46,035
Milner	PPU	2010	13,264	13,302	13,233	13,335
Minidoka	SWC	2022	74,849	75,136	71,073	75,060
NSCC	PPU	2010	224,463	224,684	220,937	154,067
TFCC	SWC	2013	194,727	195,342	179,456	194,732

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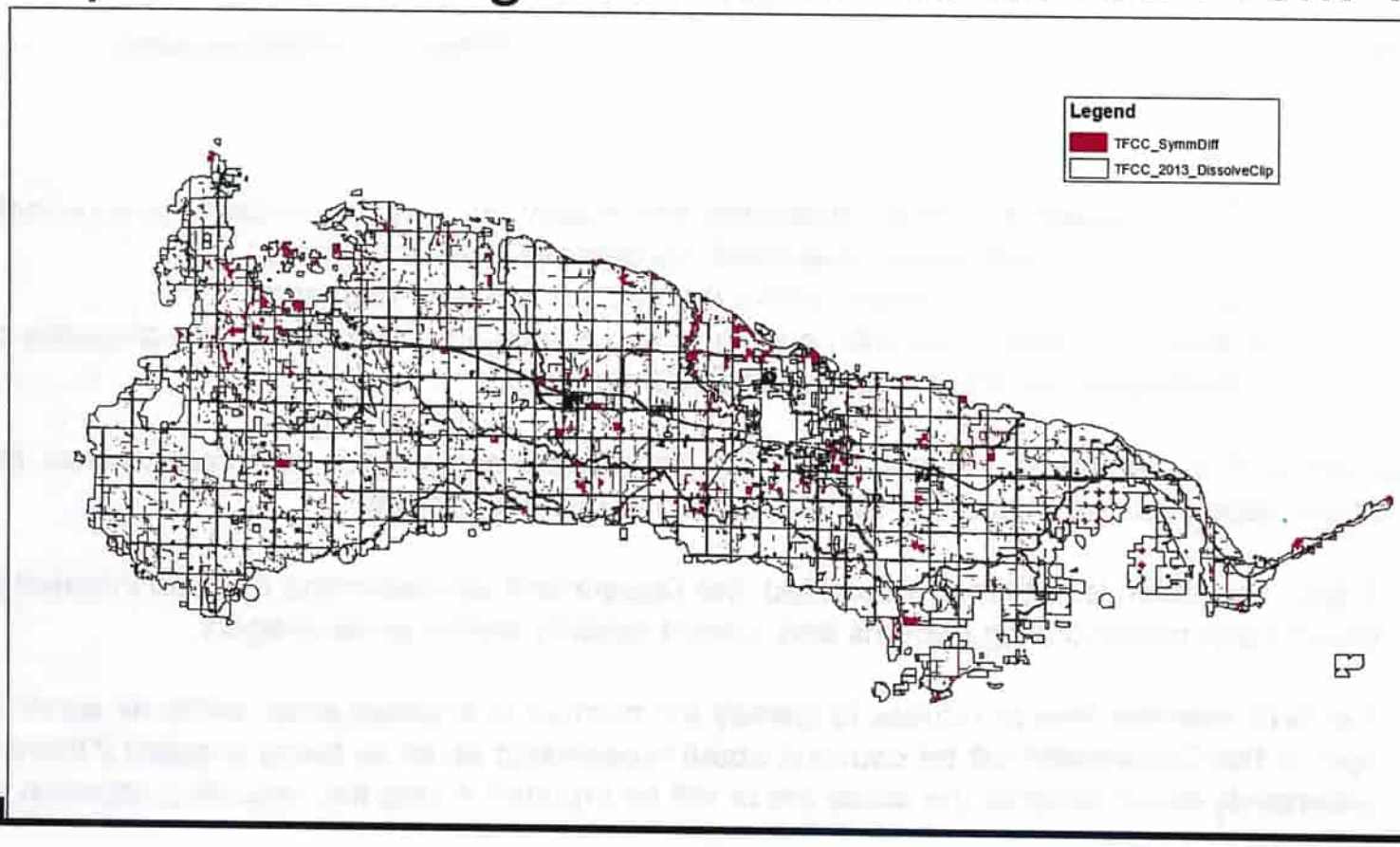
WATER RESOURCES

Example – Non-Irrigated Acres Removed From TFCC



Methodology Reference

- Irrigated Acres (Page 35 of Methodology)
  - Step 1:
    - Department staff will review submitted shapefiles and modify them as necessary to ensure that:
      - (1) the total acreage count does not exceed the decreed number of acres;
      - (2) all of the irrigated land is located within the decreed place of use; and
      - (3) acres are not counted more than once due to overlapping polygons within a shapefile or between shapefiles submitted by different SWC members.
    - Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department.
      - If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery.
      - If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season.

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SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	If Remove Non-Irrigated Acres with 2011 Irrigated lands Dataset	If Remove Non-Irrigated Acres with 2017 Irrigated lands Dataset	Methodology Acres
A&B	PPU	2010	21,972	21,585	21,634	15,924
AFRD2	PPU	2010	69,077	68,368	66,606	62,361
Burley	SWC	2013	46,035	44,113	44,168	46,035
Milner	PPU	2010	13,264	13,239	13,202	13,335
Minidoka	SWC	2022	74,849	71,295	72,016	75,060
NSCC	PPU	2010	224,463	220,953	218,498	154,067
TFCC	SWC	2013	194,727	179,486	180,956	194,732

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SWC Irrigated Acres

- IDWR Irrigated Lands Datasets
  - 2010-2017
  - 2021 complete in 2024?

Questions?

(208) 287-4816
ethan.geisler@idwr.idaho.gov

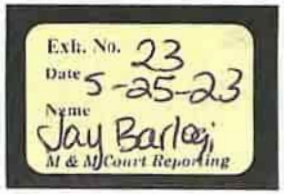
EXHIBIT 332

990	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

1991	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

1992	April	May	June	July	August	September	October
1	0.75	0.75	0.5	0.5	0.5	0.5	ALT
2	0.75	0.75	0.5	0.5	0.5	0.5	ALT
3	0.75	0.75	0.5	0.5	0.5	0.5	ALT
4	0.75	0.625	0.5	0.5	0.5	0.5	ALT
5	0.75	0.625	0.5	0.5	0.5	0.5	ALT
6	0.75	0.625	0.5	0.5	0.5	0.5	ALT
7	0.75	0.625	0.5	0.5	0.5	ALT	ALT
8	0.75	0.625	0.5	0.5	0.5	ALT	ALT
9	0.75	0.625	0.5	0.5	0.5	ALT	ALT
10	0.75	0.625	0.5	0.5	0.5	ALT	ALT
11	0.75	0.625	0.5	0.5	0.5	ALT	ALT
12	0.75	0.625	0.5	0.5	0.5	ALT	ALT
13	0.75	0.625	0.5	0.5	0.5	ALT	ALT
14	0.75	0.625	0.5	0.5	0.5	ALT	ALT
15	0.75	0.625	0.5	0.5	0.5	ALT	ALT
16	0.75	0.625	0.5	0.5	0.5	ALT	ALT
17	0.75	0.625	0.5	0.5	0.5	ALT	ALT
18	0.75	0.5	0.5	0.5	0.5	ALT	ALT
19	0.75	0.5	0.5	0.5	0.5	ALT	ALT
20	0.75	0.5	0.5	0.5	0.5	ALT	ALT
21	0.75	0.5	0.5	0.5	0.5	ALT	ALT
22	0.75	0.5	0.5	0.5	0.5	ALT	ALT
23	0.75	0.5	0.5	0.5	0.5	ALT	ALT
24	0.75	0.5	0.5	0.5	0.5	ALT	ALT
25	0.75	0.5	0.5	0.5	0.5	ALT	ALT
26	0.75	0.5	0.5	0.5	0.5	ALT	ALT
27	0.75	0.5	0.5	0.5	0.5	ALT	ALT
28	0.75	0.5	0.5	0.5	0.5	ALT	ALT
29	0.75	0.5	0.5	0.5	0.5	ALT	ALT
30	0.75	0.5	0.5	0.5	0.5	ALT	ALT
31	0.75	0.5		0.5	0.5		ALT

1993	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75



994							
	April	May	June	July	August	September	October
1	0.75	0.75	0.625	0.625	0.625	0.625	0.625
2	0.75	0.75	0.625	0.625	0.625	0.625	0.625
3	0.75	0.75	0.625	0.625	0.625	0.625	0.625
4	0.75	0.75	0.625	0.625	0.625	0.625	0.625
5	0.75	0.75	0.625	0.625	0.625	0.625	0.625
6	0.75	0.75	0.625	0.625	0.625	0.625	0.625
7	0.75	0.75	0.625	0.625	0.625	0.625	0.625
8	0.75	0.75	0.625	0.625	0.625	0.625	0.625
9	0.75	0.625	0.625	0.625	0.625	0.625	0.625
10	0.75	0.625	0.625	0.625	0.625	0.625	0.625
11	0.75	0.625	0.625	0.625	0.625	0.625	0.625
12	0.75	0.625	0.625	0.625	0.625	0.625	0.625
13	0.75	0.625	0.625	0.625	0.625	0.625	0.625
14	0.75	0.625	0.625	0.625	0.625	0.625	0.625
15	0.75	0.625	0.625	0.625	0.625	0.625	0.625
16	0.75	0.625	0.625	0.625	0.625	0.625	0.625
17	0.75	0.625	0.625	0.625	0.625	0.625	0.625
18	0.75	0.625	0.625	0.625	0.625	0.625	0.625
19	0.75	0.625	0.625	0.625	0.625	0.625	0.625
20	0.75	0.625	0.625	0.625	0.625	0.625	0.625
21	0.75	0.625	0.625	0.625	0.625	0.625	0.625
22	0.75	0.625	0.625	0.625	0.625	0.625	0.625
23	0.75	0.625	0.625	0.625	0.625	0.625	0.625
24	0.75	0.625	0.625	0.625	0.625	0.625	0.625
25	0.75	0.625	0.625	0.625	0.625	0.625	0.625
26	0.75	0.625	0.625	0.625	0.625	0.625	0.625
27	0.75	0.625	0.625	0.625	0.625	0.625	0.625
28	0.75	0.625	0.625	0.625	0.625	0.625	0.625
29	0.75	0.625	0.625	0.625	0.625	0.625	0.625
30	0.75	0.625	0.625	0.625	0.625	0.625	0.625
31		0.625		0.625	0.625		0.625

1995							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

1996							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

1997							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

998							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

1999							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2000							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2001							
	April	May	June	July	August	September	October
1	0.75	0.75	0.625	0.625	0.5	0.5	0.5
2	0.75	0.75	0.625	0.625	0.5	0.5	0.5
3	0.75	0.75	0.625	0.625	0.5	0.5	0.5
4	0.75	0.75	0.625	0.625	0.5	0.5	0.5
5	0.75	0.75	0.625	0.625	0.5	0.5	0.5
6	0.75	0.75	0.625	0.625	0.5	0.5	0.5
7	0.75	0.75	0.625	0.625	0.5	0.5	0.5
8	0.75	0.75	0.625	0.625	0.5	0.5	0.5
9	0.75	0.75	0.625	0.625	0.5	0.5	0.5
10	0.75	0.75	0.625	0.625	0.5	0.5	0.5
11	0.75	0.75	0.625	0.5	0.5	0.5	0.5
12	0.75	0.75	0.625	0.5	0.5	0.5	0.5
13	0.75	0.75	0.625	0.5	0.5	0.5	0.5
14	0.75	0.75	0.625	0.5	0.5	0.5	0.5
15	0.75	0.75	0.625	0.5	0.5	0.5	0.5
16	0.75	0.75	0.625	0.5	0.5	0.5	0.5
17	0.75	0.75	0.625	0.5	0.5	0.5	0.5
18	0.75	0.75	0.625	0.5	0.5	0.5	0.5
19	0.75	0.75	0.625	0.5	0.5	0.5	0.5
20	0.75	0.75	0.625	0.5	0.5	0.5	0.5
21	0.75	0.75	0.625	0.5	0.5	0.5	0.5
22	0.75	0.75	0.625	0.5	0.5	0.5	0.5
23	0.75	0.75	0.625	0.5	0.5	0.5	0.5
24	0.75	0.75	0.625	0.5	0.5	0.5	0.5
25	0.75	0.75	0.625	0.5	0.5	0.5	0.5
26	0.75	0.75	0.625	0.5	0.5	0.5	0.5
27	0.75	0.75	0.625	0.5	0.5	0.5	0.5
28	0.75	0.75	0.625	0.5	0.5	0.5	0.5
29	0.75	0.75	0.625	0.5	0.5	0.5	0.5
30	0.75	0.75	0.625	0.5	0.5	0.5	0.5
31		0.75		0.5	0.5		0.5

2002	April	May	June	July	August	September	October
1	0.625	0.625	0.625	0.625	0.625	0.625	0.625
2	0.625	0.625	0.625	0.625	0.625	0.625	0.625
3	0.625	0.625	0.625	0.625	0.625	0.625	0.625
4	0.625	0.625	0.625	0.625	0.625	0.625	0.625
5	0.625	0.625	0.625	0.625	0.625	0.625	0.625
6	0.625	0.625	0.625	0.625	0.625	0.625	0.625
7	0.625	0.625	0.625	0.625	0.625	0.625	0.625
8	0.625	0.625	0.625	0.625	0.625	0.625	0.625
9	0.625	0.625	0.625	0.625	0.625	0.625	0.625
10	0.625	0.625	0.625	0.625	0.625	0.625	0.625
11	0.625	0.625	0.625	0.625	0.625	0.625	0.625
12	0.625	0.625	0.625	0.625	0.625	0.625	0.625
13	0.625	0.625	0.625	0.625	0.625	0.625	0.625
14	0.625	0.625	0.625	0.625	0.625	0.625	0.625
15	0.625	0.625	0.625	0.625	0.625	0.625	0.625
16	0.625	0.625	0.625	0.625	0.625	0.625	0.625
17	0.625	0.625	0.625	0.625	0.625	0.625	0.625
18	0.625	0.625	0.625	0.625	0.625	0.625	0.625
19	0.625	0.625	0.625	0.625	0.625	0.625	0.625
20	0.625	0.625	0.625	0.625	0.625	0.625	0.625
21	0.625	0.625	0.625	0.625	0.625	0.625	0.625
22	0.625	0.625	0.625	0.625	0.625	0.625	0.625
23	0.625	0.625	0.625	0.625	0.625	0.625	0.625
24	0.625	0.625	0.625	0.625	0.625	0.625	0.625
25	0.625	0.625	0.625	0.625	0.625	0.625	0.625
26	0.625	0.625	0.625	0.625	0.625	0.625	0.625
27	0.625	0.625	0.625	0.625	0.625	0.625	0.625
28	0.625	0.625	0.625	0.625	0.625	0.625	0.625
29	0.625	0.625	0.625	0.625	0.625	0.625	0.625
30	0.625	0.625	0.625	0.625	0.625	0.625	0.625
31		0.625		0.625	0.625		0.625

2003	April	May	June	July	August	September	October
1	0.625	0.625	0.625	0.625	0.625	0.625	0.625
2	0.625	0.625	0.625	0.625	0.625	0.625	0.625
3	0.625	0.625	0.625	0.625	0.625	0.625	0.625
4	0.625	0.625	0.625	0.625	0.625	0.625	0.625
5	0.625	0.625	0.625	0.625	0.625	0.625	0.625
6	0.625	0.625	0.625	0.625	0.625	0.625	0.625
7	0.625	0.625	0.625	0.625	0.625	0.625	0.625
8	0.625	0.625	0.625	0.625	0.625	0.625	0.625
9	0.625	0.625	0.625	0.625	0.625	0.625	0.625
10	0.625	0.625	0.625	0.625	0.625	0.625	0.625
11	0.625	0.625	0.625	0.625	0.625	0.625	0.625
12	0.625	0.625	0.625	0.625	0.625	0.625	0.625
13	0.625	0.625	0.625	0.625	0.625	0.625	0.625
14	0.625	0.625	0.625	0.625	0.625	0.625	0.625
15	0.625	0.625	0.625	0.625	0.625	0.625	0.625
16	0.625	0.625	0.625	0.625	0.625	0.625	0.625
17	0.625	0.625	0.625	0.625	0.625	0.625	0.625
18	0.625	0.625	0.625	0.625	0.625	0.625	0.625
19	0.625	0.625	0.625	0.625	0.625	0.625	0.625
20	0.625	0.625	0.625	0.625	0.625	0.625	0.625
21	0.625	0.625	0.625	0.625	0.625	0.625	0.625
22	0.625	0.625	0.625	0.625	0.625	0.625	0.625
23	0.625	0.625	0.625	0.625	0.625	0.625	0.625
24	0.625	0.625	0.625	0.625	0.625	0.625	0.625
25	0.625	0.625	0.625	0.625	0.625	0.625	0.625
26	0.625	0.625	0.625	0.625	0.625	0.625	0.625
27	0.625	0.625	0.625	0.625	0.625	0.625	0.625
28	0.625	0.625	0.625	0.625	0.625	0.625	0.625
29	0.625	0.625	0.625	0.625	0.625	0.625	0.625
30	0.625	0.625	0.625	0.625	0.625	0.625	0.625
31		0.625		0.625	0.625		0.625

2004	April	May	June	July	August	September	October
1	0.625	0.625	0.625	0.5	0.5	0.5	0.5
2	0.625	0.625	0.625	0.5	0.5	0.5	0.5
3	0.625	0.625	0.625	0.5	0.5	0.5	0.5
4	0.625	0.625	0.625	0.5	0.5	0.5	0.5
5	0.625	0.625	0.625	0.5	0.5	0.5	0.5
6	0.625	0.625	0.625	0.5	0.5	0.5	0.5
7	0.625	0.625	0.625	0.5	0.5	0.5	0.5
8	0.625	0.625	0.625	0.5	0.5	0.5	0.5
9	0.625	0.625	0.625	0.5	0.5	0.5	0.5
10	0.625	0.625	0.625	0.5	0.5	0.5	0.5
11	0.625	0.625	0.625	0.5	0.5	0.5	0.5
12	0.625	0.625	0.625	0.5	0.5	0.5	0.5
13	0.625	0.625	0.625	0.5	0.5	0.5	0.5
14	0.625	0.625	0.625	0.5	0.5	0.5	0.5
15	0.625	0.625	0.625	0.5	0.5	0.5	0.5
16	0.625	0.625	0.625	0.5	0.5	0.5	0.5
17	0.625	0.625	0.625	0.5	0.5	0.5	0.5
18	0.625	0.625	0.625	0.5	0.5	0.5	0.5
19	0.625	0.625	0.625	0.5	0.5	0.5	0.5
20	0.625	0.625	0.625	0.5	0.5	0.5	0.5
21	0.625	0.625	0.5	0.5	0.5	0.5	0.5
22	0.625	0.625	0.5	0.5	0.5	0.5	0.5
23	0.625	0.625	0.5	0.5	0.5	0.5	0.5
24	0.625	0.625	0.5	0.5	0.5	0.5	0.5
25	0.625	0.625	0.5	0.5	0.5	0.5	0.5
26	0.625	0.625	0.5	0.5	0.5	0.5	0.5
27	0.625	0.625	0.5	0.5	0.5	0.5	0.5
28	0.625	0.625	0.5	0.5	0.5	0.5	0.5
29	0.625	0.625	0.5	0.5	0.5	0.5	0.5
30	0.625	0.625	0.5	0.5	0.5	0.5	0.5
31		0.625		0.5	0.5		0.5

2005	April	May	June	July	August	September	October
1	0.625	0.625	0.625	0.625	0.625	0.625	0.625
2	0.625	0.625	0.625	0.625	0.625	0.625	0.625
3	0.625	0.625	0.625	0.625	0.625	0.625	0.625
4	0.625	0.625	0.625	0.625	0.625	0.625	0.625
5	0.625	0.625	0.625	0.625	0.625	0.625	0.625
6	0.625	0.625	0.625	0.625	0.625	0.625	0.625
7	0.625	0.625	0.625	0.625	0.625	0.625	0.625
8	0.625	0.625	0.625	0.625	0.625	0.625	0.625
9	0.625	0.625	0.625	0.625	0.625	0.625	0.625
10	0.625	0.625	0.625	0.625	0.625	0.625	0.625
11	0.625	0.625	0.625	0.625	0.625	0.625	0.625
12	0.625	0.625	0.625	0.625	0.625	0.625	0.625
13	0.625	0.625	0.625	0.625	0.625	0.625	0.625
14	0.625	0.625	0.625	0.625	0.625	0.625	0.625
15	0.625	0.625	0.625	0.625	0.625	0.625	0.625
16	0.625	0.625	0.625	0.625	0.625	0.625	0.625
17	0.625	0.625	0.625	0.625	0.625	0.625	0.625
18	0.625	0.625	0.625	0.625	0.625	0.625	0.625
19	0.625	0.625	0.625	0.625	0.625	0.625	0.625
20	0.625	0.625	0.625	0.625	0.625	0.625	0.625
21	0.625	0.625	0.625	0.625	0.625	0.625	0.625
22	0.625	0.625	0.625	0.625	0.625	0.625	0.625
23	0.625	0.625	0.625	0.625	0.625	0.625	0.625
24	0.625	0.625	0.625	0.625	0.625	0.625	0.625
25	0.625	0.625	0.625	0.625	0.625	0.625	0.625
26	0.625	0.625	0.625	0.625	0.625	0.625	0.625
27	0.625	0.625	0.625	0.625	0.625	0.625	0.625
28	0.625	0.625	0.625	0.625	0.625	0.625	0.625
29	0.625	0.625	0.625	0.625	0.625	0.625	0.625
30	0.625	0.625	0.625	0.625	0.625	0.625	0.625
31		0.625		0.625	0.625		0.625

2006	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2007	April	May	June	July	August	September	October
1	0.625	0.625	0.625	0.625	0.625	0.625	0.625
2	0.625	0.625	0.625	0.625	0.625	0.625	0.625
3	0.625	0.625	0.625	0.625	0.625	0.625	0.625
4	0.625	0.625	0.625	0.625	0.625	0.625	0.625
5	0.625	0.625	0.625	0.625	0.625	0.625	0.625
6	0.625	0.625	0.625	0.625	0.625	0.625	0.625
7	0.625	0.625	0.625	0.625	0.625	0.625	0.625
8	0.625	0.625	0.625	0.625	0.625	0.625	0.625
9	0.625	0.625	0.625	0.625	0.625	0.625	0.625
10	0.625	0.625	0.625	0.625	0.625	0.625	0.625
11	0.625	0.625	0.625	0.625	0.625	0.625	0.625
12	0.625	0.625	0.625	0.625	0.625	0.625	0.625
13	0.625	0.625	0.625	0.625	0.625	0.625	0.625
14	0.625	0.625	0.625	0.625	0.625	0.625	0.625
15	0.625	0.625	0.625	0.625	0.625	0.625	0.625
16	0.625	0.625	0.625	0.625	0.625	0.625	0.625
17	0.625	0.625	0.625	0.625	0.625	0.625	0.625
18	0.625	0.625	0.625	0.625	0.625	0.625	0.625
19	0.625	0.625	0.625	0.625	0.625	0.625	0.625
20	0.625	0.625	0.625	0.625	0.625	0.625	0.625
21	0.625	0.625	0.625	0.625	0.625	0.625	0.625
22	0.625	0.625	0.625	0.625	0.625	0.625	0.625
23	0.625	0.625	0.625	0.625	0.625	0.625	0.625
24	0.625	0.625	0.625	0.625	0.625	0.625	0.625
25	0.625	0.625	0.625	0.625	0.625	0.625	0.625
26	0.625	0.625	0.625	0.625	0.625	0.625	0.625
27	0.625	0.625	0.625	0.625	0.625	0.625	0.625
28	0.625	0.625	0.625	0.625	0.625	0.625	0.625
29	0.625	0.625	0.625	0.625	0.625	0.625	0.625
30	0.625	0.625	0.625	0.625	0.625	0.625	0.625
31		0.625		0.625	0.625		0.625

2008	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2009	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2010							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2011							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2012							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.625	0.625	
2	0.75	0.75	0.75	0.75	0.625	0.625	
3	0.75	0.75	0.75	0.75	0.625	0.625	
4	0.75	0.75	0.75	0.75	0.625	0.625	
5	0.75	0.75	0.75	0.75	0.625	0.625	
6	0.75	0.75	0.75	0.75	0.625	0.625	
7	0.75	0.75	0.75	0.75	0.625	0.625	
8	0.75	0.75	0.75	0.75	0.625	0.625	
9	0.75	0.75	0.75	0.75	0.625	0.625	
10	0.75	0.75	0.75	0.75	0.625	0.625	
11	0.75	0.75	0.75	0.75	0.625	0.625	
12	0.75	0.75	0.75	0.75	0.625	0.625	
13	0.75	0.75	0.75	0.75	0.625	0.625	
14	0.75	0.75	0.75	0.75	0.625	0.625	
15	0.75	0.75	0.75	0.75	0.625	0.625	
16	0.75	0.75	0.75	0.625	0.625	0.625	
17	0.75	0.75	0.75	0.625	0.625	0.625	
18	0.75	0.75	0.75	0.625	0.625	0.625	
19	0.75	0.75	0.75	0.625	0.625	0.625	
20	0.75	0.75	0.75	0.625	0.625	0.625	
21	0.75	0.75	0.75	0.625	0.625	0.625	
22	0.75	0.75	0.75	0.625	0.625	0.625	
23	0.75	0.75	0.75	0.625	0.625	0.625	
24	0.75	0.75	0.75	0.625	0.625	0.625	
25	0.75	0.75	0.75	0.625	0.625	0.625	
26	0.75	0.75	0.75	0.625	0.625	0.625	
27	0.75	0.75	0.75	0.625	0.625	0.625	
28	0.75	0.75	0.75	0.625	0.625	0.625	
29	0.75	0.75	0.75	0.625	0.625	0.625	
30	0.75	0.75	0.75	0.625	0.625	0.625	
31		0.75		0.625	0.625		

2013							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.625	0.625	0.625	0.75
2	0.75	0.75	0.75	0.625	0.625	0.625	0.75
3	0.75	0.75	0.75	0.625	0.625	0.625	0.75
4	0.75	0.75	0.75	0.625	0.625	0.625	0.75
5	0.75	0.75	0.75	0.625	0.625	0.625	0.75
6	0.75	0.75	0.75	0.625	0.625	0.625	0.75
7	0.75	0.75	0.75	0.625	0.625	0.625	0.75
8	0.75	0.75	0.75	0.625	0.625	0.625	0.75
9	0.75	0.75	0.75	0.625	0.625	0.625	0.75
10	0.75	0.75	0.75	0.625	0.625	0.625	0.75
11	0.75	0.75	0.75	0.625	0.625	0.625	0.75
12	0.75	0.75	0.75	0.625	0.625	0.625	0.75
13	0.75	0.75	0.75	0.625	0.625	0.625	0.75
14	0.75	0.75	0.75	0.625	0.625	0.625	0.75
15	0.75	0.75	0.75	0.625	0.625	0.625	0.75
16	0.75	0.75	0.75	0.625	0.625	0.625	0.75
17	0.75	0.75	0.625	0.625	0.625	0.625	0.75
18	0.75	0.75	0.625	0.625	0.625	0.625	0.75
19	0.75	0.75	0.625	0.625	0.625	0.625	0.75
20	0.75	0.75	0.625	0.625	0.625	0.625	0.75
21	0.75	0.75	0.625	0.625	0.625	0.625	0.75
22	0.75	0.75	0.625	0.625	0.625	0.625	0.75
23	0.75	0.75	0.625	0.625	0.625	0.625	0.75
24	0.75	0.75	0.625	0.625	0.625	0.625	0.75
25	0.75	0.75	0.625	0.625	0.625	0.625	0.75
26	0.75	0.75	0.625	0.625	0.625	0.625	0.75
27	0.75	0.75	0.625	0.625	0.625	0.625	0.75
28	0.75	0.75	0.625	0.625	0.625	0.625	0.75
29	0.75	0.75	0.625	0.625	0.625	0.625	0.75
30	0.75	0.75	0.625	0.625	0.625	0.625	0.75
31		0.75		0.625	0.625		0.75

2014							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.625
2	0.75	0.75	0.75	0.75	0.75	0.75	0.625
3	0.75	0.75	0.75	0.75	0.75	0.75	0.625
4	0.75	0.75	0.75	0.75	0.75	0.75	0.625
5	0.75	0.75	0.75	0.75	0.75	0.75	0.625
6	0.75	0.75	0.75	0.75	0.75	0.75	0.625
7	0.75	0.75	0.75	0.75	0.75	0.75	0.625
8	0.75	0.75	0.75	0.75	0.75	0.75	0.625
9	0.75	0.75	0.75	0.75	0.75	0.75	0.625
10	0.75	0.75	0.75	0.75	0.75	0.75	0.625
11	0.75	0.75	0.75	0.75	0.75	0.75	0.625
12	0.75	0.75	0.75	0.75	0.75	0.75	0.625
13	0.75	0.75	0.75	0.75	0.75	0.75	0.625
14	0.75	0.75	0.75	0.75	0.75	0.75	0.625
15	0.75	0.75	0.75	0.75	0.75	0.75	0.625
16	0.75	0.75	0.75	0.75	0.75	0.75	0.625
17	0.75	0.75	0.75	0.75	0.75	0.75	0.625
18	0.75	0.75	0.75	0.75	0.75	0.75	0.625
19	0.75	0.75	0.75	0.75	0.75	0.75	0.625
20	0.75	0.75	0.75	0.75	0.75	0.75	0.625
21	0.75	0.75	0.75	0.75	0.75	0.75	0.625
22	0.75	0.75	0.75	0.75	0.75	0.75	0.625
23	0.75	0.75	0.75	0.75	0.75	0.75	0.625
24	0.75	0.75	0.75	0.75	0.75	0.75	0.625
25	0.75	0.75	0.75	0.75	0.75	0.75	0.625
26	0.75	0.75	0.75	0.75	0.75	0.75	0.625
27	0.75	0.75	0.75	0.75	0.75	0.75	0.625
28	0.75	0.75	0.75	0.75	0.75	0.75	0.625
29	0.75	0.75	0.75	0.75	0.75	0.75	0.625
30	0.75	0.75	0.75	0.75	0.75	0.75	0.625
31		0.75		0.75	0.75		0.625

2015							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2016							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2017							
	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75
31		0.75		0.75	0.75		0.75

2018	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75

2019	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75

2020	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2	0.75	0.75	0.75	0.75	0.75	0.75	0.75
3	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
5	0.75	0.75	0.75	0.75	0.75	0.75	0.75
6	0.75	0.75	0.75	0.75	0.75	0.75	0.75
7	0.75	0.75	0.75	0.75	0.75	0.75	0.75
8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
9	0.75	0.75	0.75	0.75	0.75	0.75	0.75
10	0.75	0.75	0.75	0.75	0.75	0.75	0.75
11	0.75	0.75	0.75	0.75	0.75	0.75	0.75
12	0.75	0.75	0.75	0.75	0.75	0.75	0.75
13	0.75	0.75	0.75	0.75	0.75	0.75	0.75
14	0.75	0.75	0.75	0.75	0.75	0.75	0.75
15	0.75	0.75	0.75	0.75	0.75	0.75	0.75
16	0.75	0.75	0.75	0.75	0.75	0.75	0.75
17	0.75	0.75	0.75	0.75	0.75	0.75	0.75
18	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19	0.75	0.75	0.75	0.75	0.75	0.75	0.75
20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
21	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22	0.75	0.75	0.75	0.75	0.75	0.75	0.75
23	0.75	0.75	0.75	0.75	0.75	0.75	0.75
24	0.75	0.75	0.75	0.75	0.75	0.75	0.75
25	0.75	0.75	0.75	0.75	0.75	0.75	0.75
26	0.75	0.75	0.75	0.75	0.75	0.75	0.75
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75
28	0.75	0.75	0.75	0.75	0.75	0.75	0.75
29	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.75	0.75	0.75	0.75	0.75	0.75	0.75

2021	April	May	June	July	August	September	October
1	0.75	0.75	0.75	0.75	0.625	0.5	0.5
2	0.75	0.75	0.75	0.75	0.625	0.5	0.5
3	0.75	0.75	0.75	0.75	0.625	0.5	0.5
4	0.75	0.75	0.75	0.75	0.625	0.5	0.5
5	0.75	0.75	0.75	0.75	0.625	0.5	0.5
6	0.75	0.75	0.75	0.625	0.625	0.5	0.5
7	0.75	0.75	0.75	0.625	0.625	0.5	0.5
8	0.75	0.75	0.75	0.625	0.625	0.5	0.5
9	0.75	0.75	0.75	0.625	0.625	0.5	0.5
10	0.75	0.75	0.75	0.625	0.625	0.5	0.5
11	0.75	0.75	0.75	0.625	0.625	0.5	0.5
12	0.75	0.75	0.75	0.625	0.625	0.5	0.5
13	0.75	0.75	0.75	0.625	0.625	0.5	0.5
14	0.75	0.75	0.75	0.625	0.625	0.5	0.5
15	0.75	0.75	0.75	0.625	0.625	0.5	0.5
16	0.75	0.75	0.75	0.625	0.625	0.5	0.5
17	0.75	0.75	0.75	0.625	0.625	0.5	0.5
18	0.75	0.75	0.75	0.625	0.625	0.5	0.5
19	0.75	0.75	0.75	0.625	0.625	0.5	0.5
20	0.75	0.75	0.75	0.625	0.5	0.5	0.5
21	0.75	0.75	0.75	0.625	0.5	0.5	0.5
22	0.75	0.75	0.75	0.625	0.5	0.5	0.5
23	0.75	0.75	0.75	0.625	0.5	0.5	0.5
24	0.75	0.75	0.75	0.625	0.5	0.5	0.5
25	0.75	0.75	0.75	0.625	0.5	0.5	0.5
26	0.75	0.75	0.75	0.625	0.5	0.5	0.5
27	0.75	0.75	0.75	0.625	0.5	0.5	0.5
28	0.75	0.75	0.75	0.625	0.5	0.5	0.5
29	0.75	0.75	0.75	0.625	0.5	0.5	0.5
30	0.75	0.75	0.75	0.625	0.5	0.5	0.5

| | | |

30	0.625	0.625	0.625	0.625	[redacted]
31		0.625		0.625	[redacted]

EXHIBIT 334

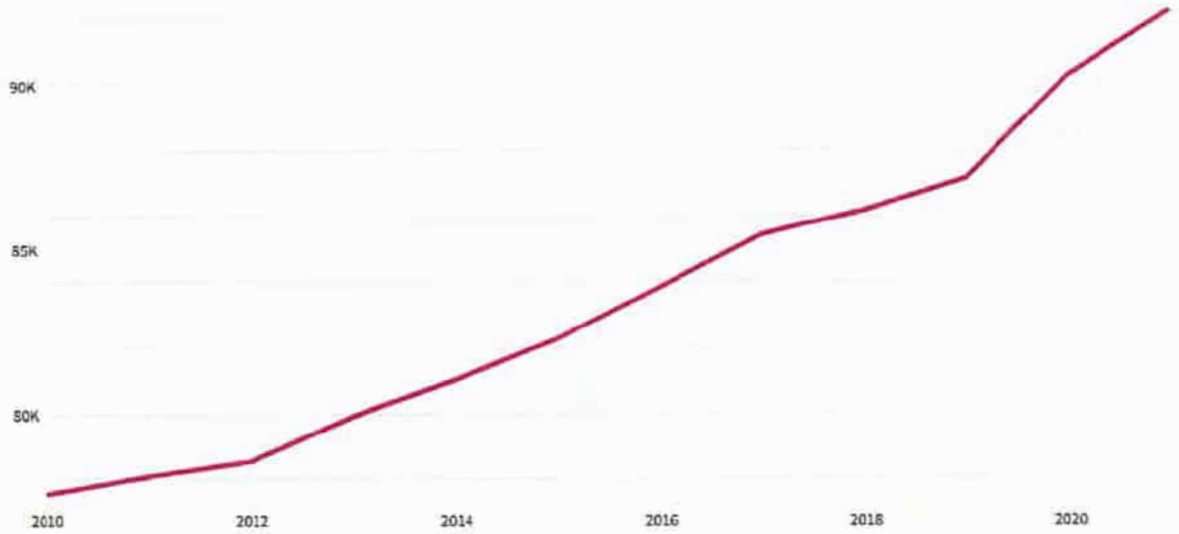
Source: Census Bureau

SHARE THIS

How many people live in Twin Falls County?

Twin Falls County's population **grew 19%** from the **77,547** people who lived there in **2010**. For comparison, the population in the US **grew 7.3%** and the population in Idaho **grew 21%** during that period.

Population in Twin Falls County



Source: Census Bureau

SHARE THIS

https://usafacts.org/data/topics/people-society/population-and-demographics/our-changing-population/state/idaho/county/twin-falls-county/
(visited May 24, 2023)

Exh. No. 25
Date 5-25-23
Name Jay Barlogi
M & M Court Reporting

EXHIBIT 337

John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Shelley M. Davis
Paul L. Arrington
Scott A. Magnuson
Sarah W. Higer

BARKER ROSHOLT & SIMPSON LLP

195 River Vista Pl., Suite 204
Twin Falls, ID 83301-3029
(208) 733-0700 telephone
(208) 735-2444 facsimile

1010 W. Jefferson St., Suite 102
P.O. Box 2139
Boise, ID 83701-2139
(208) 336-0700 telephone
(208) 344-6034 facsimile
bra@idahowaters.com

Travis L. Thompson
tlt@idahowaters.com

March 29, 2013

VIA HAND DELIVERY

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: Response to February 21, 2013 Letter (Step 1 Methodology Order)

Dear Director Spackman:

This letter responds to your February 21, 2013 to our clients, A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

Based upon a review of the information used with *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"), it is our understanding IDWR used the following acreage amounts for the Crop Water Need calculation last year.[1]

A&B	15,924	(Director's Report)
BID	44,715	(Ex. 4300)
Milner	13,335	(Director's Report)
NSCC	154,067	(Director's Report)
TFCC	183,589	(Ex. 4310)

[1] Our clients contest the Methodology Order and its application and reserve all rights as to its legal basis and application. District Court cases on judicial review are currently stayed pending a final decision from the Idaho Supreme Court in the Surface Water Coalition Delivery Call case (Consolidated Docket No. 38191-2010).

Exh. No. 29
Date 5-25-23
Name Kay Barlogi
M & M Court Reporting

All of the natural flow water rights for the above entities that identify the number of authorized acres to irrigate within their respective project boundaries have been decreed since the issuance of the Methodology Order in June 2010. Accordingly, the Director is required to use the elements of the partial decrees instead of the Director's Reports for purposes of water right administration. I.C. §§ 42-607; 1417. For A&B, Milner, and NSCC, the total irrigated acreage number is the same. Dave Shaw has conferred with the managers for A&B, Milner, and NSCC, and has reviewed the shape files underlying the partial decrees. Based upon a review of the shape files with the most recent aerial imagery (2011), and confirming a review of the expected irrigated area within each project with the managers, the decreed irrigated acreage has not varied by more than 5% from the existing electronic shape file used last year.

For BID, the Methodology Order relies upon Ex. 4300 (SPF Engineering Report, 12/29/05). That report alleged that 40% of the "miscellaneous" lands within BID were "non-irrigated" based upon a review of 1987 and 2004 imagery. Dave Shaw performed a field verification of these areas in 2007 showing the errors in this calculation. Ex. 8190 (Table 4, pp. 10-11). The Director should correct this error for purposes of the 2013 irrigated acreage ("These amounts may, of course, change as acreage is removed from irrigation or possibly added back in."). R. 7000; Methodology Order at 4. These are just some of the examples that were found to be in error. BID further prepared a GIS shapefile based upon 2011 aerial imagery. Based upon a review of that information by BID's manager and Dave Shaw, the decreed irrigated acreage has not varied by more than 5% from the decreed acreage.

For TFCC, the Methodology Order relies upon Ex. 4310 (SPF Engineering Report, 3/20/07). That report alleged various areas were "non-irrigated" based upon a review of 1987 and 2004 imagery, and site visits to 11 parcels in Aug/Sept. 2006. Brockway Engineering consulted TFCC personnel and performed field verifications in January 2006 and identified errors in the SPF Engineering Report analysis. Ex. 8190 (Table 1, pp. 3-4). Accordingly, the areas delineated as "non-irrigated" in Ex. 4310 are not accurate. The Hearing Officer accepted Brockway Engineering's rebuttal to the SPF Report and concluded that only "6,600 acres claimed by TFCC are not irrigated." R. 7100. TFCC claimed 201,560.4 acres in its water right claims in the SRBA. TFCC's partial decrees authorize the irrigation of 196,162 acres. Accordingly, there is no basis for the Director to use the 183,589 acres alleged in the SPF Engineering Report. Moreover, Dave Shaw has completed a review of IDWR's SRBA shapefile for TFCC, compared to aerial imagery from 2011 and found the acreage variation was less than 5% of the decreed acreage. That information is included herein on the attached CD and should be used for 2013.

Finally, the Director's Crop Water Need relies upon NASS crop data (average 1990-2008). Dave Shaw has compiled current NASS data from the various counties from 2011. Since that review the 2012 NASS data have become available. Based upon this review and confirmation with the managers, the cropping pattern in 2013 is expected to be similar to that experienced last year and in 2011. The Director should use the most current NASS data available from the NASS "CropScape" website, http://nassgeodata.gmu.edu/CropScape/.

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

Enc.

cc: Dan Temple, A&B
Randy Bingham, BID
Walt Mullins, Milner
Alan Hanston, NSCC
Brian Olmstead, TFCC
Randy Budge / Candice McHugh
Tom Arkoosh
Kent Fletcher
Sarah Klahn / Dean Tranmer

John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Shelley M. Davis
Paul L. Arrington
Scott A. Magnuson
Sarah W. Higer

BARKER ROSHOLT & SIMPSON LLP

195 River Vista Pl., Suite 204
Twin Falls, ID 83301-3029
(208) 733-0700 telephone
(208) 735-2444 facsimile

1010 W. Jefferson St., Suite 102
P.O. Box 2139
Boise, ID 83701-2139
(208) 336-0700 telephone
(208) 344-6034 facsimile
brs@idahowaters.com

Travis L. Thompson
tlt@idahowaters.com

RECEIVED
MAR 27 2014
DEPARTMENT OF WATER RESOURCES

March 25, 2014

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2014 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

Based upon letters to ground water users (January 28th and March 4th) it appears you will rely upon the *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order") for purposes of conjunctive administration this year.[1] If so, our clients contest any orders or administration that does not comply with the Idaho Supreme Court's recent decision *A&B Irr. Dist. et al. v. Spackman*, 315 P.3d 828 (2013). We have yet to receive any information confirming how you intend to proceed this year.

However, with respect to the prior methodology and the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you last year for purposes of 2014 administration. *See Attachment.*

As noted last year, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

[1] Our clients contest the Methodology Order and its application and reserve all rights to challenge that decision and its application. The Methodology Order and other orders concerning its implementation in prior years are currently on appeal to the Gooding County District Court (Consolidated Case No. CV-2010-382).

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that were submitted to you and referenced last year. The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you last year is as follows: A&B – 15,924; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

Enc.

cc: (by email only)
Garrick Baxter, IDWR
Dan Temple, A&B
John Lind, BID
Walt Mullins, Milner
Alan Hansten, NSCC
Brian Olmstead, TFCC
Kent Fletcher
Randy Budge / T.J. Budge
Dean Tranmer / Sarah Klahn / Mitra Pemberton

Attachment

John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Shelley M. Davis
Paul L. Arrington
Scott A. Magnuson
Sarah W. Higer

BARKER ROSHOLT & SIMPSON LLP

195 River Vista Pl., Suite 204
Twin Falls, ID 83301-3029
(208) 733-0700 telephone
(208) 735-2444 facsimile

1010 W. Jefferson St., Suite 102
P.O. Box 2139
Boise, ID 83701-2139
(208) 336-0700 telephone
(208) 344-6034 facsimile
brs@idahowaters.com

Travis L. Thompson
tlt@idahowaters.com

March 29, 2013

VIA HAND DELIVERY

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: Response to February 21, 2013 Letter (Step 1 Methodology Order)

Dear Director Spackman:

This letter responds to your February 21, 2013 to our clients, A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company.

Based upon a review of the information used with *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("Methodology Order"), it is our understanding IDWR used the following acreage amounts for the Crop Water Need calculation last year.[1]

A&B	15,924	(Director's Report)
BID	44,715	(Ex. 4300)
Milner	13,335	(Director's Report)
NSCC	154,067	(Director's Report)
TFCC	183,589	(Ex. 4310)

[1] Our clients contest the Methodology Order and its application and reserve all rights as to its legal basis and application. District Court cases on judicial review are currently stayed pending a final decision from the Idaho Supreme Court in the Surface Water Coalition Delivery Call case (Consolidated Docket No. 38191-2010).

All of the natural flow water rights for the above entities that identify the number of authorized acres to irrigate within their respective project boundaries have been decreed since the issuance of the Methodology Order in June 2010. Accordingly, the Director is required to use the elements of the partial decrees instead of the Director's Reports for purposes of water right administration. I.C. §§ 42-607; 1417. For A&B, Milner, and NSCC, the total irrigated acreage number is the same. Dave Shaw has conferred with the managers for A&B, Milner, and NSCC, and has reviewed the shape files underlying the partial decrees. Based upon a review of the shape files with the most recent aerial imagery (2011), and confirming a review of the expected irrigated area within each project with the managers, the decreed irrigated acreage has not varied by more than 5% from the existing electronic shape file used last year.

For BID, the Methodology Order relies upon Ex. 4300 (SPF Engineering Report, 12/29/05). That report alleged that 40% of the "miscellaneous" lands within BID were "non-irrigated" based upon a review of 1987 and 2004 imagery. Dave Shaw performed a field verification of these areas in 2007 showing the errors in this calculation. Ex. 8190 (Table 4, pp. 10-11). The Director should correct this error for purposes of the 2013 irrigated acreage ("These amounts may, of course, change as acreage is removed from irrigation or possibly added back in."). R. 7000; Methodology Order at 4. These are just some of the examples that were found to be in error. BID further prepared a GIS shapefile based upon 2011 aerial imagery. Based upon a review of that information by BID's manager and Dave Shaw, the decreed irrigated acreage has not varied by more than 5% from the decreed acreage.

For TFCC, the Methodology Order relies upon Ex. 4310 (SPF Engineering Report, 3/20/07). That report alleged various areas were "non-irrigated" based upon a review of 1987 and 2004 imagery, and site visits to 11 parcels in Aug/Sept. 2006. Brockway Engineering consulted TFCC personnel and performed field verifications in January 2006 and identified errors in the SPF Engineering Report analysis. Ex. 8190 (Table 1, pp. 3-4). Accordingly, the areas delineated as "non-irrigated" in Ex. 4310 are not accurate. The Hearing Officer accepted Brockway Engineering's rebuttal to the SPF Report and concluded that only "6,600 acres claimed by TFCC are not irrigated." R. 7100. TFCC claimed 201,560.4 acres in its water right claims in the SRBA. TFCC's partial decrees authorize the irrigation of 196,162 acres. Accordingly, there is no basis for the Director to use the 183,589 acres alleged in the SPF Engineering Report. Moreover, Dave Shaw has completed a review of IDWR's SRBA shapefile for TFCC, compared to aerial imagery from 2011 and found the acreage variation was less than 5% of the decreed acreage. That information is included herein on the attached CD and should be used for 2013.

Finally, the Director's Crop Water Need relies upon NASS crop data (average 1990-2008). Dave Shaw has compiled current NASS data from the various counties from 2011. Since that review the 2012 NASS data have become available. Based upon this review and confirmation with the managers, the cropping pattern in 2013 is expected to be similar to that experienced last year and in 2011. The Director should use the most current NASS data available from the NASS "CropScape" website, http://nassgeodata.gmu.edu/CropScape/.

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

Enc.

cc: Dan Temple, A&B
Randy Bingham, BID
Walt Mullins, Milner
Alan Hansten, NSCC
Brian Olmstead, TFCC
Randy Budge / Candice McHugh
Tom Arkoosh
Kent Fletcher
Sarah Klahn / Dean Tranmer

John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Shelley M. Davis
Paul L. Arrington
Scott A. Magnuson

BARKER ROSHOLT & SIMPSON LLP

195 River Vista Pl., Suite 204
Twin Falls, ID 83301-3029
(208) 733-0700 telephone
(208) 735-2444 facsimile

1010 W. Jefferson St., Suite 102
P.O. Box 2139
Boise, ID 83701-2139
(208) 336-0700 telephone
(208) 344-6034 facsimile
brs@idahowaters.com

Travis L. Thompson
tlt@idahowaters.com

March 7, 2016

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2016 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your February 8, 2016 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

[1] Step 1 did not change for purposes of the various methodology orders.

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

Enc.

cc: Managers (clients)

John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Shelley M. Davis
Paul L. Arrington
Scott A. Magnuson

BARKER ROSHOLT & SIMPSON LLP

163 Second Ave. West
P.O. Box 63
Twin Falls, ID 83303-0063
(208) 733-0700 telephone
(208) 735-2444 facsimile

1010 W. Jefferson St., Suite 102
P.O. Box 2139
Boise, ID 83701-2139
(208) 336-0700 telephone
(208) 344-6034 facsimile
bra@idahowaters.com

Travis L. Thompson
tlt@idahowaters.com

February 9, 2017

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2017 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your February 2, 2017 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration that is on file with you in this matter.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924[2]; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

---

[1] Step 1 did not change for purposes of the various methodology orders.
[2] This is the number of acres associated with A&B's decreed natural flow surface water rights (1-14 et al.). The District is also delivering surface water to other District lands through "soft conversion" projects. *See Travis L. Thompson December 22, 2016 Letter to Director Spackman.*

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP



Travis L. Thompson

cc: Managers (clients)

John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Shelley M. Davis
Scott A. Magnuson

BARKER ROSHOLT & SIMPSON LLP

163 Second Ave. West
P.O. Box 63
Twin Falls, ID 83303-0063
(208) 733-0700 telephone
(208) 735-2444 facsimile

1010 W. Jefferson St., Suite 102
P.O. Box 2139
Boise, ID 83701-2139
(208) 336-0700 telephone
(208) 344-6034 facsimile
brs@idahowaters.com

Travis L. Thompson
tlt@idahowaters.com

RECEIVED
FEB 12 2018
DEPARTMENT OF
WATER RESOURCES

February 12, 2018

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2018 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your February 1, 2018 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration that is on file with you in this matter.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924[2]; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

---

[1] Step 1 did not change for purposes of the various methodology orders.
[2] This is the number of acres associated with A&B's decreed natural flow surface water rights (1-14 et al.). The District is also delivering surface water to other District lands through "soft conversion" projects. *See Travis L. Thompson December 22, 2016 Letter to Director Spackman.*

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP



Travis L. Thompson

cc: Managers (clients)

Barker Rosholt & Simpson LLP

Twin Falls
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83301
p. 208.733.0700
f. 208.735.2444

Attorneys
John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Scott A. Magnuson
Jonas A. Reagan
Nicole L. Swafford

Travis L. Thompson
EMAIL: tlt@idahowaters.com
PHONE: 208.733.0700
WEB: idahowaters.com

RECEIVED
FEB 19 2019
DEPARTMENT OF
WATER RESOURCES

February 15, 2018

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2019 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your February 7, 2019 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration that is on file with you in this matter.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924[2]; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

[1] Step 1 did not change for purposes of the various methodology orders.
[2] This is the number of acres associated with A&B's decreed natural flow surface water rights (1-14 et al.). The District is also delivering surface water to other District lands through "soft conversion" projects. *See Travis L. Thompson December 22, 2016 Letter to Director Spackman.*

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

cc: Managers (clients)

Barker Rosholt & Simpson LLP

Twin Falls
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83301
p. 208.733.0700
f. 208.735.2444

Attorneys
John A. Rosholt
Albert P. Barker
John K. Simpson
Travis L. Thompson
Scott A. Magnuson
Jonas A. Reagan

Travis L. Thompson
EMAIL: tlt@idahowaters.com
PHONE: 208.733.0700
WEB: idahowaters.com

March 13, 2020

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2020 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your March 9, 2010 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration that is on file with you in this matter.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924[2]; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

---

[1] Step 1 did not change for purposes of the various methodology orders.
[2] This is the number of acres associated with A&B's decreed natural flow surface water rights (1-14 et al.). The District is also delivering surface water to other District lands through "soft conversion" projects. *See Travis L. Thompson December 22, 2016 Letter to Director Spackman.*

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

cc: Managers (clients)

Barker Rosholt & Simpson LLP

Twin Falls
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83301
p. 208.733.0700
f. 208.735.2444

Attorneys
Albert P. Barker
John K. Simpson
Travis L. Thompson
Scott A. Magnuson
Sarah W. Higer

John A. Rosholt
(1937-2019)

Travis L. Thompson
EMAIL: tlt@idahowaters.com
PHONE: 208.733.0700
WEB: idahowaters.com

February 19, 2021

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2021 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your February 1, 2021 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration that is on file with you in this matter.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

[1] Step 1 did not change for purposes of the various methodology orders.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924[2]; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

cc: Managers (clients)

[2] This is the number of acres associated with A&B's decreed natural flow surface water rights (1-14 et al.). The District is also delivering surface water to other District lands through "soft conversion" projects. *See Travis L. Thompson December 22, 2016 Letter to Director Spackman.*

Barker Rosholt & Simpson LLP

Twin Falls
163 Second Ave. West
P.O. Box 63
Twin Falls, Idaho 83303
p. 208.733.0700
f. 208.735.2444

Attorneys
Albert P. Barker
John K. Simpson
Travis L. Thompson
Scott A. Magnuson
of counsel
Sarah W. Higer
Michael A. Short
John A. Rosholt
(1927-2019)

Travis L. Thompson
EMAIL: tlt@idahowaters.com
PHONE: 208.733.0700
WEB: idahowaters.com

March 8, 2022

VIA EMAIL & U.S. MAIL

Director Gary Spackman
Idaho Dept. of Water Resources
322 E. Front St.
Boise, Idaho 83720-0098

Re: 2022 Conjunctive Administration (Step 1 Methodology Order)

Dear Director Spackman:

We are writing on behalf of our clients A&B Irrigation District, Burley Irrigation District, Milner Irrigation District, North Side Canal Company, and Twin Falls Canal Company in response to your March 1, 2022 letter concerning Step 1 of the Third Amended Methodology Order.

With respect to the Step 1 requirement to confirm irrigated acreage for the year, our clients adopt and resubmit the letter that was delivered to you for purposes of 2014 administration that is on file with you in this matter.[1] As noted in that letter, all of our clients' decreed natural flow water rights identify the number of authorized acres to irrigate within their respective project boundaries. Further, NSCC recently submitted information regarding certain changes to its boundary, but it did not change the total irrigated acreage. Accordingly, the Director is required to use the elements of the partial decrees for purposes of water right administration. I.C. §§ 42-607; 1417.

Moreover, all clients have confirmed that the expected irrigated area within each project this year has not varied by more than 5% from the existing information (electronic shape files) that have been submitted to you in prior years.

[1] Step 1 did not change for purposes of the various methodology orders.

The number of irrigated acres identified by existing shape files on file with the SRBA Court or as submitted to you in prior years is as follows: A&B – 15,924[2]; BID – 46,083; Milner – 13,335; NSCC – 154,067; TFCC – 194,778.

If you have any questions please contact me at (208) 733-0700.

Sincerely,

BARKER ROSHOLT & SIMPSON LLP

Travis L. Thompson

cc: Managers, via email only

[2] This is the number of acres associated with A&B's decreed natural flow surface water rights (1-14 et al.). The District is also delivering surface water to other District lands through "soft conversion" projects. *See Travis L. Thompson December 22, 2016 Letter to Director Spackman.*

Twin Falls Canal Company
Profit & Loss
November 2014 through October 2022

EXHIBIT 338

	Nov '14 - Oct 15	Nov '15 - Oct 16	Nov '16 - Oct 17
Ordinary Income/Expense			
Income			
5020.00 · Current Assesments	5,058,201.86	5,262,128.65	5,259,063.55
5040.00 · Surcharges & Penalties	9,190.33	9,133.86	10,694.78
5060.00 · Delinquent Assessments	8,877.34	7,227.57	10,565.27
5080.00 · Certificate Transfers	4,798.00	5,387.80	5,133.45
5090.00 · Sale of Water Shares	0.00	0.00	0.00
5100.00 · Services to Stockholders	4,126.39	19,610.31	12,742.64
5110.00 · Water Quality Reimbursements	58,000.00	33,476.00	45,200.00
5120.00 · Property Rental	0.00	10.00	0.00
5140.00 · Water Rental	118,562.22	100,055.07	59,458.34
5160.00 · Interest Income	4,329.53	3,944.55	8,008.53
5170.00 · Transport Water - Swid, Meyer	109,511.47	96,530.17	92,857.50
5175.00 · Recharge	100,920.52	88,317.00	71,793.00
5180.00 · Other Reimbursements	0.00	3,917.10	0.00
5190.00 · OTHER INCOME	0.00	1,074.55	0.00
5192.00 · Dirt Sales	175,565.00	16,564.00	56,638.00
5195.00 · Fuel Tax Refunds	8,981.25	12,463.04	14,553.04
5196.00 · Refund Workmans Compensation	0.00	5,804.00	500.00
5200.00 · MDI & NSCC Reimbursements	90,035.49	69,359.54	66,821.17
5202.00 · TF Energy/Midway -Reimbursement	261,068.00	286,340.00	532,247.00
5210.00 · Clover/Ida West/Am Falls-Reimb	12,615.70	4,560.56	11,891.61
5215.00 · US BureauU Of Rec-Reimbursement	0.00	0.00	0.00
5220.00 · Misc Receipts	3,912.55	7,219.95	-165.88
5220.05 · VISA CHARGES	0.00	0.00	0.00
5220.10 · Sale of Nokkentved Book	271.50	158.59	365.00
5230.00 · Gain/Loss Sale of Assets	21,300.00	72,550.55	68,000.00
5500.00 · Twin Falls Energy	0.00	0.00	0.00
5510.00 · Lower Low Line Power Receipts	135,085.68	162,481.50	154,241.38
5520.00 · Lateral 10 Power Receipts	42,512.22	63,220.59	68,357.30
5560.00 · Cedar Draw Power - Little Mac	23,296.44	24,315.52	24,811.04
5570.00 · Crystal Springs Power Receipts	24,814.98	28,135.44	26,528.95
5580.00 · Milner Dam, Inc. Dividends	0.00	0.00	0.00
5585 · MIDWAY POWER	0.00	0.00	0.00
5590.00 · Twin Falls Energy Dividends	0.00	0.00	400,000.00
5591.00 · Income from Subsidiaries	794,961.84	779,001.97	248,276.96
Total Income	7,070,938.31	7,162,987.88	7,248,582.63
Cost of Goods Sold			
50000 · Cost of Goods Sold	0.00	0.00	56,638.00
Total COGS	0.00	0.00	56,638.00
Gross Profit	7,070,938.31	7,162,987.88	7,191,944.63

Exh. No. 30
Date 5-25-23
Name Jay Pardoji
M & M Court Reporting

Twin Falls Canal Company
Profit & Loss
November 2014 through October 2022

	Nov '17 - Oct 18	Nov '18 - Oct 19	Nov '19 - Oct 20
Ordinary Income/Expense			
Income			
5020.00 · Current Assesments	5,259,560.76	5,261,737.00	5,458,962.52
5040.00 · Surcharges & Penalties	10,534.06	13,179.81	11,399.73
5060.00 · Delinquent Assessments	10,557.84	9,782.32	11,832.38
5080.00 · Certificate Transfers	6,373.60	8,525.28	5,495.36
5090.00 · Sale of Water Shares	0.00	0.00	0.00
5100.00 · Services to Stockholders	10,940.00	36,061.28	16,215.58
5110.00 · Water Quality Reimbursements	0.00	52,250.00	0.00
5120.00 · Property Rental	0.00	0.00	0.00
5140.00 · Water Rental	181,741.99	282,024.93	137,965.32
5160.00 · Interest Income	3,310.86	9,867.53	11,037.51
5170.00 · Transport Water - Swid, Meyer	99,088.83	62,628.18	29,343.32
5175.00 · Recharge	80,559.00	58,511.67	86,457.33
5180.00 · Other Reimbursements	0.00	0.00	0.00
5190.00 · OTHER INCOME	0.00	100,340.00	2,387.43
5192.00 · Dirt Sales	21,222.00	49,350.00	46,545.00
5195.00 · Fuel Tax Refunds	9,951.55	0.00	0.00
5196.00 · Refund Workmans Compensation	0.00	0.00	3,935.00
5200.00 · MDI & NSCC Reimbursements	79,335.88	99,371.31	77,155.63
5202.00 · TF Energy/Midway -Reimbursement	243,165.50	289,496.32	306,685.10
5210.00 · Clover/Ida West/Am Falls-Reimb	13,657.42	14,285.69	0.00
5215.00 · US BureauU Of Rec-Reimbursement	131,630.36	0.00	0.00
5220.00 · Misc Receipts	-426.20	0.00	0.00
5220.05 · VISA CHARGES	0.00	0.00	0.00
5220.10 · Sale of Nokkentved Book	204.40	64.38	35.00
5230.00 · Gain/Loss Sale of Assets	232,047.48	18,886.00	56,570.64
5500.00 · Twin Falls Energy	0.00	0.00	0.00
5510.00 · Lower Low Line Power Receipts	155,219.28	22,100.78	0.00
5520.00 · Lateral 10 Power Receipts	69,296.60	59,833.60	43,021.23
5560.00 · Cedar Draw Power - Little Mac	26,313.65	20,244.21	19,115.35
5570.00 · Crystal Springs Power Receipts	29,733.23	35,542.75	35,546.26
5580.00 · Milner Dam, Inc. Dividends	254,896.51	100,000.00	27,242.12
5585 · MIDWAY POWER	0.00	0.00	0.00
5590.00 · Twin Falls Energy Dividends	450,000.00	400,000.00	400,000.00
5591.00 · Income from Subsidiaries	446,976.64	249,573.64	463,815.27
Total Income	7,825,891.24	7,253,656.68	7,250,763.08
Cost of Goods Sold			
50000 · Cost of Goods Sold	21,222.00	50,106.67	47,554.35
Total COGS	21,222.00	50,106.67	47,554.35
Gross Profit	7,804,669.24	7,203,550.01	7,203,208.73

Twin Falls Canal Company
Profit & Loss
November 2014 through October 2022

	Nov '20 - Oct 21	Nov '21 - Oct 22	TOTAL
Ordinary Income/Expense			
Income			
5020.00 · Current Assesments	5,463,434.19	5,458,042.85	42,481,131.38
5040.00 · Surcharges & Penalties	12,958.54	24,746.45	101,837.56
5060.00 · Delinquent Assessments	19,196.12	7,843.56	85,882.40
5080.00 · Certificate Transfers	7,701.14	23,787.62	67,202.25
5090.00 · Sale of Water Shares	0.00	0.00	0.00
5100.00 · Services to Stockholders	4,313.20	26,427.40	130,436.80
5110.00 · Water Quality Reimbursements	50,962.00	113,165.15	353,053.15
5120.00 · Property Rental	0.00	0.00	10.00
5140.00 · Water Rental	168,472.32	424,825.00	1,473,105.19
5160.00 · Interest Income	3,757.56	2,142.98	46,399.05
5170.00 · Transport Water - Swid, Meyer	105,903.04	93,892.80	689,755.31
5175.00 · Recharge	122,481.03	80,245.00	689,284.55
5180.00 · Other Reimbursements	0.00	0.00	3,917.10
5190.00 · OTHER INCOME	0.00	0.00	103,801.98
5192.00 · Dirt Sales	17,696.00	27,662.36	411,242.36
5195.00 · Fuel Tax Refunds	0.00	0.00	45,948.88
5196.00 · Refund Workmans Compensation	0.00	0.00	10,239.00
5200.00 · MDI & NSCC Reimbursements	96,568.19	90,112.94	668,760.15
5202.00 · TF Energy/Midway -Reimbursement	322,407.53	130,000.00	2,371,409.45
5210.00 · Clover/Ida West/Am Falls-Reimb	30,138.82	25,725.69	112,875.49
5215.00 · US BureauU Of Rec-Reimbursement	0.00	17,294.00	148,924.36
5220.00 · Misc Receipts	8,080.61	21,881.18	40,502.21
5220.05 · VISA CHARGES	0.00	0.00	0.00
5220.10 · Sale of Nokkentved Book	178.58	209.15	1,486.60
5230.00 · Gain/Loss Sale of Assets	950.00	110,000.00	580,304.67
5500.00 · Twin Falls Energy	0.00	0.00	0.00
5510.00 · Lower Low Line Power Receipts	194,747.11	131,154.91	955,030.64
5520.00 · Lateral 10 Power Receipts	48,605.81	26,478.07	421,325.42
5560.00 · Cedar Draw Power - Little Mac	15,198.90	7,836.70	161,131.81
5570.00 · Crystal Springs Power Receipts	24,276.74	5,881.46	210,459.81
5580.00 · Milner Dam, Inc. Dividends	0.00	0.00	382,138.63
5585 · MIDWAY POWER	0.00	0.00	0.00
5590.00 · Twin Falls Energy Dividends	400,000.00	0.00	2,050,000.00
5591.00 · Income from Subsidiaries	505,337.93	446,799.89	3,934,744.14
Total Income	7,623,365.36	7,296,155.16	58,732,340.34
Cost of Goods Sold			
50000 · Cost of Goods Sold	18,705.35	28,669.00	222,895.37
Total COGS	18,705.35	28,669.00	222,895.37
Gross Profit	7,604,660.01	7,267,486.16	58,509,444.97

RECEIVED
Jun 05, 2023
DEPARTMENT OF
WATER RESOURCES

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **<u>UPDATED</u> EXPERT REPORT OF GREGORY K. SULLIVAN, P.E., ON BEHALF OF THE CITIES OF POCATELLO AND IDAHO FALLS, AND THE COALITION OF CITIES**

Gregory K. Sullivan, P.E.
Spronk Water Engineers, Inc.
1000 Logan Street
Denver, Colorado 80203

Exhibit 347A
Wednesday, June 7, 2023
Reported by:
Andrea Check, CSR 748, RPR, CRR

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on June 5, 2023, I caused a true and correct copy of the *UPDATED EXPERT REPORT OF GREGORY K. SULLIVAN, P.E., ON BEHALF OF THE CITIES OF POCATELLO AND IDAHO FALLS, AND THE COALITION OF CITIES* to be filed and served via electronic mail to following parties:

Idaho Dept. of Water Resources
Director Gary Spackman
file@idwr.idaho.gov
Garrick.baxter@idwr.idaho.gov
gary.spackman@idwr.idaho.gov
sarah.tschohl@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior
960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road
Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248
Burley, ID 83318
wkf@pmt.org

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391
Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Candice McHugh
Chris Bromley
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103
Boise, ID 83702
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130
Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP
P.O. Box 168
Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife
City Attorney
City of Idaho Falls
P.O. Box 50220
Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200
Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Dylan Anderson
Dylan Anderson Law
P. O. Box 35
Rexburg, ID 83440
208-684-7701
dylan@dylanandersonlaw.com

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A
Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

Courtesy copy to:
William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910
Burley, ID 83318
wparsons@pmt.org

Sarah A. Klahn, ISB #12283

(Revised 6-4-2023)

Expert Report

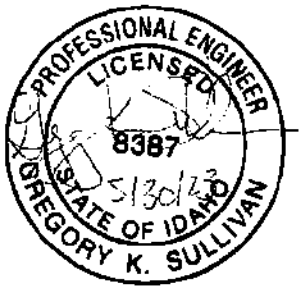
Surface Water Coalition Methodology Order

Prepared for:

City of Idaho Falls
City of Pocatello
Coalition of Cities

Prepared by:

Gregory K. Sullivan, P.E.



May 30, 2023

SWE Spronk Water Engineers, Inc.

Errata

Expert Report
Surface Water Coalition
Methodology Order

Gregory K. Sullivan, P.E.

Report Text

Section 1.0

P. 1, Paragraph 1, Line 6:	Deleted text "The Fifth Methodology Order amends and replaces the Fourth Methodology Order that was issued in 2016."
P. 1, Paragraph 2, Line 1:	Added text "The SWC members divert from the Snake River between Lake Walcott and Milner Dam under mostly senior natural flow water rights. They also have storage contracts in various upstream Bureau of Reclamation reservoirs. The following are the SWC members: • A&B Irrigation District ("A&B") • American Falls Reservoir District #2 ("AFRD2") • Burley Irrigation District ("BID") • Milner Irrigation District ("Milner") • Minidoka Irrigation District ("Minidoka") • North Side Canal Company ("NSCC") • Twin Falls Canal Company ("TFCC")"
P. 1, Paragraph 3, Line 1:	Added text "A more detailed summary of the SWC natural flow water rights and storage contracts is contained in SWE's 2007 expert report prepared for the 2008 hearing for the SWC delivery call (SWE 2007a)."
P. 2, Paragraph 1, Line 1:	"The Fifth Methodology Order made" should read "The Fifth Methodology Order amends and replaces the Fourth Methodology Order that was issued in 2016, and makes"
P. 2, Bullet 3, Line 2:	"Aquifer Groundwater Model" should read "Aquifer Model"
P. 2, Paragraph 2, Line 1:	"Hearing Officer Schroeder's ruling" should read "April 29, 2008, Order from Hearing Officer Schroeder (former Chief Justice of the Idaho Supreme Court)"
P. 3, Paragraph 4, Line 3:	"April-As Applied" should read "April As-Applied"
P. 3, Paragraph 2, Line 5:	"technical working groups" should read "technical working groups ("TWG")"
P. 3, Paragraph 2, Line 7:	"Technical Working Group ("TWG")" should read "TWG"
P. 4, Bullet 1, Line 5:	"A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District,

North Side Canal Company, and Twin Falls Canal Company ["SWC"]" should read "the SWC"

P. 4, Bullet 6, Line 2: "Idaho Department of Resources" should read "Idaho Department of Water Resources"

Section 2.0

P. 6, Paragraph 2, Line 1:	"The IDWR supports the average combined SWC diversions during 2000-2021 of 3,200,389 AF described in paragraph 27 and the reported backup file is the diversion data" should read "The IDWR support for the average combined SWC diversions during 2000-2021 of 3,200,389 AF in paragraph 27 is provided in a backup file of diversion data"
P. 6, Paragraph 3, Line 2:	"Fourth Methodology" should read "Fourth Methodology Order"
P. 6, Paragraph 3, Line 3:	"show" should read "shows"
P. 6, Paragraph 5, Line 1:	Deleted text "difference between"
P. 7, Paragraph 4, Line 6:	Added text "(Idaho 1903)"

Section 3.0

P. 8, Paragraph 1, Line 9:	"IDWRIDWR" should read "IDWR"
P. 10, Paragraph 1, Line 1:	"systems." should read "systems (blue line)."
P. 10, Paragraph 4, Line 6:	"2008" should read "2008,"
P. 12, Paragraph 1, Line 4:	Deleted text "also"
P. 12, Paragraph 1, Line 7:	"It is not expected that the SWC members would at times operate at lower efficiencies than the reasonable values" should read "The SWC members may at times operate at lower efficiencies than the reasonable values when water supplies are plentiful"
P. 12, Paragraph 1, Line 10:	"than" should read "that"
P. 13, Section Header, Line 1:	"Fifth Methodology" should read "Fifth Methodology Order"
P. 13, Paragraph 1, Line 4:	"Firth" should read "Fifth"
P. 16, Paragraph 1, Line 5:	"shortfall" should read "shortfalls"

Section 4.0

P. 17, Paragraph 1, Line 1:	"April 29, 2008," should read "2008"
P. 17, Paragraph 1, Line 1:	Deleted text "(former Chief Justice of the Idaho Supreme Court)"
P. 17, Paragraph 2, Line 2:	"IGW A" should read "IGWA"
P. 17, Paragraph 2, Line 4:	"of75,152" should read "of 75,212"

P. 18, Inset Table:	Added highlights to methodology acres column for Burley, Minidoka, and TFCC
P. 18, Paragraph 3, Line 1:	Added text "for Burley, Minidoka, and TFCC"
P. 18, Paragraph 3, Line 2:	"proposed to be used" should read "used"

Section 6.0

P. 22, Paragraph 3, Line 1:	"right" should read "rights"
P. 22, Paragraph 4, Line 1:	"The Fifth Methodology asserts that it must now update" should read "IDWR now asserts in the Fifth Methodology Order that it must"
P. 22, Paragraph 4, Line 2:	"has" should read "it has"
P. 22, Paragraph 4, Line 3:	"halfmonth time step" should read "calibration using monthly stress periods and halfmonth time steps"
P. 23, Paragraph 2, Line 1:	"The Fifth Methodology asserts" should read "IDWR asserts in the Fifth Methodology Order"
P. 23, Paragraph 6, Line 1:	"The halfmonth timestep has" should read "Monthly stress period and halfmonth time steps have"
P. 23, Paragraph 6, Line 1:	"ESPAM 2.1" should read "ESPAM"
P. 23, Paragraph 6, Line 2:	"is not a new refinement" should read "are not new refinements"
P. 23, Paragraph 6, Line 2:	"Even with prior versions of ESPAM understanding the impact difference between steady-state modeling verses transient modeling was well understood by me and all members of the ESPAM modeling committee including the Department who frequently discussed and evaluated the different versions of the model." should read "Prior to ESPAM 2.1, the differences between steady-state modeling and transient modeling were well understood by IDWR and the ESHMC members and were frequently discussed during meetings."
P. 23, Paragraph 8, Line 3:	"the pre-moratorium" should read "pumping by pre-moratorium wells"
P. 24, Paragraph 1, Line 2:	"November 28, 2022" should read "November 28, 2022,"
P. 25, Paragraph 5, Line 4:	"November 28, 2022" should read "November 28, 2022,"

Section 7.0

P. 27, Bullet 3, Line 2:	"arbitrary, capricious, and unrealistic" should read "arbitrary and unreasonable"
P. 27, Bullet 3, Line 4:	"considered" should read "considered in computing the average annual diversions"
P. 27, Bullet 4, Line 2:	"monthly project efficiencies have declined." should read "project efficiencies of most SWC members have declined."

P. 27, Bullet 5, Line 1:	"conversions, advancements" should read "conversions and advancements"
P. 27, Bullet 5, Line 2:	Deleted text ", and reductions in irrigated area due to development and urbanization"
P. 27, Bullet 6, Line 1:	"Low" should read "Lower"
P. 28, Bullet 9, Line 1:	"show" should read "during the last 15 years show"
P. 28, Bullet 11, Line 1:	"crop" should read "SWC diversion"
P..28, Bullet 12, Line 7:	Added text "The monthly efficiency values for September should be used for October."
Section 8.0	
P. 30, Paragraph 1, Line 1:	Added text "The following information was relied upon in preparing this expert report."
P. 30, Paragraph 4, Line 1:	Added text "Idaho. 1903. Contract Between Idaho State Board of Land Commissioners and Twin Falls Land and Water Company. January 2, 1903."
P. 32, Paragraph 1, Line 4:	Added text ", and all references listed therein"
P. 32, Paragraph 3, Line 4:	Added text ", and all references listed therein"
P. 32, Paragraph 4, Line 1:	Added text "Sullivan, 2008a. Spronk Water Engineers, Inc. Expert Report Dated July 16, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein."
P. 32, Paragraph 5, Line 1:	Added text "Sullivan, 2008b. Spronk Water Engineers, Inc. Expert Rebuttal Report Dated August 27, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein."
P.32, Paragraph 6, Line 1:	Added text "Sullivan, 2008c. Spronk Water Engineers, Inc. Expert Sur-Rebuttal Report Dated September 16, 2008 Prepared for the City of Pocatello. In the Matter of the Petition for Delivery Call of A&B Irrigation District for Delivery of Ground Water and for the Creation of a Ground Water Management Area, and all references listed therein."
Figures	
P. 35:	Added Figure 1-1
Tables	
P. 57, Table 3-1:	Values changed in column "CWN/Regression & Avg PE" in years 2008, 2011-2015, 2017, 2019, and 2020

P. 57, Table 3-1:	Values changed in column "CWN/Regression & 75% PE" in years 2012-2015, 2017, 2019, and 2020
P. 57, Table 3-1:	Value changed in column "Regression & Avg PE" in year 2015
P. 57, Table 3-1, Note 3:	"(min efficiency = historical average)." should read "(min efficiency = historical average; Oct PE = Sep PE)."
P. 57, Table 3-1, Note 4:	"(min efficiency = 75th percentile PE from historical data)." should read "(min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE)."
P. 58, Table 3-1:	Values changed in column "CWN/Regression & Avg PE" in years 2008-2015 and 2017-2020
P. 58, Table 3-1:	Values changed in column "CWN/Regression & 75% PE" in years 2008-2015 and 2017-2020
P. 58, Table 3-1:	Value changed in column "Regression & Avg PE" in year 2013 and 2015
P. 58, Table 3-1:	Value changed in column "Regression & 75% PE" in year 2013
P. 58, Table 3-2, Note 3:	"(min efficiency = historical average)." should read "(min efficiency = historical average; Oct PE = Sep PE)."
P. 58, Table 3-2, Note 4:	"(min efficiency = 75th percentile PE from historical data)." should read "(min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE)."

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1.0 INTRODUCTION

On April 21, 2023, the Director of the Idaho Department of Water Resources ("IDWR") issued the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury To Reasonable In-Season Demand and Reasonable Carryover* ("Fifth Methodology Order") describing procedures for IDWR's administration of a delivery call by the Surface Water Coalition ("SWC") that was originally placed in 2005 and has been administered ever since under what is generically referred to herein as the "SWC Methodology."

The SWC members divert from the Snake River between Lake Walcott and Milner Dam under mostly senior natural flow water rights. They also have storage contracts in various upstream Bureau of Reclamation reservoirs. The following are the SWC members:

- A&B Irrigation District ("A&B")
- American Falls Reservoir District #2 ("AFRD2")
- Burley Irrigation District ("BID")
- Milner Irrigation District ("Milner")
- Minidoka Irrigation District ("Minidoka")
- North Side Canal Company ("NSCC")
- Twin Falls Canal Company ("TFCC")

A more detailed summary of the SWC natural flow water rights and storage contracts is contained in SWE's 2007 expert report prepared for the 2008 hearing for the SWC delivery call (SWE 2007a).

On April 21, 2023, the IDWR Director also issued the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("April As-Applied Order") describing the Director's implementation of Steps 1-3 of the Fifth Methodology Order in forecasting in-season water supply shortages to the SWC members in 2023. Based on the forecast shortages, the Director ordered that groundwater rights with priority dates junior to December 30, 1953, that are not part of an effectively operating mitigation plan will be subject to curtailment beginning on May 5, 2023.

Finally on April 21, 2023, the IDWR Director issued a *Notice of Hearing, Notice of Prehearing Conference, and Order Authorizing Discovery* that set a hearing on the SWC Methodology for June 6-10, 2023, in Boise, Idaho. According to a subsequent order on May 2, 2023, the deadline for submittal of expert reports from the parties is seven days before the first day of the hearing, which would be May 30, 2023.

The Fifth Methodology Order amends and replaces the Fourth Methodology Order that was issued in 2016, and makes several substantive changes to the SWC Methodology including the following:

- Change in the Baseline Year used to forecast the SWC member demands from an average of the member diversions during 2006, 2008, and 2012 to instead use the member diversions during 2018.
- Changes in the monthly project efficiencies for the SWC members that are used to compute monthly diversion demands for prior months when the shortage computations are updated mid-season (July), at the time of need, and after the irrigation season (November).
- Change in how the priority date for curtailment of groundwater rights is determined using the Eastern Snake Plain Aquifer Model ("ESPAM") from using steady-state curtailment runs to using transient curtailment runs.

It has been over 15 years since the 2008 hearing and April 29, 2008, Order from Hearing Officer Schroeder (former Chief Justice of the Idaho Supreme Court) that resulted in the Second Methodology Order issued in 2010. That was the last time the SWC Methodology was significantly scrutinized, and there are now 15 years of actual operating experience available to evaluate how the SWC Methodology has functioned. In addition, there have been numerous changed conditions over the last 15 years that may have affected surface water and groundwater use in the Upper Snake River Basin including the following:

- Urbanization of formerly irrigated parcels,
- Continued gravity to sprinkler conversions,
- Changes in crops,
- Canal lining,
- Advancements in remote sensing,
- Improved irrigation management,
- More and better measurements of water distribution and water use,
- More automation of irrigation facilities,
- Delivery of mitigation supplies to SWC members,
- Changes in WD01 accounting procedures, and
- Changes in WD01 rental pool rules.

Given these changed conditions and the substantive changes to the SWC Methodology included in the Fifth Methodology Order, now is an appropriate time to review all aspects of the SWC Methodology to determine whether the SWC members are operating with reasonable efficiencies and without waste, the SWC members are protected from material injury due to junior groundwater pumping, the groundwater users are protected

from excessive or undue curtailment and mitigation obligations, and the beneficial uses of the interconnected surface water and groundwater resources of the Snake River and the ESPA are maximized.

This expert report was prepared on behalf of the following entities who successfully petitioned to intervene in the SWC Methodology matter ("ESPA Cities"):

- City of Idaho Falls,
- City of Pocatello, and
- Coalition of Cities[1].

A map showing the locations of the ESPA Cities, the service area boundaries of the SWC members, and the ESPA Area of Common Groundwater is attached as **Figure 1-1.**

The compressed schedule established by the Director to complete discovery and prepare expert reports left insufficient time to perform all of the necessary work to thoroughly review the Fifth Methodology Order, the April As-Applied Order, and the historical operations of the SWC members during the last 15 years. The time limitations have necessitated that this report focus on certain key elements of the Fifth Methodology Order and eschew the more thorough review and analysis of the order that I would have performed had more time been made available prior to the expert report deadline and June hearing. Each section of this expert report describes my review, analysis, and expert opinions on a selected element of the Fifth Methodology Order. In addition to this expert report, I prepared and submitted two declarations in support of pre-hearing motions filed by the ESPA Cities. One of those declarations contains additional details regarding my prior work on the SWC Delivery Call and related matters.

My involvement in the SWC Delivery Call extends back to the original delivery call made by the SWC in 2005. In response to that delivery call, I compiled extensive data and analyzed the operations of the SWC irrigation systems. This included several weeks in the field observing diversion and conveyance facilities, irrigated farms, and irrigation application methods. In addition, I was present at the depositions of managers and staff of each of the SWC members regarding irrigation system operations, system losses and efficiencies, record keeping, and other related matters. Based on this information, I prepared analyses of the historical irrigation operations of each SWC member over the

[1] The Coalition of Cities includes the Cities of Bliss, Burley, Carey, Declo, Dietrich, Gooding, Hazelton, Heyburn, Jerome, Paul, Richfield, Rupert, Shoshone, and Wendell.

period from 1990 – 2006. The results of my work were documented in several expert reports and testimony presented at an IDWR hearing in February 2008.

Since the 2008 hearing regarding the SWC delivery call, I have reviewed the various amended methodology orders and the various as-applied orders concerning the SWC Methodology that have been issued over the years. In May 2010, I participated in a hearing on revisions to the SWC Methodology proposed by IDWR and testified at the hearing. I have also been involved in two technical working groups ("TWG") convened by IDWR to discuss potential changes to the SWC Methodology. The first was in early 2015 and the second in late 2022. I submitted comments to IDWR and the TWG in both instances.

I am incorporating into this Expert Report by reference the following expert reports and other information previously presented to IDWR and other parties:

- Franzoy, 2007. Franzoy Consulting, Inc. Expert Rebuttal Report Prepared in Rebuttal to Analyses and Conclusions of Experts for the Surface Water Coalition Dated November 7, 2007. Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC.
- Sullivan, 2007a. Spronk Water Engineers, Inc. Updated Expert Report Dated September 26, 2007 (revised December 2007). Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC.
- Sullivan, 2007b. Direct testimony of Gregory K, Sullivan, P.E. September 26, 2007 (Revised December 2007). Submitted on behalf of the City of Pocatello. In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the SWC.
- Sullivan, 2007c. Spronk Water Engineers, Inc. Expert Rebuttal Report. November 7, 2007 (Revised December 2007). Prepared for the City of Pocatello. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC.
- Sullivan, 2015. Email to IDWR. Pocatello Comments on Draft Staff Memo. March 10, 2015.
- Sullivan and Netter, 2023. Spronk Water Engineers, Inc. Comments on behalf of the Coalition of Cities and the City of Pocatello on the Idaho Department of Water Resources Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to

Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition, by Kara Ferguson and Matt Anders on December 23, 2022. Comments Submitted on January 1, 2023.

- Sullivan, 2023a. Declaration of Gregory K, Sullivan, P.E. May 7, 2023. Case No. CM-DC-2010-0001.
- Sullivan, 2023b. Declaration of Gregory K, Sullivan, P.E. May 7, 2023. Case No. CM-DC-2010-001.

I stand by, reaffirm, and endorse my prior opinions and analyses described in the foregoing materials.

2.0 BASELINE YEAR

The Fifth Methodology Order changed the Baseline Year ("BLY") used to forecast the SWC diversion demands and reasonable carryover from the average diversions during 2006, 2008, and 2012 ("06/08/12") because the average diversions during these years reportedly no longer comply with a condition of the SWC Methodology that the BLY represent a year of above average diversions. Diversions of the SWC members reported in paragraph 27 of the Fifth Methodology Order indicated that the combined diversions of the SWC Members during 06/08/12 averaged 3,194,722 AF, which is 5,667 AF (0.18%) less than the combined diversions during 2000-2021 that averaged 3,200,389 AF. Annual diversions for the SWC members during 2000-2021 from the materials disclosed by Matt Anders (IDWR) during his deposition are summarized in **Table 2-1**.

The IDWR support for the average combined SWC diversions during 2000-2021 of 3,200,389 AF in paragraph 27 is provided in a backup file of diversion data disclosed by Matt Anders (IDWR) during his May 2023 deposition. However, the 06/08/12 average combined SWC diversions from the same data file are different than the figures reported in paragraph 27. The updated 06/08/12 combined diversions average 3,200,349 AF, which is only 40 AF (0.001%) less than the 2000-2021 average diversions.

The 06/08/12 average diversions in paragraph 27 are from the Fourth Methodology Order. Comparison of the backup data for the Fourth Methodology Order with the data disclosed by Mr. Anders shows that IDWR made some revisions to the prior data used for the Fourth Methodology Order. To be consistent, the same data should be used to compute and compare the 06/08/12 average and the 2000-2021 average.

To be sure, 3,200,349 AF is less than 3,200,389 AF, and so the 06/08/12 average is mathematically below average. However, this difference is insignificant and de minimis. Assuming a typical irrigation season from April 1 through October 31 (214 days), the combined diversions of the SWC members average approximately 15,000 AF/day. Therefore, the 40 AF that the 06/08/12 average diversions are below the 2000-2021 average represents less than five minutes of the combined amount that the SWC members divert on average.

The 40 AF that the 06/08/12 average diversions is below the 2000-2021 average is much less than the accuracy of the measuring flumes for the SWC member canals. Assuming the measurement accuracy of the SWC measuring devices is +/- 5%, the combined measurement error would be approximately 160,000 AF/year, which dwarfs the 40 AF that the 06/08/12 average diversions are below the 2000-2021 average. The Director's determination that the 06/08/12 average diversions no longer meet the above average

criteria appears arbitrary, and there is no clear and convincing evidence that this is the case.

Finally, the 22-year period from 2000-2021 that was used to compute the average diversions of the SWC members arbitrarily and conspicuously does not include the most recent year of diversion data, 2022. If the diversion data from 2022 are included, the average combined diversion for 2000-2022 is 3,189,818 AF, which is 10,530 AF less than the 06/08/12 average of 3,200,349 AF. In other words, the 06/08/12 average diversions are above the 2000-2022 average, and based on this comparison, 06/08/12 should still qualify as an above average figure.

The Director selected 2018 as the new BLY for the SWC Methodology because it reportedly met all of the BLY criteria, including being a year of above average diversions. The combined SWC member diversions during the proposed 2018 BLY (3,341,939 AF) are approximately 142,000 AF greater than the 06/08/12 average diversions (3,200,349 AF). So, the 40 AF (5,667 AF uncorrected) that the 06/08/12 average diversions are below the 2000-2021 average will translate into a much larger increase in the BLY combined diversions. In turn, this large increase will also result in substantially greater projected shortages to the SWC members under the Fifth Methodology Order than under the Fourth Methodology Order.

Review of the data in the Anders' spreadsheet indicates that the 06/08/12 average diversions are no longer above average because the diversions of six of the seven SWC members have actually increased since the Fourth Methodology Order was issued in 2016. Furthermore, the Anders spreadsheet does not factor in that the legally established delivery rate for TFCC is one cfs for each eighty acres of land, or five-eighths of a miner's inches for each acre of land (Idaho, 1903).

The diversion averaging period used for comparison to the BLY diversions in the Fourth Methodology Order was 2000 – 2014. Average combined diversions by the SWC members during 2000 – 2014 averaged 3,154,945 AF. During the recent 2015 – 2021 period, combined diversions by the SWC members increased by an average of 142,826 AF as shown in **Table 2-1**. IDWR performed no analyses to assess the reasonableness of the increased SWC member diversions since 2014 that prompted the need to change the BLY.

3.0 PROJECT EFFICIENCIES

Following the initial forecast of the shortages to the SWC members that is made in April based on the BLY estimate of the RISD, Step 6 of the Methodology Order specifies that the RISD will be updated approximately halfway through the irrigation season (~July) using the monthly figures for each SWC member of the Crop Water Need ("CWN") and the Project Efficiency ("PE") up to that point during the irrigation season, and monthly baseline demand figures from the BLY for the remaining months. Additional updates to the RISD's and shortages of the SWC members based on CWN and PE are made shortly before the Time of Need (Step 7) and following the end of the irrigation season (Step 9). The following is the formula that IDWR uses to compute the RISD at mid-season, Time of Need, and end of season (Fifth Methodology Order P. 16):

$$RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p,j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month j,
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j = index variable, and
m = upper bound of summation, equal to the month calculation occurs, where April = 1, May =2, … October = 7.

Monthly CWN values are computed for each SWC member based on Agrimet evapotranspiration data, precipitation data, and cropping information using the following formula (Fifth Methodology Order P. 14):

$$CWN = \sum_{i=1}^{n}(ET_i - W_e)A_i$$

Where,

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = effective precipitation,
A_i = total irrigated area of specific crop type,
i = index variable representing the different specific crop types grown within the irrigation entity, and
n = upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

The baseline project efficiencies for the monthly RISD calculation are computed for each SWC member for each month from April – October based on historical computations of CWN and historical monthly diversions adjusted to remove water not used for irrigation and to add water leased or rented to others. The following is the formula used to compute the monthly project efficiencies (Fifth Methodology Order P. 13):

$$E_p = \frac{CWN}{Q_D}$$

Where:

E_p = project efficiency,
CWN = crop water need, and
Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

In the Fourth Methodology Order, monthly project efficiencies for each SWC member for the preceding 8 years that were within two standard deviations of the average were averaged to compute the monthly values used in the RISD calculations. In the Fifth Methodology Order, the averaging period was changed to use data from the preceding 15 years. The following are the average monthly project efficiencies for each SWC member that will be used for the Fifth Methodology Order (P. 14):

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.98	0.33	0.45	0.87	0.43	0.24	0.31	0.51
5	0.47	0.22	0.32	0.39	0.35	0.24	0.30	0.33
6	0.66	0.40	0.49	0.60	0.56	0.41	0.51	0.52
7	0.74	0.44	0.52	0.67	0.63	0.48	0.58	0.58
8	0.58	0.41	0.42	0.55	0.52	0.43	0.46	0.48
9	0.45	0.27	0.32	0.45	0.38	0.32	0.27	0.35
10	0.18	0.16	0.09	0.14	0.11	0.06	0.04	0.11
Season Avg.	0.58	0.32	0.37	0.52	0.43	0.31	0.35	

SWC Member Average Monthly Project Efficiencies from 2007-2021.[12]

Graphs illustrating monthly and annual average project efficiencies for 2007 – 2021 with values more than two standard deviations from the average removed are shown in **Figure 3-1** and **Figure 3-2**. **Figure 3-1** includes separate graphs of the monthly average efficiencies for each SWC member (solid black line) along with the seasonal average efficiency (dotted black line); both from the table in the Fifth Methodology Order. Also shown for comparison purposes is the reasonable annual efficiency for each SWC member

that I determined in 2007 as a part of my analysis of the SWC member irrigation systems (blue line). Additional discussion of the reasonable annual efficiencies is provided in Section 3.1 below.

Figure 3-2 shows the average monthly project efficiencies during 2007 – 2021 from the Fifth Methodology Order for each SWC member on the same graph. While the monthly project efficiencies for each SWC member vary from one another, the graph depicts a similar characteristic bell-shaped project efficiency curve for each SWC member. These characteristic curves are generally shifted up or down from one another due in part to differences in conveyance losses. A relatively long canal system like AFRD2 will generally have higher conveyance losses and lower project efficiencies than a relatively short canal system like A&B that will generally have lower conveyance losses and higher project efficiencies.

3.1 Reasonableness of Project Efficiencies

The monthly project efficiencies in the Fifth Methodology Order represent the actual efficiencies that result from dividing monthly CWN by monthly adjusted diversions for each SWC member. To my knowledge and per the deposition of Matthew Anders on May 12, 2023, IDWR has not attempted to assess whether the monthly project efficiencies are reasonable in comparison to industry standards for large, well-managed irrigation districts.

Reasonably attainable project efficiencies can be determined for each SWC member based on the conveyance efficiency in delivering water from the river heading to the farms (including allowances for reasonable operational waste) multiplied by a reasonable on-farm efficiency. This is essentially the procedure that IDWR used to analyze the delivery call of the Unit B pumping division of the A&B Irrigation District, and which resulted in the January 29, 2008, Order that found Unit B had not suffered injury because it was not short of water. In that analysis, IDWR determined that a reasonable project efficiency for the Unit B was 75% based on minimal conveyance losses (3.1% in 2006) and the following reported irrigation application efficiencies for sprinklers (Unit B is predominantly sprinkler irrigated):

47. Reported application efficiencies for various sprinkler irrigation systems are as follows:

Sprinkler System	Application Efficiency
stationary lateral (wheel or hand move)	60 – 75%
solid set lateral	60 – 85%
center pivot lateral	75 – 85%

Idaho Irrigation Water Conservation Task Force, 1994, p.38, and Report Regarding Evaluation of Irrigation Diversion Rates, Report to the SRBA District Court Prepared by the Idaho Department of Water Resources, January 14, 1999, p. 38.

This is also the same procedure that I employed in assessing the irrigation operations of the SWC members that is described in my expert reports and testimony presented at the 2008 hearing in the SWC Delivery Call.

Conveyance efficiencies for the SWC members are knowable and can be determined based on records of diversions and deliveries and based on the operational experience of the SWC managers and staff. Achievable on-farm irrigation efficiencies for various application methods (flood, furrow, sprinkler, drip, etc.) are also well established in the technical literature for the industry. The sprinkler efficiencies used in the A&B Order are examples of application efficiencies reported in the literature. Design irrigation application efficiencies generally represent the efficiencies that can be achieved assuming well managed irrigation systems. In my opinion, industry standard design efficiencies represent a level of performance that the SWC members should be expected to achieve before requiring curtailment of junior groundwater users because of computed irrigation water shortages.

My prior work on the SWC Delivery Call that is documented in the expert reports submitted along with testimony in 2008 found that several of the SWC members – A&B, AFRD2, Burley, Milner, and Minidoka – were generally operating with reasonable project efficiencies while others – NSCC and TFCC – were operating at less than reasonable levels.

I analyzed the operations of the SWC members during 1990 – 2006 and determined their actual project efficiencies for each year. In addition, reasonable project efficiencies were estimated based on reported conveyance efficiencies and industry standard application efficiencies weighted based on the mix of gravity and sprinkler irrigation at that time. A summary of the results from my 2007 expert report is provided in **Figure 3-3** along with averages of the monthly project efficiencies from paragraph 32 of the Fifth Methodology Order.

As seen in **Figure 3-3**, the maximum annual efficiencies of A&B, AFRD2, Burley, Milner, and Minidoka during the 1990 – 2006 period all reached the independently computed reasonable project efficiencies that were determined from analysis of the SWC systems. This validated the methodology used to determine the reasonable project efficiencies and showed that these five SWC members were capable of operating at the reasonable efficiency levels. The efficiencies lower than the maximums tended to occur in wetter years with more ample water supplies. The SWC members may at times operate at lower efficiencies than the reasonable values when water supplies are plentiful because it is generally easier to operate an irrigation system with an excess of diversions. However, the SWC should be held to a higher operational standard that they have shown they can achieve when junior groundwater users are being required to mitigate or be curtailed.

The maximum and average project efficiencies determined for NSCC and TFCC during 1990 – 2006 are well below the reasonable efficiencies determined for these two users based on their reported conveyance losses and irrigation application practices.

In my opinion, the analyses that I presented in expert reports and testimony during the 2008 Hearing on the SWC Methodology established reasonable annual project efficiencies that should be used in determining the SWC diversion requirements. These analyses showed that five of the seven SWC members had performed at the reasonable project efficiency levels, while NSCC and TFCC were operating at efficiencies well below reasonable levels. My opinions should not be construed as suggesting that the SWC members must operate at certain efficiency levels. However, when determining whether they are short of water, thus requiring mitigation or curtailment of junior groundwater users, reasonable project efficiencies using the procedures that I employed for my 2007 expert report should be used in determining the shortages.

Had there been time, I would have compiled the necessary information regarding the operations of the SWC members to update the operations analyses that I performed in 2007. Until these analyses can be updated, the reasonable project efficiency values that I determined in 2007 are reasonable for use in the SWC Methodology. This is because it is reasonable to expect that the reasonable project efficiencies for the SWC members should have increased during the last 15 years based on continued gravity to sprinkler conversions and general advancements in irrigation system operation and management.

Despite the expected advances in irrigation system efficiencies during the last fifteen years, comparison of the average project efficiencies determined by IDWR for 2007 – 2021 (black line in **Figure 3-3**) are lower than the average project efficiencies determined for 1990-2006 (red line in **Figure 3-3**). It appears that the declines in average project efficiencies since 2006 are due to these systems not being managed as well as they were in the past.

3.2 Proposed Adjustments to Fifth Methodology Order Efficiencies

If IDWR will not review and assess the reasonableness of the SWC member project efficiencies like it did in the A&B Delivery Call, and like I did in my expert reports and testimony presented in the 2008 hearing, I have developed an alternative proposal for assessing and revising the monthly project efficiencies used in the Fifth Methodology Order. This alternative builds upon the actual efficiencies that the SWC members have demonstrated they routinely achieve and conforms to the framework of the Fifth Methodology Order.

First, I offer the following opinions regarding the patterns of the actual monthly project efficiencies that are summarized in **Figure 3-1**:

- April: Efficiencies tend to be lower than mid-season efficiencies because of temporarily high conveyance losses during the initial period while the distribution system is "wetting." In addition, diversions may contribute to filling of soil moisture for crop use later in the season resulting in lower apparent efficiencies because the soil moisture filling is not included in the formula. Efficiencies are high for A&B and Milner, likely because their diversions tend to commence later in the month resulting in high CWNs use relative to diversions that are satisfied in part by soil moisture and possibly supplemental pumping.
- May: Similar to April, efficiencies tend to be lower than mid-season efficiencies because portions of the diversions are stored in soil moisture for later use. Also, spring precipitation events can reduce CWNs without a corresponding reduction in diversions.
- June-August: Efficiencies during June – August are highest when CWNs are peaking, and the systems are being operated most efficiently. The peak computed efficiencies may result from a portion of the CWNs being met from stored soil moisture and supplemental groundwater pumping.
- September: Efficiencies drop below mid-season values as CWNs decline due to harvesting and lower temperatures without a commensurate decline in diversions. In other words, the CWN declines are greater than the diversion declines.
- October: Efficiencies are typically very low because CWNs decline further due to harvesting and lower temperatures (including freezes) while relatively high diversions continue.

The low monthly average project efficiencies in April, May, September, and October can cause unreasonable spikes in the computed monthly diversion demand when the monthly

CWN is higher than average. This is because the actual efficiency in such a month would generally be higher than the monthly average value used in the demand calculation. This is demonstrated in the analyses presented below.

To further assess the project efficiencies used in the Fifth Methodology Order, graphs were prepared to assess the relationships between:

- Annual Adjusted Diversion vs. Annual CWN (**Figure 3-4**),
- Monthly Adjusted Diversion vs. Monthly CWN (**Figure 3-5 – Figure 3-11**),
- Annual Project Efficiency vs. Annual CWN (**Figure 3-12**), and
- Monthly Project Efficiency vs. Monthly CWN (**Figure 3-13 – Figure 3-19**).

The annual and monthly Adjusted Diversion vs. CWN graphs indicate that there is some correlation between adjusted diversion and CWN. The strength of the correlation indicated by the R-squared value varies by SWC member and by month. In addition to the scatter plots of adjusted diversion vs CWN, the graphs in **Figure 3-4 – Figure 3-11** also show the RISD predictor used in the Fifth Methodology Order (CWN/PE), plotted as a black line. In almost all graphs, the black line exhibits a greater slope than the linear trendline plotted through the data points. This indicates that the CWN/PE predictor is not a robust predictor of diversion demand. In many months, the monthly diversions appear relatively insensitive to changes in CWN. This is indicated in the plots with a relatively flat trendline juxtaposed with a relatively steep CWN/PE line.

The annual and monthly graphs of Project Efficiency vs. CWN in **Figure 3-12 – Figure 3-19** show moderate to strong positive correlations between project efficiency and CWN for the SWC members in many months. The months with moderate to strong PE to CWN correlations (R-squared > 50%) tend to be months with significant differences between the slopes of the diversion vs. CWN trendline and CWN/PE predictor (black line) in **Figures 3-4 through 3-10**. It generally appears that the greater the disparity between slopes of the Diversion to CWN trendline and the CWN/PE predictor, the stronger the correlation between PE and CWN. The following is a list of months for each SWC member in which this relationship exists:

- A&B – Jul, Aug, Sep, Oct;
- AFRD2 – May, Jul, Sep;
- BID – May, Jun, Aug, Sep, Oct;
- Milner – May, Oct;
- Minidoka – May, Jul, Aug, Sep, Oct;
- NSCC – May, Jun, Jul, Aug, Sep, Oct; and,
- TFCC – May, Jun, Jul, Aug, Sep, Oct.

In my opinion, months with strong PE to CWN correlations reflect months in which there tend to be over-diversions relative to the CWN. In such months, the CWN is easily met and months with greater CWN are months with greater project efficiency.

IDWR's use of fixed monthly project efficiencies for computing RISD from monthly CWN is inconsistent with the relationships in **Figures 3-13** through **3-19** that indicate for many months that project efficiencies vary with CWN. Rather than using the fixed monthly values for project efficiency in Paragraph 32 of the Fifth Methodology Order, the SWC Methodology would be improved in many months by using regression equations based on monthly CWN to compute the monthly project efficiencies that are used in the RISD calculations.

I propose that the regression equations be used in the months of April – September with R-squared values greater than 0.50. In the months in which the regression equation is used, I propose that a floor for the monthly efficiencies be specified based on the average monthly efficiency during 2007 – 2021. This will ensure that the demand calculations use monthly project efficiencies that are at or above average consistent with efficiencies that the historical operational data show they have routinely attained.

In the other May – September months with R-squared values less than 0.50, the regression equation is not a good predictor of the project efficiency. In these months, I propose that the 75th percentile efficiency be used (i.e., the value at which 25% of the monthly project efficiencies are greater). To simplify the procedure, the 75th percentile method could be used in all May – September months.

To avoid use of unreasonably low project efficiencies in October, I propose that the 75th percentile efficiency for September be used for computing the October demand for all SWC members.

The proposed revised procedure for determining the monthly project efficiencies used in computing the monthly diversion demands will result in efficiency values that are at or above the historical averages. This will help avoid unreasonably low efficiency values creating unreasonable shortages to the SWC members requiring undue mitigation or curtailment of junior groundwater users (that generally operate with relatively high irrigation efficiencies).

A hindcast analysis for TFCC and AFRD2 was performed to illustrate the effects of using alternate methods of computing project efficiencies. The project efficiencies were computed using (1) the proposed monthly averages from the Fifth Amended Methodology Order, (2) the regression equations shown on **Figure 3-14** and **Figure 3-19** limited to a minimum of the historical monthly average project efficiency, and (3) the

regression equations on **Figure 3-14** and **Figure 3-19** limited to a minimum of the 75th percentile historical monthly project efficiency. If the regression R-Squared is less than 0.5, the monthly average project efficiency was used for (2), and the 75th percentile historical monthly project efficiency was used for (3). **Table 3-1** and **Table 3-2** show the 2007 – 2021 computed demands (CWN/PE) and the November 1 RISD shortfalls using the three different project efficiency methods for TFCC and AFRD2.

In my opinion, the foregoing discussion clearly and convincingly establishes that the SWC members often operate at unreasonably low project efficiencies, particularly NSCC and TFCC. The proposed procedure will ensure to a clear and convincing standard, that (a) shortages to the SWC members will be computed only when they are operating at reasonable project efficiencies, (b) the SWC members are protected from material injury by junior groundwater pumping, (c) the groundwater users are protected from excessive or undue mitigation obligations and curtailment, and (d) the beneficial uses of the interconnected surface water and groundwater resources of the Snake River and the ESPA are maximized.

4.0 IRRIGATED AREA

The 2008 Order from Hearing Officer Schroeder in the SWC Delivery Call found that non-irrigated acres should not be included in determining the irrigation demands of the SWC members:

> *"Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members. IGWA has established that at least 6,600 acres claimed by TFCC in its district are not irrigated. Similar information was submitted concerning the Minidoka Irrigation District, indicating that the claimed acreage of 75,152 includes 5,008 acres not irrigated and Burley Irrigation District has some 2,907 acres of the 47,622 acres claimed not irrigated. These amounts may, of course, change as acreage is removed from irrigation or possibly added back."*
> (IDWR, 2008 at P. 53)

The April As-Applied Order determined that the following acreages for the SWC members will be used to compute the monthly CWN and RISD values using the equations listed above in Section 3.0.

6. Based on the information submitted by the SWC, the Department will use the following total irrigated acres:

	Total Irrigated Acres[1]	Data Source
A&B	15,924	SRBA Partial Decree
AFRD2	62,361	SRBA Partial Decree
BID	46,035	2013 shapefile submitted by BID, reduced by Department for overlapping acres and acres outside of service area.
Milner	13,264	2010 service area shapefile, reduced by Department for overlapping acres and acres outside of service area.
Minidoka	75,093	SRBA Partial Decree
NSCC	154,067	SRBA Partial Decree
TFCC	194,732	2013 shapefile submitted by TFCC, reduced by Department for overlapping acres and acres outside of service area.

As indicated in the above table, the total irrigated area figures for the SWC members are based either on figures from their partial decrees or from shapefiles submitted to IDWR many years ago. Neither of these sources have been shown to reflect the acres actually irrigated by the SWC members.

During the meetings of the SWC TWG held in late 2022, IDWR presented analyses of the SWC member irrigated area in 2011, 2017, and 2021 with non-irrigated acres removed.

The following is a summary of the irrigated area figures that IDWR presented for the three years.

SWC Irrigated Acres

SWC Member	2011 Acres*	2017 Acres*	2021 Acres*	Methodology Acres
A&B	21,585	21,634	21,625	15,924
AFRD2	68,368	66,606	68,384	62,361
Burley	44,113	44,168	44,139	46,035
Milner	13,239	13,202	13,233	13,264
Minidoka	71,295	72,016	71,073	75,093
NSCC	220,953	218,498	220,937	154,067
TFCC	179,486	180,956	179,456	194,732

* with non-irrigated acres removed

According to deposition testimony from Matt Anders, IDWR overlaid aerial imagery from 2011, 2017, and 2021 on the irrigated area shapefiles from the SWC members and determined whether each parcel was irrigated, not irrigated, or partially irrigated. The partially irrigated parcels included hardened acres (roads, buildings, etc.) and other areas that that were not irrigated. If the non-irrigated portions of the partially irrigated parcels were removed, the 2011, 2017, and 2021 irrigated area figures would be lower than the amounts shown in the above table.

The highlighted methodology acres in the above table for Burley, Minidoka, and TFCC represent irrigated acres used in the SWC Methodology that exceed that irrigated acres determined by IDWR. Clearly, based on IDWR's own data, the highlighted methodology acres do not represent the actual irrigated areas of the SWC members. In my opinion, it would be more appropriate to use the 2021 acres for purposes of the demand calculations. The acres in 2021 are shown to be generally consistent with acreages from 2011 and 2017, all of which are less than IDWR's proposed methodology acres.

The 2021 acres for the TFCC are 15,276 acres less than the methodology acres. Based on the weighted average annual crop irrigation requirement for the TFCC over the last 20 years of approximately 2.2 AF/acre and an average project efficiency of 35%, the acreage

difference will overstate the TFCC annual demand by approximately 96,000 AF. This is more than the projected 2023 TFCC shortage of 75,200 AF in the April As-Applied Order.

5.0 SUPPLEMENTAL GROUNDWATER

According to the Fifth Supplemental Order, the use of supplemental groundwater may be considered in determining the irrigated acreage of the SWC members.

> *"In determining the total irrigated acreage, the Department may account for supplemental ground water use. The Department currently does not have sufficient information to accurately determine the contribution of supplemental ground water to lands irrigated with surface water by the SWC. If and when reliable data is available to the Department, the methodology will be amended to account for the supplemental ground water use."*
> (Fifth Methodology Order at P. 40)

IDWR has been asserting a lack of information regarding the use of supplemental groundwater by the SWC members for over ten years. The subject of supplemental groundwater use by the SWC members was raised as a concern in the SWC TWG meetings in 2015 and 2022, and the response has always been that there is not enough information.

In my 2007 expert report for the SWC Delivery Call, I summarized the supplemental groundwater acres based on information the SWC members submitted to the IDWR Director in response to his request for information. The following is the tabulation of supplemental groundwater acres that was in my 2007 report.

Table 3

Supplemental Ground Water Acreage
Surface Water Coalition
(acres)

District/Company	Acres
A&B Irrigation District	-
American Falls Reservoir District #2	11,462
Burley Irrigation District	263
Milner Irrigation District	1,890
Minidoka Irrigation District	4,650
North Side Canal Company	16,358
Twin Falls Canal Company	13,775

Source: Supplemental Response to Director's Information Request, April 15, 2005

IDWR maintains a database and shapefiles for groundwater rights and surface water rights in the state. It would be a relatively simple matter to overlay the shapefiles of the groundwater water right acreages on the shapefiles of the surface water irrigated areas for the SWC members to determine the surface water acres with access to groundwater.

In addition, IDWR now requires all ESPA groundwater pumping to be measured or estimated, so there should be pumping records available for the groundwater rights having acres that overlap the irrigated area shapefiles for the SWC members.

A reasonable mechanism could be developed to estimate the supplemental groundwater use by the SWC members. Repeated assertions that insufficient information is available to assess the use of supplemental groundwater use by the SWC members is unreasonable and is starting to ring hollow.

6.0 TRANSIENT GROUNDWATER MODELING

Until the Fifth Methodology Order, all prior methodology orders determined the priority date for curtailment of junior groundwater users because of a determination of material injury to the SWC members caused by a shortage in RISD or a shortage to reasonable carryover based on steady-state runs of the ESPAM. Repeated ESPAM runs were made simulating the impacts of pumping junior to various assumed priority dates until the annual impact at steady-state to the near Backfoot to Minidoka reach of the Snake River matched the amount of the predicted combined shortage to the SWC members.

The Fifth Methodology Order proposes a sea-change in the procedure for determining the priority date for curtailment of junior groundwater users. Instead of steady-state runs, IDWR will perform transient runs of the ESPAM to determine the priority date of curtailment. IDWR will make repeated transient runs of the ESPAM simulating the impacts of curtailing pumping junior to various assumed priority dates until the impact on the near Blackfoot to Minidoka reach between May 1 and September 30 in the first year of curtailment totals the amount of the predicted combined shortage to the SWC members.

In the April As-Applied Order, IDWR determined curtailment of groundwater rights with priority dates junior to December 30, 1953, was necessary to produce a reach gain to the near Blackfoot to Minidoka reach between May 1, 2023, and September 30, 2023, totaling 75,200 AF (forecast combined shortage to the SWC members in 2023).

IDWR now asserts in the Fifth Methodology Order that it must move from steady-state to transient modeling because it has a better understanding of applying the two different types of modeling and that the calibration using monthly stress periods and halfmonth time steps is a refinement that now allows such a change.

> *"Furthermore, the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling to determine a curtailment priority date that would supply adequate water to the senior water right holders. The first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version was calibrated using monthly stress periods and halfmonth time steps, a refinement that facilitates in-season transient modeling for calculating the response to curtailment of groundwater use. The purpose of this Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("Fifth Methodology Order") is to update the Director's methodology for determining material injury to storage and natural flow water*

rights either held by or committed to members of the SWC consistent with the Director's ongoing obligation to use the best available science and information." (Fifth Methodology Order at P.2)".

IDWR asserts in the Fifth Methodology Order that curtailment of groundwater rights junior to a curtailment date determined based on steady-state modeling would not produce sufficient water during the first year of curtailment to offset the impact to the senior surface water rights.

"Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year. Fifty percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately four years. Ninety percent of the steady-state response is predicted to accrue at the near Blackfoot to Minidoka reach within approximately 24 years." (Fifth Methodology Order at P. 30).

The Fifth Methodology Order cites the mechanism used for surface water administration in support of the need for transient curtailment analysis.

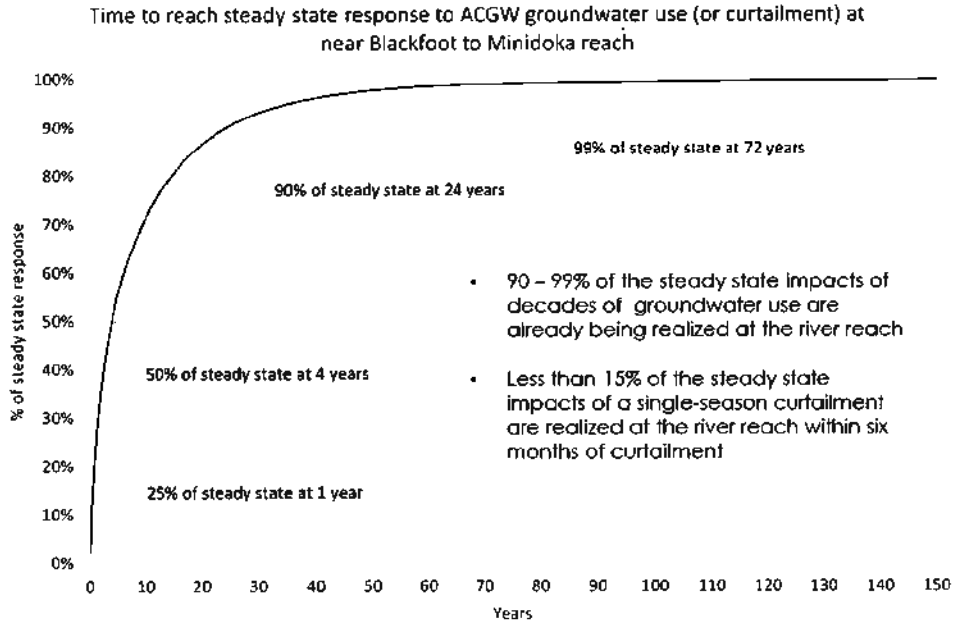
"In surface water administration, uses by holders of junior priority surface water rights are curtailed until the senior surface water rights are fully satisfied, absent a futile call and if the senior surface water users need the water to accomplish a beneficial use. In other words, under surface water administration, junior surface water rights are generally curtailed unless the senior gets water in the quantity and at the time and place required." (Fifth Methodology Order at P. 35).

Monthly stress periods and halfmonth time steps have been part of the ESPAM model since 2013 and are not new refinements. Prior to ESPAM 2.1, the differences between steady-state modeling and transient modeling were well understood by IDWR and the ESHMC members and were frequently discussed during meetings.

In my opinion, given the circumstances of the conjunctive administration of groundwater and surface water in the Upper Snake River Basin, use of steady-state modeling to determine the priority date of curtailment is reasonable and appropriate. In addition, as described below, administration that treats ground water rights like surface water rights (i.e., by requiring curtailment to satisfy seniors) is grossly inefficient and results in disproportionate impacts on junior ground water users.

There has been a moratorium against new groundwater development in the ESPA without mitigation since 1993. Therefore, all pre-moratorium wells have been pumping for at least 30 years, and most wells for much longer. As a result, the effects of the pumping by pre-moratorium wells on Snake River flows have reached near steady state. This is

evident in the following results of a curtailment run that was presented by Jennifer Sukow (IDWR) during the November 28, 2022, TWG meeting (Slide 6) that show the effects of ESPA pumping are approximately 93% of steady-state after 30 years and 98% of steady-state after 50 years:



It follows that the steady-state curtailment runs that IDWR has used for eighteen years, since the Director issued his first SWC curtailment order in 2005, represent reasonable estimates of the last increment of depletions to the near Blackfoot to Minidoka reach being caused by wells that are junior to the simulated curtailment date. These impacts reflect the aggregated impacts of all current and prior pumping by the junior wells. In my opinion, steady-state modeling is the technically correct way to determine the curtailment date for the SWC Methodology.

In Colorado, it was recognized early on that it was impractical to conjunctively administer wells and surface water rights in the same manner as administration between surface water rights because of the delayed impacts on surface streams from curtailing groundwater pumping. Use of transient modeling effectively attempts to administer groundwater rights as if they were surface water rights, which is ill advised because of the delayed response of streamflows to groundwater curtailment. A more elegant and efficient solution is to require junior groundwater users to offset impacts to senior surface water rights caused by current and prior pumping. In that way, the seniors are protected

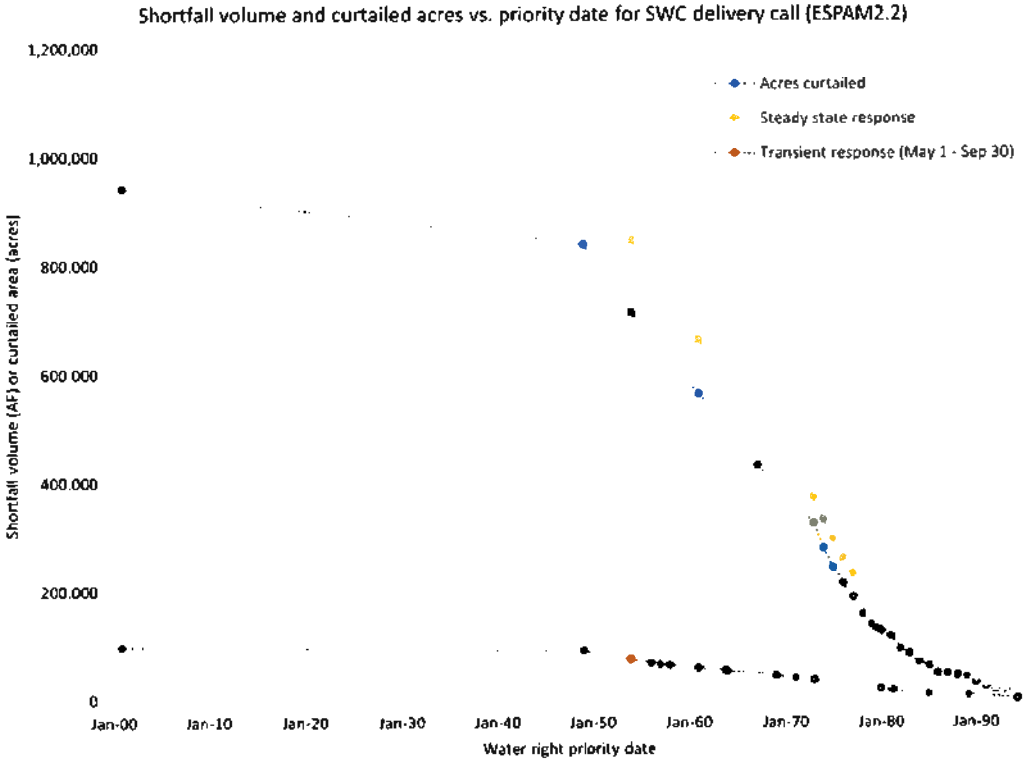
from injury and the junior groundwater users can continue to pump. This was the practice in Idaho until the imposition of the Fifth Methodology Order and has been the practice in Colorado for over 50 years.

In Colorado, junior groundwater users are required to have a judicially or administratively approved plan in place that is capable of replacing the injurious impacts on surface users in time, place, and amount in order for the juniors to pump any groundwater. Otherwise, the junior groundwater user is permanently curtailed unless or until they can obtain approval of a replacement plan.

In sum, the process of determining curtailment dates based on steady-state runs should *continue* to be applied in the Upper Snake River Basin because it will properly assign the obligation for mitigating any computed shortages to the SWC members to the junior groundwater users whose current and prior pumping is the cause of the shortage.

Further, in my opinion, implementation of transient groundwater modeling in the Fifth Methodology Order will cause injury to certain groundwater users by requiring them to mitigate for impacts to senior surface water rights that they did not cause.

Consider the present situation with a predicted shortage to the TFCC of 75,200 AF in 2023. It is the last 75,200 AF of depletions to the near Blackfoot to Minidoka reach that created the current shortage. Based on the following graph presented by Jennifer Sukow during the November 28, 2022, TWG meeting, curtailment of pumping from wells junior to sometime in the mid-1980s would produce 75,200 AF/y of water at steady state to the near Blackfoot to Minidoka reach.



In other words, the last 75,200 AF of depletions to this reach that created the shortage to the TFCC was caused by wells junior to the mid-1980s.

Under the prior appropriation doctrine, the wells senior to the mid-1980s are entitled to the conditions that existed at the time of their appropriation. Among those conditions would be that the last 75,200 AF of depletion to the near Blackfoot to Minidoka reach caused by more junior wells would not have occurred and would not have created the shortage to TFCC that exists in 2023. Curtailing or requiring mitigation from groundwater rights in 2023 with priority dates senior to the mid-1980s would injure those groundwater rights because pumping under these more senior groundwater rights did not create the shortage to the TFCC this year. The obligation to mitigate the 75,200 AF of shortage to the TFCC in 2023 should be shouldered by wells junior to the mid-1980s. These are the wells whose current and prior pumping created the shortage in 2023.

7.0 SUMMARY OF OPINIONS

Based on my review and analysis of the materials disclosed by IDWR, my involvement in SWC Delivery Call matters since 2005, and my 37 years of experience in conjunctive administration of groundwater and surface water rights, the following is summary of my professional opinions on the Fifth Methodology Order and the April As-Applied Order.

1. IDWR made substantive changes to the SWC Methodology in the Fifth Methodology Order including a change in the BLY used to forecast SWC member demands at the beginning of the year, changes in the monthly project efficiencies used to compute demands mid-season, and changes in how the priority date for curtailment of junior groundwater users is determined.
2. It has been over 15 years since the last comprehensive review of the SWC Methodology. During that time, there have been numerous changed conditions that dictate that all elements of the SWC Methodology be reassessed to determine if they remain appropriate for determining shortages to the SWC members caused by junior groundwater pumping and whether the proposed changes to the SWC Methodology are reasonable and appropriate.
3. The proposed change in the BLY from 06/08/12 to 2018 that increased the combined BLY demand by approximately 142,000 AF was arbitrary and unreasonable given that the 06/08/12 BLY is only 40 AF (0.001%) less than the 2000 – 2021 average diversions. Further, if the diversions from 2022 are considered in computing the average annual diversions, then the 06/08/12 diversions would still be above average and would still qualify as a BLY.
4. The combined diversions of the SWC members have increased by an average of 148,826 AF since 2005 while average project efficiencies of most SWC members have declined. IDWR has not analyzed the reasonableness of these changes in light of the substantive increases these changes will cause to the computed shortages of the SWC members.
5. Continued sprinkler conversions and advancements in irrigation technology and management suggest that project efficiencies should have increased over the last 15 years rather than decreased.
6. Lower project efficiencies for certain of the SWC members in some or all months will cause unreasonable increases in computed diversion demands and water shortages, especially for TFCC.

7. Unreasonably low efficiencies during the shoulder months of April, May, September, and October will cause unreasonable monthly water demands, especially in months when the CWN is greater than average.

8. Industry standard procedures should be employed to assess the reasonableness of the monthly project efficiencies of the SWC members, including the reductions in project efficiencies that have occurred over the last 15 years. IDWR employed such procedures in evaluating whether Unit B was short of water in assessing the A&B delivery call in 2008.

9. Scatter plots of monthly diversions vs CWN during the last 15 years show that CWN is often a poor predictor of the diversion demands of the SWC members. This indicates that the SWC Methodology should be examined and revised to improve how the diversion demands of the SWC members are determined.

10. Project efficiencies are unexpectedly well-correlated to CWN for many SWC members in some months and for NSCC and TFCC in most months. This is a symptom of more water being diverted than is needed to meet crop water demand.

11. Use of CWN and average monthly project efficiencies will overstate SWC diversion demands in months with above average CWN.

12. The SWC Methodology would be improved by changing the way that monthly project efficiencies are determined for computing RISD. Regression equations based on CWN should be used for months with a moderate to strong correlation (R-squared > 0.5) with a floor no lower than the average monthly efficiency during the past 15 years. In months without a good correlation to CWN (R-squared < 0.5), project efficiencies should be set at the 75th percentile of efficiencies during the past 15 years. The monthly efficiency values for September should be used for October.

13. The irrigated area determined from shapefiles submitted by several of the SWC members exceeds the irrigated area determined by IDWR from analysis of aerial imagery and remote sensing in recent years. It is unreasonable and unlawful for non-irrigated acreages to be included in computing the CWN of the SWC members.

14. The discrepancy between claimed and actual irrigated area is especially egregious for TFCC which claims an irrigated area that is 15,276 acres greater than the irrigated area determined by IDWR in 2021. Based on an average annual ET rate of 2.2 AF/ac and an average project efficiency of 35%, the acreage discrepancy for TFCC would amount to approximately 96,000 AF, which is greater than the forecast shortage for TFCC in 2023 of 75,200 AF in the 2023 April As-Applied Order.

15. The SWC Methodology has long specified that supplemental groundwater pumping be considered in determining whether shortages to the SWC members exist. However, IDWR has done nothing over the past fifteen years to quantify or estimate the supplemental pumping of the SWC members. This is despite the availability of groundwater right mapping and groundwater pumping records that could be analyzed to reasonably determine the supplemental pumping of the SWC members.

16. The change in use of the ESPAM to determine the priority date of curtailment based on transient groundwater modeling is unreasonable because it will result in groundwater users having to mitigate or be curtailed for shortages to the SWC members that they did not cause. This is counter to the prior appropriation system and will cause injury to groundwater users.

17. Steady-state groundwater modeling is more appropriate for use in determining the priority date of curtailment for purposes of the SWC Methodology because virtually all of the ESPA pumping has been occurring since at least the early 1990s when the moratorium against new wells was instituted, and by 2023, the effects of ESPA pumping on Snake River flows have reached near-steady state.

18. Use of transient groundwater modeling to determine the priority date of curtailment improperly attempts to conjunctively administer groundwater rights under surface water right administration procedures. Conjunctive administration through curtailment is extremely inefficient and counter to mechanisms developed in Colorado and other western states in which conjunctive administration is enacted through replacement of depletions rather than through curtailment.

8.0 INFORMATION RELIED ON

The following information was relied upon in preparing this expert report.

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and the Request for Delivery of Water to Senior Surface Water Rights by the SWC. Including IDWR backup documents. June 23, 2010.

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IDWR 2015. Third Amended Final Order Regarding Methodology Order for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover. In the Matter of the Request of Administration in Water District 120 and the Request for Delivery of Water to Senior Surface Water Rights by the SWC. April 16, 2015.

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IDWR 2022a. Presentations and backup documents provided as part of the Surface Water Coalition Delivery Call Technical Working Group. Meetings held on November 16, 17, and 28 and December 1, 9, and 14 in 2022.

IDWR 2022b. Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition. By: Kara Ferguson, Staff Hydrologist & Matt Anders, Hydrology Section Supervisor. December 23, 2022.

IDWR. 2023a. 37.03.11 – Rule for Conjunctive Manage of Surface and Ground Water Resources. IDAPA 37 – Department of Water Resources. Water Compliance Bureau. Available from: https://adminrules.idaho.gov/rules/current/37/. Last Accessed: May 22, 2023.

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Sullivan, 2007b. Direct testimony of Gregory K, Sullivan, P.E. September 26, 2007 (Revised December 2007). Submitted on behalf of the City of Pocatello. In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the SWC.

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Sullivan, 2023b. Declaration of Gregory K, Sullivan, P.E. May 7, 2023. In Regard to Irrigated Acres in the SWC Methodology Order. In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the SWC.

FIGURES

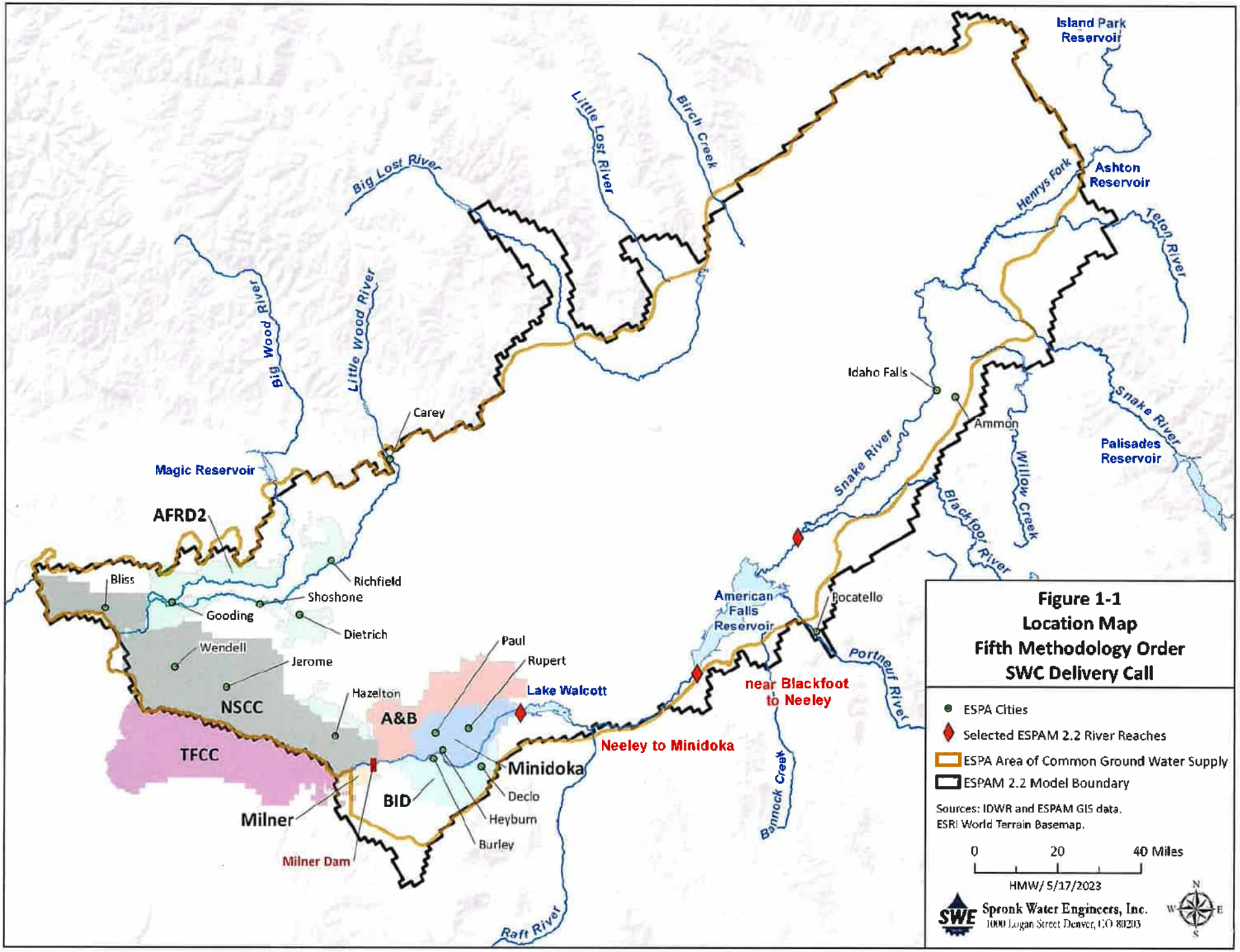
Island Park Reservoir
Big Lost River
Little Lost River
Birch Creek
Henrys Fork
Ashton Reservoir
Teton River
Big Wood River
Little Wood River
Carey
Idaho Falls
Ammon
Snake River
Snake River
Palisades Reservoir
Willow Creek
Blackfoot River
Magic Reservoir
AFRD2
Bliss
Richfield
Shoshone
Gooding
Dietrich
American Falls Reservoir
Pocatello
Portneuf River
Wendell
Jerome
Paul
Rupert
Lake Walcott
near Blackfoot to Neeley
Hazelton
NSCC
A&B
TFCC
Neeley to Minidoka
Minidoka
Declo
Heyburn
Burley
BID
Milner
Milner Dam
Bannock Creek
Raft River
Figure 1-1
Location Map
Fifth Methodology Order
SWC Delivery Call
ESPA Cities
Selected ESPAM 2.2 River Reaches
ESPA Area of Common Ground Water Supply
ESPAM 2.2 Model Boundary
Sources: IDWR and ESPAM GIS data.
ESRI World Terrain Basemap.
0
20
40 Miles
HMW/ 5/17/2023
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
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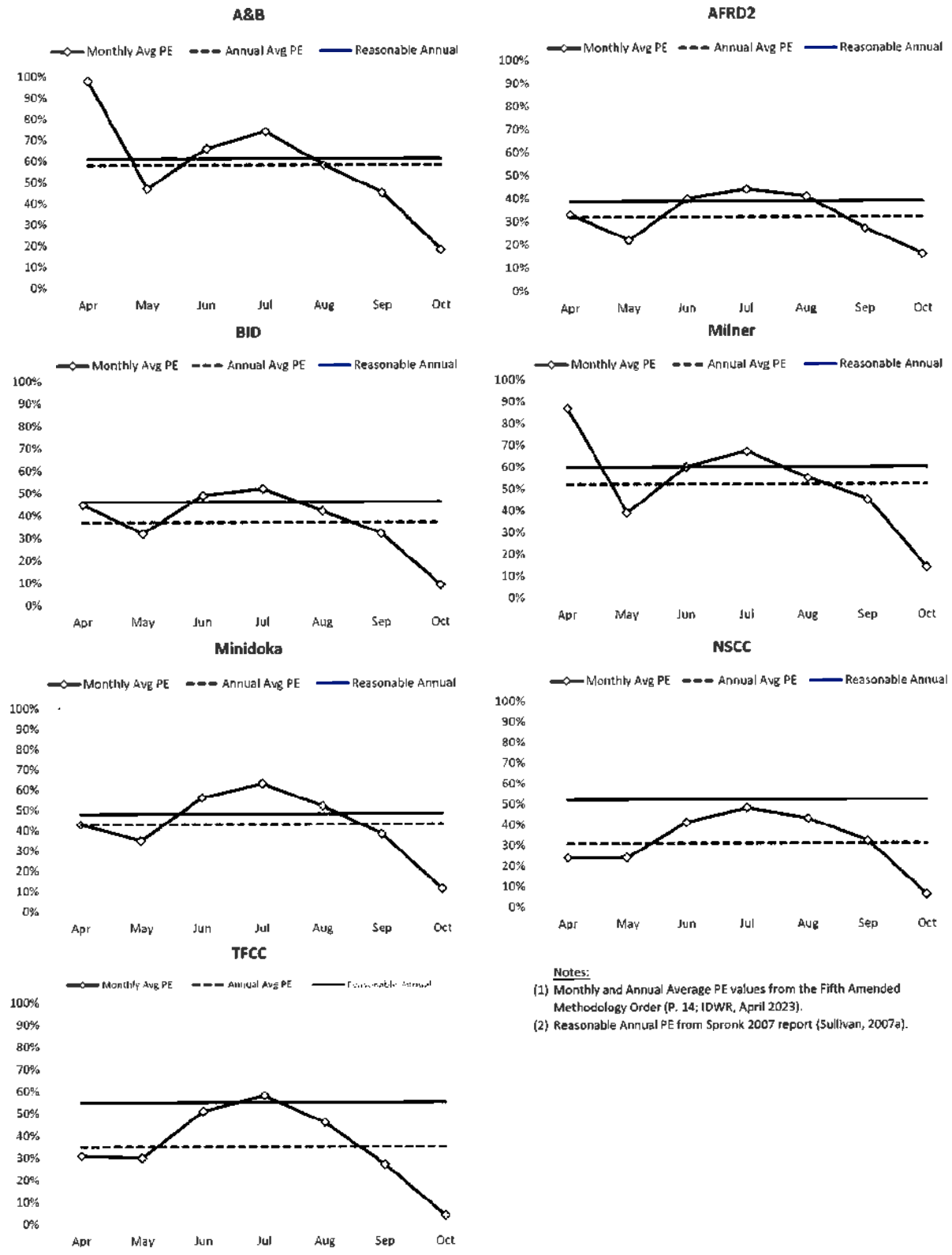
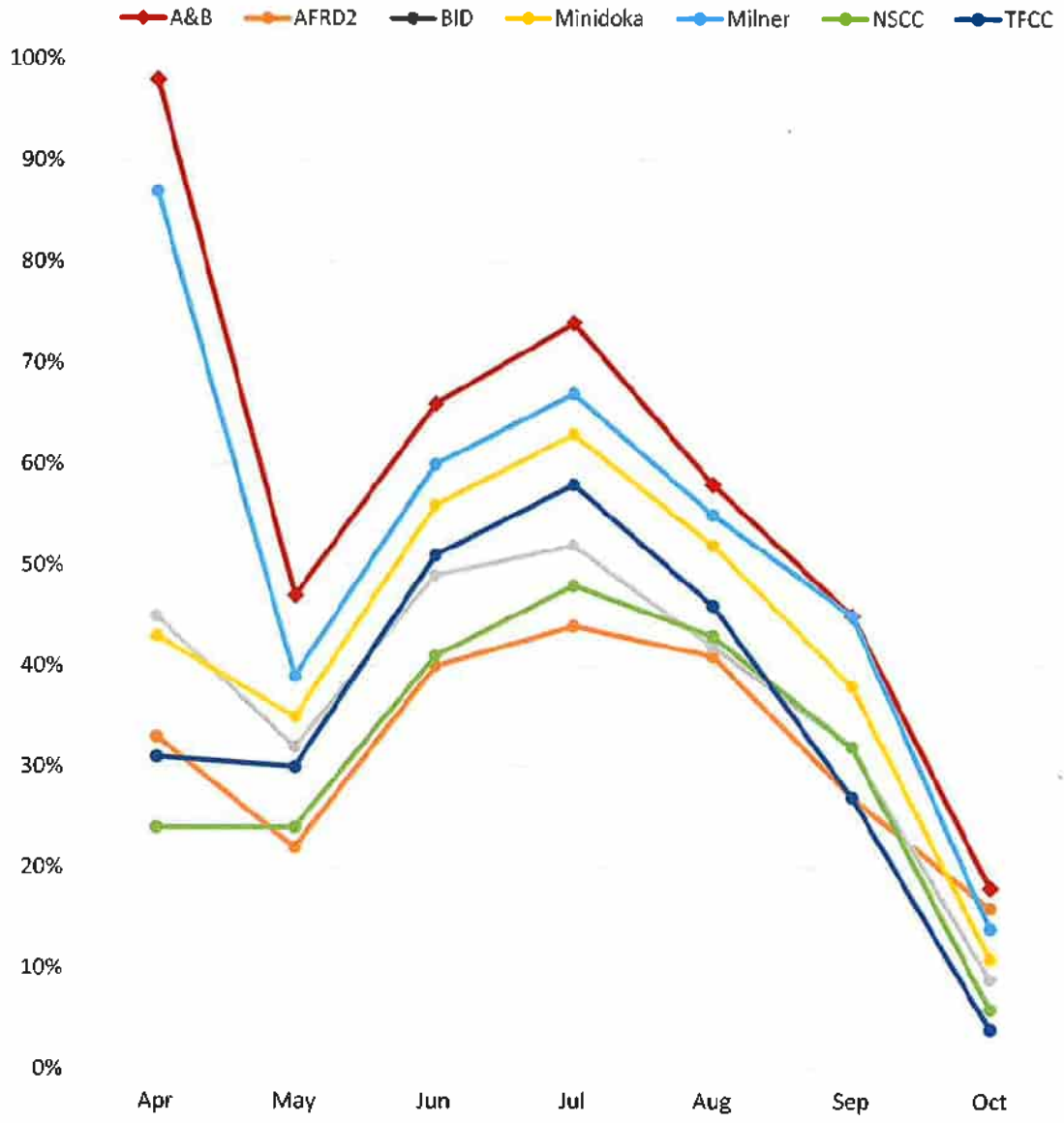
Figure 3-1
Annual and Monthly Average Project Efficiency
Surface Water Coalition Members
2007 - 2021
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:
(1) Monthly and Annual Average PE values from the Fifth Amended Methodology Order (P. 14; IDWR, April 2023).
(2) Reasonable Annual PE from Spronk 2007 report (Sullivan, 2007a).

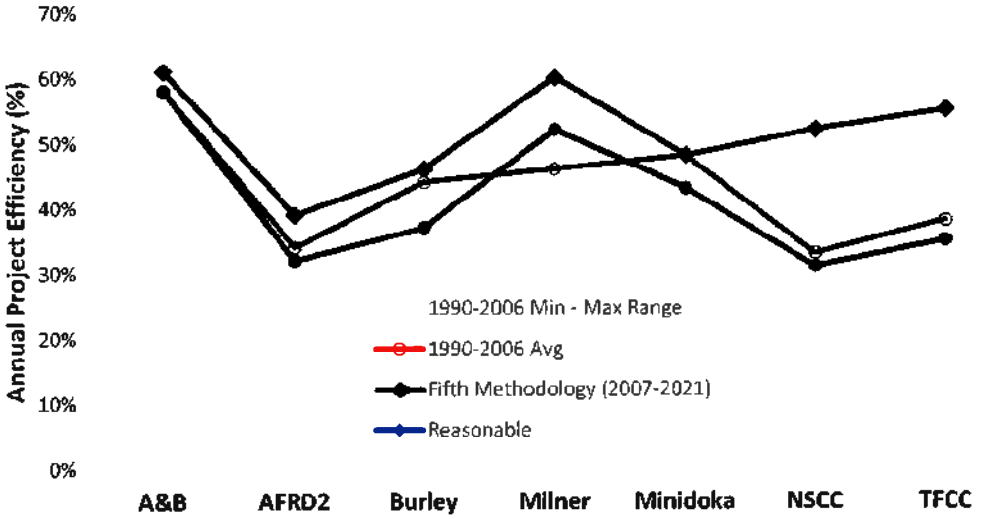
Figure 3-2
Monthly Average Project Efficiency
Surface Water Coalition Members
5th Amended Methodology Order



Notes:
Monthly average PE values from Fifth Amended Methodology Order (P. 14; IDWR, April 2023).

Figure 3-3

Reasonable and Actual Project Efficiencies
2008 Hearing vs. Fifth Methodology Order



SWC Member	(1) Reasonable (Achievable) Project Efficiencies	(2) Actual Project Efficiencies (1990-2006) Min	Average	Max	(3) Fifth Methodology Order (2007-2021)
A&B	61%	49%	58%	61%	58%
AFRD2	39%	25%	34%	40%	32%
Burley	46%	37%	44%	46%	37%
Milner	60%	39%	46%	61%	52%
Minidoka	48%	40%	48%	48%	43%
NSCC	52%	26%	33%	39%	31%
TFCC	55%	31%	38%	45%	35%

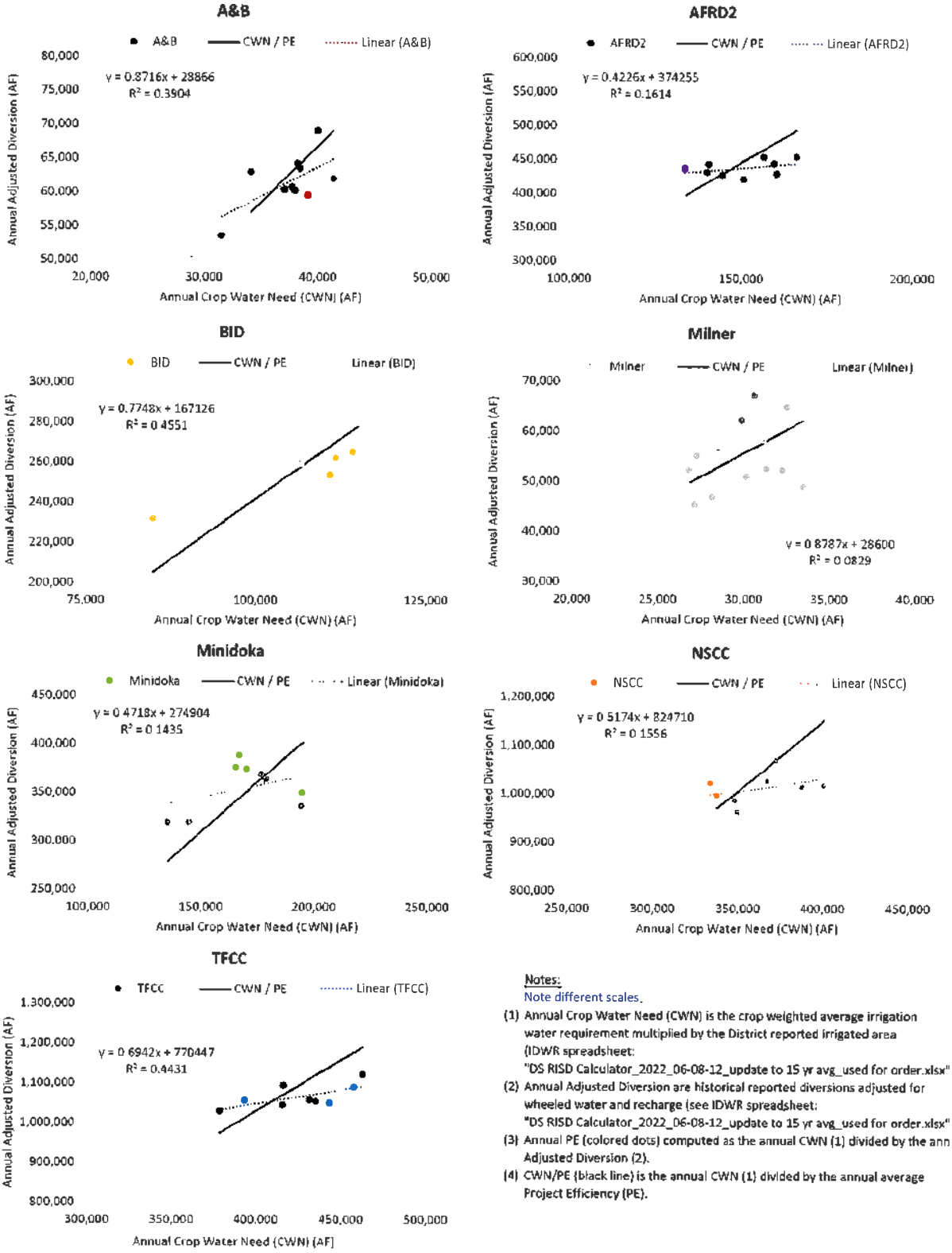
Notes:

(1) From September 26, 2007 Sullivan Expert Report, SWC Delivery Call.
Based on reported conveyance efficiency x achievable on farm efficiencies.

(2) From September 26, 2007 Sullivan Expert Report, SWC Delivery Call.
Based on analysis of SWC operations for 1990 - 2006.

(3) From April 21, 2023 Fifth Methodology Order at 14.
Based on average of monthly efficiencies during 2007 - 2021.

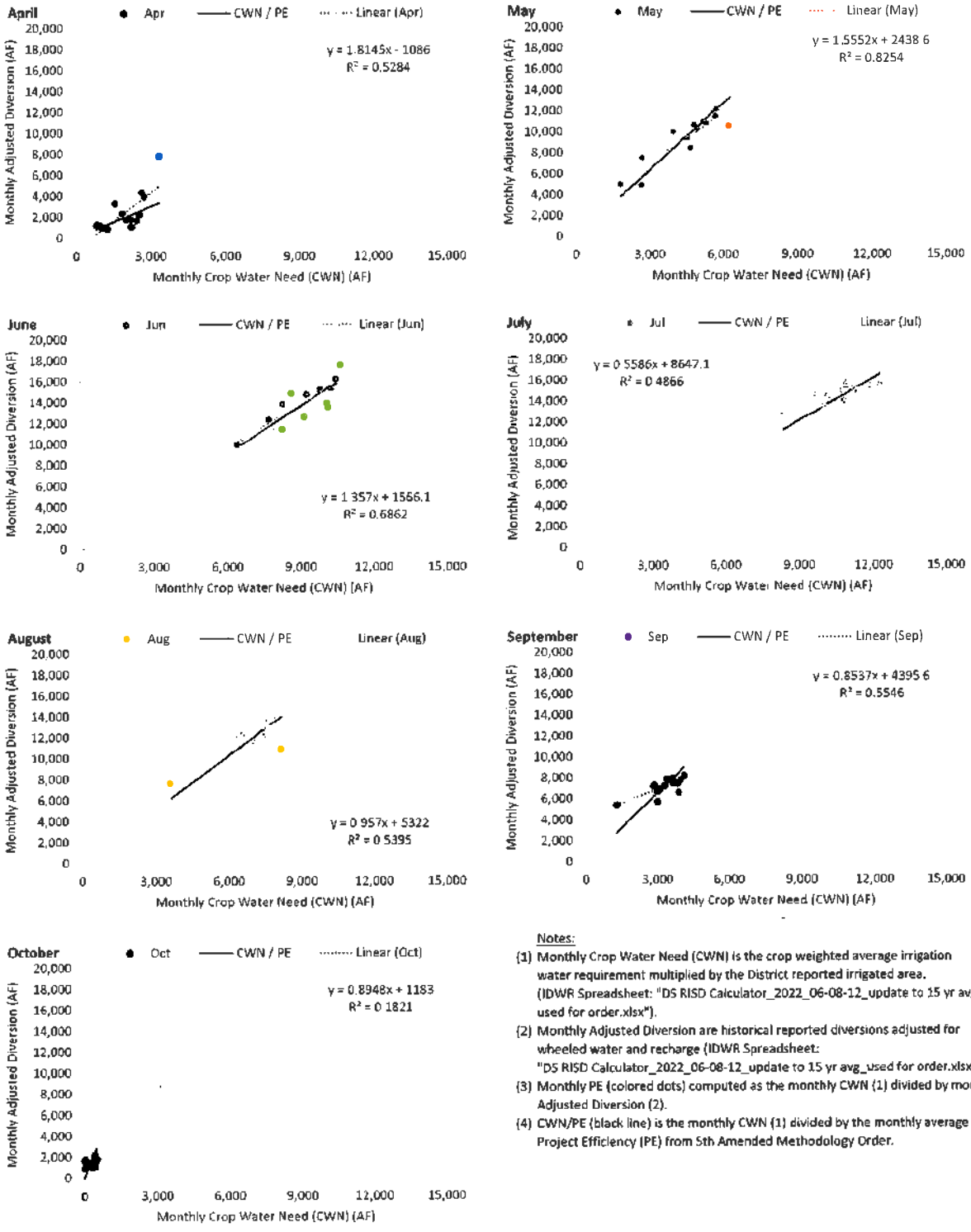
Figure 3-4
Annual Adjusted Diversion v. Annual Crop Water Needs (CWN)
Surface Water Coalition Members
2007 - 2021
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:
Note different scales.

(1) Annual Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area (IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"
(2) Annual Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (see IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"
(3) Annual PE (colored dots) computed as the annual CWN (1) divided by the ann Adjusted Diversion (2).
(4) CWN/PE (black line) is the annual CWN (1) divided by the annual average Project Efficiency (PE).

Figure 3-5
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
A&B
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

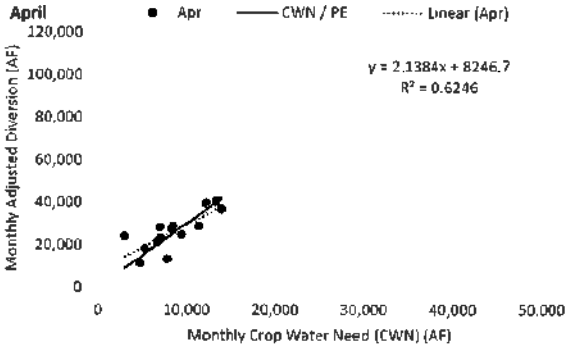
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

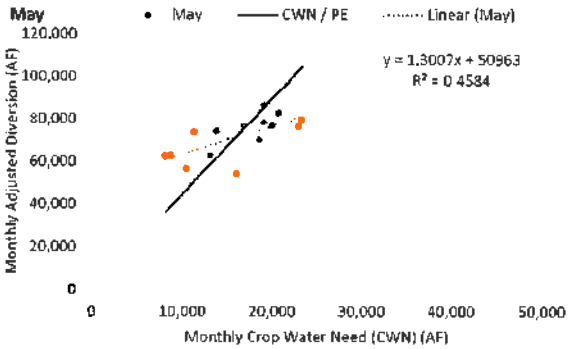
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

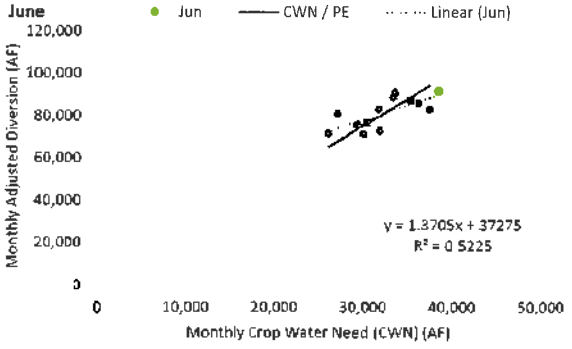
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

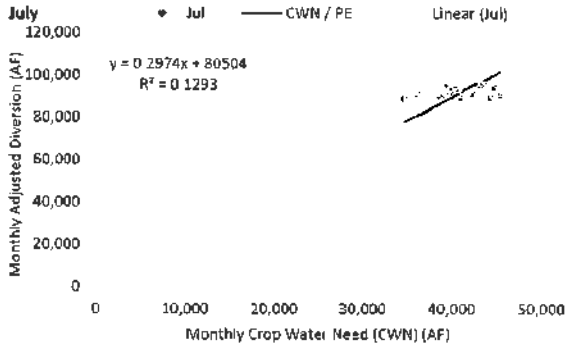
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

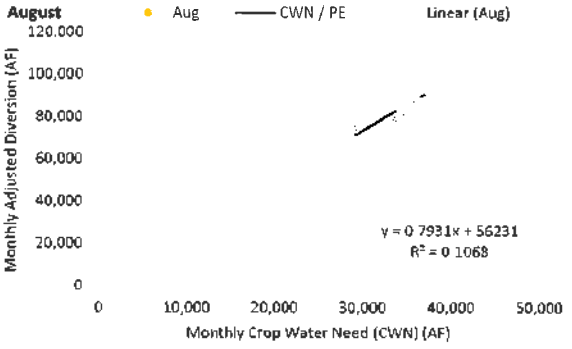
Figure 3-6
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
AFRD2
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)

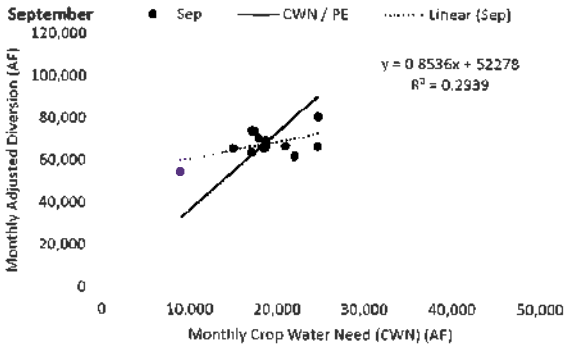


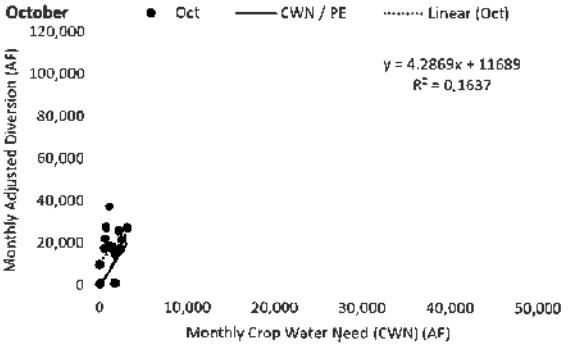






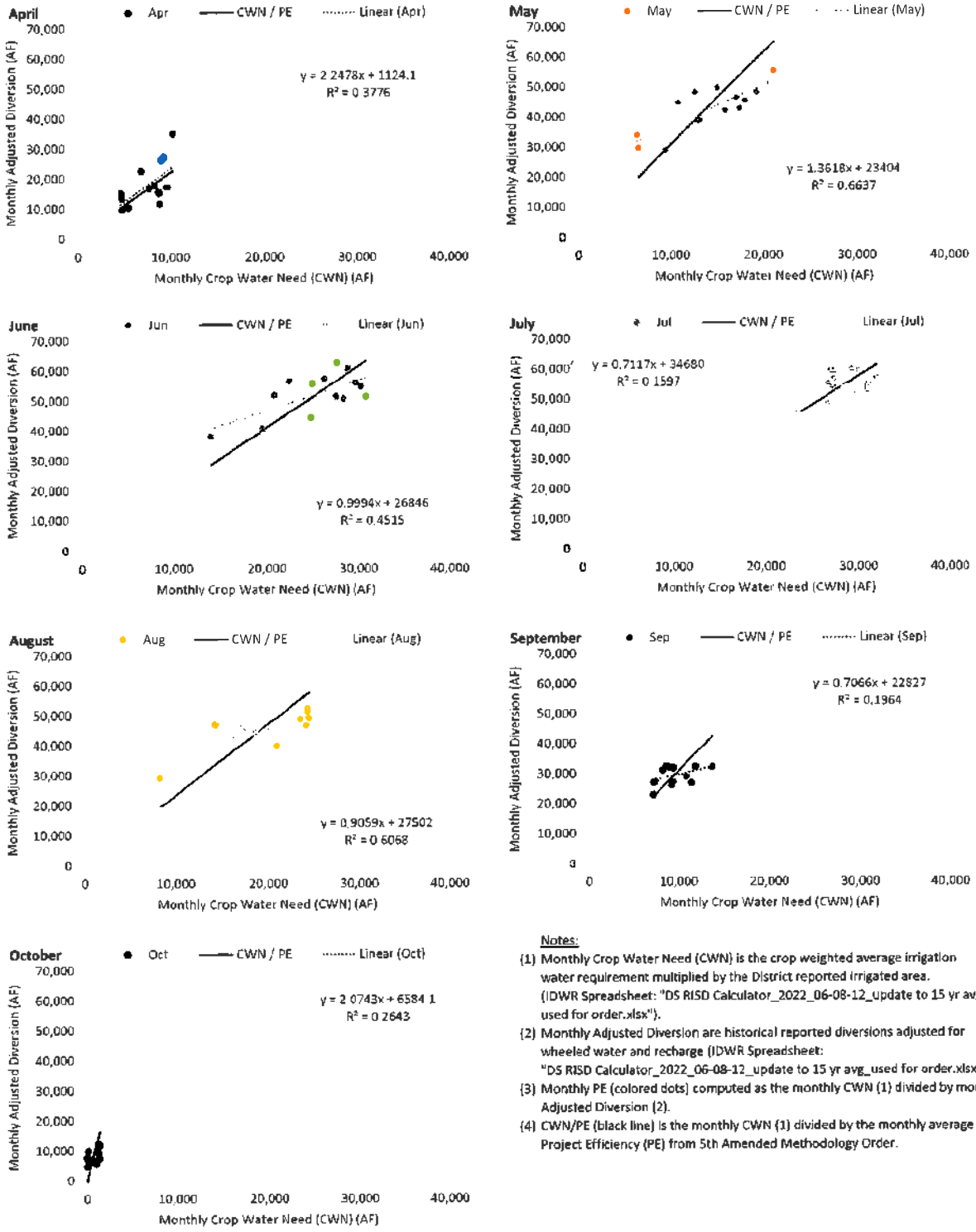






Notes:
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montl Adjusted Diversion (2).
(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-7
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
BID
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

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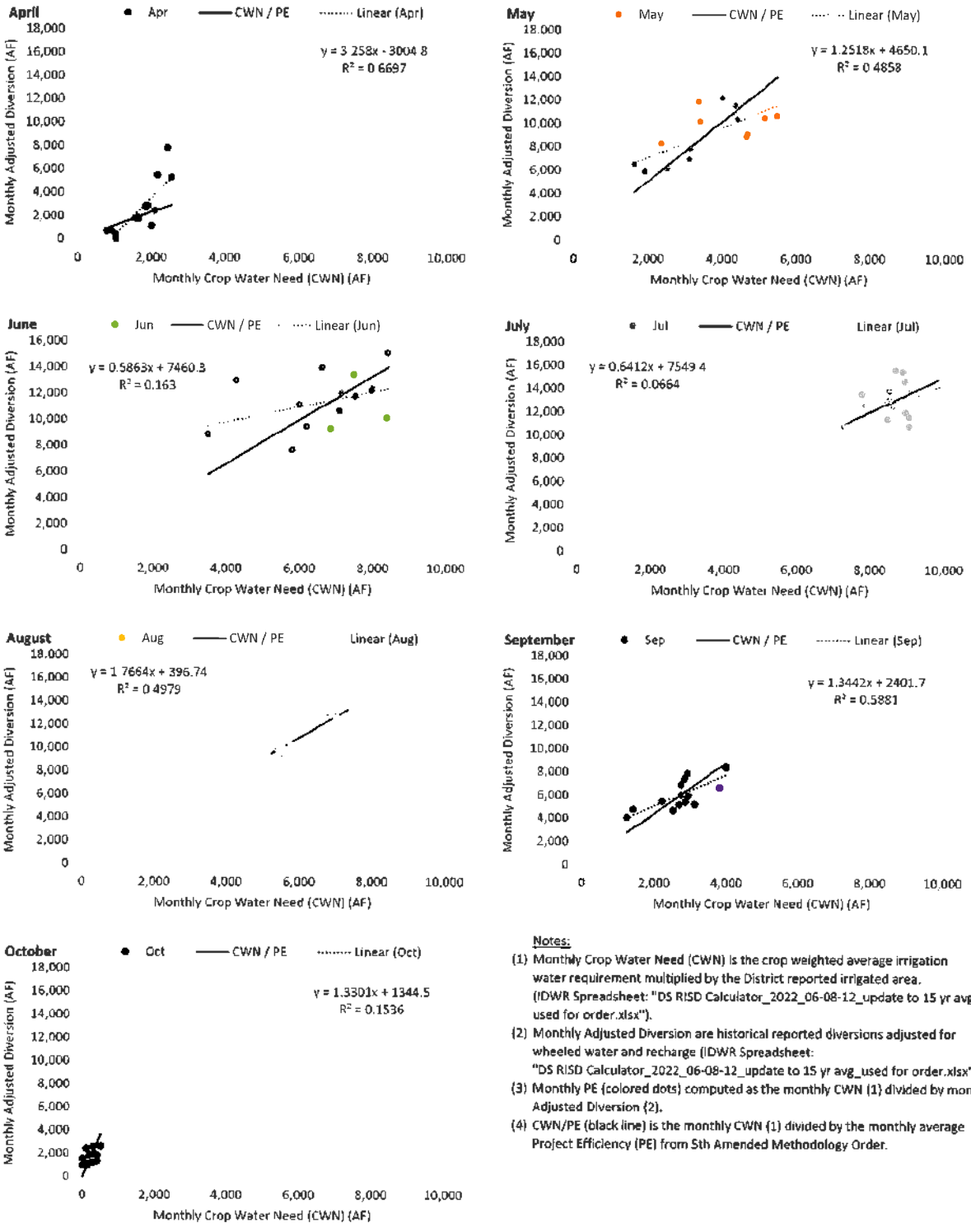
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthly Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-8
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
Milner
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

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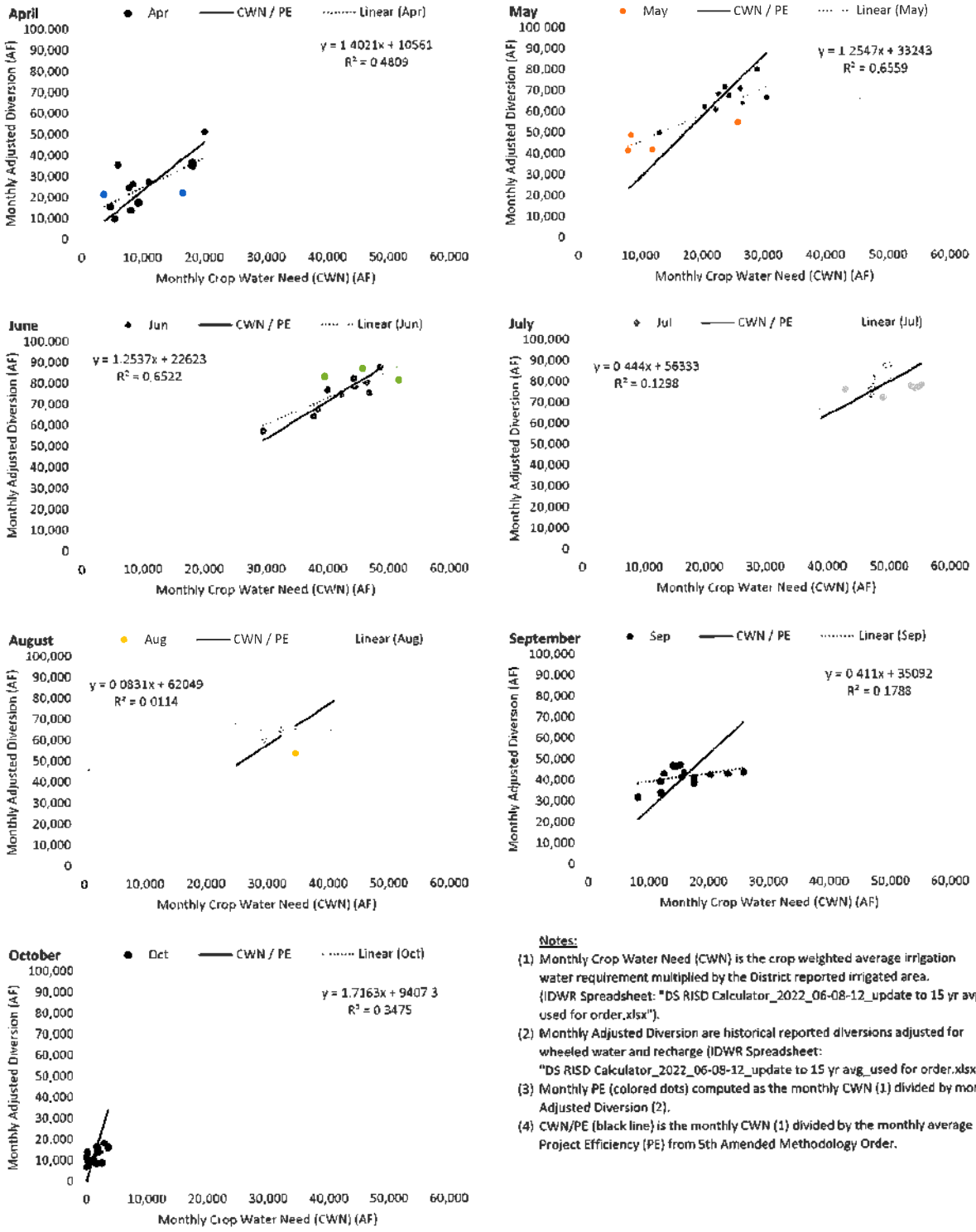
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-9
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
Minidoka
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

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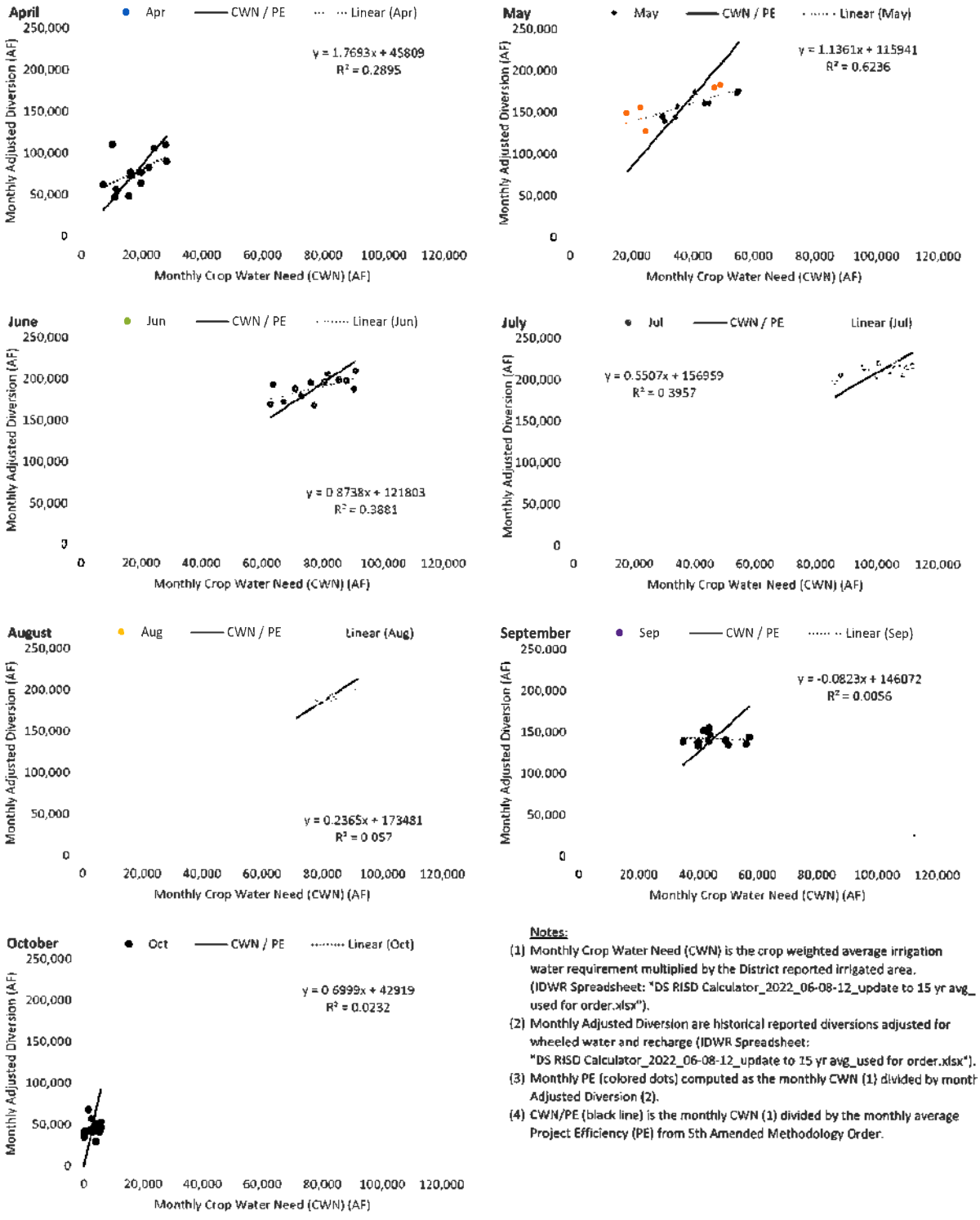
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthl Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-10
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
NSCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

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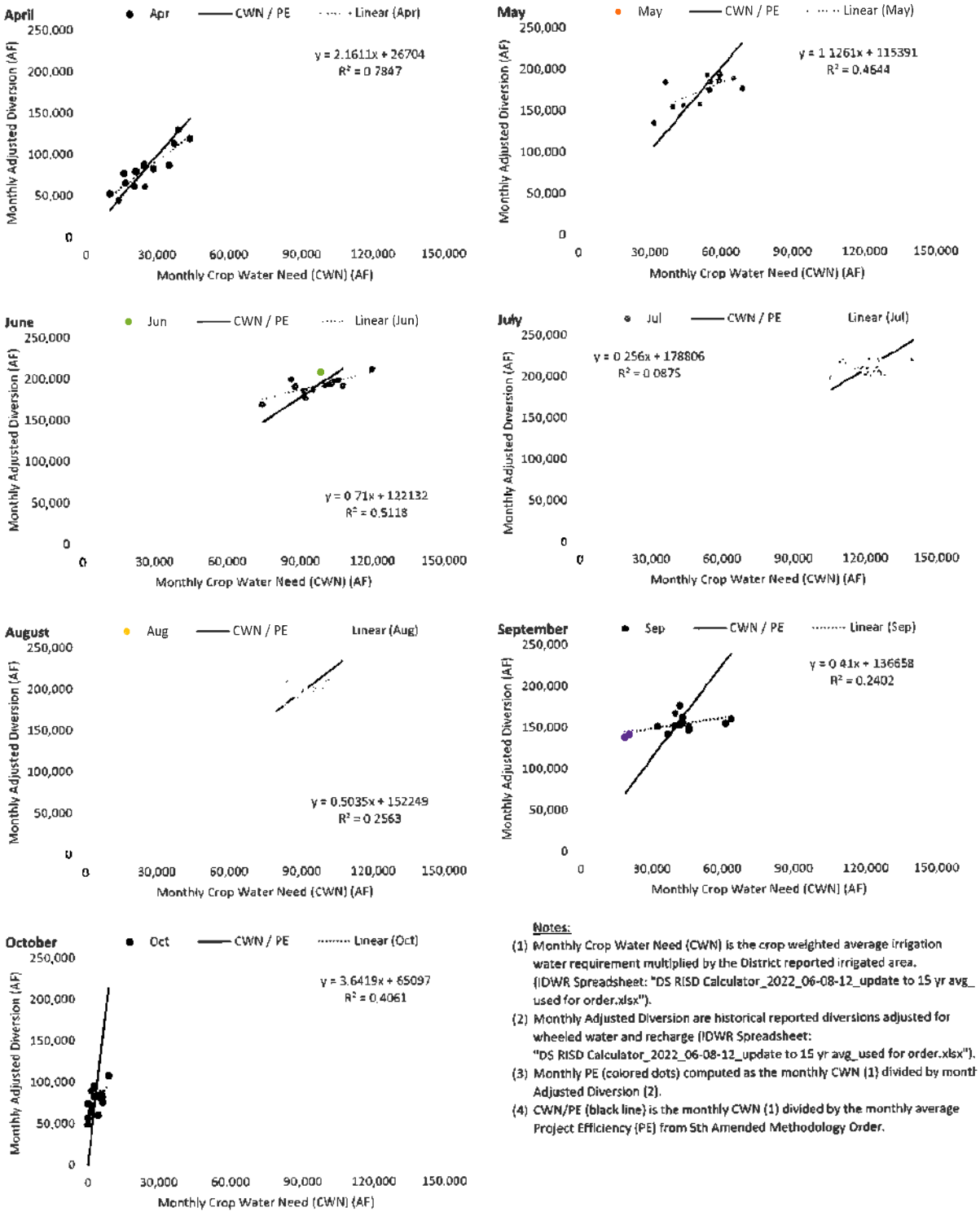
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-11
Monthly Adjusted Diversion v. Monthly Crop Water Need (CWN)
TFCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

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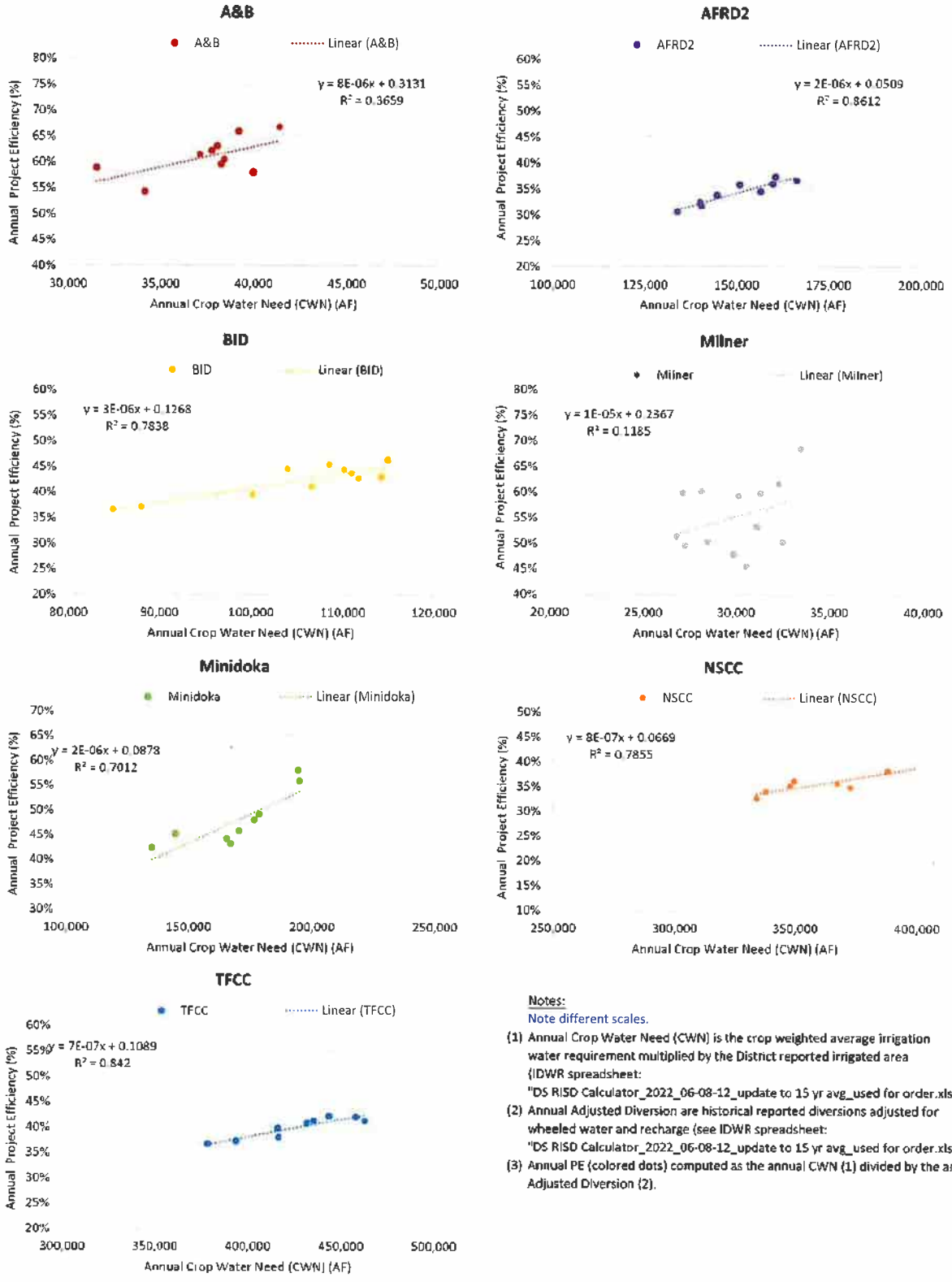
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthl Adjusted Diversion (2).

(4) CWN/PE (black line) is the monthly CWN (1) divided by the monthly average Project Efficiency (PE) from 5th Amended Methodology Order.

Figure 3-12
Annual Project Efficiency v. Annual Crop Water Need (CWN)
Surface Water Coalition Members
2007 - 2021
Exclude PE Outlier Months (> +/- 2 Std Dev)



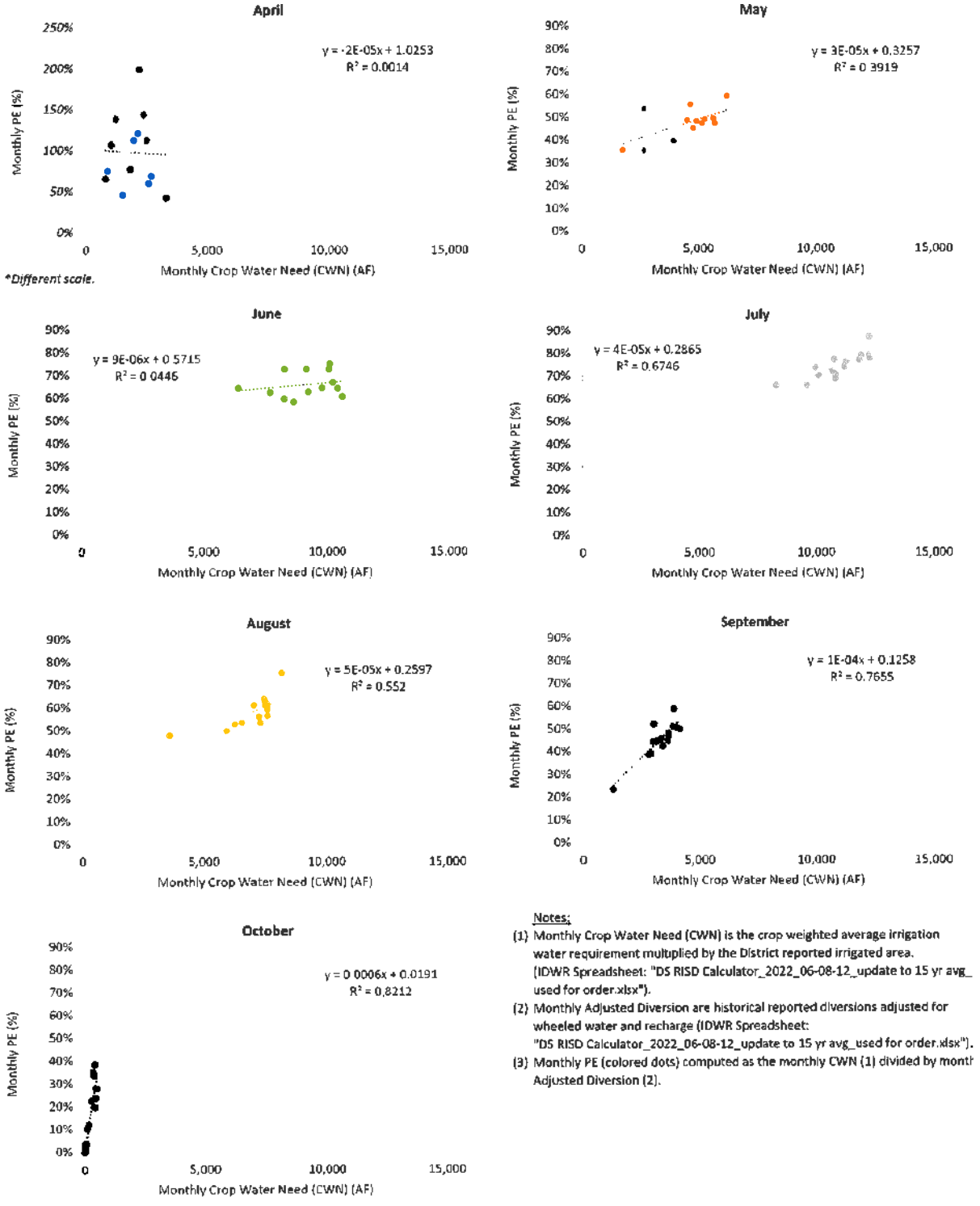
Notes:
Note different scales.

(1) Annual Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area (IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx";

(2) Annual Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (see IDWR spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx"|

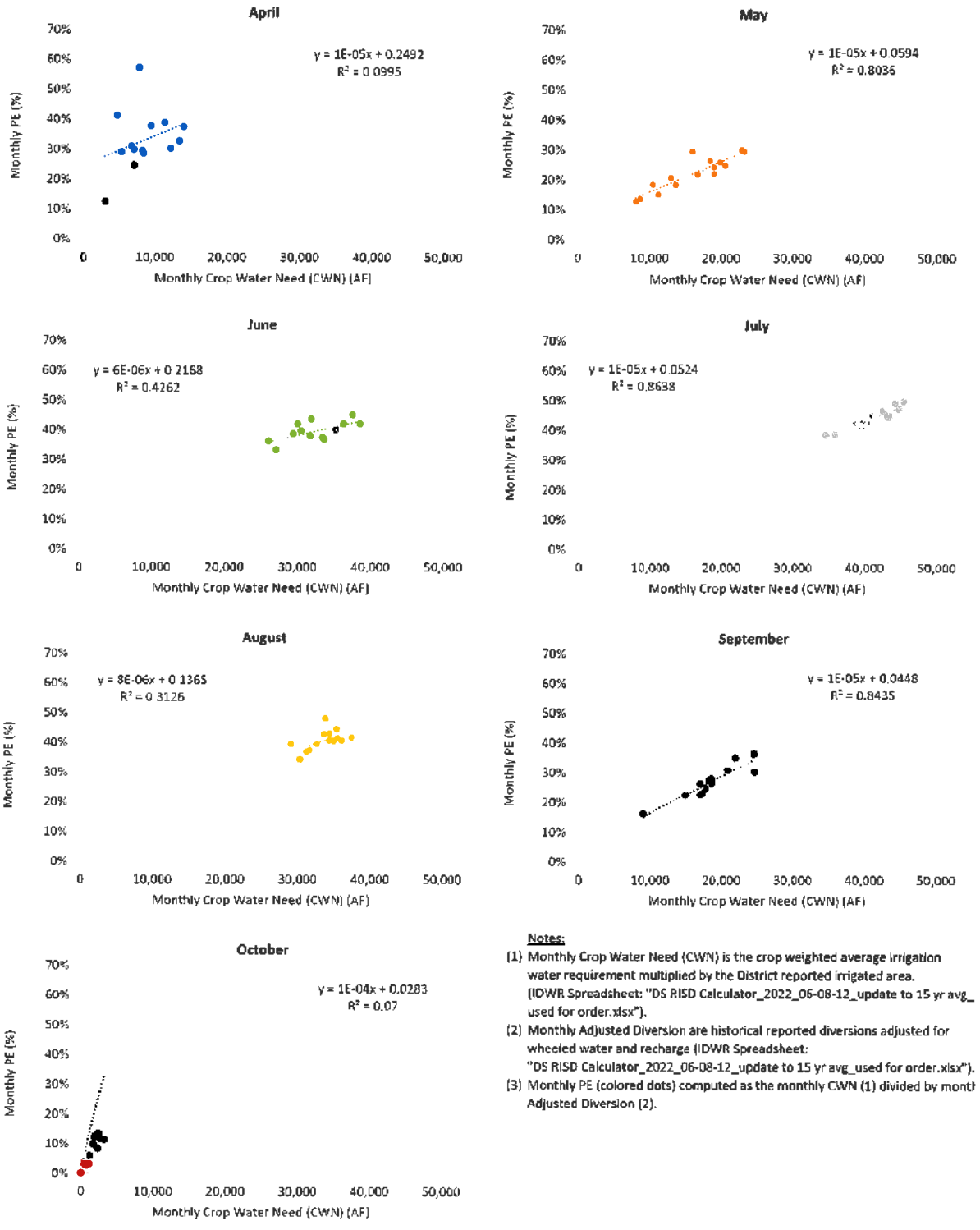
(3) Annual PE (colored dots) computed as the annual CWN (1) divided by the annu Adjusted Diversion (2).

Figure 3-13
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
A&B
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:
(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").
(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").
(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by month Adjusted Diversion (2).

Figure 3-14
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
AFRD2
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



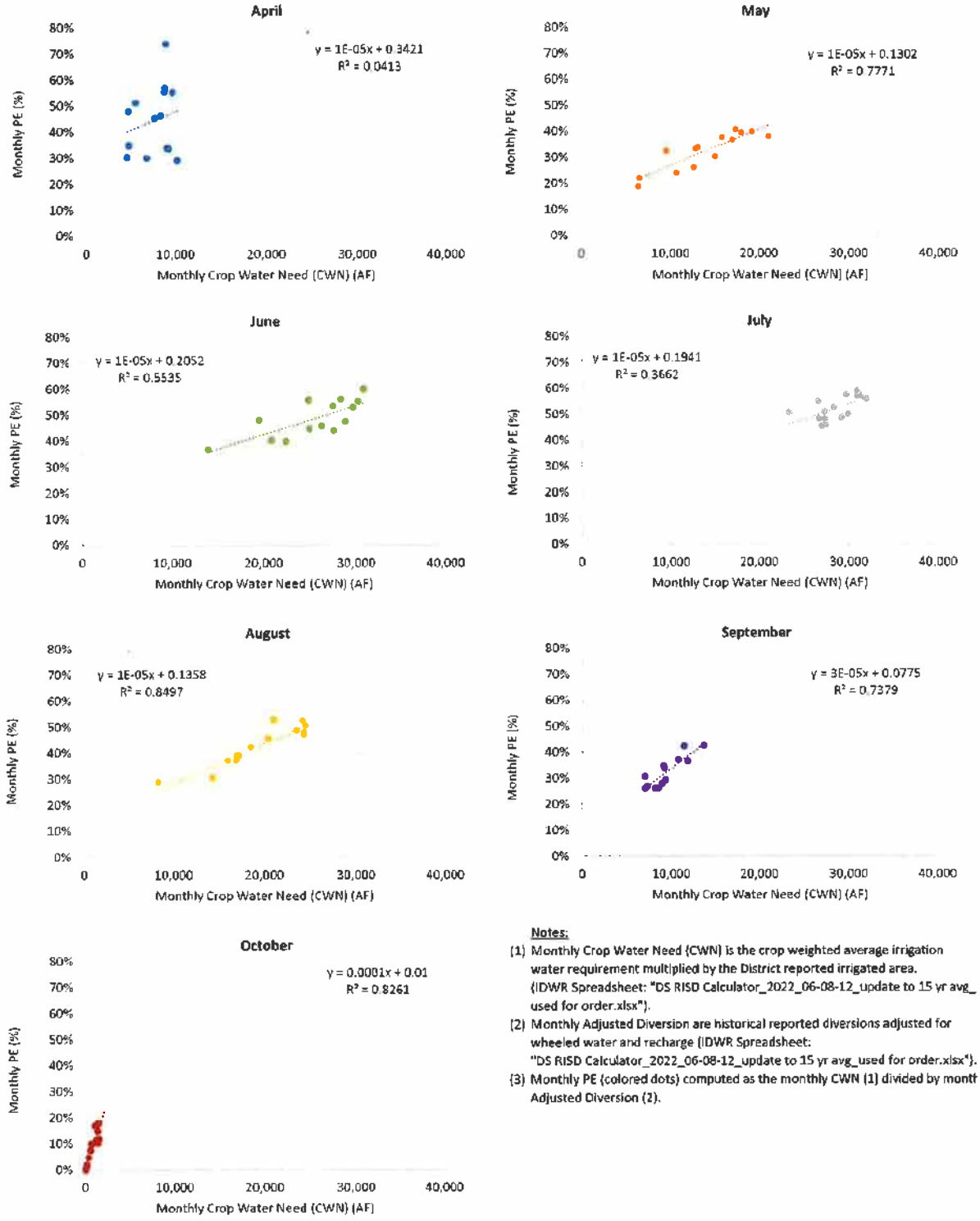
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthly Adjusted Diversion (2).

Figure 3-15
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
BID
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



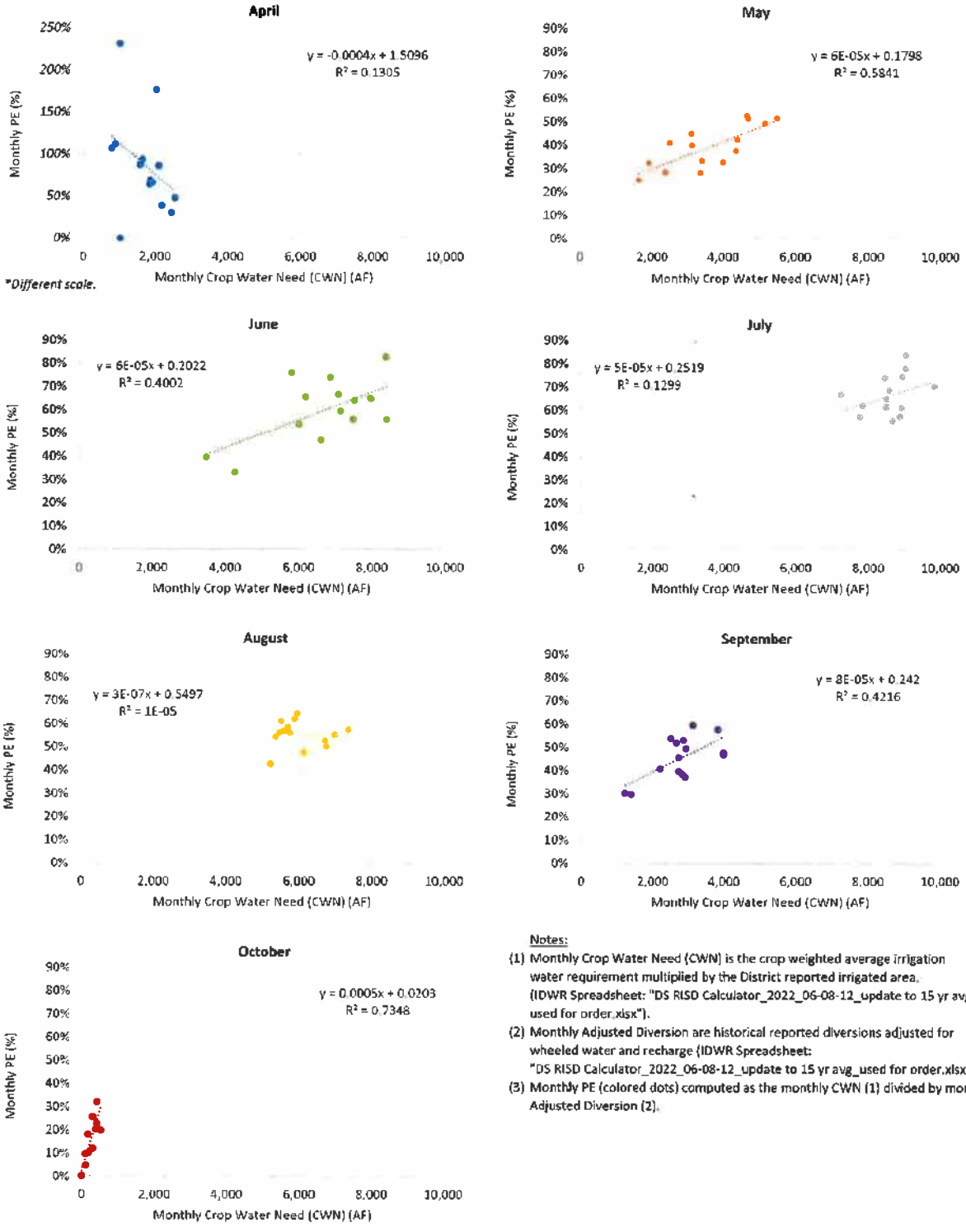
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montl Adjusted Diversion (2).

Figure 3-16
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
Milner
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



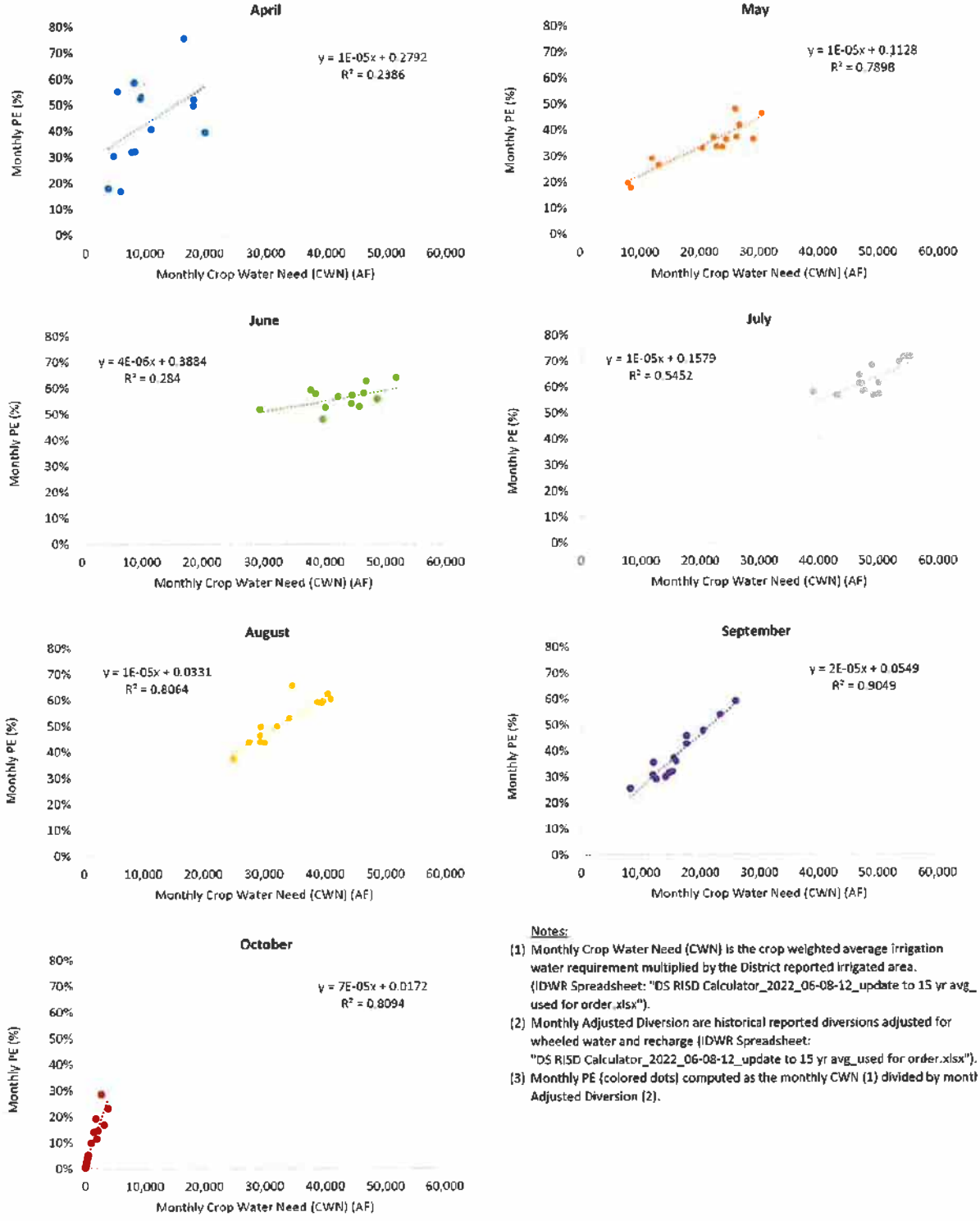
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthl Adjusted Diversion (2).

Figure 3-17
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
Minidoka
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



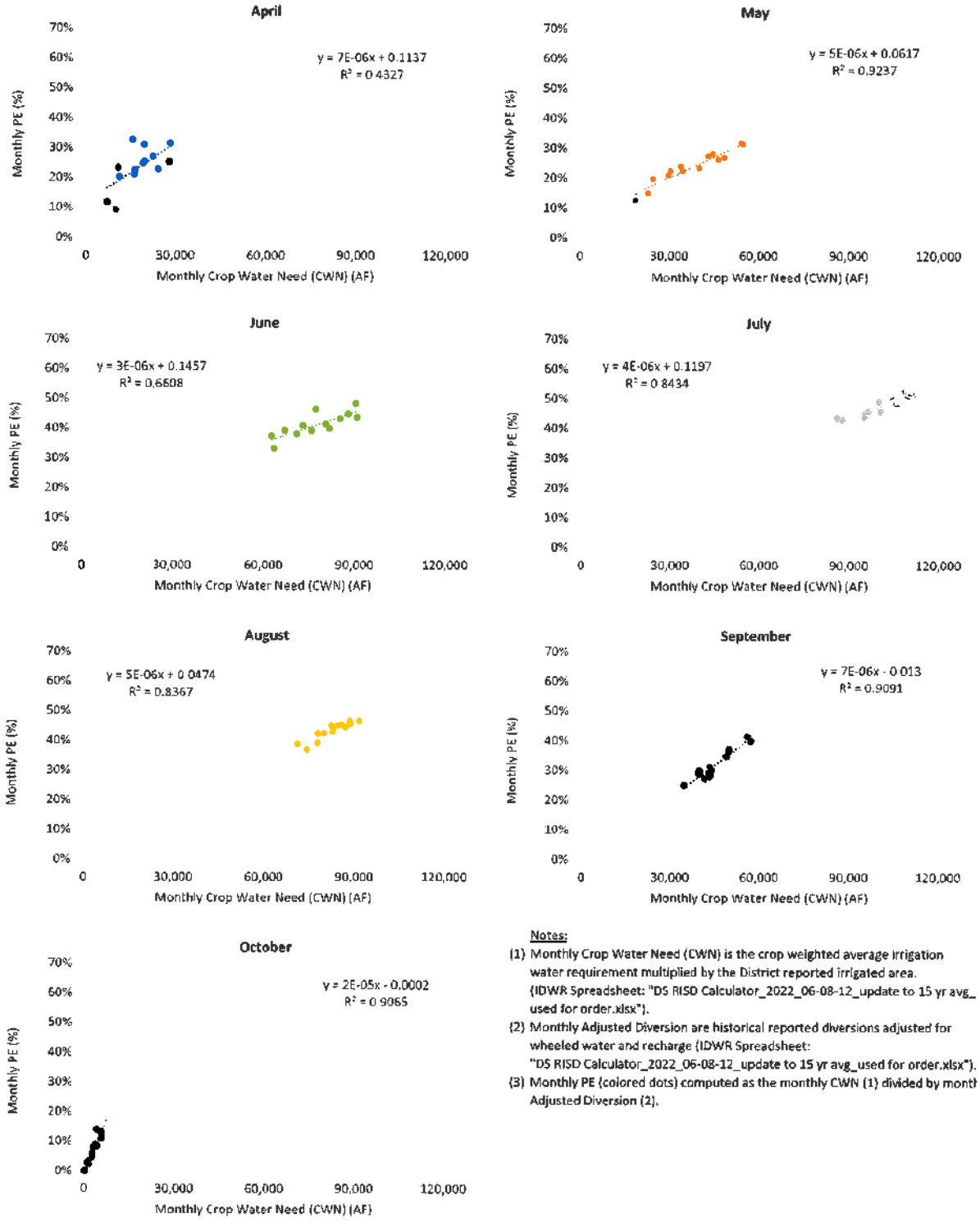
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthly Adjusted Diversion (2).

Figure 3-18
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
NSCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



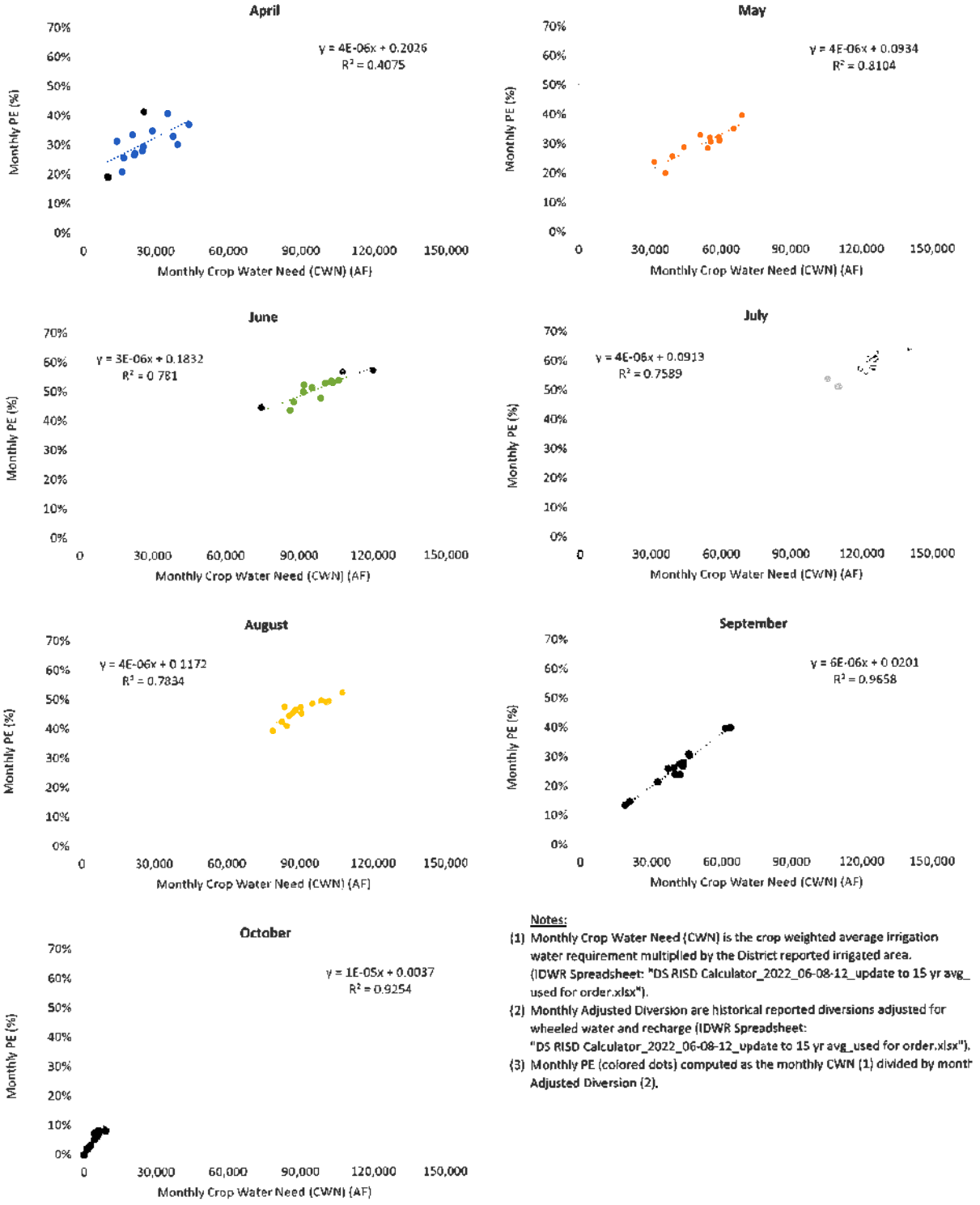
Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by monthl Adjusted Diversion (2).

Figure 3-19
Monthly Project Efficiency v. Monthly Crop Water Need (CWN)
TFCC
2007 - 2021 (AF)
Exclude PE Outlier Months (> +/- 2 Std Dev)



Notes:

(1) Monthly Crop Water Need (CWN) is the crop weighted average irrigation water requirement multiplied by the District reported irrigated area. (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_ used for order.xlsx").

(2) Monthly Adjusted Diversion are historical reported diversions adjusted for wheeled water and recharge (IDWR Spreadsheet: "DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx").

(3) Monthly PE (colored dots) computed as the monthly CWN (1) divided by montr Adjusted Diversion (2).

TABLES

Table 2-1
Annual Diversions
Surface Water Coalition Members
(AF)

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Total
2000	62,623	512,980	268,653	66,583	400,544	1,119,218	1,160,451	3,591,053
2001	63,229	415,977	225,398	53,572	369,320	979,689	1,012,202	3,119,388
2002	59,354	400,654	229,261	60,327	349,680	926,219	1,009,092	3,034,586
2003	59,479	397,573	249,562	56,966	353,245	929,453	1,046,624	3,092,903
2004	49,708	299,371	254,082	35,674	340,958	924,324	1,001,779	2,905,896
2005	46,929	401,735	219,600	38,948	307,628	900,339	918,011	2,833,190
2006	57,493	410,376	247,849	41,672	352,269	963,208	995,822	3,068,689
2007	60,227	429,040	259,495	52,342	375,519	1,015,260	1,048,965	3,240,849
2008	59,493	421,083	254,105	50,994	373,499	967,543	1,094,941	3,221,658
2009	57,344	453,757	236,983	55,713	343,520	1,007,862	1,043,006	3,198,185
2010	53,528	431,376	231,542	45,471	319,837	995,820	1,029,645	3,107,219
2011	53,788	427,228	219,855	46,932	319,744	963,049	1,054,435	3,085,031
2012	63,550	454,143	248,557	49,038	387,998	1,018,145	1,089,269	3,310,699
2013	62,016	400,729	248,424	52,561	364,124	1,021,024	1,058,154	3,207,032
2014	60,392	459,017	233,728	49,961	368,685	1,021,605	1,114,409	3,307,796
2015	62,975	442,896	253,107	55,153	368,773	1,021,958	1,102,412	3,307,275
2016	60,409	438,224	250,702	56,550	349,779	978,658	1,045,567	3,179,888
2017	60,713	391,658	239,685	62,371	335,922	987,102	1,053,742	3,131,193
2018	64,192	453,890	262,211	58,417	354,851	1,026,661	1,121,717	3,341,939
2019	56,115	436,533	254,189	52,326	327,963	1,032,687	1,075,987	3,235,802
2020	65,828	493,153	282,949	67,227	373,531	1,048,708	1,206,401	3,537,797
2021	69,035	444,126	265,141	64,748	354,595	1,069,340	1,083,514	3,350,499
2022	63,848	405,410	235,119	49,787	311,795	941,270	950,024	2,957,253
Averages								
(1) 2000-2021	59,474	427,978	247,049	53,343	354,181	996,267	1,062,098	3,200,389
(2) 2000-2022	59,664	426,997	246,530	53,188	352,338	993,876	1,057,225	3,189,818
(1) 2000-2014	57,944	421,003	241,806	50,450	355,105	983,517	1,045,120	3,154,945
(1) 2015-2021	62,752	442,926	258,283	59,542	352,202	1,023,588	1,098,477	3,297,770
(3) 06/08/12	60,179	428,534	250,170	47,234	371,255	982,965	1,060,011	3,200,349
(4) 06/08/12 (Old)	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011	3,194,722
Old 06/08/12 Average (Fourth Methodology Order) Minus 2000-2021 and 2000-2022 Averages								
2000-2021	519	-306	4,482	-6,208	15,311	-17,379	-2,087	-5,668
2000-2022	329	675	5,001	-6,053	17,154	-14,988	2,786	4,904
Revised 06/08/12 Average Minus 2000-2021 and 2000-2022 Averages								
2000-2021	705	556	3,121	-6,109	17,074	-13,302	-2,087	-41
2000-2022	515	1,537	3,640	-5,954	18,917	-10,910	2,786	10,530

Notes:

(1) Annual diversions from 2000 - 2021 from spreadsheet provided by Mat Anders at his deposition on May 12, 2023: "BLYReview_2022_v1 used for TWG_used for order.xlsx".

(2) Annual diversions for 2022 from IDWR Spreasdheet: "DS RISD Calculator_2023_05_03.xlsx"

(3) Calculated average of 2006, 2008, and 2012 using data in table.

(4) 06/08/12 Average from Fourth Amended Methodology Order (April 2016).

Table 3-1

Summary of Annual Reasonable In-Season Demands and Shortages

TFCC

2007 - 2021 (AF)

Year	(1) CWN	(1) Historical Adjusted Diversion	(1) Nov. 1 Forecast Supply	(2) Annual RISD CWN/ Methodology Order 5 PE	(3) Annual RISD CWN/ Regression & Avg PE	(4) Annual RISD CWN/ Regression & 75% PE	(5) November 1 RISD Shortfall Methodology Order 5 PE	(6) November 1 RISD Shortfall Regression & Avg PE	(7) November 1 RISD Shortfall Regression & 75% PE
2007	443,275	1,048,965	1,030,224	1,127,782	1,073,397	1,035,277	97,558	43,173	5,053
2008	416,362	1,094,941	1,170,179	1,056,414	1,057,689	1,005,709	0	0	0
2009	352,119	1,043,006	1,141,701	947,397	940,865	896,483	0	0	0
2010	378,349	1,029,645	1,064,441	961,189	961,189	906,143	0	0	0
2011	393,611	1,054,435	1,215,802	972,593	981,358	938,090	0	0	0
2012	457,841	1,089,269	1,173,413	1,153,456	1,104,500	1,075,324	0	0	0
2013	431,633	1,058,154	1,128,023	1,084,050	1,014,099	984,820	0	0	0
2014	365,130	1,114,409	1,258,773	932,688	910,543	872,296	0	0	0
2015	409,472	1,102,412	969,761	1,035,362	1,014,356	967,927	65,601	44,595	0
2016	415,928	1,045,567	1,031,291	1,018,220	996,747	957,887	0	0	0
2017	435,307	1,053,742	1,212,718	1,096,031	1,071,959	1,035,776	0	0	0
2018	462,889	1,121,717	1,193,720	1,178,165	1,060,523	1,031,778	0	0	0
2019	396,648	1,075,987	1,176,197	991,190	965,223	931,602	0	0	0
2020	465,580	1,206,401	1,281,322	1,214,351	1,100,743	1,063,109	0	0	0
2021	478,907	1,084,609	1,063,647	1,242,713	1,195,067	1,138,478	179,066	131,420	74,831

Notes:

(1) Monthly Crop Water Need (CWN), monthly Historical Adjusted Diversion, and November 1 Forecast Supply volumes from IDWR spreadsheet: *DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx* .

(2) Monthly CWN divided by monthly average PE from 5th Amended Methodology Order (IDWR method).

(3) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = historical average; Oct PE = Sep PE).

(4) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE).

In (2)-(4), per the IDWR Methodology, the April and October minimum and maximum limits are applied and outliers +/- two standard deviations are removed for purposes of computing the PE.

(5) Maximum [(2) - Nov. 1 Forecast Supply, 0].

(6) Maximum [(3) - Nov. 1 Forecast Supply, 0].

(7) Maximum [(4) - Nov. 1 Forecast Supply, 0].

Table 3-2

Summary of Annual Reasonable In-Season Demands and Shortages

AFRD2

2007 - 2021 (AF)

Year	(1) CWN	(1) Historical Adjusted Diversion	(1) Nov. 1 Forecast Supply	(2) Annual RISD CWN/ Methodology Order 5 PE	(3) Annual RISD CWN/ Regression & Avg PE	(4) Annual RISD CWN/ Regression & 75% PE	(5) November 1 RISD Shortfall Methodology Order 5 PE	(6) November 1 RISD Shortfall Regression & Avg PE	(7) November 1 RISD Shortfall Regression & 75% PE
2007	160,584	429,040	437,004	463,777	431,895	417,823	26,773	0	0
2008	150,892	421,083	525,302	435,515	423,846	401,770	0	0	0
2009	129,641	453,757	623,736	390,936	375,244	361,230	0	0	0
2010	140,084	431,376	539,947	397,330	391,574	369,223	0	0	0
2011	144,619	427,228	701,749	410,255	399,657	378,691	0	0	0
2012	166,340	454,143	490,168	483,272	452,317	441,601	0	0	0
2013	156,747	400,729	412,067	450,789	421,329	404,622	38,723	9,262	0
2014	132,568	459,017	551,279	393,507	366,471	355,017	0	0	0
2015	140,505	442,896	392,208	395,557	390,220	361,712	3,349	0	0
2016	139,802	438,224	488,209	379,802	379,802	352,307	0	0	0
2017	147,288	391,658	608,214	425,202	420,602	391,734	0	0	0
2018	156,633	453,890	579,089	439,069	409,156	389,840	0	0	0
2019	133,905	436,533	539,070	379,019	372,850	349,675	0	0	0
2020	156,003	493,153	591,776	461,089	428,276	403,450	0	0	0
2021	159,868	444,126	454,968	459,813	438,704	419,380	4,845	0	0

Notes:

(1) Monthly Crop Water Need (CWN), monthly Historical Adjusted Diversion, and November 1 Forecast Supply volumes from IDWR spreadsheet: *DS RISD Calculator_2022_06-08-12_update to 15 yr avg_used for order.xlsx* .

(2) Monthly CWN divided by monthly average PE from 5th Amended Methodology Order (IDWR method).

(3) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = historical average; Oct PE = Sep PE).

(4) Monthly CWN divided by monthly PE computed using regression equation if R^2 > 0.5 (min efficiency = 75th percentile PE from historical data; and Oct PE = Sep PE).

In (2)-(4), per the IDWR Methodology, the April and October minimum and maximum limits are applied and outliers +/- two standard deviations are removed for purposes of computing the PE.

(5) Maximum [(2) - Nov. 1 Forecast Supply, 0].

(6) Maximum [(3) - Nov. 1 Forecast Supply, 0].

(7) Maximum [(4) - Nov. 1 Forecast Supply, 0].

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EXHIBIT 348

Summary of Water Rights
City of Pocatello

	Water Right	Water Rights: Priority Date	Diversion Rate (cfs)	Cum Rate (cfs)	Vol Limit (af/y)	Irrigated Acreage	Season of Use	Purpose of Use	Historical Well No. or Source (1)	AKA/Name	Aquifer
SURFACE WATER RIGHTS											
	29-271	2/26/1869	3.22	3.22	-	-	1/1 - 12/31	Municipal	Mink Creek		N/A
	29-4222	6/16/1898	5.00	8.22	-	-	1/1 - 12/31	Municipal	Gibson Jack Creek		N/A
	29-272	10/1/1901	0.56	8.78	-	-	1/1 - 12/31	Municipal	Mink Creek		N/A
	29-273	10/1/1917	1.218	10.00	-	-	1/1 - 12/31	Municipal	Mink Creek		N/A
INTERCONNECTED CITY ("IC") WELLS AND WATER RIGHTS											
(2)	29-13558	7/16/1924	1.34	1.34	-	-	1/1 - 12/31	Municipal	Alameda 1		LPRVA
(2)	29-13559	12/31/1925	0.96	2.30	-	-	1/1 - 12/31	Municipal	Alameda 2		LPRVA
(2)	29-13560	12/31/1926	9.13	11.43	-	-	1/1 - 12/31	Municipal	1/5 (2.45 cfs)		LPRVA
(2)									2 (2.45 cfs)		LPRVA
(2)									3 (4.23 cfs)		LPRVA
(2)	29-13561	8/31/1931	4.23	15.66	-	-	1/1 - 12/31	Municipal	4		LPRVA
(2)	29-13562	12/31/1936	2.45	18.11	-	-	1/1 - 12/31	Municipal	6		LPRVA
(2)	29-13637	12/31/1940	4.46	22.57	-	-	1/1 - 12/31	Municipal	7		LPRVA
(2)	29-4221	6/1/1943	2.67	25.24	-	-	1/1 - 12/31	Municipal	26	PIP	LPRVA
(3)	29-2274	6/15/1948	9.69	34.93	-	-	1/1 - 12/31	Municipal	8		LPRVA
									9		LPRVA
									10		LPRVA
									44		LPRVA
(2)	29-11348	8/31/1951	4.90	39.83	-	-	1/1 - 12/31	Municipal	28	20/Turner	LPRVA
(2)	29-13639	10/21/1952	3.68	43.51	-	-	1/1 - 12/31	Municipal	22	Alameda 3	LPRVA
(3)	29-2338	9/1/1953	9.53	53.04	-	-	1/1 - 12/31	Municipal	12		LPRVA
									13	17	LPRVA
									15		LPRVA
(2)	29-4224	9/15/1955	3.89	56.93	-	-	1/1 - 12/31	Municipal	21	Alameda 4	LPRVA
(2)	29-4226	12/31/1955	0.22	57.15	-	-	1/1 - 12/31	Municipal	14	Cree	LPRVA
(2)	29-4225	8/15/1956	4.44	61.59	-	-	1/1 - 12/31	Municipal	23	Alameda 5	LPRVA
(2)	29-2401	10/16/1958	12.22	73.81	-	-	1/1 - 12/31	Municipal	13 (0.89 cfs)	17	LPRVA
									16 (6.67 cfs)		LPRVA
									18 (4.66 cfs)		LPRVA

Summary of Water Rights
City of Pocatello

	Water Right	Water Rights							(1) Historical Well No. or Source	AKA/Name	Aquifer
		Priority Date	Diversion Rate (cfs)	Cum Rate (cfs)	Vol Limit (af/y)	Irrigated Acreage	Season of Use	Purpose of Use			
	INTERCONNECTED CITY ("IC") WELLS AND WATER RIGHTS (cont.)										
(2)	29-11339	12/31/1961	3.36	77.17	-	-	1/1 - 12/31	Municipal	Alameda 6 (1.70 cfs) Alameda 7 (1.66 cfs)		LPRVA LPRVA
(2)	29-4223	10/1/1962	0.21	77.38	-	-	1/1 - 12/31	Municipal	33	Call	LPRVA
(2)	29-2499	12/10/1964	4.10	81.48	-	-	1/1 - 12/31	Municipal	27		LPRVA
(2)	29-7106	11/6/1972	3.90	85.38	-	-	1/1 - 12/31	Municipal	29		LPRVA
(2)	29-7322	4/25/1976	17.07	102.45	-	-	1/1 - 12/31	Municipal	30 (5.58 cfs) 31 (8.03 cfs) 32 (3.46 cfs)		LPRVA LPRVA ESPA
(3)	29-7375	2/24/1977	2.23	104.68	-	-	1/1 - 12/31	Municipal	15		LPRVA
	29-7782	1/18/1985	7.00	111.68	-	-	1/1 - 12/31	Municipal	34		LPRVA
(4)	29-8086	3/26/1992	4.00	115.68	-	-	1/1 - 12/31	Municipal	36		LPRVA
	INTERCONNECTED AIRPORT ("IA") WELLS AND WATER RIGHTS										
(5)	29-13638	12/31/1940	2.20	2.20	-	-	1/1 - 12/31	Municipal	39	Phillips 1	ESPA
(5)	29-7450	6/13/1978	3.34	5.54	-	-	1/1 - 12/31	Municipal	35	Phillips 3	ESPA
	BIOSOLIDS PROGRAM WATER RIGHTS										
(6)	29-2255D	5/22/1939	0.482	0.482	96.4	24.1	4/1 - 11/1	Irrigation	2	Swanson	ESPA
	29-4276	4/1/1940	0.27 0.01	0.752	- -	13.5 -	4/1 - 10/31 1/1 - 12/31	Irrigation Stockwater	Douglas Spring	Spring	N/A
	29-11344	12/31/1942	1.92	2.67	-	-	1/1 - 12/31	Municipal	40	Phillips 2	ESPA
	29-2259	6/20/1944	2.60	5.27	600.0	150.0	4/1 - 10/31	Irrigation	Pit Road	Swanson	ESPA
(6)	29-2255F	9/16/1949	0.40	5.67	80.0	20.0	4/1 - 11/1	Irrigation	2	Submers	ESPA
	29-2344A	12/31/1953	1.18	6.85	289.0	91.0	4/1 - 10/31	Irrigation	DP 140		ESPA
	29-7073	9/30/1971	1.49	8.34	266.0	76.0	5/1 - 9/1	Irrigation	3	Vertical turb	ESPA
	29-7118	4/11/1973	4.01	12.35	1,114.0	278.5	4/1 - 11/1	Irrigation	42	A0007545	ESPA
	29-7119	4/11/1973	6.00	18.35	1,200.0	300.0	4/1 - 11/1	Irrigation	41	A0007547	ESPA
	29-7770	5/21/1984	4.46	22.81	1,120.0	280.0	4/1 - 10/31	Irrigation	WPC	City Pivot	ESPA

Summary of Water Rights
City of Pocatello

	Water Right	Water Rights							(1) Historical Well No. or Source	AKA/Name	Aquifer
		Priority Date	Diversion Rate (cfs)	Cum Rate (cfs)	Vol Limit (af/y)	Irrigated Acreage	Season of Use	Purpose of Use			
	OTHER WATER RIGHTS										
(7)	29-2354	8/27/1954	0.28	0.28	56.0	19.0	4/1 - 10/31	Irrigation	Restlawn Cemetery		LPRVA
	29-2382	12/21/1956	3.82	4.10	450.0	-	4/1 - 10/31	Municipal	17	Highland GC	LPRVA
	29-13636	10/16/1958	0.80	4.90	-	-	1/1 - 12/31	Municipal	19		ESPA
	29-7222	8/22/1974	1.00	5.90	-	50.0	4/1 - 11/1	Irrigation	43	Ward Park	ESPA
	29-7431	12/29/1977	9.28	15.18	3,108.0	777.0	4/1 - 11/1	Irrigation	Wastewater		N/A
(7)	29-7502	7/6/1979	0.10	15.28	20.0	19.0	3/15 - 11/15	Irrigation	Restlawn Cemetery		LPRVA
	STORAGE RIGHTS										
	01-2068	7/28/1939	50,000 AF	-	50,000 AF	-	1/1 - 12/31	Storage	Palisades Reservoir		N/A

Notes:

(1) Flow rate in parenthesis is the diversion rate associated with individual well to the extent necessary for administration between points of diversion for ground water, and between points of diversion for ground water and hydraulically connected surface sources.

(2) "IC Wells" - Municipal water rights decreed in SRBA with 22 PODs for ground water rights.

(3) "IC Wells" - Municipal water rights decreed in SRBA with 13 PODs for ground water rights. Water right part of Transfer No. 5452.

(4) Post SRBA water right.

(5) "IA Wells" - Municipal water rights decreed in SRBA with 2 PODs for ground water rights.

(6) Use of water right nos. 29-2255D and 29-2255F is limited to the irrigation of a combined total of 44.1 acres in a single irrigation season.

(7) Use of water right nos. 29-2354 and 29-7502 is limited to the irrigation of a combined total of 19.0 acres in a single irrigation season.

EXHIBIT 349

Table 1-2
List of Water Rights Held by
City of Idaho Falls

Owner	Water Right No.	Priority Date	Rate (cfs)	Source	Use
Idaho Falls	1-40	4/20/1900	140.00	Snake River	Power
Idaho Falls	1-41	10/22/1904	48.00	Snake River	Power
Idaho Falls	1-281	12/29/1905	1500.00	Snake River	Power
Idaho Falls	1-2014	12/3/1907	485.00	Snake River	Power
Idaho Falls	1-4002	2/5/1915	388.00	Snake River	Power
Idaho Falls	1-360	7/18/1919	394.00	Snake River	Power
Idaho Falls	1-361	10/5/1923	485.00	Snake River	Power
Idaho Falls	25-2095	2/25/1927	5.20	Ground Water	Municipal
Idaho Falls	1-2047	10/28/1927	500.00	Snake River	Power
Idaho Falls	1-4003	5/3/1930	580.00	Snake River	Power
Idaho Falls	1-2049	2/14/1936	1080.00	Snake River	Power
Idaho Falls	1-4001	10/5/1940	1240.00	Snake River	Power
Idaho Falls	25-13067	2/11/1947	0.04	Ground Water	Domestic
Idaho Falls	25-13068	6/1/1947	0.04	Ground Water	Domestic
Idaho Falls	35-12568	6/4/1959	0.04	Ground Water	Domestic
Idaho Falls	35-14624	3/17/1961	0.22	Ground Water	Irrigation
Idaho Falls	25-13062	2/15/1962	0.04	Ground Water	Domestic
Idaho Falls	25-13063	2/15/1962	0.04	Ground Water	Domestic
Idaho Falls	25-2142	4/8/1963	50.20	Ground Water	Municipal
Idaho Falls	35-3020	4/8/1963	2.23	Ground Water	Municipal
Idaho Falls	25-2143	11/22/1963	17.10	Ground Water	Municipal
Idaho Falls	35-7001	7/13/1967	8.90	Ground Water	Municipal
Idaho Falls	25-7009	8/7/1970	0.23	Ground Water	Municipal
Idaho Falls	25-13069	11/1/1971	0.04	Ground Water	Domestic
Idaho Falls	25-7022	1/18/1972	7.35	Ground Water	Municipal
Idaho Falls	25-7044	1/23/1974	0.14	Ground Water	Domestic
Idaho Falls	25-7058	8/22/1974	6.14	Ground Water	Municipal
Idaho Falls	35-12567	7/15/1975	0.04	Ground Water	Domestic
Idaho Falls	1-7013	11/9/1977	2600.00	Snake River	Power
Idaho Falls	1-7014	11/9/1977	4800.00	Snake River	Power
Idaho Falls	1-7015	11/9/1977	2600.00	Snake River	Power
Idaho Falls	1-7018	3/17/1978	5000.00	Snake River	Power
Idaho Falls	25-13066	3/17/1978	0.04	Ground Water	Domestic
Idaho Falls	35-7841	2/7/1979	7.35	Ground Water	Municipal
Idaho Falls	1-7023	2/15/1979	1240.00	Snake River	Power
Idaho Falls	1-7024	2/15/1979	1460.00	Snake River	Power
Idaho Falls	1-7025	2/15/1979	900.00	Snake River	Power
Idaho Falls	25-7188	3/21/1980	0.10	Ground Water	Domestic, Stockwater
Idaho Falls	25-7298	12/23/1982	3.35	Ground Water	Municipal
Idaho Falls	25-7299	12/23/1982	2.23	Ground Water	Irrigation
Idaho Falls	25-7398	1/11/1985	1.55	Ground Water	Municipal
Idaho Falls	25-7415	2/23/1987	0.04	Ground Water	Domestic
Idaho Falls	35-8682	2/10/1988	8.02	Ground Water	Municipal
Idaho Falls	25-13064	4/1/1988	0.04	Ground Water	Domestic

Table 1-2
List of Water Rights Held by
City of Idaho Falls

Owner	Water Right No.	Priority Date	Rate (cfs)	Source	Use
Idaho Falls	25-7467	9/9/1988	8.02	Ground Water	Municipal
Idaho Falls	25-7500	4/21/1989	0.02	Ground Water	Domestic, Irrigation
Idaho Falls	25-7501	4/21/1989	0.02	Ground Water	Domestic
Idaho Falls	35-8934	6/2/1989	0.24	Ground Water	Commercial
Idaho Falls	1-7104	9/22/1989	10.00	Snake River	Irrigation, Wildlife
Idaho Falls	25-7604	2/18/1992	2.98	Ground Water	Irrigation
Idaho Falls	25-7654	9/3/1997	4.93	Ground Water	Municipal
Idaho Falls	1-10637	7/23/2015	4.00	Snake River	Aesthetic, Diversion to Storage, Irrigation, Recreation, Recreation Storage
Idaho Falls	1-10698	8/16/2021	2.00	Snake River	Aesthetic Storage, Recreation, Recreation Storage, Wildlife Storage

Notes:

Water rights from IDWR's Water Right and Adjudication Search. Available from:
https://research.idwr.idaho.gov/apps/waterrights/wrajsearch/SearchPage.aspx
Last Accessed: May 31, 2023.

EXHIBIT 350

Table 1-1
List of Water Rights Held by Coalition of Cities

Owner	Water Right No.	Priority Date	Rate (cfs)	Source	Use
Bliss	37-4305	8/1/1960	0.12	Ground Water	Municipal
Bliss	37-4306	2/1/1960	0.15	Ground Water	Municipal
Bliss	37-8886	11/24/1998	0.45	Ground Water	Municipal
Burley	45-4097	4/14/1905	0.89	Ground Water	Municipal
Burley	45-4095	4/1/1917	1.11	Ground Water	Municipal
Burley	45-4096	12/31/1917	1.34	Ground Water	Municipal
Burley	45-13895	10/30/1926	0.89	Ground Water	Municipal
Burley	45-4092	4/1/1928	1.34	Ground Water	Municipal
Burley	45-2179	9/22/1930	1.51	Ground Water	Irrigation
Burley	45-4093	12/31/1934	2.00	Ground Water	Municipal
Burley	45-14083	3/31/1939	1.34	Ground Water	Municipal
Burley	45-4088	6/1/1939	0.04	Ground Water	Domestic
Burley	45-4087	6/1/1940	0.12	Ground Water	Municipal
Burley	45-4099	12/31/1941	2.67	Ground Water	Municipal
Burley	45-4090	4/1/1943	2.01	Ground Water	Municipal
Burley	45-14290	4/1/1944	0.44	Ground Water	Municipal
Burley	45-4089	5/31/1947	1.23	Ground Water	Municipal
Burley	45-4094	12/31/1949	1.66	Ground Water	Municipal
Burley	45-11133	12/31/1954	0.89	Ground Water	Municipal
Burley	45-4091	4/1/1955	1.72	Ground Water	Municipal
Burley	45-4085	12/31/1959	0.89	Ground Water	Municipal
Burley	45-4098	9/30/1960	2.67	Ground Water	Municipal
Burley	36-4080	8/7/1961	0.91	Ground Water	Municipal
Burley	36-4180	8/1/1962	0.02	Ground Water	Irrigation
Burley	36-4181	9/8/1962	0.02	Ground Water	Irrigation
Burley	36-4182	10/1/1962	0.02	Ground Water	Industrial
Burley	36-2729	3/3/1964	0.56	Ground Water	Industrial
Burley	36-2648A	4/6/1966	1.96	Ground Water	Industrial
Burley	36-2648B	4/6/1966	0.70	Ground Water	Industrial
Burley	45-2719	5/9/1966	0.30	Ground Water	Industrial
Burley	45-11847	12/31/1966	0.50	Ground Water	Industrial
Burley	45-7002	8/24/1967	4.00	Ground Water	Commercial, Domestic, Irrigation
Burley	45-7092	3/10/1972	0.44	Ground Water	Municipal
Burley	45-7114	12/7/1972	0.18	Ground Water	Municipal
Burley	45-7269	5/25/1976	3.56	Ground Water	Municipal
Burley	45-7436	2/15/1980	0.69	Ground Water	Municipal
Burley	1-7082	2/24/1983	1.60	Snake River	Water Quality
Burley	36-8154	2/24/1983	1.20	Ground Water	Industrial
Burley	1-10243	4/1/1983	1.90	Snake River	Irrigation
Burley	1-7099	6/20/1989	1.19	Snake River	Irrigation
Burley	45-7686	2/11/1991	0.54	Ground Water	Fire Protection
Burley	45-7735	9/3/1996	4.46	Ground Water	Municipal
Burley	45-13411	10/22/2001	4.07	Ground Water	Fire Protection

Table 1-1
List of Water Rights Held by
Coalition of Cities

Owner	Water Right No.	Priority Date	Rate (cfs)	Source	Use
Carey	37-7766	2/21/1979	0.71	Ground Water	Municipal
Carey	37-20384	3/20/2001	0.70	Ground Water	Municipal
Carey	37-21243	12/25/2003	0.60	Ground Water	Municipal
Carey	37-21355	9/23/2004	1.29	Ground Water	Municipal
Carey	37-22661	8/18/2011	1.45	Ground Water	Municipal
Declo	45-11024	12/31/1945	0.15	Ground Water	Irrigation
Declo	45-2676	12/8/1961	1.11	Ground Water	Municipal
Declo	45-7726	2/16/1995	2.23	Ground Water	Municipal
Dietrich	37-20729	12/31/1910	0.37	Ground Water	Municipal
Dietrich	37-22751	6/1/2012	0.20	Ground Water	Municipal
Gooding	37-282	4/1/1877	1.00	Little Wood River	Ground Water Recharge
Gooding	37-271A	6/30/1882	0.32	Little Wood River	Ground Water Recharge
Gooding	37-262A	2/22/1883	3.16	Little Wood River	Ground Water Recharge
Gooding	37-709A	2/22/1883	0.74	Little Wood River	Ground Water Recharge
Gooding	37-960A	4/1/1883	0.57	Little Wood River	Ground Water Recharge
Gooding	37-662	6/15/1885	1.42	Little Wood River	Ground Water Recharge
Gooding	37-4080	9/28/1928	2.80	Ground Water	Municipal
Gooding	37-4087	6/1/1948	0.04	Ground Water	Domestic
Gooding	37-11221	4/20/1977	5.90	Ground Water	Municipal
Gooding	37-7597	5/5/1977	1.07	Ground Water	Irrigation
Gooding	37-22850	8/27/2013	7.21	Ground Water	Municipal
Gooding	37-23059	6/26/2017	300.00	Little Wood River	Ground Water Recharge
Hazelton	36-4250	6/21/1917	0.28	Ground Water	Domestic, Municipal
Hazelton	36-2282	4/25/1955	0.20	Ground Water	Domestic, Municipal
Hazelton	36-7634A	7/23/1976	0.19	Ground Water	Domestic
Hazelton	36-7634B	7/23/1976	0.14	Ground Water	Irrigation
Hazelton	36-7858	6/12/1979	1.00	Ground Water	Domestic, Municipal
Heyburn	36-11510	12/31/1906	0.04	Ground Water	Domestic, Stockwater
Heyburn	36-11573	12/31/1915	0.04	Ground Water	Domestic, Stockwater
Heyburn	35-14680	12/24/1948	2.67	Ground Water	Irrigation
Heyburn	36-4210	7/1/1953	0.03	Ground Water	Irrigation
Heyburn	36-4233	3/1/1963	0.20	Ground Water	Domestic, Irrigation
Heyburn	35-14683	5/27/1974	1.48	Ground Water	Irrigation
Heyburn	36-7970	3/10/1981	0.20	Ground Water	Domestic
Heyburn	36-7970	3/10/1981	0.20	Ground Water	Domestic
Heyburn	36-8332	10/12/1987	0.04	Ground Water	Commercial
Heyburn	36-8550	5/29/1990	6.67	Ground Water	Municipal
Heyburn	36-8738	5/22/1995	3.30	Ground Water	Municipal
Heyburn	36-8744	12/22/1995	0.07	Ground Water	Domestic, Irrigation
Heyburn	36-17185	12/22/1995	0.05	Ground Water	Domestic
Jerome	36-4195	12/31/1907	0.39	Ground Water	Municipal
Jerome	36-15361	12/31/1930	2.87	Ground Water	Municipal
Jerome	36-4196	7/4/1957	5.68	Ground Water	Municipal
Jerome	36-2518	9/14/1961	1.11	Ground Water	Municipal

Table 1-1
List of Water Rights Held by Coalition of Cities

Owner	Water Right No.	Priority Date	Rate (cfs)	Source	Use
Jerome	36-2526	10/27/1961	5.68	Ground Water	Municipal
Jerome	36-8111	8/20/1982	0.53	Ground Water	Municipal
Jerome	36-8237	12/22/1983	2.71	Ground Water	Municipal
Jerome	36-8234	1/11/1984	1.23	Ground Water	Commercial, Domestic, Irrigation, Recreation
Paul	36-4083	4/27/1920	0.67	Ground Water	Municipal
Paul	36-12179	1/1/1942	0.22	Ground Water	Domestic
Paul	36-7206	8/9/1971	1.06	Ground Water	Municipal
Paul	36-7899	2/27/1980	0.78	Ground Water	Municipal
Paul	36-8763	10/18/1999	2.75	Ground Water	Municipal
Richfield	37-4084	6/1/1914	0.15	Ground Water	Municipal
Richfield	37-4085	6/1/1956	0.14	Ground Water	Municipal
Richfield	37-8402	9/22/1988	1.63	Ground Water	Municipal
Richfield	37-22431	1/13/2009	1.19	Ground Water	Municipal
Rupert	36-15488	4/10/1913	0.67	Ground Water	Municipal
Rupert	36-15489	11/29/1917	2.95	Ground Water	Municipal
Rupert	36-15491	12/31/1934	6.00	Ground Water	Municipal
Rupert	36-15490	4/1/1952	0.07	Ground Water	Aesthetic, Irrigation
Rupert	36-4075	12/31/1955	27.00	Ground Water	Municipal
Rupert	36-7656	9/18/1962	3.44	Ground Water	Municipal
Rupert	36-7115	3/15/1970	2.40	Ground Water	Municipal
Rupert	36-7863	6/30/1979	3.83	Ground Water	Municipal
Rupert	36-8198	7/1/1979	4.83	Ground Water	Irrigation from Storage, Irrigation Storage
Rupert	36-7862	7/2/1979	5.83	Ground Water	Municipal
Shoshone	37-560A	11/28/1882	0.40	Little Wood River	Irrigation
Shoshone	37-560B	11/28/1882	0.14	Little Wood River	Irrigation
Shoshone	37-606C	11/28/1882	1.00	Little Wood River	Irrigation
Shoshone	37-691G	4/1/1885	1.14	Little Wood River	Irrigation
Shoshone	37-4173	10/1/1951	4.12	Ground Water	Municipal
Shoshone	37-7432	5/6/1975	2.00	Ground Water	Municipal
Shoshone	37-7662	8/30/1977	2.01	Ground Water	Municipal
Wendell	36-8421	12/31/1929	0.67	Ground Water	Municipal
Wendell	36-8764	4/27/1951	1.33	Ground Water	Municipal
Wendell	36-11277	8/25/1961	1.50	Ground Water	Irrigation
Wendell	36-11276	2/6/1974	0.22	Ground Water	Industrial
Wendell	36-2509	6/20/1977	2.67	Ground Water	Municipal
Wendell	36-7722	3/28/1997	1.27	Ground Water	Municipal
Wendell	36-7440	9/14/1998	2.76	Ground Water	Municipal

Notes:

Water rights from IDWR's Water Right and Adjudication Search. Available from:
https://research.idwr.idaho.gov/apps/waterrights/wrajsearch/SearchPage.aspx
Last Accessed: May 31, 2023.

RECEIVED

APR 16 2020

DEPT OF WATER RESOURCES
SOUTHERN REGION

FORM 202 Rev. 09/16

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

Ident. No. 45-14537

AMENDED APPLICATION FOR PERMIT

To appropriate the public waters of the State of Idaho

1. Name of applicant(s) Twin Falls Canal Company Phone (208) 733-6731
   Name connector (check one): ☐ and ☐ or ☐ and/or
   Mailing address 357 6th Ave. West City Twin Falls
   State Idaho ZIP 83301 Email jbarlogl@tfcanal.com
2. Name of representative, if any Sarah W. Higer, Barker Rosholt & Simpson Phone (208) 336-0700
   Mailing address 1010 Jefferson, Ste. 102 City Boise
   State Idaho ZIP 83702 Email swh@idahowaters.com
   a. ☐ Send all correspondence for this application to the representative and not to the applicant OR
      ☑ Send original correspondence to the applicant and copies to the representative.
   b. ☐ The representative may submit information for the applicant but is not authorized to sign for the applicant OR
      ☑ The representative is authorized to sign for the applicant. Attach a Power of Attorney or other documentation.
3. Source of water supply Dry Creek which is a tributary of Snake River
4. Location of point(s) of diversion:

Twp	Rge	Sec	Govt Lot	¼	¼	¼	County	Source	Local name or tag #
11S	20E	18		NE	SE		Twin Falls	Dry Creek	

5. Water will be used for the following purposes:
   Amount 7200 acre-feet (cfs or acre-feet per year) for Ground Water Recharge Storage purposes from 1/1 to 3/31 (both dates inclusive)
   Amount _____ (cfs or acre-feet per year) for _____ purposes from _____ to _____ (both dates inclusive)
   Amount _____ (cfs or acre-feet per year) for _____ purposes from _____ to _____ (both dates inclusive)
   Amount _____ (cfs or acre-feet per year) for _____ purposes from _____ to _____ (both dates inclusive)
6. Total quantity to be appropriated is (a) _____ cubic feet per second (cfs) and/or (b) 7200 acre-feet per year (af).
7. Proposed diverting works:
   a. Describe type and size of devices used to divert water from the source. See Attachment A
   b. Height of storage dam _____ feet; active reservoir capacity _____ acre-feet; total reservoir capacity _____ acre-feet. If the reservoir will be filled more than once each year, describe the refill plan in item 12. For dams 10 feet or more in height AND having a storage capacity of 50 acre-feet or more, submit a separate Application for Construction or Enlargement of a New or Existing Dam. Application required? ☐ Yes ☐ No
   c. Proposed well diameter is _____ inches; proposed depth of well is _____ feet.
   d. Is ground water with a temperature of greater than 85°F being sought? ☐ Yes ☐ No
   e. If well is already drilled, when? _____; drilling firm _____
      well was drilled for (well owner) _____; Drilling Permit No. _____

EXHIBIT 363
6/7/23
M&M Court Reporting Service
Reported by: Andrea Check

For Department Use

Received by DM Date 4-16-2021 Time 1:45 PM Preliminary check by _____

Fee $ _____ Receipted by _____ Receipt No. _____ Date _____

AMENDED

8. Description of proposed uses (if irrigation only, go to item 9):
   a. Hydropower; show total feet of head and proposed capacity in kW. _____
   b. Stockwatering; list number and kind of livestock. _____
   c. Municipal; must complete and attach the Municipal Water Right Application Checklist.
   d. Domestic; show number of households _____
   e. Other; describe fully. Ground Water Recharge Storage

9. Description of place of use:
   a. If water is for irrigation, indicate acreage in each subdivision in the tabulation below.
   b. If water is used for other purposes, place a symbol of the use (example: D for Domestic) in the corresponding place of use below. See instructions for standard symbols.

TWP	RGE	SEC	NE				NW				SW				SE				TOTALS
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
11S	20E	19																	
11S	20E	18																	
11S	20E	17																	
11S	20E	20																	

Total number of acres to be irrigated: _____

10. Describe any other water rights used for the same purposes as described above. Include water delivered by a municipality, canal company, or irrigation district. If this application is for domestic purposes, do you intend to use this water, water from another source, or both, to irrigate your lawn, garden, and/or landscaping? See Attachment A

11. a. Who owns the property at the point of diversion? See Attachment A
    b. Who owns the land to be irrigated or place of use? N/A
    c. If the property is owned by a person other than the applicant, describe the arrangement enabling the applicant to make this filing: See Attachment A

12. Describe your proposal in narrative form, and provide additional explanation for any of the items above. Attach additional pages if necessary. See Attachment A

13. Time required for completion of works and application of water to proposed beneficial use is 5 years (minimum 1 year).

14. **MAP OF PROPOSED PROJECT REQUIRED** - Attach an 8½" x 11" map or maps clearly identifying the proposed point of diversion, place of use, section #, township & range. The map scale shall not be less than two (2) inches equal to one (1) mile.

The information contained in this application is true to the best of my knowledge. I understand that any willful misrepresentations made in this application may result in rejection of the application or cancellation of an approval.

Signature of Applicant

Jay Barlogi, Manager Twin Falls Canal Company
Print Name (and title, if applicable)

Signature of Applicant

Sarah W. Higer, Attorney for Twin Falls Canal Co.
Print Name (and title, if applicable)

AMENDED

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DEPT OF WATER RESOURCES
SOUTHERN REGION

Attachment A – Supplemental Information

7. Supplemental Information: The diversion is made by capturing the flow of Dry Creek into Murtaugh Lake when Dry Creek is running.

9. Description of Place of Use: Entirety of Murtaugh Lake:

Township	Range	Section	QQQ	QQ	Q	County
11S	19E	13		NE	SE	Twin Falls
11S	19E	13		SE	SE	Twin Falls
11S	19E	24		NE	NE	Twin Falls
11S	20E	17		SW	NE	Twin Falls
11S	20E	17		SE	NE	Twin Falls
11S	20E	17		SE	NW	Twin Falls
11S	20E	17		NE	SW	Twin Falls
11S	20E	17		NW	SW	Twin Falls
11S	20E	17		SW	SW	Twin Falls
11S	20E	17		SE	SW	Twin Falls
11S	20E	17		NE	SE	Twin Falls
11S	20E	17		NW	SE	Twin Falls
11S	20E	17		SW	SE	Twin Falls
11S	20E	17		SE	SE	Twin Falls
11S	20E	18		SW	NW	Twin Falls
11S	20E	18		SE	NW	Twin Falls
11S	20E	18		NE	SW	Twin Falls
11S	20E	18		NW	SW	Twin Falls
11S	20E	18		SW	SW	Twin Falls
11S	20E	18		SE	SW	Twin Falls
11S	20E	18		NE	SE	Twin Falls
11S	20E	18		NW	SE	Twin Falls
11S	20E	18		SW	SE	Twin Falls
11S	20E	18		SE	SE	Twin Falls
11S	20E	19		NE	NE	Twin Falls
11S	20E	19		NW	NE	Twin Falls
11S	20E	19		NE	NW	Twin Falls
11S	20E	19		NW	NW	Twin Falls
11S	20E	20		NW	NE	Twin Falls
11S	20E	20		NE	NW	Twin Falls
11S	20E	20		NW	NW	Twin Falls

Amended

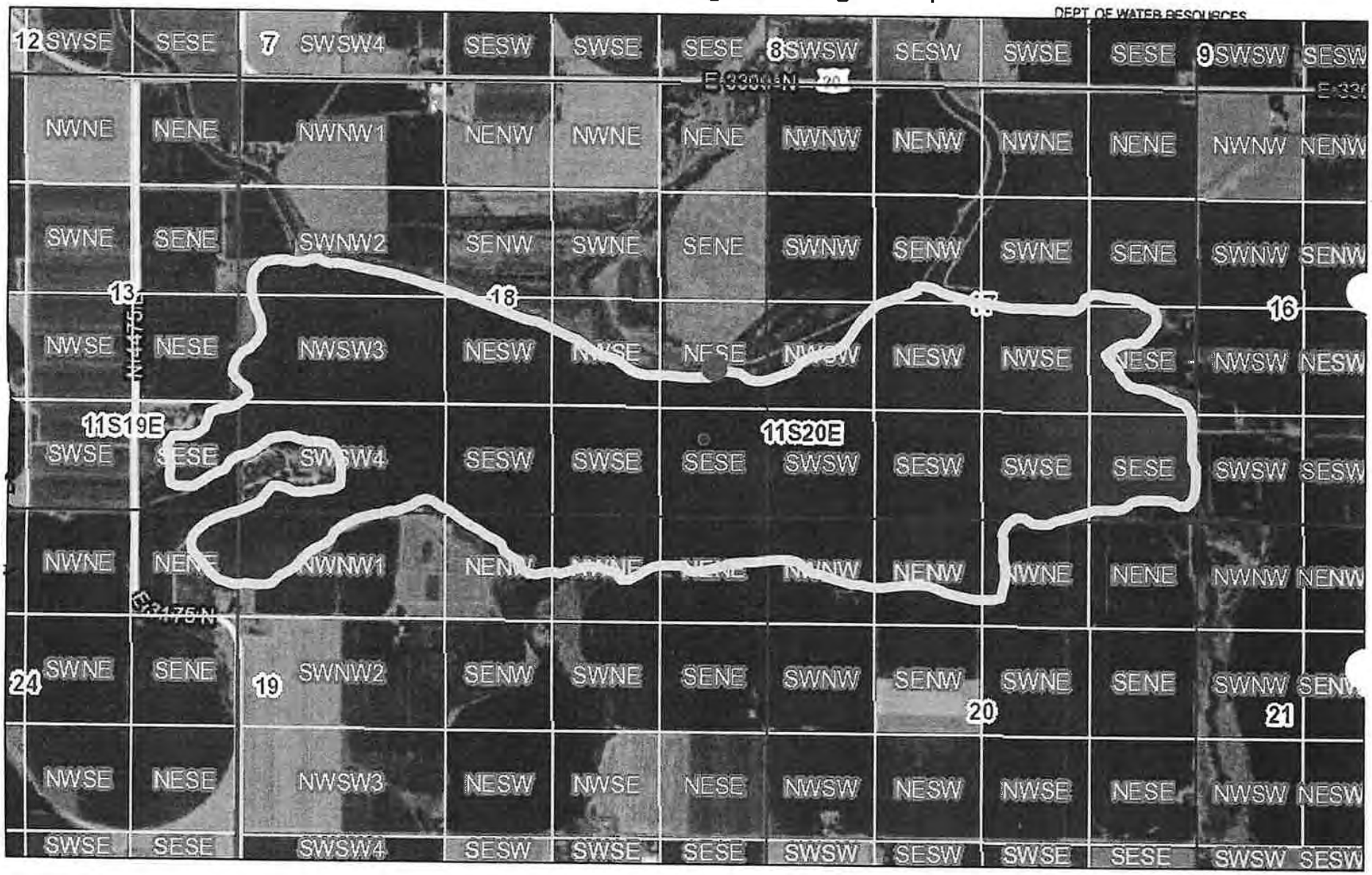
10. Supplemental Information: Southwest Irrigation District holds water rights for recharge from Dry Creek. The water right in this application would be junior to those existing water rights for recharge.

11a & c. Supplemental Information: The land at the point of diversion and place of use, Murtaugh Lake, is owned by the State of Idaho and the United States. Murtaugh Lake, its dam and associated irrigation facilities, are owned and operated by Twin Falls Canal Company as part of Carey Act filing of 1900 that allowed for the construction of these facilities.

12. Supplemental Information: Twin Falls Canal Company is applying for a water right for the ground water recharge that occurs through seepage from Murtaugh Lake when water from Dry Creek, a tributary to Murtaugh Lake, discharges into the lake. Dry Creek is dry throughout much of the year, but when it discharges water into Murtaugh Lake, the Main Line Canal is shutoff so that the lake is filled with water from Dry Creek.

RECEIVED
APR 21 2021
DEPT OF WATER RESOURCES

TFCC GW Recharge Storage Map



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0 0.15 0.3 0.6 mi

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Override 1
Override 1
Counties
Quarter Quarter
Section
Township/Range
Idaho Outline
Idaho Mask

45-14537

Esri, HERE, Created by NRCS from 1:24,000 scale USGS topographic

Idaho Department of Water Resources

Maxar | Created by NRCS from 1:24,000 scale USGS topographic maps. | Idaho Department of Water Resources | USDA,Natural Resources Conservation Services | Esri, HERE, IPC |

001884

CONTRACT

Between State Board of Land Commissioners and Twin Falls Land & Water Company

Dated January 2, 1903

THIS AGREEMENT, made and entered into in duplicate this 2nd day of January, 1903, by and between the State of Idaho, the party of the first part, through the State Board of Land Commissioners of said State, said Board consisting of Frank W. Hunt, Governor, C. J. Bassett, Secretary of State, Frank Martin, Attorney General, and Permeal French, Superintendent of Public Instruction of said State, and the Twin Falls Land and Water Company, a corporation organized and existing under the laws of the State of Utah, the party of the second part, Witnesseth:

That, Whereas the party of the second part did heretofore, to-wit: on the 12th day of October, 1900, file with the State Board of Land Commissioners of the State of Idaho, a proposal for the construction of certain irrigation works in the counties of Cassia and Lincoln in the State of Idaho, under the provisions of the Act of Congress commonly known as the "Carey Act," and the acts amendatory thereof and the laws of the State of Idaho enacted in pursuance of the power granted by the said Act, and, whereas, at the request of the State of Idaho the lands lying under said irrigation works have been by contract between the United States and the State of Idaho, dated July 1st, 1901, set apart by the United States in compliance with the provisions of said Acts of Congress, said lands being List Numbered Six of the State of Idaho, filed at the United States Land Office at Hailey, Idaho, and more fully described in the contract above mentioned between the United States and the State of Idaho; and, whereas said State Board of Land Commissioners have duly notified the said party of the second part to enter into a formal contract for the construction of said irrigation works in pursuance of said proposal; said irrigation works being known as the Twin Falls Dam and Canals, and whereas said State Board of Land Commissioners did on the 2nd day of January, 1903, resolve to enter into a contract with the said pary of the second part for the construction of said irrigation works, it is therefore mutually covenanted and agreed as follows:

PURPOSE OF CONTRACT

First: That for and in consideration of the covenants of said party of the first part herein contained, the party of the second part agrees to construct and build the said Twin Falls Dam and Canals and their main laterals, beginning at the points of diversion particularly described and designated on the map descriptive of said canals and the lands herein described, which map is hereto attached and made a part of this contract, marked Exhibit A, a copy of which is filed in the office of the State Engineer, and to sell shares or water rights in said canal system from time to time as hereinafter provided, to the persons filing upon the lands hereafter described, and to the owners of other lands not described herein but which are susceptible of irrigation from this canal system said shares or water rights to be sold on the terms herein provided, and to transfer the ownership, management and control of said system to said purchasers of shares or water rights as hereinafter provided.

GENERAL SPECIFICATIONS FOR CONSTRUCTION

Second: It is hereby agreed that the party of the second part shall construct the said Dam and Canals and Lateral system according to the following specifications:

The proposed point of diversion of the south side canal is situated north 30 degrees west 1320 feet from the southeast corner of Section 29, Township 10 South, Range 21 East. The point of diversion of the north side canal is situated south 2 degrees 20 minutes west 2425 feet from the northeast corner of Section 29, Township 10 South, Range 21 East.

General description of proposed works is as follows:

Dam: Water to be raised above its present level thirty-eight feet by closing the present three channels of the river by loose rock embankment or masonry or concrete dams, thereby forcing the water over two islands of solid lava rock, which will be blasted down to form a suitable crest and will give a free waterway of 815 feet. Rock embankment to be carried six feet above extreme high water, to have a slope of 1:1 and to be backfilled with gravel or earth on slope of 1 1-2:1.

South side canal: Total length about sixty-five miles. First section (from point of diversion to Rock Creek) eighty feet on the bottom, gradually narrowing to sixty feet on the bottom at Rock Creek. Slope of sides 2:1 depth of water ten feet, lower bank twelve feet on top; grade one foot to 5000 feet, capacity three thousand second feet. From Rock Creek to terminus bottom width gradually narrowed from sixty feet to fifteen feet, slopes 1 1-2:1, grades increased to two feet to 5000 feet at lower end. Rock Creek at head extends for one and one-half miles estimated sixty per cent solid rock, balance of canal in earth until last twenty miles, where it is estimated fifty per cent of loose rock will be encountered.

North side canal: Total length about twenty miles. First section (being the first thirteen miles of the canal) twenty-five feet wide on the bottom, gradually narrowing to twenty feet at the end of the thirteenth mile. Second section from end of thirteenth mile to terminus, gradually narrowing to ten feet in width at terminus. Slope of sides, 1 1-2:1, depth of water 5 1-2 feet; grade 1 foot to 2640 feet; capacity 400 second feet. The first mile will be in heavy rock cuts, balance of canal in earth.

Structure: Both headgates will be built in solid rock. The main waste gates or spill ways will be located near the head of the canal in solid rock. All other waste gates, lateral gates and weirs will be of masonry or concrete.

Laterals: Approximately one hundred and twenty miles of main and three hundred and eighty miles of subordinate laterals are required with the necessary weirs and distributing gates. In case of variance between these specifications and Exhibit A, these specifications shall control.

Said dams, canals, laterals, gates, weirs and all other structures to be built and constructed in a workmanlike manner.

It shall be the duty of the said second party to file with the State Engineer of Idaho notes showing the size and the courses and distances from angle to angle of the canals and main laterals as soon as the same shall have been finally determined.

Changes may be made in these specifications from time to time by agreement between the State Engineer and said second party; such changes, however, not to impair the efficiency of the works for the purposes for which they are intended.

Said second party shall on demand of first party, furnish any further detailed specifications that may be required.

The main canals of this system shall have a carrying capacity when completed sufficient to deliver simultaneously one second foot of water to every eighty acres of land described in this contract, together with all other lands susceptible of irrigation from said canals as nearly as the same can be estimated and agreed upon between the State Engineer and the Engineers of the second party.

The plans, specifications and details for the construction of the dam, canals, headgates, weirs, etc., so far as the same are not covered by the above specifications, shall be submitted to the State Engineer of Idaho for his approval prior to the construction of any of said works, with the right of appeal by said second party from his decision to the State Board of Land Commissioners; but the work, when completed, shall be in accordance with the specifications as finally determined upon to the satisfaction of the State Engineer.

RIGHTS OF WAY

Third: The said party of the first part hereby grants to the said party of the second part a right of way across lands belonging to the State of Idaho or that may be ceded to the State, for the construction and operation of said canals and main laterals, which right of way shall be equal to the actual width of said canals or laterals at their base from toe to toe of the embankment of the same together with a strip of land along one side of each canal or lateral, and adjacent thereto; said strip of land not to exceed fifty (50) feet in width along the main canal, thirty (30) feet in width along main laterals, and a proportionate width along smaller laterals.

APPROPRIATION OF WATER

Fourth: As there has been issued by the State Engineer to the party of the second part a permit to construct said irrigation works and to divert and appropriate from the waters of Snake River 3400 second feet for the purpose of irrigation, power and other beneficial uses, said permit being dated October 8th, 1900, the said party of the second part agrees to cause to be furnished and delivered to said canals all of said appropriated waters to irrigate and reclaim such portions of the following described lands together with such portions of other lands not described herein, but which lie below the line of said canal as are susceptible of irrigation and reclamation therefrom, and said second party hereby covenants and agrees that it has not done, suffered or permitted any act or thing by reason whereof the appropriation so made by it as aforesaid of the said waters of Snake River for the purposes of the irrigation and reclamation of lands through the system of works to be constructed hereunder has been or in future may be in any way impeached, clouded or impaired.

ENTRY OF LANDS

Fifth: Upon the execution of this contract and when the actual construction of said canal shall have been inaugurated, and so far completed as to insure that said water will be furnished the hereinafter described lands, the State Board of Land Commissioners shall cause to be opened for settlement as provided by law, the following described portion or parcels of the land herein described, to-wit:

All of that portion of said lands on the southerly side of Snake River under said canal system that is shown on the map Exhibit A herewith, lying to the east and south of the east line of section sixteen (16), township nine (9) south, range nineteen (19) east, Boise Meridian.

Also all of the said lands on the northerly side the Snake River under said canal system as shown on said map, Exhibit A.

That when said canal on the southerly side of Snake River shall have been completed to a point twenty (20) miles measured along its course from the dam and head of said canal, then the State Board of Land Commissioners shall cause to be opened for settlement in like manner the following described lands, to-wit:

All of said lands under said canal lying to the east of the west boundary of township ten (10) and eleven (11) south of

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range seventeen (17) east of Boise Meridian as shown on the map, Exhibit A.

And when said canal on the southerly side of Snake River shall have been completed to a point thirty (30) miles measured along the canal from the head thereof, then the remaining portion or parcels of said land shall be thrown open for settlement in the manner provided by law.

APPLICATION FOR LANDS

Sixth: The said party of the first part through its State Board of Land Commissioners, agrees that it will not approve any application for or filing on said lands until the person or persons so applying shall furnish to the said Board a true copy of the contract entered into with the said party of the second part for the purchase of sufficient shares or water rights in said irrigation works or shares of stock in the corporation owning, controlling and managing the same for the irrigation of the lands applied for. The second party stipulates and agrees that to the extent of the capacity of the irrigation works, and as rapidly as lands are opened for entry and settlement, it will be filed upon to qualified entrymen or purchasers, without preference or partiality other than that based upon priority of application.

SALE OF LAND BY THE STATE

Seventh: That the said party of the first part, acting through its State Board of Land Commissioners, agrees to sell the lands herein described to such persons as are or will be, by law entitled to file upon the same, for the sum of Fifty (50c) Cents per acre, one-half of which shall be paid at the time of application for the entry of such lands made to said Board and the remaining one-half at the time of making final proof on the land as required by law.

PRICE OF WATER RIGHTS

Eighth: Said party of the second part further agrees and undertakes that it will sell or cause to be sold to the person or persons filing upon any of the lands herein described or to the owner of other lands not described herein, but susceptible of irrigation from its said canal system, by good and sufficient contract of sale with right of possession and enjoyment by the purchaser pending its fulfillment, a water right or share in the said canal for each and every acre owned, filed upon or purchased from the State.

Each of said shares or water rights shall represent a carrying capacity in said canal sufficient to deliver water at the rate of one-eightieth of one second foot per acre, and each share or water right sold or contracted as herein provided shall also represent a proportionate interest in the said canal together with all rights and franchises based upon the number of shares finally sold in the said canals.

Such water rights or shares shall be sold to the person or persons aforesaid as follows: To the person or persons filing upon any of the lands herein described at a price not exceeding $25.00 per share, the same to be paid for as follows: One-fifth in cash at the time of sale and the remainder in five annual installments bearing interest at the rate of six per cent per annum; to the person or persons purchasing any portion of sections numbered sixteen or thirty-six, or any other lands belonging to the State of Idaho which are susceptible of irrigation and reclamation from this canal and to which such water rights are to be applied and dedicated at a price not exceeding fifteen and 50-100 ($15.50) dollars per share provided said water rights are purchased within one year after date of sale or contract by the State of Idaho, and not exceeding Twenty-five ($25.00) dollars at any time thereafter; and to the person or persons owning other lands not herein described but susceptible of irrigation and reclamation from this canal, and to which said water rights or shares are to be applied or dedicated at a price not exceeding Twenty-five ($25.00) dollars per share, payment in either case to be made therefor in installments upon interest as hereinbefore provided in the case of other lands.

This agreemtn shall not, however, be construed to prevent the sale of shares or water rights to purchasers on terms more favorable than those hereinbefore provided, or to prevent payment of installments or purchase price in advance of the maturity of the same at the option of purchaser.

But in no case will water rights or shares be dedicated to any of the lands aforementioned or said beyond the carrying capacity of the canal system, nor in excess of the appropriation of water as hereinbefore mentioned.

It is expressly agreed that prior to the time when the said water rights or shares shall have been converted into or replaced by shares of stock of the Twin Falls Canal Company, Limited, a corporation to be formed as hereinafter provided, said water rights or shares in this section referred to shall be understood to represent only a right to the use and enjoyment of the water flowing through or supplied by the canal system, and shall not in any case be held or understood to transfer to or vest in the purchaser thereof a right of ownership in the dam, or rights of way, canals, headgates, weirs or other irrigation works, or the right to interfere or participate in the control or management thereof as against the said second party.

It is further stipulated and agreed that any and all contracts upon which water rights or shares in the canal are sold, may by express agreement, provide that upon full payment of the purchase price there shall be given at the option of the second party hereto either a warranty deed for an undivided interest in the canal system or shares in the Twin Falls Canal Company, Limited, hereafter described, one share of stock for one share of water right.

Whereas, it is determined to be necessary to provide a convenient method of transferring the ownership and control of said canal from the purchasers of shares or water rights in said canals, and determining their rights among themselves and between said purchasers and the party of the second part herein, and for the purpose of levying and collecting reasonable tolls, charges and assessments for the care and maintenance of said canals, it is hereby further provided that at any time after the completion of the entire system of dam and canals as hereinbefore provided in the specifications and within seven (7) years from the date of this contract, or at any time prior thereto, upon the consent of the State Board of Land Commissioners, a corporation shall be formed under the laws of the State of Idaho, to be known and called the Twin Falls Canal Company, Limited, having the powers and limitations and with the mutual covenants and agreements substantially as set forth in the draft of the Articles of Incorporation hereunto attached marked Exhibit B. "But said Articles of Incorporation must conform to the provisions of this contract, and must be approved by the State Board of Land Commissioners before said corporation can be formed." The said corporation shall be formed by said second party at its expense, all the stock thereof being subscribed by the second party and such other persons, not exceeding six, as may be necessary and all the stock being subscribed by or for said second party. And immediately upon the formation of said corporation said second party shall by good and sufficient deed convey to it the dam and entire system of canals, and the dam and irrigation works and the water rights connected therewith, free of all debt, lien or encumbrance. And upon the formation of said corporation, the shares or water rights theretofore sold or contracted to be sold shall be converted into or replaced by the shares of said corporation, share for share, and from and after the date of the formation of said corporation the party of the second part shall sell to purchasers or owners of lands under the canal system shares of stock of said corporation upon the same terms in all respects as hereinbefore provided for the sale of water rights or shares prior to the formation of such corporation. The said second party agrees that until it shall have assigned and transferred to settlers and owners of lands under said canal a majority of the stock of the Twin Falls Canal Company, Limited, and thereafter so long as it shall manage and control the said canal system there shall be delivered through the canals and laterals the water flowing therein equally and proportionately according to the representative rights of the parties entitled thereto.

Any and all deferred payments for the purchase price of water rights or shares of stock may be secured by express contract of the purchaser pledging the water right or stock sold together with any and all rights in the lands to which the water is to be applied and the lien thereby granted shall be in addition to all liens granted by the laws of Idaho.

WATER RIGHT DEDICATED

Ninth: The certificates of sale of water rights and the certificates of shares of stock of the Twin Falls Canal Company, Limited, shall each upon being issued to the purchaser or holder of land under the canal system, be made to indicate and define in the contract or certificate as the case may be, the amount of water, to-wit: One eightieth of a second foot allotted to each acre represented thereby, and carrying capacity of the canal sufficient therefor, the water to be delivered from the canal during each and every irrigation season, said amount to be measured at or within one-half mile of the place of intended use in such quantities and at such times as the condition of the soil, crops and weather may determine but according to such rules and regulations based upon a system of distribution of water to the irrigators in turn and by rotation as will best protect and serve the interests of all the users of water from this canal system. It is agreed that said system of distribution by rotation shall be devised by the said party of the second part and used by it during the period while it retains the management of said system, and that it shall meet the approval of the State Engineer.

The sale or contract of the water right to the purchaser shall be a dedication of the water to the land to which the same is to be applied, and the water right so dedicated shall be a part of and shall relate to the water right belonging to the said system of canals.

All deeds for water rights if any be issued by the said second party, shall be based upon this contract, and shall meet the approval of the said party of the first part, the State of Idaho.

MEASUREMENT OF WATER CHARGES FOR DELIVERY

Tenth: The said party of the second part agrees to construct and until it shall convey and turn over the title and possession to the Twin Falls Canal Company, Limited, to operate said canal and main laterals so that water conducted through the same may be delivered at a point not exceeding one-half mile from any legal subdivision of one hundred and sixty acres of land herein described, filed upon, owned or occupied as aforesaid and to be irrigated or reclaimed by the water conducted through said canals and main laterals. That it will construct and place in position and while it retains possession, maintain all headgates, flumes, weirs and other devices through which water may be turned off from said canal or main laterals; that the said party of the second part will construct and place in said canal or laterals such devices for measuring water to irrigators as shall be deemed necessary and best by the State Engineer of Idaho.

It is hereby agreed that every purchaser of shares in said canal or holder of stock in said Twin Falls Canal Company, Limited, shall be entitled to have delivered for the irrigation of his land, its full amount of water as herein provided, and it is hereby stipulated and agreed that while it retains pos-

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session and control of said canal system the party of the second part may make a charge for the delivery of said water for irrigation to the purchaser of said shares on the following basis and in the following manner: All of the water dedicated to his land shall be delivered free of all charges during the first irrigating season that water is delivered to said purchaser, and thereafter an annual charge not to exceed 60 cents per acre may be made for each and every acre irrigated, or at the option of the purchaser, a charge not to exceed 20 cents per acre foot may be made for each and every acre foot delivered by the second party at th request of such purchaser.

INCREASE OF CAPACITY OF CANAL

Eleventh: The party of the second part shall be entitled at any time within five years from the date hereof to increase the appropriation of water from Snake River at the said dam hereinbefore described, to increase the capacity of said canals or either of them or any lateral thereof, and to use the same so enlarged or increased for the purpose of carrying any water belonging to the said party of the second part under such additional appropriation, provided, however, that such use shall be allowed only upon the making of such reasonable arrangements as to the expense of and care and maintenance of the canals and irrigation system, as may be agreed upon between the said party of the second part and the said Twin Falls Canal Company, Limited, whenever said last named company shall take possession of the canal system and as shall be approved by said party of the first part. Any rights acquired by the party of the second part under the provisions of this section shall be at all times held, used and enjoyed subject and subordinate to the rights of the purchasers of water rights for the irrigation of lands as provided in this contract.

It is further agreed that the said party of the second part, for the purpose of raising funds to construct the said canal system may execute a mortgage or deed of trust upon all its rights which it has or may hereafter acquire by virtue of this contract to any third party, provided that such mortgage or deed of trust shall contain a clause requiring the trustee or mortgagee as the case may be, upon the payment to such mortgagee or trustee of the amount stipulated to be paid by any purchaser of water rights to thereupon give a full release to such purchaser for the amount of the water rights so purchased by him; such mortgage or deed of trust to be subject to the terms and conditions of this contract and receive the approval of the Attorney General of the State of Idaho. All payments upon water rights are to be made to the trustee or mortgagee, if any, but trustee or mortgagee may consent otherwise.

TRANSFER OF THE MANAGEMENT AND CONTROL OF SAID CANAL SYSTEM TO PURCHASERS OF SHARES

Twelfth: Said party of the second part covenants and agrees that until such time as the majority of the shares of the Twin Falls Canal Company, Limited, shall have been conveyed and transferred to the owners and holders of the land under said canal system, it will cause to be maintained, operated and kept in good repair the said canals and irrigation system, and that if at any time during said period, the proper revenue, tolls, and income of the said Twin Falls Canal Company, Limited, shall be insufficient for the purpose of maintaining, operating and keeping in repair, the said canals and irrigation system, and that if at any time during said period the proper revenue, tolls, and income to the said Twin Falls Canal Company, Limited, shall be insufficient for the purpose of maintaining, operating and keeping in repair all the irrigation works hereinbefore referred to, it will at its own expense, and without cost or charge to the said Twin Falls Canal Company, Limited, supply to the treasury of the said last named corporation the funds necessary to supply such deficiency.

COMPLETION OF THE CANAL SYSTEM

Thirteenth: Said party of the second part agrees to begin work on said dam and canals and irrigation system within six months from the date of this contract, and that at least one-tenth of the construction work shall be completed within two years from the date hereof, that the construction of said works shall be prosecuted diligently and continuously to completion, and that a cessation of work after the second year without the sanction of said Board will forfeit to the State all rights under this contract, and second party further agrees to have said canal system fully constructed and in operation in accordance with this contract on or before five years from the date of this contract. It is understood and agreed that upon completion of the dam hereinbefore provided, and upon the completion of any such portion or portions of the said canal and laterals as may be conveniently operated by said Twin Falls Canal Company, Limited, said party of the second part will, upon the completion of said portion or portions of the canal or canals or laterals and in advance of the completion of the entire canal system, turn over and deliver possesion of such completed portion to the said Twin Falls Canal Company, Limited, provided said last named company shall with the consent of the State Board of Land Commissioners be organized prior to the completion of the canal, to the end that as rapidly as may be, the operation, maintenance and control of the said canal and irrigation system may be placed under the control and in the possession of said last named company.

FORFEITURE

Fourteenth: The said party of the second part agrees that upon the failure on its part to begin the construction of the said canal within the time specified in this contract, or upon the failure to proceed with the work, as agreed upon in this contract, after receiving sixty days' notice from the Secretary of the State Board of Land Commissioners, the bond given to secure the strict performance of the agreement herein contained, together with any portion or portions of said canal that may have been constructed under the conditions of the contract, shall be at once forfeited to the said party of the first part, the State of Idaho, and that the said party of the first part, acting through its said Board of Land Commissioners, may declare the same forfeited and proceed to enforce said bond and to take possession of said canal and irrigation works, and all the rights the said party may have acquired therein, as provided in the Act of the Legislature of the State of Idaho first referred to in this contract.

ESTIMATED COST

Fifteenth: The estimated cost of the proposed irrigation works is One Million Five Hundred Thousand ($1,500,000.00) Dollars. It is understood and agreed that the existing law under which this contract is executed is as much a part of this contract as if specifically herein set forth.

DESCRIPTION OF LANDS

Sixteenth: The lands hereinbefore referred to being the lands donated by Act of Congress to the State of Idaho under and pursuant to the Act approved August 18th, 1894, commonly called the "Carey Act," the reclamation and irrigation of which lands this contract is especially designed to effect, are duly set forth and described in a list hereunto attached and made part of this contract marked Exhibit C.

IN WITNESS WHEREOF, the said party of the first part, the State of Idaho, has by resolution of its State Board of Land Commissioners caused this agreement to be signed in duplicate by its Governor, attested by its Secretary of State, and the Great Seal of said State to be affixed hereto, and the said party of the second part has hereunto caused its corporate name to be attached by its President and attested by its Secretary, and its corporate seal to be affixed, as well as on the duplicate hereof, the day and year first above written.

(SEAL)

For the State of Idaho,
By F. W. HUNT, Governor.

Attest:
CHAS. J. BASSETT, Secretary of State.

THE TWIN FALLS LAND AND WATER COMPANY,
By S. B. MILNER, President.

(SEAL) Attest:
HARRISON E. JENKINS, Secretary.

Boise, Idaho, March 29, 1911.

State of Idaho, } ss.
County of Ada, }

I, N. Jenness, Register of the State Board of Land Commissioners of the State of Idaho, do hereby certify that the foregoing and hereto attached instrument is a true and correct copy of the contract between the State of Idaho and the Twin Falls Land and Water Company, as same appears of record and on file in my office.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 20th day of March, 1911.

N. JENNESS, Register.

NAME OF APPLICANT.....

Form No. 0

SCALE: 2 Inches Equal 1 Mile. Draw Plan in Ink.

trol the said canal system there shall be delivered through the canals and laterals the water flowing therein equally and proportionately according to the representative rights of the parties entitled thereto.

Any and all deferred payments for the purchase price of water rights or shares of stock may be secured by express contract of the purchaser pledging the water right or stock sold together with any and all rights in the lands to which the water is to be applied and the lien thereby granted shall be in addition to all liens granted by the laws of Idaho.

WATER RIGHT DEDICATED

Ninth: The certificates of sale of water rights and the certificates of shares of stock of the Twin Falls Canal Company, Limited, shall each upon being issued to the purchaser or holder of land under the canal system, be made to indicate and define in the contract or certificate as the case may be, the amount of water, to-wit: One eightieth of a second foot allotted to each acre represented thereby, and carrying capacity of the canal sufficient therefor, the water to be delivered from the canal during each and every irrigation season, said amount to be measured at or within one-half mile of the place of intended use in such quantities and at such times as the condition of the soil, crops and weather may determine but according to such rules and regulations based upon a system of distribution of water to the irrigators in turn and by rotation as will best protect and serve the interests of all the users of water from this canal system. It is agreed that said system of distribution by rotation shall be devised by the said party of the second part and used by it during the period while it retains the management of said system, and that it shall meet the approval of the State Engineer.

The sale or contract of the water right to the purchaser shall be a dedication of the water to the land to which the same is to be applied, and the water right so dedicated shall be a part of and shall relate to the water right belonging to the said system of canals.

All deeds for water rights if any be issued by the said second party, shall be based upon this contract, and shall meet the approval of the said party of the first part, the State of Idaho.

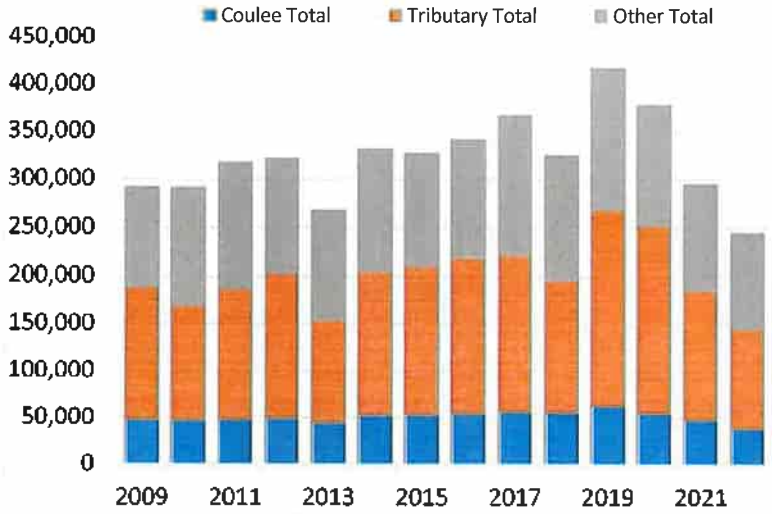
MEASUREMENT OF WATER CHARGES FOR DELIVERY

Tenth: The said party of the second part agrees to construct and until it shall convey and turn over the title and possession to the Twin Falls Canal Company, Limited, to operate said canal and main laterals so that water conducted through the same may be delivered at a point not exceeding one-half mile from any legal subdivision of one hundred and sixty acres of land herein described, filed upon, owned or oc-

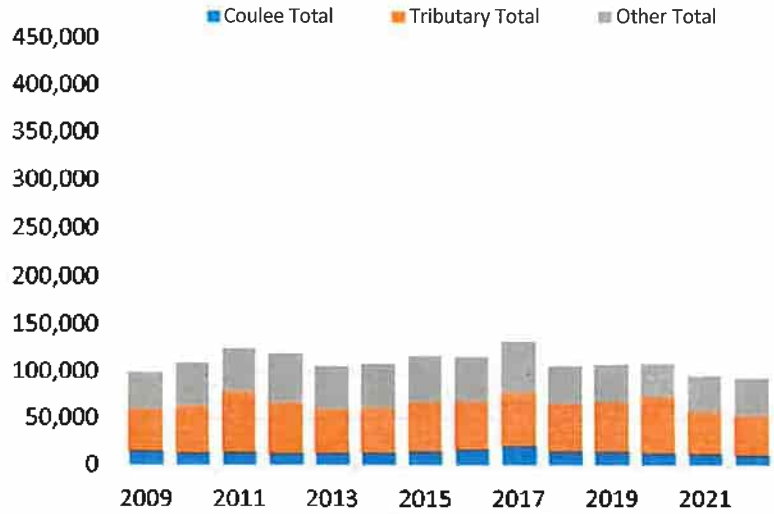
EXHIBIT 364
6/7/23
M&M Court Reporting Service
Reported by: Andrea Check

Summary of TFCC Return Flows (AF)
2009 - 2022

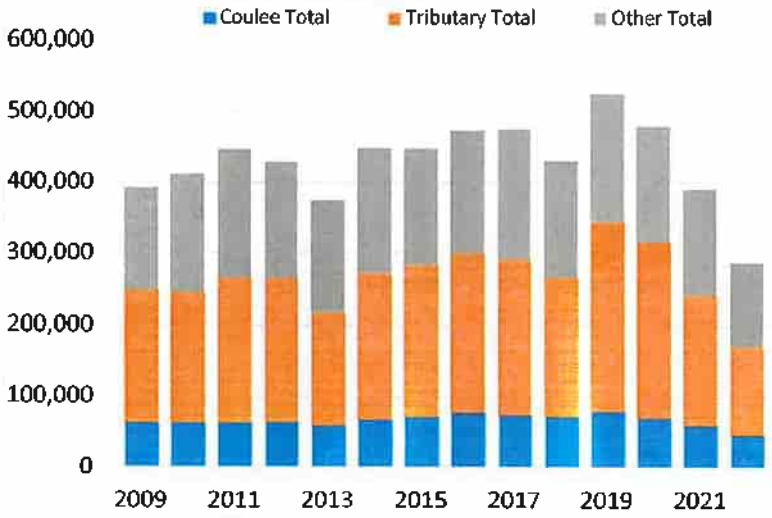
Irrigation Season (April - October)



Non-Irrigation Season (November - March)



Annual (April - March) *



Notes:

(1) Since 2009, most gages are available, except missing data for A10 Coulee 2009-2014 (average flow around 1,200 AF/y).

(2) Coulee gages: A10 Coulee, East Perrine Coulee, I Coulee, N Coulee, Perrine Coulee, Q Coulee, S Coulee, and S2 Coulee.

(3) Tributary gages: Cedar Draw, Deep Creek, and Mud Creek.

(4) Other gages: Rock Creek at Poleline, L10 Power Plant, and Twin Falls WWTP.

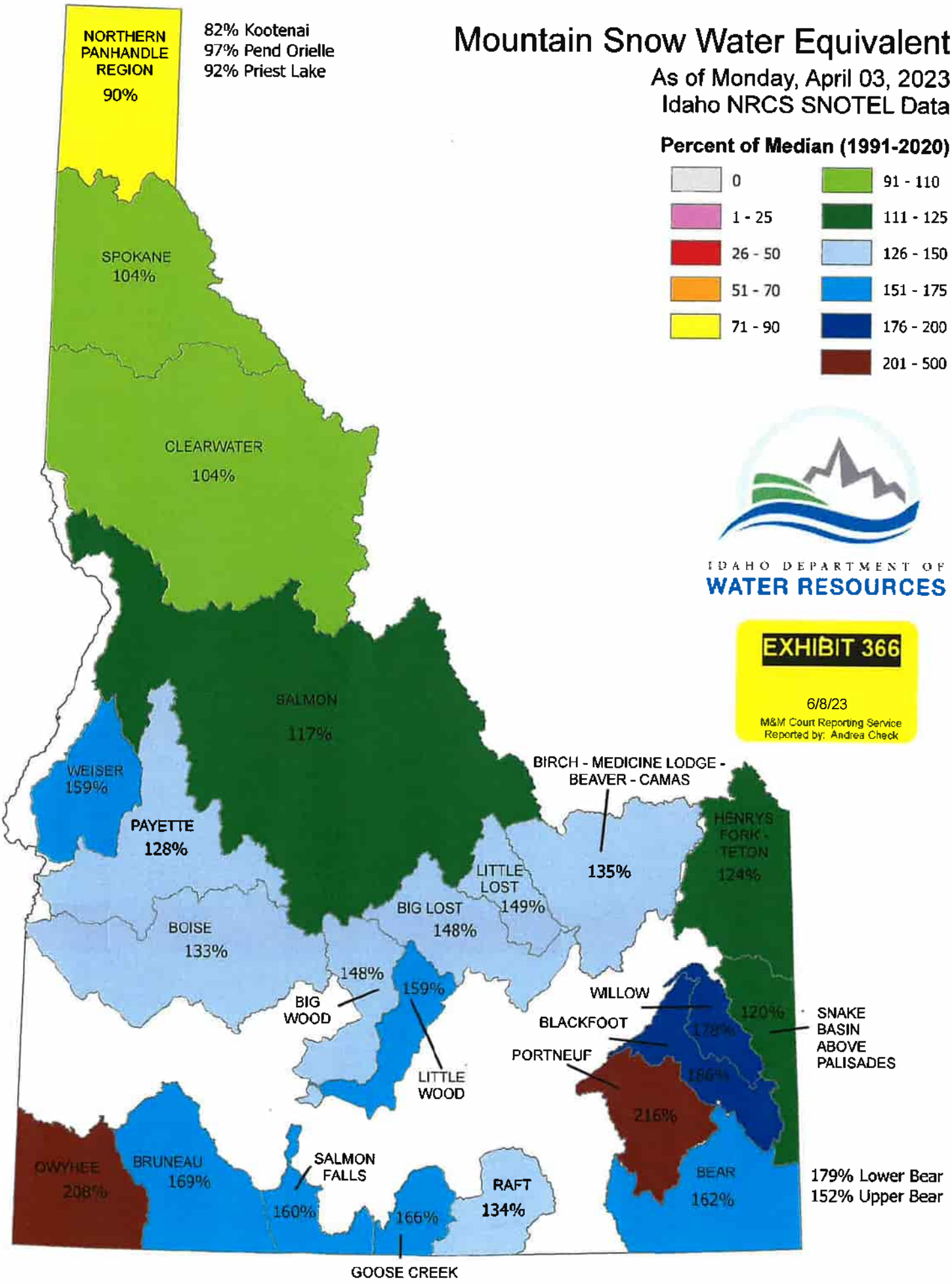
(5) Data downloaded from IDWR Aqua Info (accessed on 6/4/2023).
https://research.idwr.idaho.gov/apps/hydrologic/aquainfo/Home/Data#!/

* Different scale.

EXHIBIT 365
6/7/23
M&M Court Reporting Service
Reported by: Andrea Check

Spronk Water Engineers, Inc.

6/6/2023


NORTHERN PANHANDLE REGION
90%
82% Kootenai
97% Pend Orielle
92% Priest Lake
Mountain Snow Water Equivalent
As of Monday, April 03, 2023
Idaho NRCS SNOTEL Data
Percent of Median (1991-2020)
0
1 - 25
26 - 50
51 - 70
71 - 90
91 - 110
111 - 125
126 - 150
151 - 175
176 - 200
201 - 500
SPOKANE
104%
CLEARWATER
104%
SALMON
117%
WEISER
159%
PAYETTE
128%
BOISE
133%
BIG LOST
148%
LITTLE LOST
149%
BIRCH - MEDICINE LODGE - BEAVER - CAMAS
135%
HENRYS FORK - TETON
124%
148%
BIG WOOD
159%
LITTLE WOOD
WILLOW
BLACKFOOT
PORTNEUF
216%
120%
SNAKE BASIN ABOVE PALISADES
OWYHEE
208%
BRUNEAU
169%
SALMON FALLS
160%
166%
GOOSE CREEK
RAFT
134%
BEAR
162%
179% Lower Bear
152% Upper Bear
IDAHO DEPARTMENT OF
WATER RESOURCES
EXHIBIT 366
6/8/23
M&M Court Reporting Service
Reported by: Andrea Check

Expert Report Regarding Selected Technical Aspects of the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*

May 31, 2023
Bryce A. Contor
Principal Hydrologist
Rocky Mountain Environmental Associates, Inc.

Introduction

To aid in an administrative hearing concerning the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* (Fifth Order), Rocky Mountain Environmental Associates Inc. (RMEA) provides this expert report regarding technical topics. This is not an exhaustive report, but is confined to the following technical issues:

- Technical arguments used by the Idaho Department of Water Resources (IDWR) to justify the use of transient modeling as opposed to stead state modeling;
- Purposes of the Enhanced Snake River Plain Aquifer Model (ESPAM) and technical opinions regarding its use;
- Possible application of source water fraction methods to parse out supplemental water use by the Surface Water Coalition;
- Logical consistency in the use of transient and steady-state modeling.

In this report, all references to Finding(s) of Fact or Conclusion(s) of law are to the Fifth Order unless explicitly stated otherwise.

Technical Arguments for use of Transient Modeling

Perhaps the most influential change in the Fifth Order is the change from steady-state modeling to transient-state modeling in determining a priority date for curtailment. The Fifth Order provides the following technical rationale for the change to transient modeling:

1. Page 2, last paragraph of the "Background" section states, *"the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling…."*
2. Also on page 2, the Fifth Order states *"The first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version [of ESPAM] was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling…"*
3. Finding of Fact #83 quotes the Merriam-Webster dictionary for a plain-language meaning of the term "steady state," then asserts that *"A steady-state ESPAM simulation can only model [effects]… resulting from continuous curtailments of an identical magnitude and location until the effects of curtailment are fully realized."* Finding of Fact #84 states: *"For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved."*

Each of these stated rationales is discussed in turn, followed by a general conclusion.

Multiple Years of Experience

Concerning the stated reason that *"the Department now has multiple years of experience with the methodology to better understand the impact of applying steady-state modeling versus transient modeling,"* the Snake River Plain Aquifer Model Scenario: Hydrologic Effects of Curtailment of Ground-water Pumping Using Snake Plain Aquifer Model Version 1.1 "Curtailment Scenario" (Scenario) presented to IDWR in 2006 all of the implications of steady-state modeling vs transient described in the Fifth Order, that are correct. No data or modeling advances since 2006 have qualitatively changed the results of the Scenario. In the following excerpts, quotes from the Scenario are in italics, with square brackets *[ ]* showing clarifications that are compatible with the original text and analysis. Non-italic type not set off with brackets is commentary added with this report:

> *Page3: "It is important to recognize that even after curtailment of ground-water rights, there is a residual impact to river reaches due to previous years of ground-water pumping. The magnitude and timing of this residual impact can also be evaluated using these scenario simulations.*
>
> *Page 3: "The specific objectives [of the Scenario] are to:*
> *1) Determine the magnitude of increase in spring discharges and river gains over time for each sub-reach of the Snake River.*
> *2) Determine the seasonal magnitude of the expected increases.*
> *3) Determine the predicted impacts to aquifer water levels."*
>
> *Page 3 and page 4: "Initially, ground-water pumping removes water from aquifer storage, causing a localized cone of depression. As pumping continues, the effects propagate until a hydraulically connected boundary is reached. A recharge boundary will act as a source for the water being removed via ground-water pumping. Changes in*

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aquifer water levels will impact the amount of water being recharged or discharged from a hydraulically connected recharge or discharge boundary. For example, in a hydraulically connected river reach, the relationship between river stage and aquifer water level will determine the amount of water moving between the aquifer and the river. For a gaining river reach, a decrease in aquifer water level will result in a decrease in the rate of ground-water discharge to the river....

As time passes and the collective impacts of ground-water pumping on the eastern Snake River Plain propagate throughout the aquifer system, less of the removed water is coming out of aquifer storage and more is coming from the river, either in the form of reduced spring discharges, decreased aquifer discharges to the river, or increased losses from the river. Ultimately, however, all of the ground water pumped and consumptively used for irrigation will come from the Snake River. It is difficult to quantify the volume and timing of these impacts to the river reaches. A numerical ground-water model is the best available tool for such an estimation."

Page 5 and 6: "The numerical superposition version of the ESPA model [used in the Scenario] is very similar to the fully populated ESPA model with all recharge and discharge terms removed and with a zero initial gradient. The numerical superposition model uses the concepts of superposition as detailed in Reilly and others (1987). The fundamental basis of superposition theory is that, for a strictly linear system, a complex problem can be decomposed into more simple sub-problems. The sum of the solutions of the sub-problems will be the same as the solution to the whole, more complex problem....

Confined aquifer model representations are strictly linear; unconfined aquifer model representations are non- linear due to the fact that aquifer transmissivity changes as aquifer water levels change. In the eastern Snake River Plain aquifer, the changes in water levels are very small relative to the total saturated thickness, so these nonlinearities are considered negligible. A comparison of the confined version of the ESPA model versus the unconfined version has been done by IWRRI and is published in ESPAM Design Document DDM-019, <u>Comparison of Unconfined and Confined Aquifer Representation</u>. Similarly, a comparison of model results using the fully populated model versus the numerical superposition model has been done by IWRRI and will also be documented in a report. The results of these evaluations support the conclusion that the non- linearities of the ESPAM are negligible. These results have been presented to the ESHMC [Eastern Snake Hydrologic Modeling Committee]....

The results from this [superposition] simulation represent the impacts from the particular aquifer stress being evaluated in isolation of all other recharge and discharge."

Page 6: "Evaluation of the impacts of curtailment of ground-water pumping was greatly facilitated by using the numerical superposition model. The numerical superposition model is not restricted to the 22-year period of the fully populated model and the effects of curtailment can be evaluated in isolation of all other recharge and discharge, yielding an estimate of expected <u>changes</u> in river gains and spring discharges due to curtailment. Evaluations of the results of these scenarios using numerical superposition can be used

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to estimate expected future impacts to river gains due to curtailment and the residual impacts to river gains from ground-water pumping after ground-water curtailment. Using superposition allows analysis of the future impacts of a specified stress (in this case, ground-water pumping) without requiring knowledge of other future conditions such as weather" (emphasis in original).

Page 7: "For the long-term curtailment assessment, the annual averages of precipitation and evapotranspiration were used. For the seasonal curtailment assessment, summer and winter (corresponding to irrigation season and non- irrigation season) averages were used."

Page 8: "Additionally, Table 1 lists the time for each reach to come within 10% of the steady state value. For example, in Table 1, curtailment of all ground water is predicted to cause a 298 cfs accrual in the Devil's Washbowl to Buhl reach. Transient simulation results indicate that it would take approximately 59 years for the recovery to reach 90% of the steady state value. Similarly, curtailment of ground water junior to January 1, 1973 is predicted to cause an 88 cfs recovery in the same reach. Ninety percent of this recovery would be realized in 51 years."

Page 9: "Table 2 summarizes the predicted reach accrual after one year of curtailment for each reach for each cutoff date." Unfortunately, the units of Table 1 are "cfs" and the units of Table 2 are "acre feet," so it would take some calculation to perceive the difference between the first-year results and the total result.

Page 10: "Figures 18 through 28 show the seasonal predictions of reach accruals for the 11 reaches of the Snake River for each of the five cutoff priority dates....

Many of the reaches... show a winter decline almost back to the river reach gain levels of the previous year. Some of the reaches, however, show a smaller decline relative to the predicted accruals. This would indicate that the curtailed areas are more distant from the reach and that the accruals are taking longer to get to the reach...." Figure 18 also shows single-year results for two of the cutoff dates.

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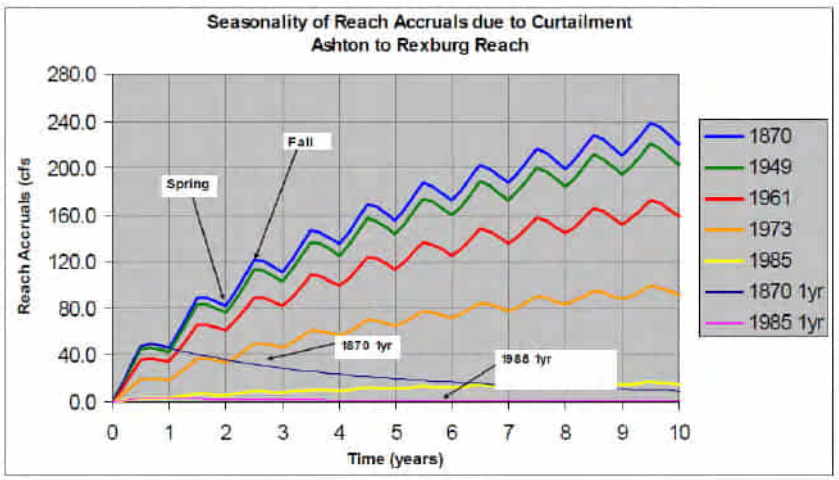

Figure 18. Seasonality of Reach Accruals due to Curtailment of Ground-Water Pumping for Ashton-Rexburg Reach (generated using ESPAM v1.1).

Figure R1: Figure 18 reproduced from Scenario.

Page 11: "Just as curtailment of ground-water pumping will cause increases in river gains, curtailment will also cause a recovery of aquifer water levels. Figures 29 through 34 show predicted changes in water levels at six locations throughout the plain due to curtailment of all ground-water pumping." Page 11 also states *"The magnitude of the rise is driven by how proximal the curtailed ground-water irrigated lands are to the river reach under evaluation."* This is incorrect and should read "how proximal... to the location where water-level changes were considered."

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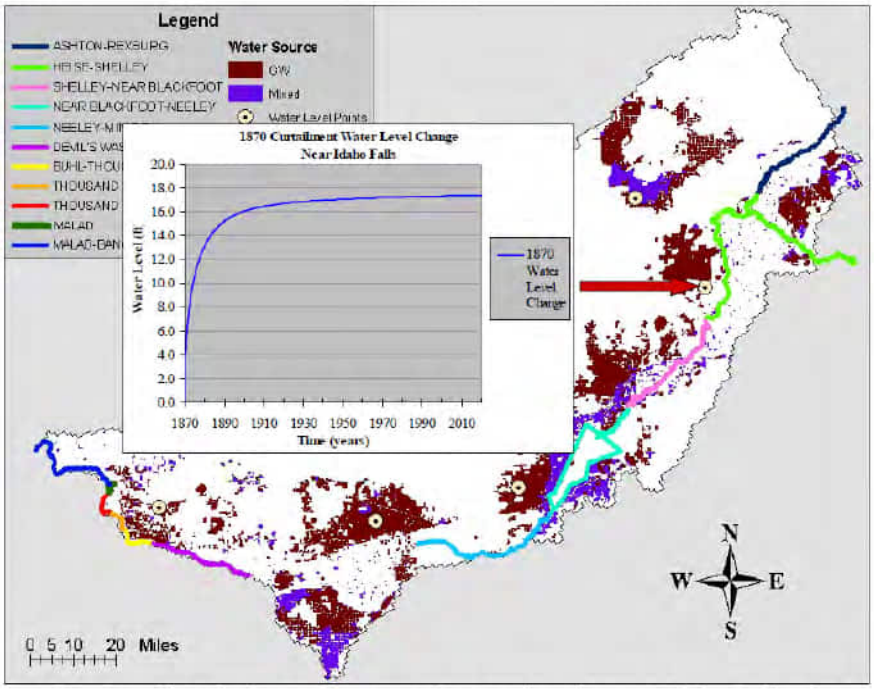

Figure 30. Predicted change in ground water level near Idaho Falls due to curtailment of ground water pumping junior to 1870 (generated using ESPAM v1.1).

Figure R2: Figure 30 reproduced from Scenario.

> *Page 11: "For the temporary, 1-year simulation, maximum realizable accruals are relatively small but the benefits last for several years."*

These excerpts show the state of knowledge that has been available to IDWR since 2006. It could be argued that a 2006 report is so old that no IDWR personnel who were familiar with it were involved with technical input to the Fifth Order. However, a 2013 staff memo from Jennifer Sukow to Gary Spackman indicates that in 2012 Sukow repeated the curtailment scenario exercise using both ESPAM2.0 and ESPAM2.1. It is clear that in 2012 Sukow was aware of the 2006 work, and that Spackman had an opportunity to be aware of it at least as early as 2013. Both still are employed at IDWR and could have applied this knowledge at any time in approximately the last decade.

Modeling Time Scale

The second stated reason is that the *"first version of the ESPA groundwater flow model was not calibrated at a time-scale that supported in-season transient modeling. In contrast, the current version [of ESPAM] was calibrated using monthly stress periods and half-month time steps, a refinement that facilitates in-season transient modeling…."* A stress period in modeling parlance is a representation of a period of time during which model inputs (recharge and

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discharge data, and calibration targets) are held constant. Table 1 in this report shows the date of release and stress period lengths used in the various versions of the model discussed above. The timing of events shown in Table R1 is different than intimated by the statement in the Fifth Order.

Table R1. Model Versions, Report Dates, and Stress-Period Lengths

Model	Report Year	Stress-Period Length
SRPAM	1999	15.2 days
ESPAM1.0	(no report)	6 months
ESPAM1.1	2006	6 months
ESPAM2.0	(no report)	1 month
ESPAM2.1	2013	1 month
ESPAM2.2	2021	1 month

In addition to the fact that ESPAM modeling with one-month stress periods precedes the 2016 Fourth Methodology order by three years, the notion that earlier versions did not facilitate ***"in-season transient modeling"*** should be considered in light of the following:

- The 1999 SRPAM stress period was shorter even than the ESPAM2.2 stress period.
- The 2005 – 2006 ESPAM1.0 and ESPAM1.1 stress periods were approximately the length of an irrigation season and were assigned to winter and summer months in a fashion that facilitates evaluation of effects upon surface-water irrigation supplies.
- As illustrated by the Scenario, the ESPAM1.0 and ESPAM1.1 models not only were explicitly designed to represent seasonal effects of activities, they were used for that purpose at least as early as 2006.
- It is not necessary for the stress-period length in model application to match the stress-period length in calibration, as demonstrated by all versions of the IDWR transfer tool (ETRAN).

It is acknowledged that generally it is not considered good modeling practice to apply the model with shorter stress periods than used in calibration, though this guideline was not adhered to in the first single-cell versions of IDWR's transfer tool.

Time constraints precluded more robust analysis, and precluded analysis using ESPAM2.2. However, a limited analysis was conducted using a monthly version and a trimester version of ESPAM2.1, at three of the points shown in Figure R3. These points were not selected to be representative but rather to fully explore differences across the aquifer.

The monthly version of ESPAM2.1 is referred to as "RSP_E2_1." It is a proprietary tool developed by Rocky Mountain Environmental Associates that uses a mathematical modeling procedure called ***convolution*** to apply a table of input stresses to a large database (approximately two gigabytes) of transient response functions that provide responses from each of approximately 11,000 model cells to each of approximately 60 modeled spring and river reaches. The trimester version is IDWR's "ETRAN3.3" transfer tool.

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For each point, the model was applied three times; once with ETRAN3.3, and twice with RSP_E2_1. Results are illustrated in Figure R4 through Figure R6. Only the first two years of results are shown, and only for the Near Blackfoot to Minidoka reach. All three applications represented a curtailment event that would produce 100 acre feet of reduction at the modeled point. For the results labeled "Trimester," the 100 acre feet were applied uniformly across one four-month trimester, and results modeled on a trimester stress period. For results labeled "Monthly 1," the 100 acre feet were applied uniformly across the first four months, so the application of effect was identical to the "Trimester" rendition. However, the modeling used one-month stress periods. The "Monthly 2" results also reflect 100 acre feet of relief modeled using one-month stress periods, but the relief was applied variably across six months in an effort to simulate the approximate timing of relief from an actual curtailment event.

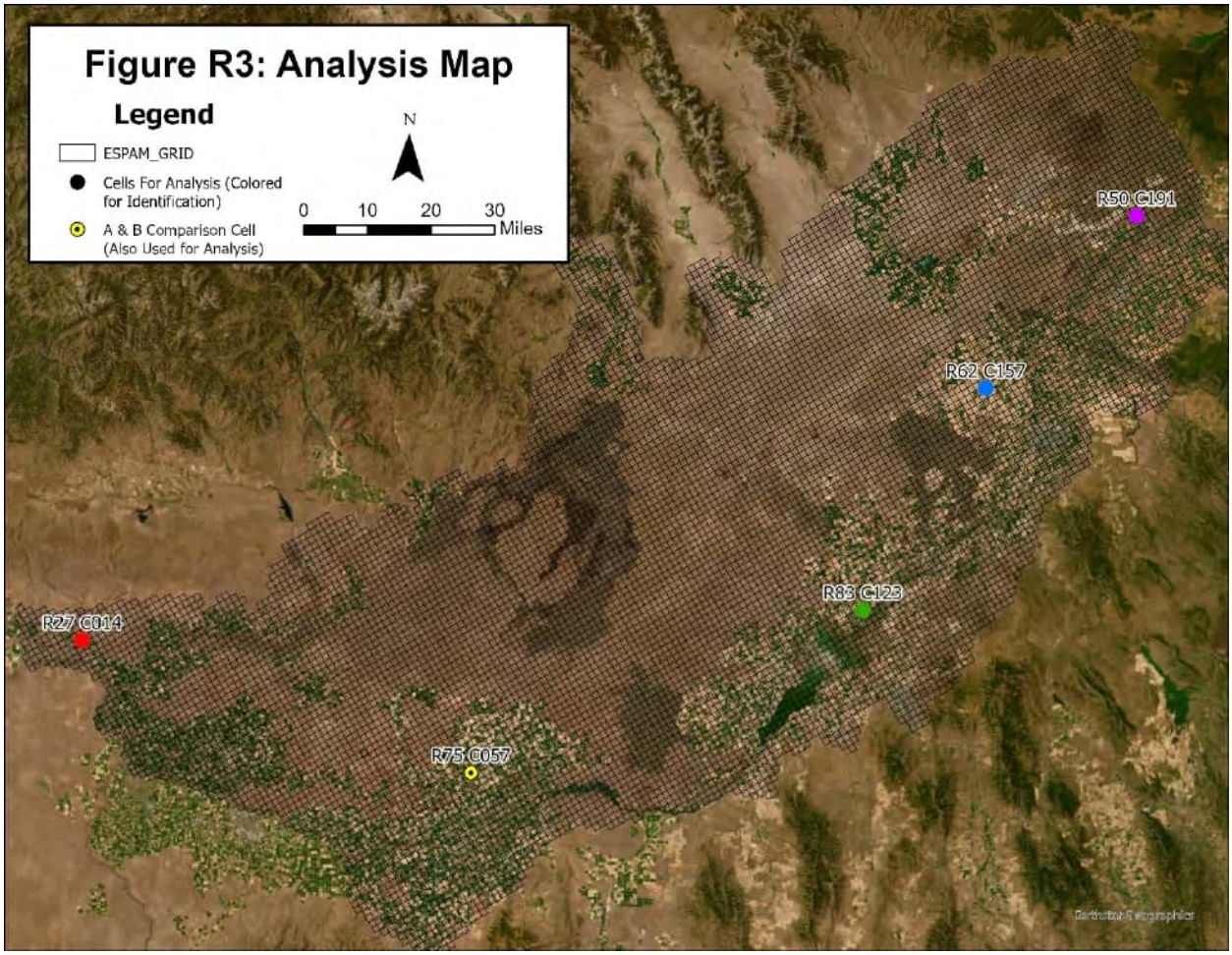

Figure R3.

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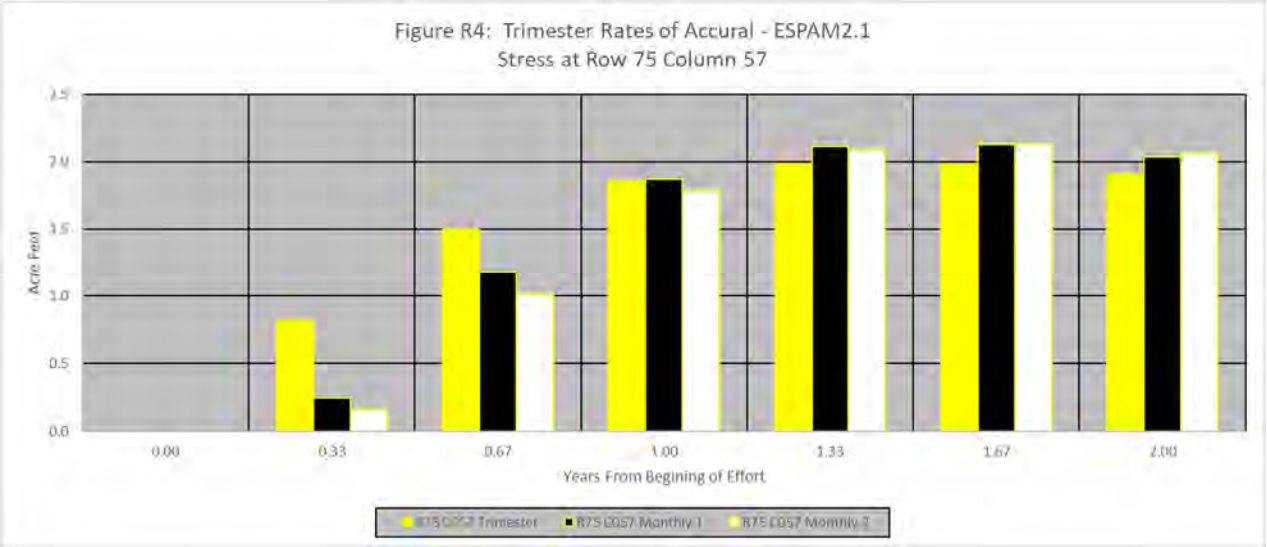

Figure R4.

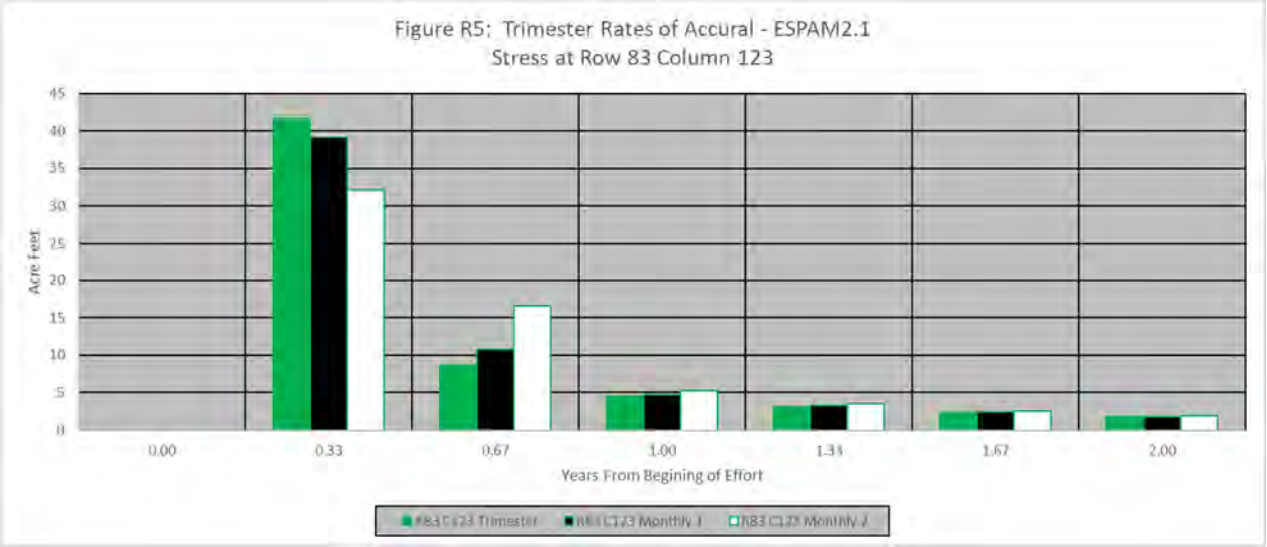

Figure R5.

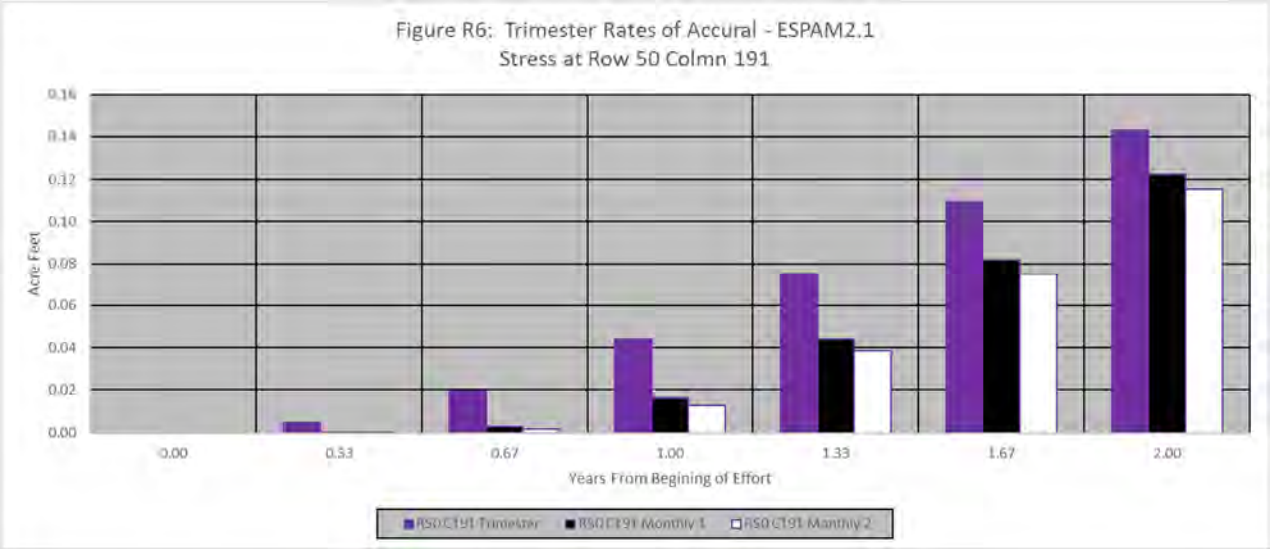

Figure R6.

Conclusions from this limited exercise are as follows:

- Within the first two years, results are qualitatively similar but not quantitatively identical.
- The differences resulting from stress-period length and temporal description of the effect of curtailment subjectively appear to be smaller than the differences between successive versions of the model, as discussed later in this report.
- The largest discrepancies, in terms of percent difference between model outputs, were observed in the point that showed the smallest overall response to the Near Blackfoot to Minidoka reach. Time constraints precluded exploration of whether this is a general result.

The results may be somewhat misleading; the model can be set to produce results as of the beginning of a stress period, or as of the end. Time constraints did not allow exploration of whether the RSP_E2_1 and ETRAN3.3 were consistent in this setting. If they were not, the discrepancies may be smaller than the figures suggest. Nevertheless, the overall conclusion is that monthly stress periods are somewhat different, and perhaps "better," than longer stress periods, but that four month stress periods and by extension probably six month stress periods can be used for evaluation on the time frame of individual irrigation seasons, as intended and practiced with ESPAM models prior to 2013.

The Nature of Steady-state Modeling

The third stated technical reason to adopt transient modeling is that *"A steady-state ESPAM simulation can only model [effects]… resulting from continuous curtailments of an identical magnitude and location until the effects of curtailment are fully realized."* It is true that permanent curtailment *could* be a presumption of steady-state analysis, and this could be the

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presumption that was made in constructing the Scenario in terms of cubic feet per second, as suggested by the following quote:

> *Page 8: "The steady state analysis presumes the unlikely case that pumping has been permanently curtailed."*

If this was meant to apply generally to steady state modeling, it is incorrect, though it may be a reasonable explanation for a model run whose input and output values were contemplated in terms of flow rate (cfs). If the input and output values were contemplated in terms of acre feet (as is done in assigning a curtailment date), a more correct statement would have been that "Steady state analysis estimates only where the effects of curtailment will accrue and provides no information on the timing of curtailment or accrual." The most striking example of this fact is that steady-state modeling has been used to calculate curtailment date under all prior methodology orders, and is used in the Fifth Order to partition mitigation responsibility.

Despite the incorrect, or at best unfortunate, wording in the Scenario, its results did show that at long time periods, transient modeling very closely approximates time-agnostic steady-state modeling:

> *Page 9: "Figures 7 through 17 show the predicted reach accruals over a long period of time for each modeled reach, for each cutoff date..... Each figure also shows the steady state value for predicted accruals for each of the cutoff dates."*

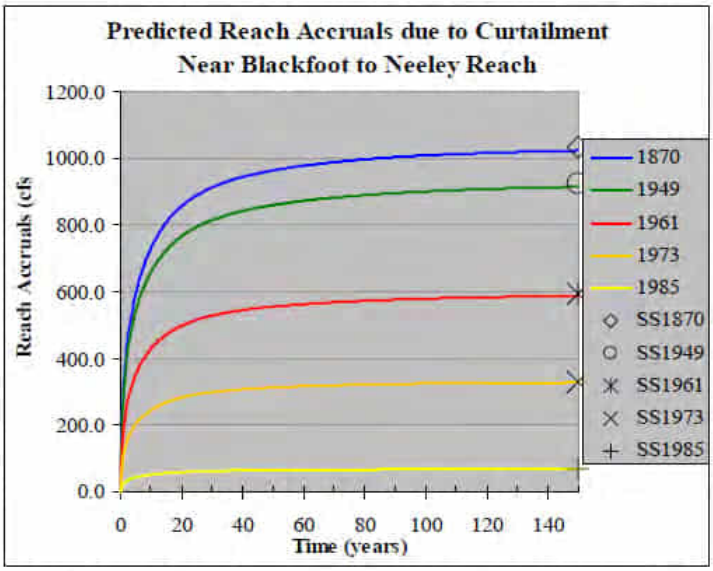

Figure 10. Predicted Reach Accruals due to Curtailment of Ground-Water Pumping for Near Blackfoot-Neeley Reach (generated using ESPAM v1.1).

Figure R7: Figure 10 reproduced from Scenario.

Intuitively, and as explained in the Scenario in 2006, if the modeling period is sufficiently long

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relative to the duration of the event and the proximity of it to springs and rivers, transient results will begin to approach steady-state results and would equal them if the transient simulation could be run to infinite time.

A technically-correct Finding of Fact #83 could read:

> *Merriam-Webster's Dictionary defines steady-state as "a state or condition of a system or process … that does not change in time." Steady state, Merriam-Webster.com, https://www.merriam-webster.com/dictionary/steady-state (April 19, 2023). A steady-state ESPAM simulation based on input values of acre feet of curtailment can only ~~model increases in aquifer discharge~~ indicate total acre feet of accrual to modeled reaches of the Snake River and tributary springs resulting ~~from continuous curtailments of an identical magnitude and location until the impacts~~ after the effects of curtailment ~~are~~ have fully been realized. For example, a steady-state analysis of the curtailment of 1,000 acre feet would indicate where the 1,000 acre feet of accrual eventually would be expressed, but would not describe the timing of arrival of accruals. ~~acres, assumes that irrigation of the same 1,000 acres is curtailed every year at the same rate of consumptive use, until the impacts of that curtailment reach a steady state, or no longer change from year to year~~.*

A technically-correct Finding of Fact #84 could read in part:

> *Steady-state analysis does not calculate the time to reach steady-state conditions nor describe the seasonal timing of the impacts, but only estimates the spatial distribution of accruals. To estimate the timing of accruals, transient modeling must be employed. ~~For the benefits of curtailment predicted by steady-state analysis to be realized by the river, the curtailment must occur continuously until steady-state is achieved. The assumption of continuous curtailment does not reflect reality in the SWC Delivery Call~~* [SWC refers to the Surface Water Coalition].

Conclusions Regarding Technical Justification for Adopting Transient Modeling

It is my professional opinion that the Fifth Order's technical arguments for adoption of transient modeling are not factually sound:

- IDWR has had access to the current understanding of the general implications of transient vs. steady-state modeling since at least 1999, and access to the specific implications of a curtailment context since 2006;
- The 1999 SRPAM model had stress periods even shorter than the current model;
- Though its stress periods were longer than the current model, the 2006 ESPAM1.1 model was designed and deployed to represent effects on an irrigation-season time scale;
- The 2013 ESPAM2.1 model had identical stress periods to the current ESPAM2.2 model.
- The transient version of the model can be used to represent temporary curtailment of water rights.

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Since the technical rational presented is not factually correct, it is my professional opinion that the Fifth Order does not reveal the true rationale for the change from steady-state to transient. I therefore am unable to comment on the technical merit of the actual rationale.

Purposes and Use of ESPAM Modeling

The 1999 SRPAM model was stated "*to be a planning and management tool for use by both agencies [IDWR and US Bureau of Reclamation]*. The subsequent ESPAM model reports have indicated the stated purpose of informing *"conjunctive management,"* a misnomer that has been used for decades in Idaho for conjunctive ***administration*** of groundwater and surface-water rights. Curtailment is a conjunctive-administration activity, and in all likelihood, curtailment calculations always have been a consideration of IDWR. However, the ESPAM reports have cautioned that model use should correspond to its regional nature; for instance, from the ESPAM2.2 report: *"The [model] is a regional groundwater model. For this reason, the model is best used for broad-scale predictions. The user should avoid the temptation to model localized phenomena…. This limitation exists in part because the input data used to compute the agricultural impacts are still coarse."*

In 2007 and again in 2012, many members of the Eastern Snake Plain Hydrologic Modeling Committee (ESHMC) responded to invitations to participate in drafting of "white papers," which in reality were compilations of individual statements on model use. Opinions ranged widely, from: "*It is our professional opinion that the current model has no technical credibility as a tool for water rights administration*" (2007 White Paper) to: *"[I]nformation from the model can be used to estimate the effects of curtailment of ground water pumping on aggregated river reaches."* (2007 White Paper).

An especially insightful comment elaborates on the caution regarding coarse data: *"The effects of temporal imprecision are analogous to the effects of spatial imprecision, but are compounded with concerns about the difficulty the calibrators have had in matching seasonal amplitude in some target springs. These suggest to us that while the model <u>can</u> be used to estimate effects on a monthly basis, it <u>should not</u> be used to make administrative decisions that hinge on monthly distribution of effects"* (2012 White Paper contribution from Eastern Idaho Water Rights Coalition, emphasis in original).

Implicit in using any tool for any purpose is a determination that the tool satisfies the minimum criteria for its use. Establishing criteria is a policy question, and whether criteria are met is a technical question. The Fifth Order does not describe the policy criterion for the model's ability to match month-to-month variation, nor the rationale for the criterion. However, a metric is available; the ESPAM2.2 report provides an R^2 score for each model reach, shown in the bottom right panel of the corresponding figure of calibration results. The R^2 statistic can be described as a score of the fraction of variability in a data set that are described by an algorithm and its input data. Figure 119 shows an R^2 value of 0.4232 (i.e. the model and its input data can explain approximately 42% of monthly variability) for the Near Blackfoot to Neeley reach, and Figure

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120 shows an R^2 value of 0.0079 (under 1%) for the Neeley to Minidoka reach. The bottom center panel provides an indication of when in the year discrepancies generally occur; these are the months when the blue and orange lines are most disparate. In both cases, the average results are worst during the irrigation season.

It is my professional opinion that unless the criterion for the ability to match monthly values is very low, ESPAM2.2 likely should not be considered appropriate for estimating month-by-month effects for the combined Near Blackfoot to Minidoka model reach when substantial consequences depend on decisions made on its basis.

Technical work that could inform the policy decision of establishing a criterion would explore the ratio of the potential relief of curtailment to the known cost. Additional technical defensibility could be gained by holistically considering all the hydrologic implications of the fundamental differences in spatial and temporal responses between groundwater systems and surface-water systems, as discussed later in this report.

It is my professional opinion that the use of ESPAM modeling is technically defensible when ratios of relief to cost are considered in light of modeling precision and imprecision, and when policy adjusts for spatial and temporal responses. This is true for both steady-state and transient modeling analysis.

Supplemental Water Use by SWC

Finding of Fact #23 states: *"There are lands within the service areas of SWC entities that are irrigated with supplemental groundwater. Exhibit 3007. Supplemental groundwater is a factor the Director can consider in the context of a delivery call…. At this time, the information submitted or available to the Department is insufficient to determine the extent of supplemental irrigation on lands within the service areas of SWC entities."*

My professional opinion is that because this statement is not factually correct, the true rational for this decision has not been disclosed. Therefore, I cannot respond to the technical content of the actual rationale. The basis for this opinion is:

- Since the initial development of ESPAM1.0 in the early 2000s, the extent and effect of supplemental groundwater irrigation has been calculated for the parts of the SWC Service Areas that are within the ESPAM model boundary.
- The data and methods that have been used in the ESPAM model are readily available and applicable to the parts of the SWC Service Areas that are outside the ESPAM model boundary.
- As a result of measurement orders, the measurement and report of well discharge data, and the availability of these data in IDWR's Water Measurement Information System (WMIS) are much more robust than in the early 2000s when these calculations first were undertaken and the methods developed.

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- IDWR has known, or could have known, since at least 2015 that these data would be important to a correct calculation of Reasonable In Season Demand. The intervening eight years would have been sufficient time to apply the existing data and methods, or to improve them, for purposes of the methodology.

Because of the existence of these methods and data, it is my professional opinion that a defensible adjustment for supplemental groundwater use within the SWC Service Areas is reasonably within reach, on a technical basis. The existence of these methods and data is documented in accompanying documents:

- Cosgrove, D.M., B.A. Contor and G.S. Johnson. 2006 Enhanced Snake Plain Aquifer Model Final Report, pages 50 – 54.
- Contor, Bryce A. and Paul L. Pelot. April, 2008. Draft 2. Determination of Source of Irrigation Water for Calibration of Eastern Snake Plain Aquifer Model Version 2.
- Idaho Department of Water Resources. 2013. Enhanced Snake Plain Aquifer Model Version 2.1 Final Report, pages 50 – 52.
- Sukow, Jennifer. 2021. Model Calibration Report Eastern Snake Plain Aquifer Model Version 2.2, pages 15 – 17.

In addition, substantially more acre feet of diversion are required to support a surface-water irrigated acre than a groundwater-irrigated acre because the curtailment requirement is multiplied by the following:

- An acre of groundwater irrigation requires fewer acre feet of gross diversion than does an acre of surface-water irrigation supplied by a long canal.
- For most groundwater-irrigated lands, more accrual from curtailment arrives at non-target reaches than arrives at the Near Blackfoot to Minidoka Reach
- The curtailment requirement again is multiplied by the fact that more accruals from curtailment occur in future years than in the year of need.

Thus, it is my professional opinion that neglecting a single acre of supplemental irrigation within the SWC Service Area results in needless curtailment of many groundwater-irrigated acres. Therefore, strictly on a technical basis, the refinement of quantifying the effect of supplemental irrigation within the Surface Water Coalition service area could provide substantial relief to a broad constituency of Idaho water users.

Logical Consistency

This section of the report addresses logical consistency in application of modeling, from a technical viewpoint. It also lays groundwork for an attempt to address a hearing officer's complaint from a number of years ago that expert reports tend to focus on what ***cannot*** be done, without providing a hearing officer any input on what could be done from a technical standpoint. In response to that complaint, this report concludes with a conceptual discussion of a technical

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approach that is logically consistent and coherent, that could be considered as foundation for policy deliberations.

Accruals beyond the Irrigation Season

Finding of Fact #86 indicates that: *"Only 9% to 15% of the steady state response is predicted to accrue to the near Blackfoot to Minidoka reach between May 1 and September 30 of the same year,"* indicating that the bulk of accruals from curtailment do not arrive during the time period of indicated shortfall. Time constraints prevented confirmation of the numerical values, but conceptually this matches my understanding. However, the actual response time is independent of modeling and is governed by the physical properties of the aquifer/river system. While 9% to 15% probably is a reasonable estimate, whatever the true value is, it applies identically to any curtailment regardless of whether it was calculated using steady-state or transient modeling. The only difference is that the transient modeling produces an estimate of the delay in accrual.

The delay in accrual depends on the spatial relationship of the well curtailed and the reach for which accruals are desired. The spatial distribution of the delayed response from curtailment is illustrated using evaluation of the sample points illustrated in Figure R3, presented earlier. Spatial distribution is illustrated using results from the ETRAN3.4 Transfer Tool realization of the transient ESPAM2.2 model.

Time constraints precluded duplicating the five-month May 1 to September 30 period considered important in Finding of Fact #86. However, the ETRAN3.4 Transfer Tool four-month period is not too different, and allows conceptual discussion of the results shown in Figure R8 through Figure R13. Though the transfer tool assigns its summer trimester to July, August, September, and October, from my involvement in the development of the original transfer tool I know that this assignment is arbitrary and that it is valid to consider that the figures illustrate the results of a four-month curtailment beginning in May.

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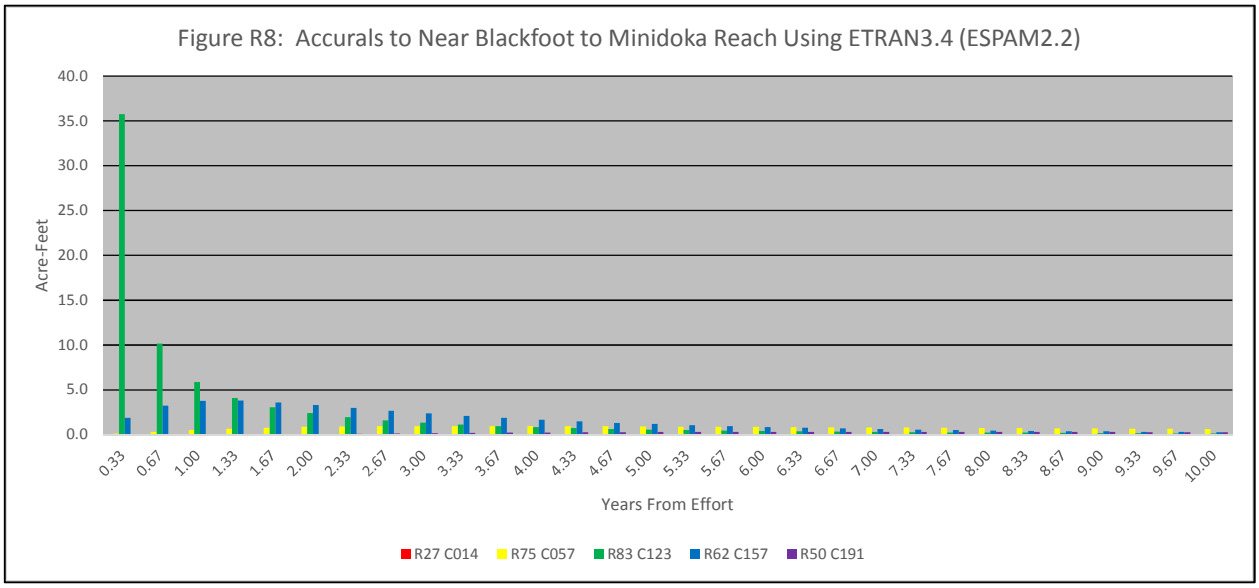

Figure R8.

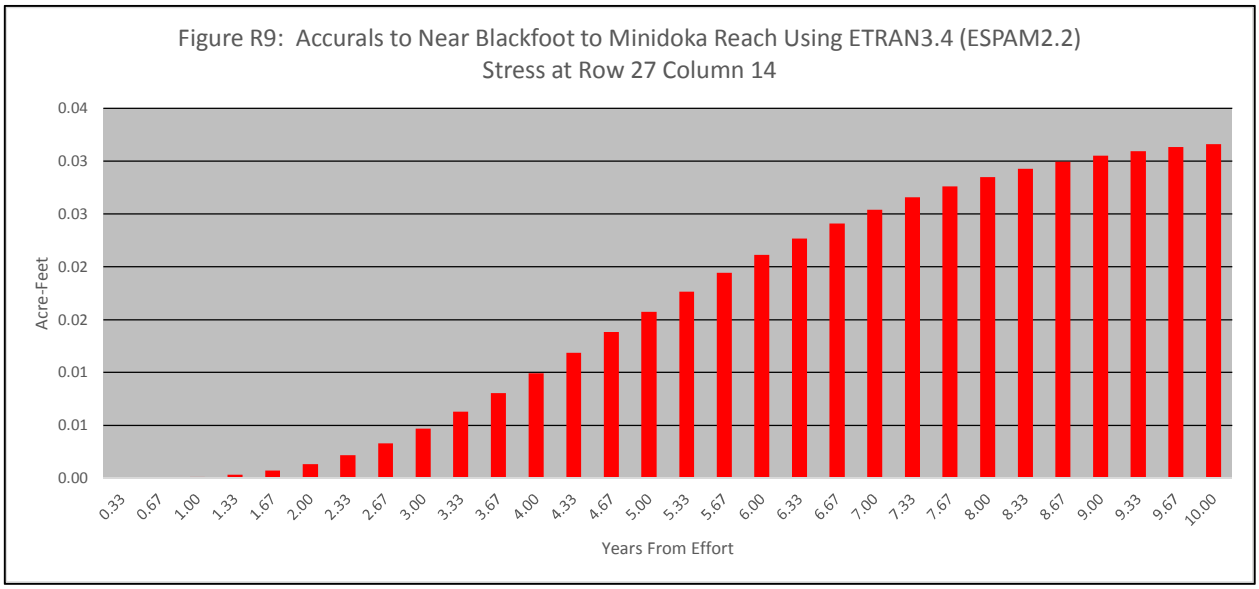

Figure R9.

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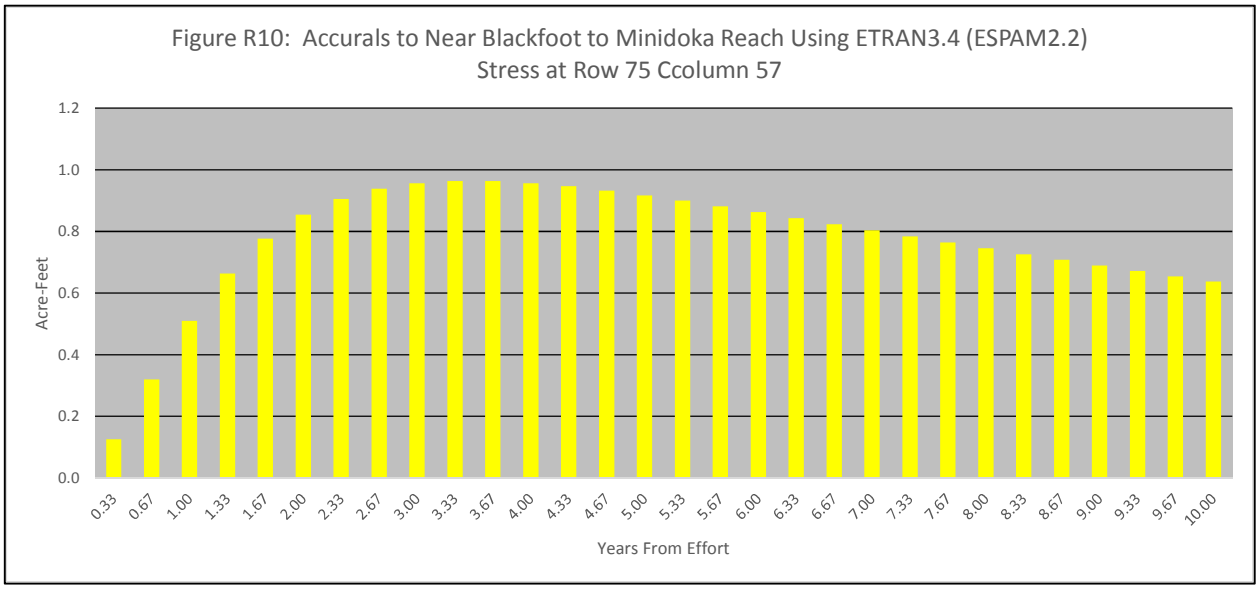

Figure R10.

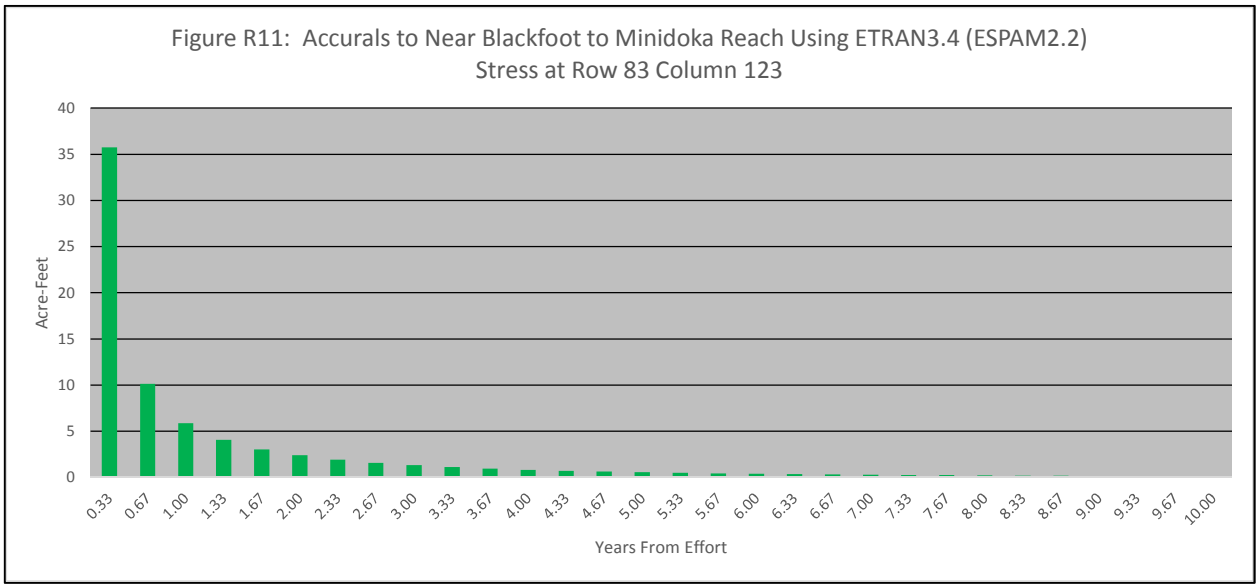

Figure R11.

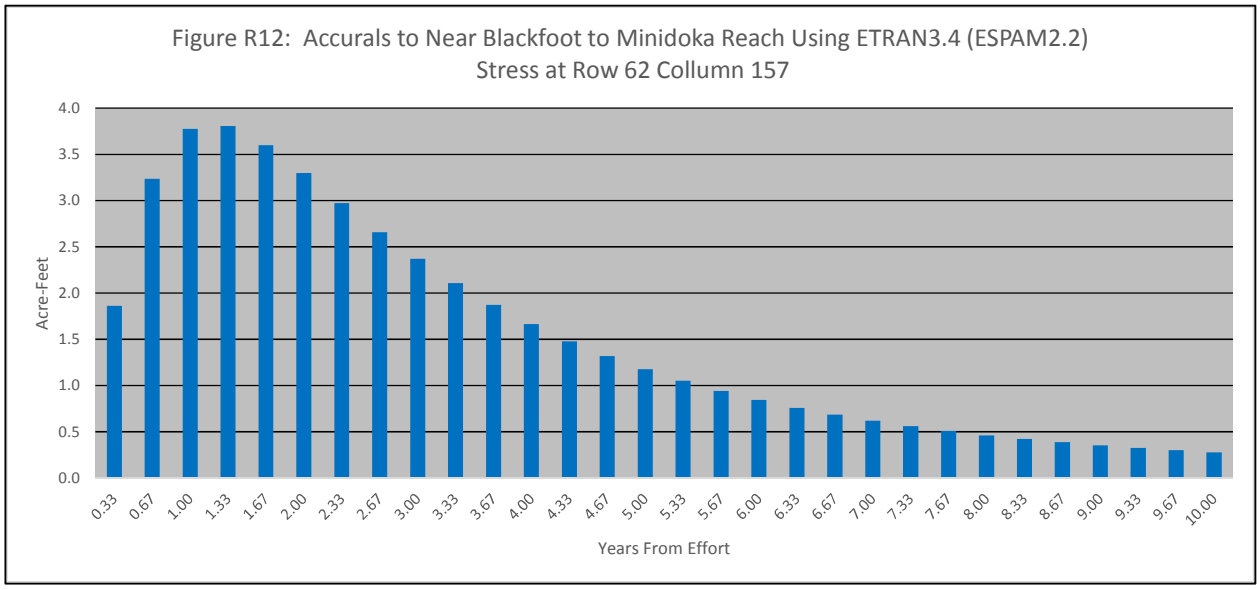

Figure R12.

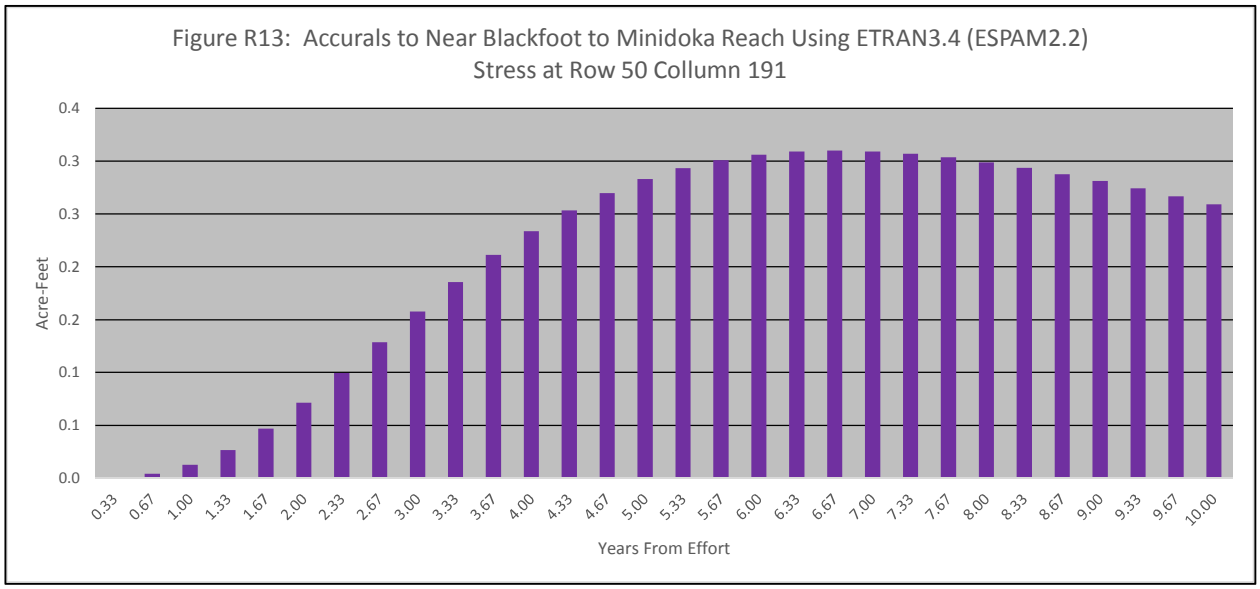

Figure R13.

Qualitatively, these figures can be summed up with the statement that: "Accruals from curtailment predominantly arrive in years later than the curtailment event, except for curtailment that occurs very near the river in the Near Blackfoot to Minidoka reach."

In deposition testimony in May, 2023, Jennifer Sukow of IDWR indicated her opinion that model-indicated future accruals to irrigation-season reach gains could be applied to offset future calculated shortfalls. This is logically consistent with the physical nature of propagation of effects, and with the modeling. However, because this carry-forward does not appear to be specified in the Fifth Order it is not clear whether such a carry-forward would be authorized. Additionally, earlier orders' Step 10, using transient modeling in relationship to reasonable

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carryover, was remanded by the court (Fourth Methodology Order page 3). Time constraints preclude exploration of the arguments and rationale behind this remand, and without this understanding, it is difficult to assess whether Sukow's proposed carry-forward would survive judicial review. Regardless, even if the Fifth Order does would allow it, and even if it would survive judicial review, its omission from the Fifth Order leaves it as a mechanism that cannot be relied upon.

Sukow also indicated that the effect of curtailment on future carryover calculations would be implicit in the data relied upon. Though time constraints preclude a robust analysis, it appears that the assumption of the methodology calculations is that the data represent a single snapshot of time within a dynamic equilibrium. If this is true, then for Sukow's argument to be logically consistent, the implicit effect of prior curtailment on the well that is used in calculations would be expected to be dynamically stable, meaning that water level in said well would be relatively consistent over time. However, this is not the case following a one-time curtailment event, and the departure of the assumption from reality depends on the temporal and spatial distance of the curtailment event from the well, and also on its magnitude. Considering that modeled reach gains are a manifestation of aquifer heads in model river cells, the temporal aspects of effects on the well can be qualitatively compared to the model results summarized in Figure R8 through R13.

In Figure R11, early accruals are greater than subsequent accruals. This scenario reflects a curtailment that occurred relatively near the well, much as cell R83 C123 is relatively near the Near Blackfoot to Minidoka reach. Sukow’s implicit assumption would overestimate accruals during the second year after curtailment. Overestimates, such as this one, hurt the SWC by providing less during the second year than the model would suggest. Conversely, Figures R9, R10, and R13 show scenarios for locations more distant, where subsequent accruals exceed the initial accruals. In this case, Sukow’s implicit assumption would underestimate accruals during the second year after curtailment, harming potentially-curtailed water users by requiring more curtailment than is necessary to meet the need of a call. A solution would be to explicitly model and account for all future accruals, much as Sukow proposed for in-season demand calculations.

Accruals to Non-Target Reaches

The Fifth Order does not discuss the fact that curtailment would result in greater accruals to non-target reaches than it would to the Near Blackfoot to Minidoka Reach. Time constraints did not allow exploration of ESPAM2.2 results, but they would be qualitatively similar to the ESPAM1.1 results from Table 1 of the Scenario, reproduced here.

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Table 1. Predicted steady state reach accruals for each curtailment period (using ESPAM v1.1).

Cutoff Date	All Pumping		Post January 1, 1949		Post January 1, 1961		Post January 1, 1973		Post January 1, 1985	
Reach Name	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain
Ashton to Rexburg	316	20	290	20	222	19	128	19	22	19
Heise to Shelley	211	18	195	18	141	17	78	17	15	17
Sum of Reaches Above Shelley	**526**		**484**		**363**		**206**		**37**	
Shelley to Near Blackfoot	406	30	368	30	240	28	132	25	26	28
Near Blackfoot to Neeley	1035	35	925	36	593	33	331	29	69	32
Neeley to Minidoka	158	62	134	65	84	61	46	55	10	60
Sum of Reaches Shelley to Milner	**1598**		**1427**		**917**		**509**		**105**	
Devil's Washbowl to Buhl	298	59	257	61	160	57	88	51	18	60
Buhl to Thousand Springs	137	49	122	50	81	43	47	37	8.0	51
Thousand Springs	89	48	79	48	54	42	31	35	5.6	47
Thousand Springs to Malad	10	45	9	46	6.4	38	3.7	32	0.74	42
Malad	77	50	68	51	47	43	29	35	5.5	44
Malad to Bancroft	5.8	38	5.2	38	3.8	34	2.4	31	0.59	36
Sum of Thousand Springs Reaches	**617**		**541**		**352**		**201**		**38**	
Total (cfs)	**2741**		**2453**		**1633**		**916**		**180**	
Total (acre-feet/year)	**1,984,659**		**1,775,637**		**1,182,086**		**663,362**		**130,506**	

Figure R14: Table 1 reproduced from Scenario.

Extracting the Near Blackfoot to Neeley and Neeley to Minidoka results, and comparing them to the total results, indicates the relationships show in Table R2.

Table R2: Summary of ESPAM1.1 results from Scenario

	Near Blackfoot to Neeley Accrual (cfs)	**Neeley to Minidoka Accrual (cfs)**	**Near Blackfoot to Minidoka Accrual (cfs)**	**Total Accrual (cfs)**	**Percentage of Accrual to Near Blackfoot to Minidoka**
All Pumping	1,035	158	1,193	2,741	44%
Junior to January 1, 1949	925	134	1,059	2,453	43%
Junior to January 1, 1961	593	84	677	1,633	41%
Junior to January 1, 1973	331	46	377	916	41%
Junior to January 1, 1985	69	10	79	180	44%

Depending on viewpoint, the fact that more than half the accruals from curtailment arrive at non-target reaches is either a windfall or is collateral damage. Regardless, the Fifth Order is silent on the fact of the accrual and on the technical ability to assess and report its timing and magnitude

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for potential application to needs that might arise in non-target reaches, such as the small amounts of additional accrual that sometimes are needed to facilitate a Point of Diversion transfer of a groundwater right.

Consistency between Calculation of Priority Date and Partition of Responsibility

In deposition testimony in May, 2023, Jennifer Sukow indicated that the partition of responsibility for mitigation in lieu of curtailment is done on a steady-state basis on the rationale that all users bear responsibility for cumulative effects of past pumping that have been propagating toward the reach for decades. Whether this is valid rationale is a policy question beyond the scope of this report, but use of steady-state modeling is consistent with the rationale.

Use of steady-state partitioning of responsibility would be logically consistent with steady-state calculation of curtailment date, as would the use of transient partitioning be consistent with transient calculation of curtailment. The linkages are a result of the concept that mitigation in lieu of curtailment is both defined and constrained by the alternate relief that curtailment would provide.

Time constraints preclude analysis using correct spatial distributions of irrigated lands and consumptive use, but the concept can be explored hypothetically. If each of the five points illustrated in Figure R3 represented an equal number of acre feet of consumptive use from groundwater, the assignment of responsibility could be made based on model-indicated contributions to the Near Blackfoot to Minidoka reach. Using the IDWR-generated steady-state models reflected in accompanying file "E2_SSRF.csv," the steady-state assignment to Row 27 Column 14 would be 1.8% of the total obligation. The four-month contribution of curtailment at that location is represented in Figure R9. Conversely, calculating percentages to three significant figures, the four-month transient contribution of curtailment at that location using ETRAN3.4 is 0.000%. This does not mean that there is *no* benefit, but that if mitigation in lieu of curtailment were to be defined and constrained by the accruals estimated per a transient curtailment, the technically-correct mitigation would be substantially less than the steady-state partition of responsibility.

It is my professional opinion that partitioning responsibility using a different modeling framework than was used to calculate curtailment can result in some users being held responsible for more mitigation than the relief that their curtailment would have provided.

Consistency between Precision and Burden

Conclusion of Law #21 articulates understanding of the fundamental difference between groundwater hydrology and surface-water hydrology, yet the unenviable burden of IDWR is to administer the connected resources conjunctively. To frame and provide context to the technical discussion of consistency between precision and burden, the following rhetorical questions are posed for surface-water Points of Diversion:

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- Would prior appropriation require curtailment of junior whose Point of Diversion was adjacent to the senior Point of Diversion, given that curtailment of the junior could make water immediately available to the senior?
- Would prior appropriation require curtailment of a junior whose Point of Diversion was on a stream not tributary to the senior's source?

In essence, there is a continuum comprised of the ratio between the relief afforded the senior and the cost to the junior. In a surface-water context, results tend to fall on one end of the continuum or the other. In the first hypothetical, the ratio of benefit to burden is one to one. In the second, it is zero.

Some groundwater scenarios fall on the "zero" end of the spectrum; curtailment of a well in Rathdrum likely would not provide relief to the Surface Water Coalition. A few fall close to the "full and immediate relief" end of the spectrum; for instance, modeling indicates that curtailment at the location represented by Figure R11 would produce 35% accrual to Near Blackfoot to Minidoka within four months, and 45% within eight months.

The legal meaning of the Conclusions of Law #4, #5 and #6 is beyond the scope of this report but a plain-language reading suggests that priority is not the only factor to consider. The Rathdrum example indicates that a continuum exists for groundwater, as it does for surface water. Conclusion of Law #7 indicates that IDWR requires knowledge of *"how, when, where and to what extent the diversion and use of water from one source impacts the water flows in... other sources"* (emphasis added). If knowledge of something is required, the implication is that the knowledge must be utilized in making some decision. Under that assumption, *where* the cutoff is located is a policy decision, and once the decision is made, technical work can quantify where efforts fall in relation to it.

Conclusion of Law #21 states:

> *"Rule 43 of the CM Rules mandates that when the Director evaluates a mitigation plan, the mitigation plan must ensure that water is delivered to holders of senior priority surface water rights in both the quantity and at the time and place required by the senior. In considering a proposed mitigation plan pursuant to Rule 43, the Director must evaluate:*
>
> > ***b.*** *Whether the mitigation plan will provide replacement water, at the time and place required by the senior-priority water right, sufficient to offset the depletive effect of ground water withdrawal on the water available in the surface or ground water source at such time and place as necessary to satisfy the rights of diversion from the surface or ground water source. Consideration will be given to the history and seasonal availability of water for diversion so as not to require replacement water at times when the surface right historically has not received a full supply, such as during annual low-flow periods and extended drought periods.*
> > ***c.*** *Whether the mitigation plan provides replacement water supplies or other appropriate compensation to the senior-priority water right when needed during*

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> *a time of shortage even if the effect of pumping is spread over many years and will continue for years after pumping is curtailed. A mitigation plan may allow for multi-season accounting of ground water withdrawals and provide for replacement water to take advantage of variability in seasonal water supply. The mitigation plan must include contingency provisions to assure protection of the senior-priority right in the event the mitigation water source becomes unavailable* (emphasis in Fifth Order).

Time constraints, the scope of this report and the expertise of the author preclude full exploration of the implications of this excerpt, in context of the full Conjunctive Management rules. The importance here is the explicit recognition of fundamental difference between time frames of surface-water processes and the effects of groundwater activities upon surface-water processes.

Within the context of both the magnitude of expected relief and the requirement that relief be timely, an added complexity of groundwater is that the linkages are not always apparent, nor are the methods to discern them infallible. An additional policy decision that could be articulated would be a specification of if or how precision of the knowledge of the degree of hydrologic connection might inform the policy decision of where the cutoff point is on the continuum between ratios of zero and one-to-one. If that decision were to be undertaken, it could be informed by technical knowledge of the precision of the model. IDWR's contribution to the 2012 white paper discussed above could be a starting point for analysis of the precision of the model, and such analyses may already have been performed. Qualitative insight into the relative quality of the model can be gleaned from comparisons of successive models, each in their time deemed to be the best available science.

Figure R17 shows a map of points that were used for such a qualitative view of ESPAM2.0, with graphical output provided in Figure R18. Figure R18 attempts to inform both quantity and timing issues. The top three panels, with blue-colored bars, show the fraction of accruals from the three points that the models indicate would be captured by a particular reach. The bottom panels, with red-colored bars, represent the differences in modeled timing of accrual. The metric is the number of months for the model to indicate that half of the captured accruals have arrived at the reach of interest.

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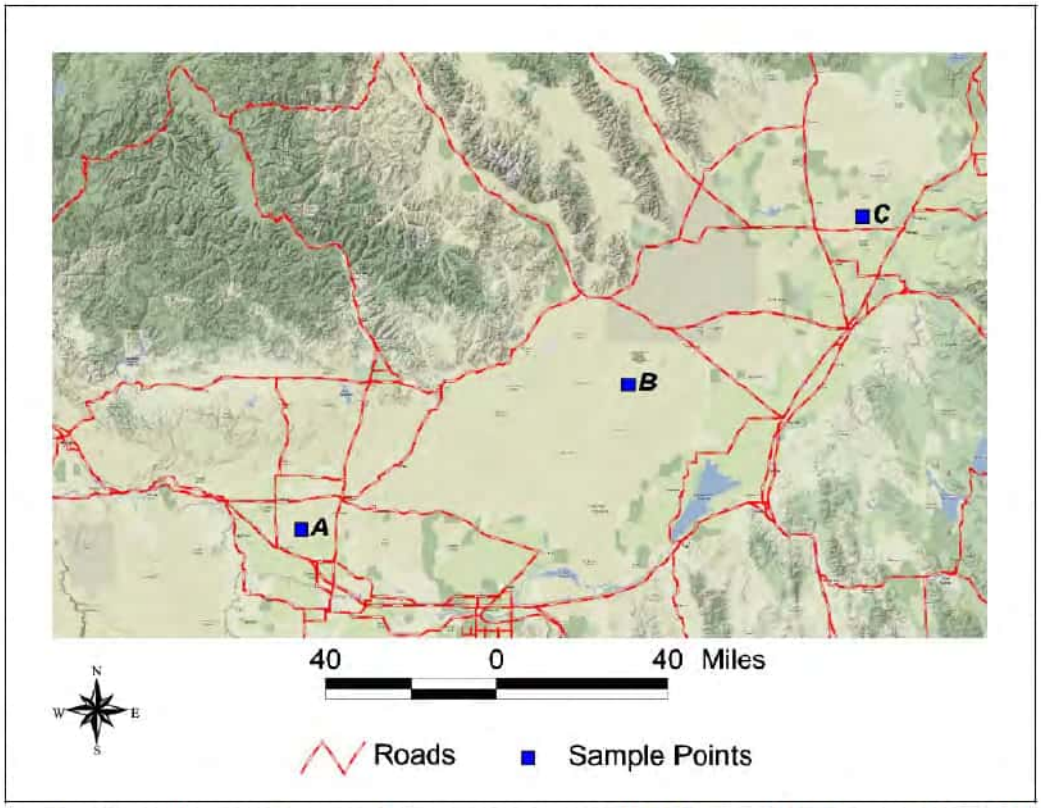

Figure 7. Sample points used to compare SRPAM, ESPAM1.1 and ESPAM2.0.

Figure R17: Figure 7 reproduced from Technical Report on ESPAM2.0 Modeling Issues

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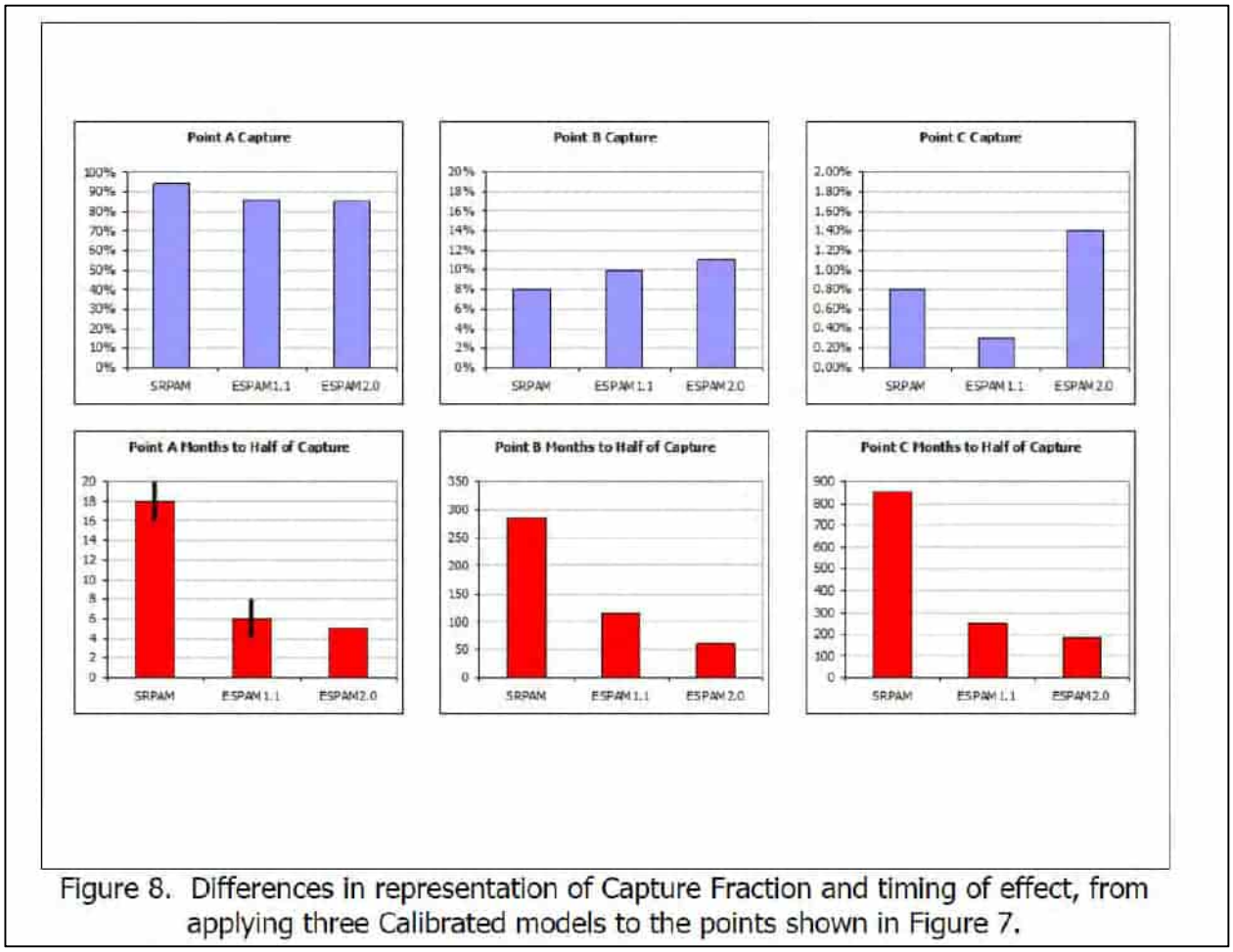

Figure 8. Differences in representation of Capture Fraction and timing of effect, from applying three Calibrated models to the points shown in Figure 7.

Figure R18: Figure 8 reproduced from Technical Report on ESPAM2.0 Modeling Issues.

Time constraints preclude comparison of ESPAM2.0 with ESPAM2.1, but Figure R19, Figure R20 and Figure R21 allow qualitative assessment of the differences between ESPAM2.1 as realized in the ETRAN3.3 Transfer Tool, and ESPAM2.2 as realized in the ETRAN3.4 transfer tool. Table R3 summarizes qualitative comparisons of the two models for these three points. The points intentionally are of disparate character and are not intended to be representative of the plain as a whole.

Table R3. Qualitative Comparison of ESPAM2.1 and ESPAM2.2 via Figures R19, R20 and R21

Point	General Location	ESPAM2.1 Years to Peak	ESPAM2.2 Years to Peak	Subjective Comparison of 10-year Sum of Accruals
R75 C57	A&B Irrigation District	1.67	3.67	ESPAM2.1 slightly higher
R83 C123	Very close to Near Blackfoot to Neeley	0.33	0.33	Very similar
R50 C191	Near Henry's Fork	5.00	6.67	Very similar

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These results underscore Eastern Idaho Water Right Coalition's 2012 observation that:

> All of these uncertainties are a function of the spatial scale at which answers are sought. If the question is asked: "How much pumping at location X will propagate to river and spring reaches?" the answer can be determined with very little uncertainty, and independently of the limitations described above.
>
> If refined estimates of above-Milner vs. below-Milner effects are required, the uncertainty depends on the location of the well. For wells distant from Milner, none of these conceptual simplifications are likely to materially affect the answer. For wells near to Milner, all of these affect the results and a different set of assumptions would be expected to produce a markedly different result.
>
> Similarly, refining the question to include some understanding of the timing of effect begins to introduce additional uncertainty. The answer to "How much will propagate in time period Y" is less certain than "How much will eventually propagate," and results are sensitive to changes in conceptual simplifications.

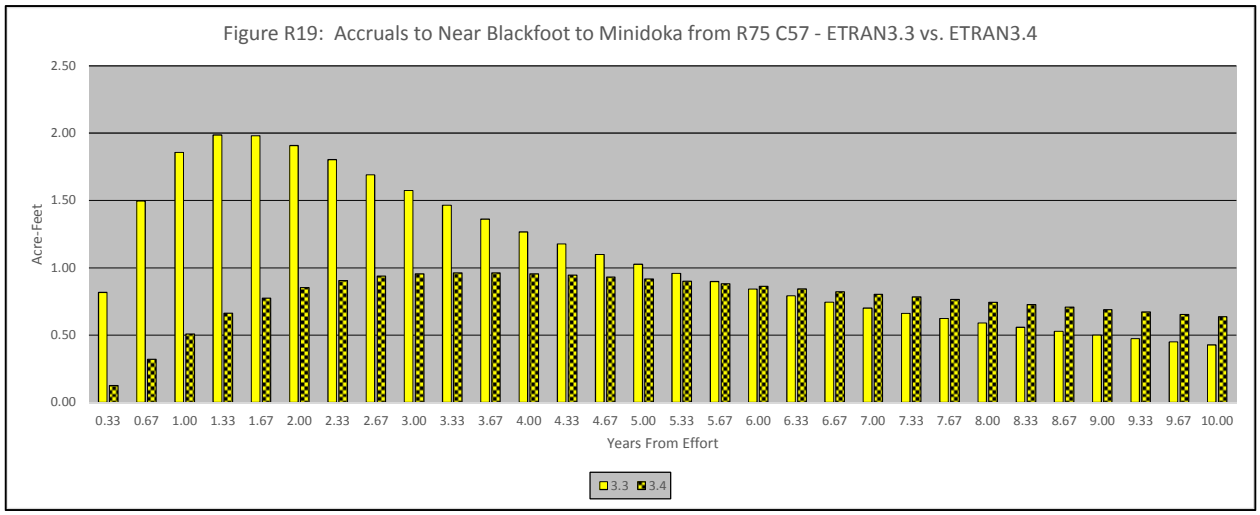

Figure R19.

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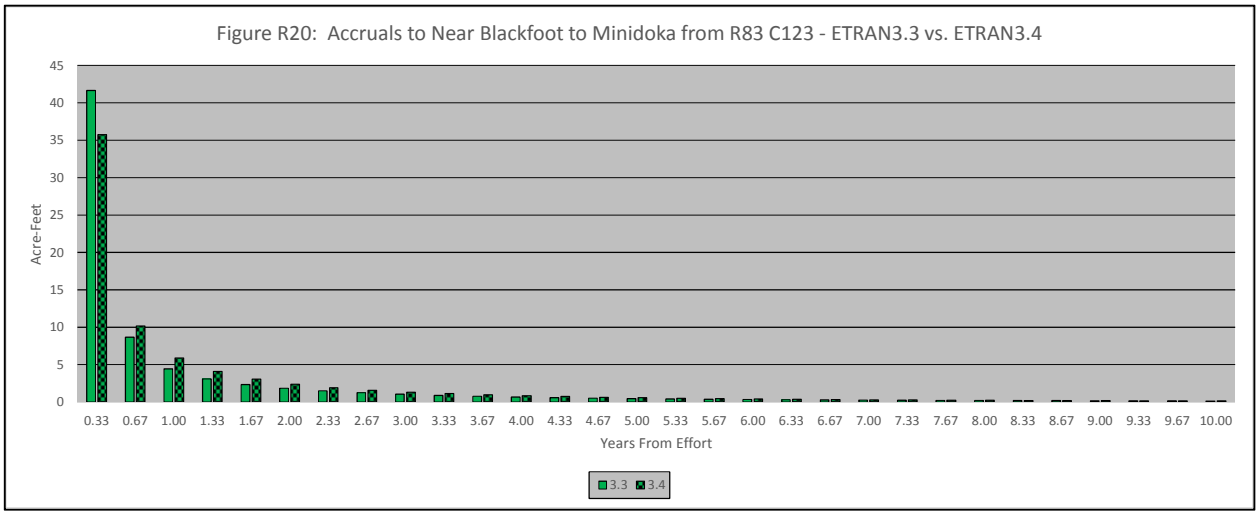

Figure R20.

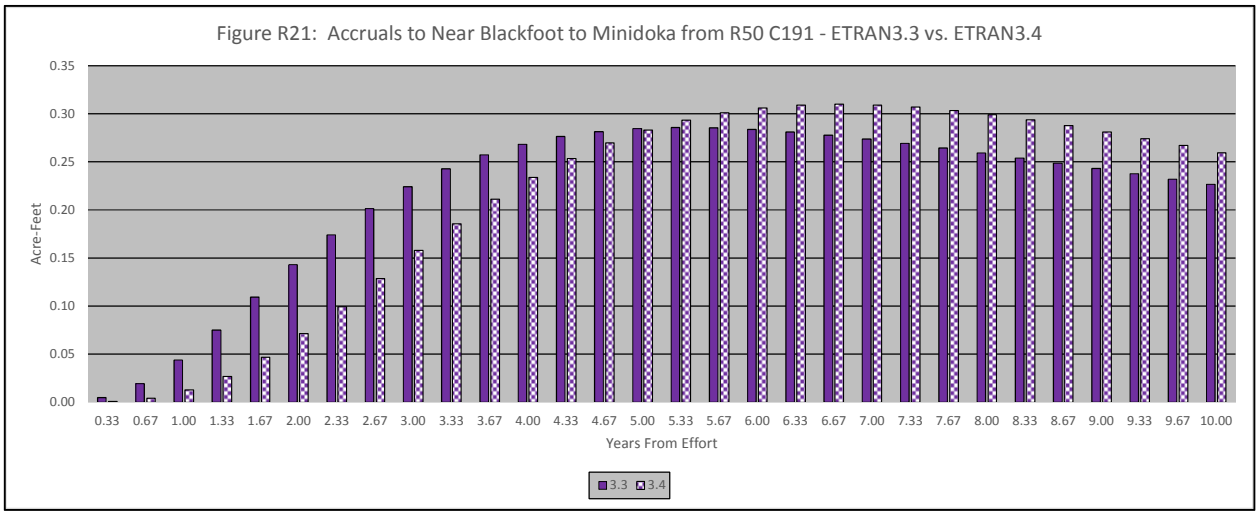

Figure R21.

A thoughtful reader might ask a policy question such as: "Is it fair to the SWC to use the model to estimate timing of accruals in the trimester of curtailment, when the two most recent best-available-science models differ by approximately a factor of six?" Technical analysis could inform policy deliberations about such a question.

Discussion of Technically-consistent Options

As indicated earlier, this report attempts to remedy a shortcoming identified by the hearing officer in another case, that expert reports offer no solutions. While implementation of a solution is a policy decision, technical work can help frame the understanding of what is possible, and what the implications of alternatives might be.

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Alignment of Modeling Time Frame with Policy. In deposition in May 2023, Jennifer Sukow stated that she was *"told by Allan Wylie that [former Director] Karl Dreher did not want to use a transient analysis, because he did not like the additional volume of water that would accrue to the reach in future years."* This may have been how the decision was communicated, but it is likely that rather than not "liking" the result, the former Director deliberately selected steady-state analysis as a policy response to some of the temporal issues that have been explored above. However, applying the steady-state values only in years of shortfall still was technically inconsistent with the temporal delay in accrual. The Fifth Order methodology attempts to address that inconsistency but brings others, discussed above. The current methodology produces results such as seen in 2023, with curtailment of most groundwater irrigation threatened in a season of abundant snowpack and local flooding in some areas.

Visual inspection of Figure R16 suggests a cyclical pattern with a period of a few years. Robust time series analysis likely could quantify the periodicity. The periodicity likely could be partitioned into components of different periodicity, such as natural flow, return flows from surface-water irrigation, and groundwater contribution. Both time-series analysis and water-budget analysis could contribute to this understanding. Additionally, if the zeros in the hindcast were replaced by numerical values of surpluses that occurred, a statistical distribution of supply could be derived that would allow calculation of an appropriate level of conservatism to protect the SWC interests.

Similarly, as shown by Figures R8 through R13 and R19 through R20, the transient ESPAM model could be used to explore the characteristic time of response for curtailment of zones of similar hydraulic distance from the reach in question.

Combined, these two analyses could inform a curtailment scheme and a frequency of adaptive management that allowed the temporal pattern of need to be matched to the temporal response of reach gains to curtailment activities.

It is my professional opinion that a technically- and logically-coherent curtailment strategy could be constructed using either steady-state or transient analysis. The key would be to align the calculation and expectations of relief to the physical time frame of aquifer response. Something akin to Sukow's proposal for considering future accruals likely would be an important element.

Accounting for Non-Target Accruals. The key to accounting for non-target accruals is to be sure that the accounting decay of accruals, and the spatial assignment, match reality. A possible method is described in the Journal of the American Water Resources Association (Contor, 2009) that links transient *"aquifer response functions with double-entry accounting technologies"* and *"honors the hydrologic realities of groundwater/surface water interaction, the legal requirements of prior appropriation water law, and the economic requirements for equitable and efficient allocation of resources."*

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Summary and Conclusions

My professional opinions regarding the Fifth Order are as follows:

- The arguments presented for transition to transient modeling are not factually correct, and therefore the true rationale has not been revealed.
    - Because I do not have access to the true rationale, I cannot assess it technically.
- Unless the criteria for accuracy and precision are very low, ESPAM2.2 is not sufficiently precise for monthly estimation of effects to the Near Blackfoot to Minidoka reach, for decisions that precipitate large financial burdens.
- The use of ESPAM modeling is technically defensible when ratios of relief to cost are considered in light of modeling precision, and when policy adjusts for spatial and temporal differences in response.
- The arguments presented against considering supplemental groundwater use within the SWC are not factually correct, and therefore I cannot technically assess the unrevealed true rationale.
- It is technically possible and reasonably achievable to assess and address supplemental groundwater use within the SWC.
- The following factors multiply the effect of ignoring supplemental groundwater use within the SWC:
    - Because of inherent characteristics of surface-water delivery systems, supplying one acre with surface water requires substantially more water than supplying an acre with groundwater.
    - Not all effects of curtailment of groundwater propagate to the Near Blackfoot to Minidoka reach, so more than one acre foot of curtailment is required to produce one acre foot of accrual.
    - When obligations are calculated on a transient basis, the temporal delay in propagation creates an additional multiplier of effort.
- Partitioning responsibility using a different modeling framework than was used to calculate curtailment can result in some users being held responsible for more mitigation than the relief that their curtailment would have provided.
- Technical methods exist to inform a coherent plan under either a transient or a steady-state paradigm.

Signature



Bryce A. Contor
Principal Hydrologist

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SNAKE RIVER PLAIN AQUIFER MODEL SCENARIO:

HYDROLOGIC EFFECTS OF CURTAILMENT OF GROUND-WATER PUMPING USING SNAKE RIVER PLAIN AQUIFER MODEL VERSION 1.1

"Curtailment Scenario"

March, 2006

By
B. A. Contor, D. M. Cosgrove,
G. S. Johnson, N. Rinehart,
Idaho Water Resources Research Institute,
University of Idaho

for the
Idaho Department of Water Resources

with guidance from the
Eastern Snake Hydrologic Modeling Committee

Idaho Water Resources Research Institute
Technical Report 2006-001

Idaho Legislature

Eastern Snake Plain Aquifer Model Enhancement Project
Scenario Document Number DDS-004rev1

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INTRODUCTION

Hydrologic Effects of Curtailment of Ground-Water Pumping (also known as the Curtailment Scenario), was originally performed using version 1.0 of the Snake River Plain aquifer model [Idaho Water Resources Research Institute (IWRRI), 2004]. The Eastern Snake River Plain Aquifer Model (ESPAM) has been updated to version 1.1, and the results of re-running the Curtailment Scenario with the updated model are presented here. The Curtailment Scenario is one of many Snake River Plain aquifer model scenarios being developed to assist in resolution of conflicts among water users and guide future water management such as implementation of managed recharge. Water management should be guided by a collective perspective from many of the scenario evaluations rather than a single document.

The present version of the ESPAM was developed with funding provided by the State of Idaho, Idaho Power Company, the U.S. Geological Survey, and the U.S. Bureau of Reclamation. The model was designed with the intent of evaluating the effects of land and water use on the exchange of water between the Snake River Plain aquifer and the Snake River. This evaluation is part of the application of the model towards this purpose.

The model was developed by the IWRRI under the guidance, and with the participation of, the Eastern Snake Hydrologic Modeling Committee (ESHMC). The effort was led by the Idaho Department of Water Resources (IDWR) and active participants in the Committee included Idaho Power Company, the U.S. Geological Survey, the U.S. Bureau of Reclamation, IWRRI and technical experts representing water user groups. The ESHMC has also served to guide and review the scenario evaluation process. Documentation of the model and related activities are available from the IDWR and the IWRRI at the University of Idaho.

This "Curtailment Scenario" is intended to answer the question "If all ground-water rights with priorities after a specified date were to be curtailed, what would the effect be on spring discharge and Snake River gains and losses?" This set of scenario simulations assesses this question for ground-water rights with priorities junior to the following dates:

a) the onset of ground-water irrigation (1870)
b) January 1, 1949
c) January 1, 1961
d) January 1, 1973
e) January 1, 1985

The underlying theory of this set of scenario simulations is that if all ground-water rights junior to a certain priority date were to be curtailed, benefits would be accrued to the river gains and spring discharges from the eastern Snake River Plain aquifer. These simulations illustrate the model-predicted increases in river gains and spring discharges over time. Benefit to river gains could be in the form of increased aquifer discharge to the river, decreased losses from the river to the aquifer or increased spring discharge from the aquifer. Future reference to increased river reach gains in this report will include all three of these cases.

It is important to recognize that even after curtailment of ground-water rights, there is a residual impact to river reaches due to previous years of ground-water pumping. The magnitude and timing of this residual impact can also be evaluated using these scenario simulations.

The Curtailment Scenario has been evaluated using numerical superposition. Using numerical superposition, the impacts of curtailment of ground-water pumping can be assessed in isolation of all other recharge and discharge.

The purpose of these scenario simulations is to determine and describe how spring discharges and river gains and losses would be affected by curtailment of ground-water pumping with priorities junior to some specified date. The specific objectives are to:

1) Determine the magnitude of increase in spring discharges and river gains over time for each sub-reach of the Snake River.
2) Determine the seasonal magnitude of the expected increases.
3) Determine the predicted impacts to aquifer water levels.

A related report exists which documents the Modflow files used for the Curtailment Scenario. This report is: Addendum A: CURTAILMENT SCENARIO: Modflow DATA AND PROGRAMS (DDS-004rev1–Addendum).

ESPAM Version 1.1

In May 2005, errors were discovered in v1.0 of the calibrated ESPAM, necessitating recalibration of the model. Correction of these errors and recalibration resulted in ESPAM v1.1, as documented in the ESPAM project final report. Most notable among the errors were: a) ESPAM v1.0 was inadvertently calibrated using the old irrigation return flow lag factors, and b) there was a discretization error in the Shelley to Near Blackfoot and Near Blackfoot to Neeley reaches. Each of these errors would cause a re-distribution of recharge and discharge among reaches of the Snake River and affect the final model parameters (transmissivity, storativity and riverbed conductance). The ESHMC decided that the Curtailment Scenario should be re-run using ESPAM v1.1.

BACKGROUND

Since the onset of ground-water irrigation on the eastern Snake River Plain, ground-water withdrawals have impacted aquifer water levels and river gains and losses. Initially, ground-water pumping removes water from aquifer storage, causing a localized cone of depression. As pumping continues, the effects propagate until a hydraulically connected boundary is reached. A recharge boundary will act as a source for the water being removed via ground-water pumping. Changes in aquifer water levels will impact the amount of water being recharged or discharged from a hydraulically connected recharge or discharge boundary. For example, in a hydraulically connected river reach, the relationship between river stage and aquifer water level will determine the amount of

water moving between the aquifer and the river. For a gaining river reach, a decrease in aquifer water level will result in a decrease in the rate of ground-water discharge to the river.

Sources of recharge and discharge on the eastern Snake River Plain include precipitation, recharge incidental to surface water irrigation, ground-water withdrawals, evapotranspiration, tributary valley underflow, and river gains and losses. Of these sources of recharge and discharge, only the Snake River gains and losses are modeled as head-dependent.

As time passes and the collective impacts of ground-water pumping on the eastern Snake River Plain propagate throughout the aquifer system, less of the removed water is coming out of aquifer storage and more is coming from the river, either in the form of reduced spring discharges, decreased aquifer discharges to the river, or increased losses from the river. Ultimately, however, all of the ground water pumped and consumptively used for irrigation will come from the Snake River. It is difficult to quantify the volume and timing of these impacts to the river reaches. A numerical ground-water model is the best available tool for such an estimation.

Historically, the development of ground-water irrigation lagged the development of surface water irrigation by several decades. Figure 1 shows the increase in nominal diversion rate of ground-water rights versus time. The development of ground-water-irrigated land was tied to rural electrification and innovations in pump technology. This increase in ground-water development and other changes in water use caused a corresponding trend of decrease in river gains over time. The resultant decrease in surface water supplies has the potential for a senior surface water user to be damaged by a junior ground-water user. This is the motivation for investigating the potential hydrologic changes associated with curtailment of ground-water use by priority date. In presenting these scenario results, no implication is made of injury to surface water users. The results presented in this paper merely illustrate the potential impact to river gains and losses which could be attained via curtailment.

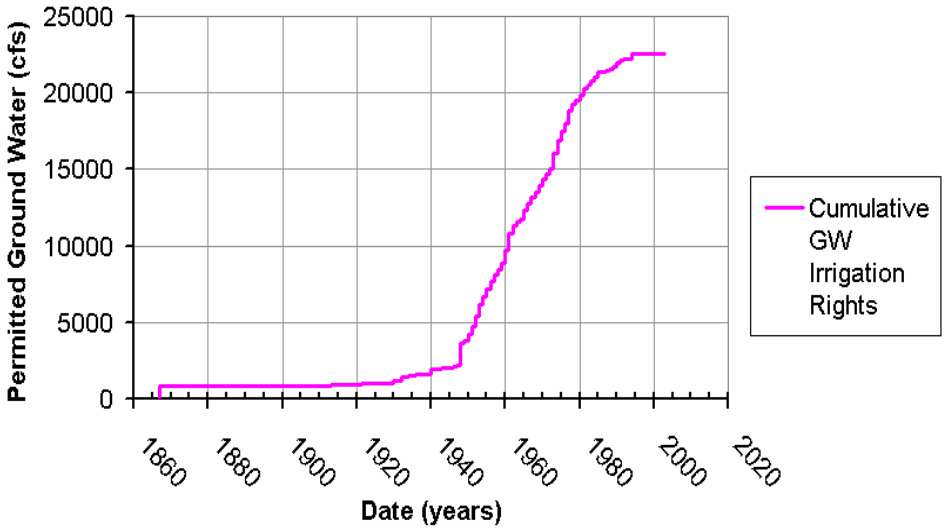

Figure 1. Ground water priorities on the eastern Snake River Plain.

DESCRIPTION OF THE NUMERICAL SUPERPOSITION MODEL

The numerical superposition version of the ESPA model is very similar to the fully populated ESPA model with all recharge and discharge terms removed and with a zero initial gradient. The numerical superposition model uses the concepts of superposition as detailed in Reilly and others (1987). The fundamental basis of superposition theory is that, for a strictly linear system, a complex problem can be decomposed into more simple sub-problems. The sum of the solutions of the sub-problems will be the same as the solution to the whole, more complex problem.

The ESPA model is a confined representation of a generally unconfined aquifer system. Confined aquifer model representations are strictly linear; unconfined aquifer model representations are non-linear due to the fact that aquifer transmissivity changes as aquifer water levels change. In the eastern Snake River Plain aquifer, the changes in water levels are very small relative to the total saturated thickness, so these non-linearities are considered negligible. A comparison of the confined version of the ESPA model versus the unconfined version has been done by IWRRI and is published in ESPAM Design Document DDM-019, Comparison of Unconfined and Confined Aquifer Representation. Similarly, a comparison of model results using the fully populated model versus the numerical superposition model has been done by IWRRI and will also be documented in a report. The results of these evaluations support the conclusion that the non-linearities of the ESPAM are negligible. These results have been presented to the ESHMC.

Model parameters, which represent physical traits of the aquifer system, are the same for the numerical superposition model and the fully populated model. These parameters include aquifer transmissivity and storativity and river and drain conductance. The

numerical superposition model requires a zero initial hydraulic gradient, so the initial aquifer head is uniformly set to zero. The Modflow (McDonald and Harbaugh, 1988) representation of drains (springs) only allows water to leave the aquifer. The Modflow representation of rivers allows water to leave or enter the aquifer. Otherwise, drain and river representations in Modflow are identical. For the numerical superposition model, all drain cells (which were used to represent spring discharge between Milner and King Hill) are converted to river cells. The initial elevation of the river cells is set to zero. This creates an initial condition where there is no flux between the aquifer and surface water features. All recharge and discharge terms are removed in the numerical superposition model except for the aquifer stress being evaluated. For example, simulation of an aquifer stress will induce flux from represented surface water features in an amount that is equal to the depletion of rivers and springs for the same stress in the fully populated model. The results from this simulation represent the impacts from the particular aquifer stress being evaluated in isolation of all other recharge and discharge.

A simple example of an evaluation using numerical superposition would be an evaluation of the impacts to river reaches due to pumping at a single well. Pumping at the well does not affect any of the sources of recharge or discharge which are not hydraulically connected. For example, pumping will have no effect on precipitation or evapotranspiration from shallow-rooted plants in an area where the water table is deep, such as in the eastern Snake River Plain aquifer. The cone of depression from the pumping well will propagate radially from the well until the resultant drawdown affects water levels near a river reach. At that time, the pumping will result in a reduction of the river gain or increase in river loss. By analyzing this stress using the numerical superposition model, all exchanges between the river and aquifer will be due to the ground-water pumping being evaluated. Evaluation of the same pumping well using the fully populated model would require running the fully populated model with and without the pumping well and differencing results of the two model runs. The latter analysis is more cumbersome and more prone to analysis and numerical error.

Evaluation of the impacts of curtailment of ground-water pumping was greatly facilitated by using the numerical superposition model. The numerical superposition model is not restricted to the 22-year period of the fully populated model and the effects of curtailment can be evaluated in isolation of all other recharge and discharge, yielding an estimate of expected *changes* in river gains and spring discharges due to curtailment. Evaluations of the results of these scenarios using numerical superposition can be used to estimate expected future impacts to river gains due to curtailment and the residual impacts to river gains from ground-water pumping after ground-water curtailment. Using superposition allows analysis of the future impacts of a specified stress (in this case, ground-water pumping) without requiring knowledge of other future conditions such as weather.

GROUND-WATER PUMPING CURTAILMENT ANALYSIS METHOD

The Curtailment Scenario has been evaluated using the following general steps:

a) Retrieve data from the IDWR water rights database which describes point of diversion, purpose of use, priority date, diversion rate and place of use for all ground-water rights. The results of this one-time query were intersected with the model grid and stored in a database.
b) Query the database created in step a) for ground-water irrigation rights with a priority date junior to the date of interest. The percentage of ground-water use in each model cell that is junior to the specified priority date is calculated. The results are applied to the current GIS layer of irrigated lands and multiplied by the ground-water irrigated area within the model cell, creating a new GIS layer containing the lands irrigated under water rights that are junior to a specific priority date.
c) Apply average (1961-1990) values of precipitation and average (1980-2001) evapotranspiration to this new irrigated lands coverage to estimate net consumptive use for the lands identified in the query. For the long-term curtailment assessment, the annual averages of precipitation and evapotranspiration were used. For the seasonal curtailment assessment, summer and winter (corresponding to irrigation season and non-irrigation season) averages were used. These data were used as input to the GIS-Fortran Recharge Program to create the Modflow Well File for the numerical superposition version of the ESPA ground-water model, representing only the consumptive use associated with ground-water development across the eastern Snake River Plain under water rights that are junior to the specified priority date.
d) Run the numerical superposition version of the ESPA ground-water model using the Modflow Well File created in step c). Both the steady state and transient numerical superposition versions of the ESPA ground-water model were run for this step.
e) Determine the impacts to each river reach due to the ground-water pumping.

Step a) was only done one time. Steps b) through e) were done once for each of the five selected priority dates and for both the average and seasonal cases. Each of these steps is described in more detail in Appendix A.

For the ESPAM v1.1 version of the Curtailment Scenario, no changes were made to the GIS processing used to produce the Modflow well file. Therefore, the only changes were to the Modflow files representing storativity, transmissivity and river and drain conductance.

DISTRIBUTION OF CURTAILED AREAS

How river reaches are affected over time by curtailment depends on the distribution of the area being curtailed and the consumptive use associated with the curtailed area. Figure 2 shows the proportion of the ground-water irrigated area junior to 1870 (nearly all ground-water irrigated lands) for each model cell. The irrigated areas are color-coded, with dark cells being 80-100% irrigated by ground water junior to 1870, lighter colors being less. Figures 3 through 6 show the proportion junior to January 1, 1949, January 1, 1961, January 1, 1973 and January 1, 1985, respectively. Figures 2 through 6 show the

spatial distribution of ground-water use relative to river and spring reaches as well as the location of new ground-water development for each time period.

Close inspection of Figures 2 through 6 shows where ground-water development was most common during various time periods. For example, looking at the difference between Figures 3 and 4, it is clear that much of the development with priority dates between 1949 and 1961 was in the area of the A&B Irrigation District, the Oakley Fan and north of American Falls.

The analysis of curtailed areas excluded ground-water rights in the Ft. Hall area that were senior to 1870. These are tribal rights and are not subject to curtailment. Appendix B contains a summary of the number of curtailed acres and the associated amount of consumptive use by ground-water district.

MODELING ANALYSES

Determine the Magnitude of Expected Spring and River Accruals Due to Long-Term Curtailment of Ground-Water Pumping (Objective 1)

Curtailment of ground-water pumping will result in increases in river gains (or decreases in river losses) either due to a) increased spring discharge in the Thousand Springs and American Falls area or b) higher aquifer water levels near other hydraulically connected reaches of the river, causing more water to discharge to the river reach (or, in the case of a losing reach, causing less water to be lost from the river reach). River gains were evaluated for each of the five cutoff dates for ground-water pumping as detailed in the Introduction. The gains were evaluated for both the steady state case (infinitely long time) and for the transient case (predicting impacts over time).

Steady State Results

Steady state simulations were performed to predict the accruals to river reaches after the full impact of the curtailment has been realized. The steady state analysis presumes the unlikely case that pumping has been permanently curtailed. Table 1 lists the predicted steady state gains by river reach for each modeled cutoff period. Additionally, Table 1 lists the time for each reach to come within 10% of the steady state value. For example, in Table 1, curtailment of all ground water is predicted to cause a 298 cfs accrual in the Devil's Washbowl to Buhl reach. Transient simulation results indicate that it would take approximately 59 years for the recovery to reach 90% of the steady state value. Similarly, curtailment of ground water junior to January 1, 1973 is predicted to cause an 88 cfs recovery in the same reach. Ninety percent of this recovery would be realized in 51 years.

Comparison of Table 1 with Figures 2 through 6 shows that the magnitude of the predicted accrual for each reach is dependent upon proximity of the area being curtailed to the specific reach and the volume of ground water pumped within that area. For example, although the Devil's Washbowl to Buhl reach has significantly less spring

discharge than the Malad reach, the predicted steady state gain in the Devil's Washbowl to Buhl reach due to curtailment of all ground-water pumping is 298 cfs versus 77 cfs for the Malad reach. Figure 2 shows that most of the ground-water irrigated acres are east of the Malad reach, so curtailment will have the greatest impact in the eastern and northern areas of the eastern Snake River plain. Table 1 provides some indication of the spatial distribution of predicted impacts due to curtailment of ground-water irrigation.

Transient Results

Figures 7 through 17 show the predicted reach accruals over a long period of time for each modeled reach, for each cutoff date. For example, Figure 17 shows predicted accruals for the Malad to Bancroft reach in the Thousand Springs area. The yellow line in Figure 17 represents the expected reach accrual (which, in this case, equates to an expected increase in spring discharge for this reach) if ground-water pumping junior to January 1, 1985 were to be curtailed. Similarly, the orange line shows expected accruals if pumping junior to January 1, 1973 were curtailed, etc. Each figure also shows the steady state value for predicted accruals for each of the cutoff dates.

Also apparent in Figures 7 through 17 is the fact that some of the river reaches approach steady state more rapidly than others. This is due to how proximal the curtailed ground-water pumping is to the river reach and the magnitude of the change in stress. If the pumping is distant from the reach or the change in stress is very large, the effects take longer to propagate through the aquifer, causing a longer time until steady state is reached.

Similarly, within a given reach, curtailment related to each cutoff date approaches steady state at a different rate. Again, using Figure 17 as an example, in the Malad to Bancroft reach, the impacts associated with a cutoff date of January 1, 1985 approach steady state after approximately 50 years. However, the impacts associated with a cutoff date of January 1, 1949 do not approach steady state until approximately 90 years. This is due to the spatial distribution of the ground-water pumping being curtailed as well as the spatial distribution of storativity and transmissivity. The response to curtailment will also vary reach by reach. Figures 7 through 17 were generated using an average annual net consumptive use and, therefore, show no seasonality.

Table 2 summarizes the predicted reach accrual after one year of curtailment for each reach for each cutoff date. These results can be used to estimate impacts of curtailment of ground-water pumping on a year-by-year basis. Looking at the Buhl to Thousand Springs reach, a 1-year curtailment of all ground-water pumping junior to January 1, 1870 would result in a 34,000 acre-foot accrual. Similarly, in the Buhl to Thousand Springs reach, a 1-year curtailment of all ground water junior to January 1, 1973 would result in a 16,000 acre-foot accrual by the end of that year.

Determine the Seasonality of River Accruals Due to Curtailment of Ground-Water Pumping (Objective 2)

The seasonal nature of ground-water pumping will cause the impacts of curtailment to have seasonal swings. These seasonal swings will be most prominent in reaches very close to curtailed areas and more dampened in reaches that are affected more by distant ground-water pumping. The seasonal swings are important, however, in that the reach accruals due to curtailment will vary seasonally and not be a continuous smooth curve as those shown in Figures 7 through 17. This means that the peak of the accrual due to curtailment may come at a time other than when the water is most needed in the reach.

Since curtailment represents the cessation of an activity, it is conceptually difficult to understand why the predicted accruals will have a seasonal component. These simulations are intended to predict the changes in river reach accruals due to curtailment. Under normal operation, the river reaches would be seasonally impacted due to ground-water pumping, with depletions occurring during the irrigation season and recovery during the non-irrigation season. The numerical superposition model is used for estimating *changes* in river reach gains. When these changes are superimposed on measured reach gains, the model predicts what the measured reach gains would have been, had the change already occurred. Figures 18 through 28 show curtailment effects during the irrigation season with an estimated attendant reach accrual, and less accrual during the non-irrigation season because there is no pumping to curtail at that time.

Figures 18 through 28 show the seasonal predictions of reach accruals for the 11 reaches of the Snake River for each of the five cutoff priority dates. Each of these figures shows the characteristic increase in reach accruals during the irrigation season with a diminished accrual during the non-irrigation season. The reader should note that the scale on the y-axis varies for each of the graphs in Figures 18 through 28, indicating a variation in magnitude of the accrual and the seasonal variation. The magnitude of the seasonal variation depends upon how close the reach is to the areas being curtailed and the overall magnitude of the predicted reach accruals. For example, the Malad-Bancroft reach, shown in Figure 28, has a seasonal variation in spring discharge of only about 3 cfs due to curtailment of all ground-water pumping. In contrast, the Buhl to Thousand Springs reach, shown in Figure 24, has an almost 80 cfs seasonal swing between spring and fall.

Many of the reaches depicted in Figures 18 through 28 show a winter decline almost back to the river reach gain levels of the previous year. Some of the reaches, however, show a smaller decline relative to the predicted accruals. This would indicate that the curtailed areas are more distant from the reach and that the accruals are taking longer to get to the reach. Figure 18 shows this dampened seasonal effect for the Ashton to Rexburg reach. Inspection of Figures 2 through 6 show that relatively little of the curtailed area is close to this reach, so the impacts are traveling further and are attenuated before impacting the Ashton to Rexburg reach.

Figures 18 through 28 also show the predicted 10-year accrual for a 1-year curtailment of pumping junior to 1985 and pumping junior to 1870, for each reach. As can be seen in

Figures 18 through 28, even after the 1-year curtailment is lifted, there would be residual accruals at the river reach from the 1-year curtailment.

Determine the Predicted Impacts to Aquifer Water Levels After Curtailment of Ground-Water Pumping (Objective 3)

Just as curtailment of ground-water pumping will cause increases in river gains, curtailment will also cause a recovery of aquifer water levels. Figures 29 through 34 show predicted changes in aquifer water levels at six locations throughout the plain due to curtailment of all ground-water pumping. In each case, the aquifer water levels are predicted to rise. The magnitude of the rise is driven by how proximal the curtailed ground-water irrigated lands are to the river reach under evaluation.

SUMMARY

Curtailment of ground-water pumping by specified priority date will have varied impacts on reaches of the Snake River, depending upon the location and size of the curtailed areas. Even with permanent curtailment of ground-water pumping, there would be residual impacts to the river for decades into the future. The magnitude of predicted accruals at each river reach is dependent upon how close the curtailed area is to each reach and the magnitude of the curtailment.

There will be a seasonal aspect to the actual accruals to river reaches as a result of curtailment. Curtailment will result in peak increases in the fall, at the end of the irrigation season, declining over winter to a low in the spring. This seasonal aspect to the recovery of the modeled reaches could be important depending upon what the water is being used for.

For the temporary, 1-year simulation, maximum realizable accruals are relatively small but the benefits last for several years. Most of the ground-water pumping occurs in the eastern and northern portions of the eastern Snake River plain, creating a natural limit on the benefit that can be realized at the most western reaches of the Snake River.

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Appendix A. Detailed Procedures Used for Curtailment Scenario.

Data Retrieval from IDWR Water Rights Database

The point-of-diversion water right table described in the main body of the report is based on the IDWR water rights and adjudication databases, and processed specifically for this application. IDWR personnel extracted point-of-diversion data for all ground-water rights within all the Administrative Basins that intersect the plain. Because of the ongoing Snake River Basin Adjudication, each right may be represented in multiple locations within the databases. The query was structured to avoid duplicate retrievals and extract only current data. Where available, adjudication partial decrees were used.

The result was two data tables. The first was a point-of-diversion table that contained an entry for every unique combination of point of diversion and water right. The table contained many data fields, including geographic location (X and Y coordinates), a water-right identifier, a priority date and an enlargement flag. The second table was a water-right table that contained an entry for every unique combination of water right and water use. This table included the water-right identifier, water use, and diversion rate specific to the water use.

A GIS program was used to assign model-cell identifiers to each point of diversion, and perform a many-to-many data-table join. This generated a data table with an entry for every unique combination of point of diversion, water right, and water use. For each use, the associated diversion rate was apportioned to all points of diversion for that use, for that right. The priority dates were retained in calendar date format, but were also recorded in new data fields representing the priority dates as integer numbers. One of these represented the nominal water-right priority date and the other represented the effective date, considering that enlargement water rights are subordinated to April 12, 1994. IWRRI and IDWR performed careful quality-assurance checks on the joined data table (Ciscell, 2004).

Determination of Net Consumptive Use Associated With Ground-Water Irrigated Areas Junior to Specified Priority Date

Irrigated areas were identified using the GIS polygons used in model calibration. Water-right place-of-use descriptions were not used to determine irrigated areas because of the effects of overlapping water rights. Irrigation water source (i.e. surface water or ground water) was identified using data from the model calibration.

In the recharge tool, the irrigated area for each model cell was calculated using GIS-derived area multiplied by a source fraction. In these simulations, the source fraction was set to zero on surface-water-irrigated areas (including the surface-water member of each mixed-source pair). On ground-water-irrigated areas (including mixed-source members), the source fraction was set equal to the calibration-period source fraction (indicating the fraction of irrigation water supplied by surface or ground water) multiplied by a

consumptive use fraction. The consumptive use fraction was based on priority dates and derived from water right point-of-diversion data.

Scenario consumptive use was based on the average of 22 years of calibration data (May, 1980-April, 2001). In the recharge calculations, consumptive use is applied only to irrigated areas. By scaling the irrigated area according to priority-date consumptive fraction, only the consumptive use represented by the selected priorities was applied to the model.

The consumptive use associated with a given priority date was determined by the fraction of total diversion rate that is junior to the given priority for water-right points of diversion within each model cell. Face-value diversion rates were used, without considering combined use limitations, because only the face-value rate is readily extracted by a database query. This process of scaling the calibration-data consumptive use allows direct comparison to other model runs and avoids the difficult problem of establishing a linkage between water-right diversion rate and consumptive use. It relies on an assumption that the progression of nominal diversion rate over time paralleled the progression of consumptive use.

To test this key assumption, a statistical sampling of 20 quarter-quarter sections was evaluated. All irrigation rights within each tract were examined manually, considering all combined use limitations on acreage. The actual progression of irrigated acreage over time was calculated, assuming that consumptive use would correspond to irrigated acreage. This was compared with the progression of nominal diversion rate that could be automatically extracted from the data. Some individual tracts showed considerable over- or under-estimation at some priority dates. Figure A-1 shows the combined results for the entire sample. Across the range of priority dates, the difference between the two methods was not statistically significant.

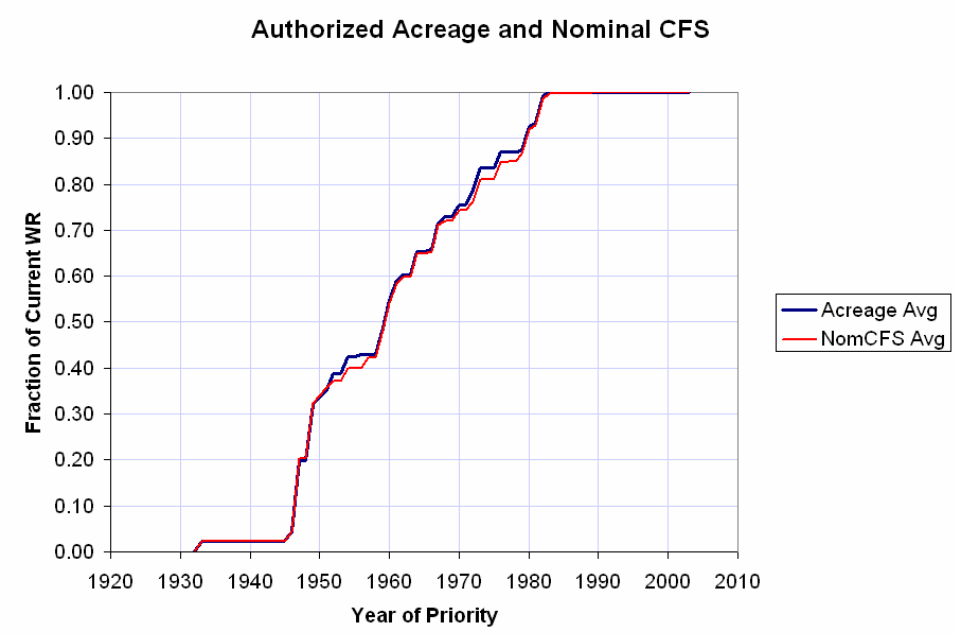

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Figure A-1. Results of diversion-rate method test for statistical sample

To move from a data table of diversion rates to a consumptive use fraction by model cell, a Visual Basic program (P_DIV_FRAC.EXE) was utilized to manipulate the point-of-diversion water-right file. The water-right file can be queried for specific water uses before calculating the diversion fractions; in this case only irrigation rights were selected.[1] This assumed that minor omissions would not affect the illustrative nature of these simulations. For a simulation evaluating an actual contemplated administrative action, other assumptions could be made.

The program P_DIV_FRAC.exe uses the selected records to produce a new data table listing the fraction of diversion rate within each model cell that is junior to a user-specified priority date. The process was repeated for each of the sample curtailment dates, but any desired date may be analyzed when an actual situation is to be evaluated.

Once consumptive use and ground-water irrigated areas were determined, the data were processed using the Fortran component of the GIS-Recharge Tool, resulting in Modflow Well files, the input files for the ground water model which represents the ground water pumping. The Well files for the long-term curtailment simulations represent the rate of average daily ground water pumping, spread out over a year, for each model cell. The Well files for the seasonal curtailment simulations represent the average net consumptive use alternating for the irrigation season and for the non-irrigation season. One Well file was generated for each of the five desired time periods, for each type of simulation.

Handling of Mixed Source Lands

Mixed source lands, where the same acreage is permitted for both ground water and surface water use, present a particular challenge in this analysis. Acreage has been authorized with both surface water and ground water supplies for multiple reasons. In some cases, the original diversion structures have been replaced by wells but the nominal surface water rights are still recorded, resulting in mixed source authorizations. In other cases, ground water rights have been issued to supplement surface water use during water shortages, but in fact are seldom if ever used.

The amount of benefit gained by curtailing ground water-irrigated areas which are assigned to mixed source lands will be driven by what happens after the curtailment. If the curtailment results in the land not being irrigated, then using consumptive use as an estimate of the benefit of curtailment is reasonable. However, if curtailment of ground water pumping results in an increased use of surface water on the same acreage, then no benefit is seen from curtailment.

In the model calibration, the fraction of supply on mixed-source parcels was partitioned between ground-water and surface-water using a diversion-depth analysis. The fraction of supply is represented in the GIS data by a “source fraction” value. The curtailment of

[1] IWRRI calculations and independent USGS data (Goodell 1988, Maupin 2004) indicate that 95% to 97% of all consumptive use from ground water is associated with irrigation.

ground-water pumping is represented by reducing the source fraction of all ground-water irrigated parcels within a model cell according to the fraction of ground water rights junior to the date of interest, within that model cell. Three methods were tested, as outlined in Appendix C. The method selected was to proportionally reduce the source fraction according to the priority fraction, without consideration of the total amount of supply coming from ground water. This is a simplification of the conceptual model of what actually may occur, but the test shows that results obtained using this method are within 1% of more sophisticated methods that increase opportunities for error and require estimation of additional parameters. Appendix C documents this test.

Running of ESPA Model

Both the steady state and transient versions of the numerical superposition ESPA model were run using the Modflow well files described in the previous section. The steady state model predicts impacts to river reaches after the full effect of the aquifer stress has been realized (essentially after infinite time). The transient model predicts the impacts as they occur over time. The transient ESPA model for the long-term curtailment simulations was set up using 150 1-year stress periods, with each stress period having 5 time steps. The transient ESPA model for the long-term curtailment simulations was set up using 20 6-month stress periods, with each stress period having 3 time steps. A stress period is the period of time during which the representation of aquifer pumping is held constant. A time step is an intermediate calculation point.

As discussed in the previous section, the Modflow well files for the long-term curtailment simulations represent average daily ground-water pumping, applied as continuous pumping for the duration of the model scenario, for each model cell. For the seasonal curtailment scenarios, the Modflow well files represent the net recharge due to precipitation and evapotranspiration for 6-month periods, representing irrigation and non-irrigation seasons, for each model cell.

Determination of Impacts to River Reaches Due to Modeled Ground-Water Pumping

Once the ESPA model is run, a post-processing utility is run to sum river reach impacts for each of the eleven modeled reaches of the Snake River. These results are available for each of the modeled cutoff dates for both steady state and transient simulations. The results are then imported into a Microsoft EXCEL workbook for preparation of resulting graphs and tables.

Appendix B. Irrigated Land and Consumptive Use by Ground-Water District

A request was made for a summary by ground-water district of how many acres and how much consumptive use would be curtailed for each priority date cutoff. No statement is being made in this appendix of plans for curtailment of any particular group of ground-water pumpers. These data are merely being supplied as a courtesy. Figure B-1 shows the map of water districts used for this analysis.

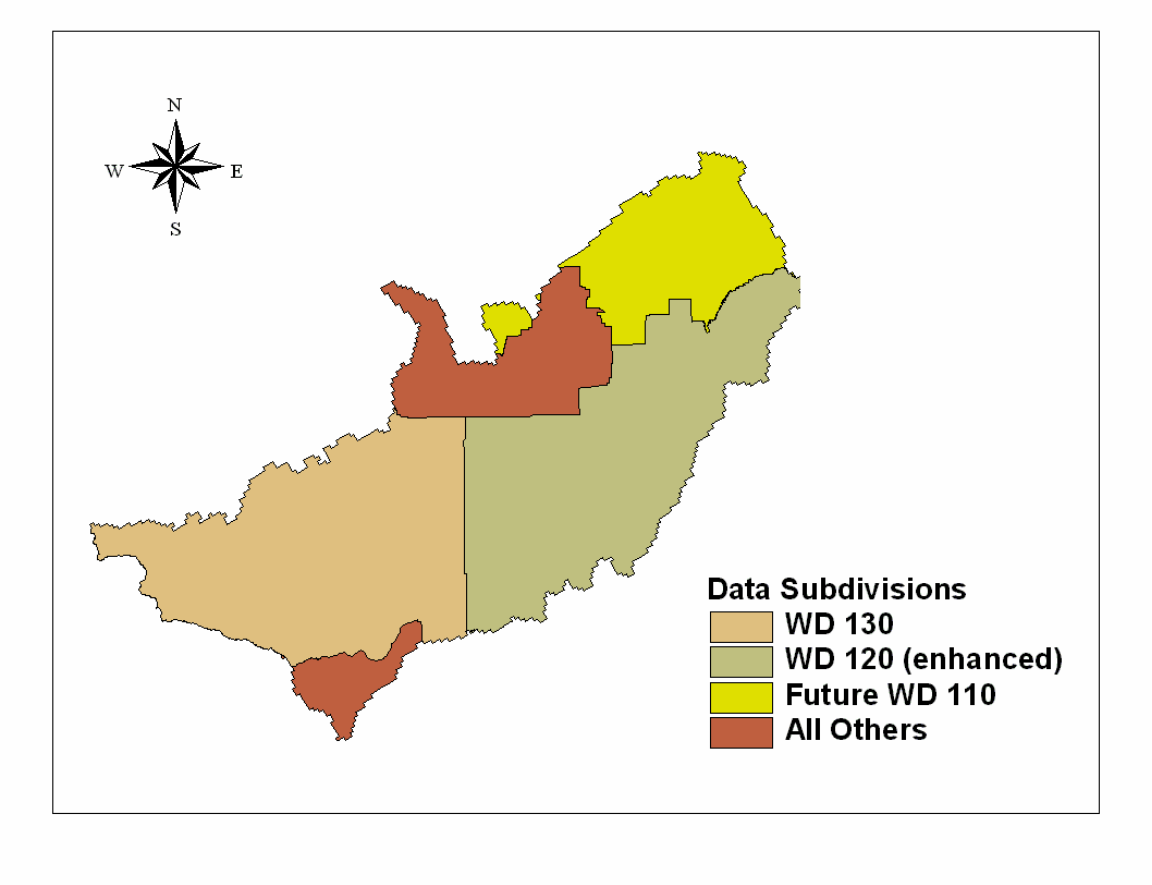

Figure B-1. Ground-water district boundaries used for summary of curtailed acres and consumptive use.

Table B-1 summarizes the number of acres curtailed and the associated consumptive use for each ground-water district for each of the cutoff periods.

Table B-1. Curtailed acres and consumptive use by district.

Cutoff Date	Post January 1, 1870		Post January 1, 1949		Post January 1, 1961		Post January 1, 1973		Post January 1, 1985	
Basin Name	Acres Curtailed	Curtailed CU (ac-ft)	Acres Curtailed	Curtailed CU (ac-ft)	Acres Curtailed	Curtailed CU (ac-ft)	Acres Curtailed	Curtailed CU (ac-ft)	Acres Curtailed	Curtailed CU (ac-ft)
WD130—North Snake	274,600	561,900	215,500	440,600	140,100	289,300	80,400	167,200	15,800	32,000
WD120—American Falls	484,300	876,900	457,700	827,900	309,200	558,000	171,600	309,700	38,900	70,100
Future WD110—Upper Snake	185,200	350,400	167,900	317,100	129,700	242,000	78,400	145,600	9,900	18,700
Other	158,000	307,900	148,500	289,300	854,00	165,200	41,700	80,500	9.600	18,900
Total	1,102,000	2,097,000	989,700	1,874,900	664,300	1,245,500	372,000	702,900	74,200	139,600

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Appendix C. Analysis of Impact of Mixed Source Lands on Curtailment Scenarios.

When ground-water rights are curtailed, there is an effect on mixed-source lands. Preliminary calculations assumed that the reduction in consumptive use with curtailment is proportional to the fraction of supply from ground water for the area being evaluated. However, it is possible that actual responses will depend on the adequacy of the surface-water supply and the reliance on ground water. To determine the significance of this possibility on curtailment scenarios, three alternate methods of treating mixed-source lands were considered.

The fine black line in Figure C-1 illustrates the conceptual model that the reduction in consumptive use from curtailment is dependent on the fraction of supply from ground water. When ground water is a high fraction of supply, a unit reduction in supply may reduce consumptive use by more than one unit, but when ground water is a low fraction of supply, curtailment may not reduce consumptive use at all.

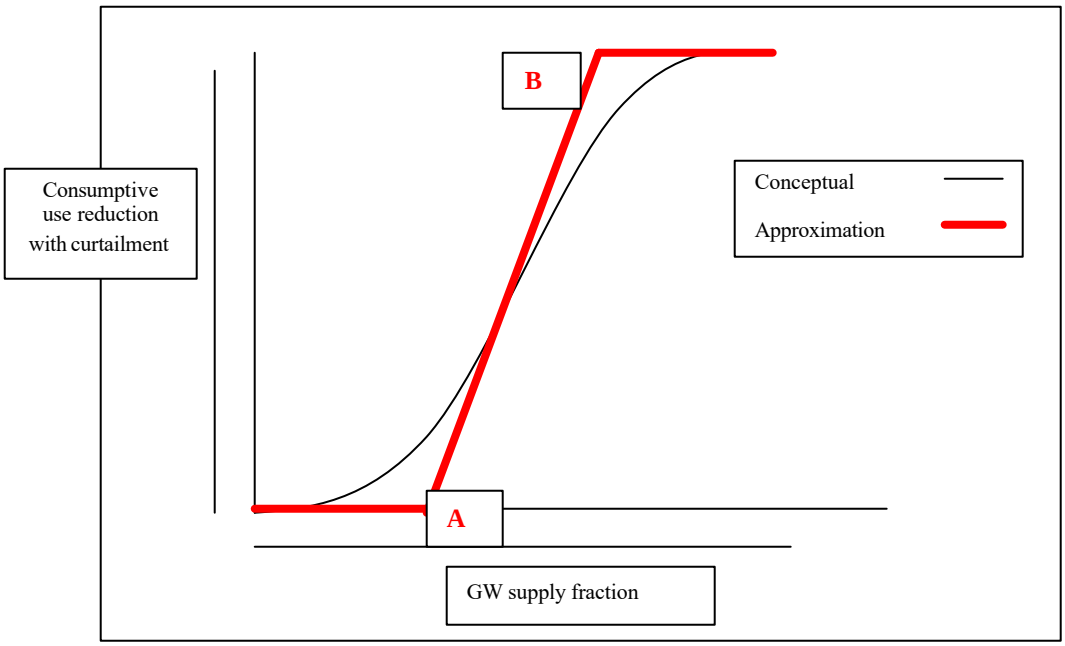

Figure C-1. Conceptual Model

An approximation of the unknown non-linear relationship could be the stepwise-linear relationship illustrated with the heavy red line. The shape of the approximation line is governed by placing of breakpoints A and B. Three pairs of breakpoints "A" and "B" were tested: 1) 0% and 100%, 2) 10% and 90%, 3) 20% and 80%. Option 1 is a straight diagonal line, corresponding to preliminary analyses.

Using GIS analysis of the ground-water-irrigated polygons from model calibration, the three breakpoint pairs were applied to all the ground-water polygons within the study area. Polygons that were ground water only were left with a source fraction of 100%, and mixed-source polygons were scaled according to the following rules:

1. If ground-water fraction is less than breakpoint A, set source fraction to zero. This implies that for parcels with only a small supply of ground water, the response to curtailment will be more careful management of surface water with no reduction in acreage or consumptive use.

2. If ground-water fraction is greater than breakpoint B, set source fraction to 100%. This implies that for parcels almost totally dependent on ground water, curtailment will result in fallowing the entire farm. All consumptive use, even that formerly associated with the small surface-water supply, will cease.

3. If ground-water fraction is between A and B, set the source fraction equal to:

   (GW fraction - A) / (B - A)

   This sets the transition line on a diagonal between the breakpoints.

For the 0%/100% pair, this rule simply set the source fraction equal to the original ground-water fraction from the calibration data. Figure C-2 illustrates the results graphically.

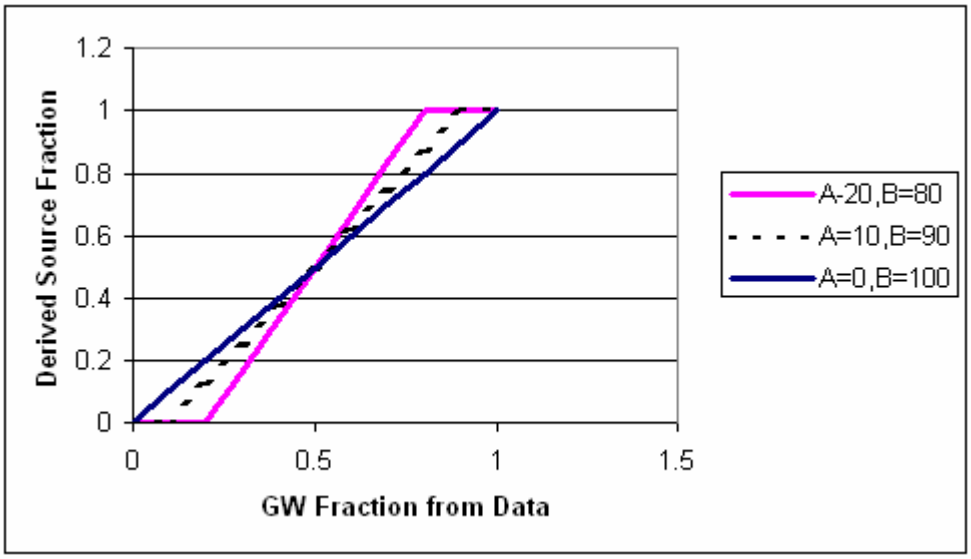

Figure C-2. Results of Calculations.

To test the impact of these three options, acreage was calculated for each polygon. For each polygon, the acreage was multiplied times the three different rule-derived source fractions to obtain the equivalent acreage suggested by the three different rules. To compare results, the effective acreage for all polygons was summed for each option. Table C-1 shows the results:

Table C-1
Results of Test

Breakpoint A	Breakpoint B	Effective Acres	Acres, % of Calibration-period acres
0%	100%	1,111,000	100%
10%	90%	1,120,000	101%
20%	80%	1,125,000	101%

Because the percentages were so similar, the original method was retained. When considering the effect of curtailment on mixed-source lands, the impact on consumptive use is represented as proportional to the fraction of supply from ground water.

Table 1. Predicted steady state reach accruals for each curtailment period (using ESPAM v1.1).

Cutoff Date	All Pumping		Post January 1, 1949		Post January 1, 1961		Post January 1, 1973		Post January 1, 1985	
Reach Name	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain	Steady State Gain (cfs)	Time (yrs) to realize 90% of gain
Ashton to Rexburg	316	20	290	20	222	19	128	19	22	19
Heise to Shelley	211	18	195	18	141	17	78	17	15	17
Sum of Reaches Above Shelley	**526**		**484**		**363**		**206**		**37**	
Shelley to Near Blackfoot	406	30	368	30	240	28	132	25	26	28
Near Blackfoot to Neeley	1035	35	925	36	593	33	331	29	69	32
Neeley to Minidoka	158	62	134	65	84	61	46	55	10	60
Sum of Reaches Shelley to Milner	**1598**		**1427**		**917**		**509**		**105**	
Devil's Washbowl to Buhl	298	59	257	61	160	57	88	51	18	60
Buhl to Thousand Springs	137	49	122	50	81	43	47	37	8.0	51
Thousand Springs	89	48	79	48	54	42	31	35	5.6	47
Thousand Springs to Malad	10	45	9	46	6.4	38	3.7	32	0.74	42
Malad	77	50	68	51	47	43	29	35	5.5	44
Malad to Bancroft	5.8	38	5.2	38	3.8	34	2.4	31	0.59	36
Sum of Thousand Springs Reaches	**617**		**541**		**352**		**201**		**38**	
Total (cfs)	**2741**		**2453**		**1633**		**916**		**180**	
Total (acre-feet/year)	**1,984,659**		**1,775,637**		**1,182,086**		**663,362**		**130,506**	

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Table 2. Predicted reach gains during first year of curtailment (ESPAM v1.1).

Cutoff Date	January 1, 1870	January 1, 1949	January 1, 1961	January 1, 1973	January 1, 1985
Reach Name	Predicted Gain During First Year of Curtailment (ac-ft)	Predicted Gain During First Year of Curtailment (ac-ft)	Predicted Gain During First Year of Curtailment (ac-ft)	Predicted Gain During First Year of Curtailment (ac-ft)	Predicted Gain During First Year of Curtailment (ac-ft)
Ashton to Rexburg	34,000	32,000	25,000	14,000	2,500
Heise to Shelley	39,000	37,000	26,000	13,000	3,100
Shelley to Near Blackfoot	83,000	78,000	50,000	28,000	6,000
Near Blackfoot to Neeley	240,000	220,000	140,000	82,000	18,000
Neeley to Minidoka	11,000	10,000	7,000	4,700	1,100
Devil's Washbowl to Buhl	37,000	36,000	26,000	16,000	2,100
Buhl to Thousand Springs	34,000	33,000	26,000	16,000	1,900
Thousand Springs	23,000	23,000	18,000	11,000	1,600
Thousand Springs to Malad	3,000	2,900	2,400	1,500	270
Malad	18,000	18,000	15,000	11,000	1,700
Malad to Bancroft	1,300	1,200	1000	760	120

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MEMO

State of Idaho
Department of Water Resources
322 E Front Street, P.O. Box 83720, Boise, Idaho 83720-0098
Phone: (208) 287-4800 Fax: (208) 287-6700

Date: February 27, 2013

To: Gary Spackman, Hearing Officer

From: Jennifer Sukow

cc: Rick Raymondi, Sean Vincent, Allan Wylie, Neal Farmer, Tim Luke, Cindy Yenter

Subject: Staff memorandum in response to expert reports submitted for Rangen Delivery Call (In the Matter of Distribution for Water to Water Right Nos. 36-02551 and 36-07694)

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ATTACHMENT B. ALTERNATIVE PREDICTIVE METHODS

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Executive Summary

This report was prepared in response to expert reports submitted for the Rangen Delivery Call, which requests curtailment of groundwater users with water right priority dates junior to July 13, 1962 for distribution of water to water rights 36-2551 and 36-7694. A total of 18 expert reports and rebuttal reports were submitted to the Idaho Department of Water Resources (IDWR) on behalf of Rangen, Inc. (Rangen), the Idaho Ground Water Appropriators (IGWA), the City of Pocatello, and Freemont Madison Irrigation District (FMID). The main issues raised by the parties' experts appear to be[1]:

1. Whether Rangen is entitled to make a call based on discharge from the entire spring complex or only discharge from Martin-Curren Tunnel, which is the source listed on the partial decrees for Rangen's water rights.
2. Whether Martin-Curren Tunnel is a surface water source.
3. Whether Rangen is beneficially using available water with reasonable efficiency, or is using water inefficiently and wasting water.
4. Whether Rangen has suffered material injury because of reduced water availability.
5. Whether the economic impact of curtailment outweighs the economic benefit to Rangen and Rangen's right to water.
6. Whether Rangen's water measurement methods are acceptable.
7. Whether Rangen has made sufficient efforts to increase water availability to its facility.
8. Whether ESPAM2.1 is capable of providing a reasonable prediction of the effects of curtailment at the Rangen spring complex, or is only capable of providing predictions to a larger reach.
9. Whether some groundwater users should be excluded from curtailment based on the fraction of their curtailed use that will accrue to springs and river reaches other than Rangen.
10. Whether water that would accrue to springs and river reaches other than Rangen would be wasted.

Several of these issues are legal or policy issues that cannot be appropriately addressed by IDWR technical staff. This memorandum was prepared by IDWR staff with the intent of summarizing the parties' expert reports and providing IDWR staff opinions regarding Rangen's water measurement methods and the use of ESPAM2.1 as a tool to provide information on the hydrologic effects of curtailment of junior groundwater use. IDWR staff contributors to this memorandum included:

[1] This is a summary of the issues identified in the expert and rebuttal reports and is not intended to convey agreement or disagreement regarding the relevancy of these issues.

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- Jennifer Sukow, P.E., P.G., primary author, ESPAM2.1 analyses
- Dr. Allan Wylie, P.G., Ph.D., report reviewer, ESPAM2.1 analyses
- Tim Luke, contributing author, water measurement methods
- Neal Farmer, report reviewer, geology
- Sean Vincent, P.G., report reviewer
- Rick Raymondi, report reviewer
- Cindy Yenter, report reviewer, water measurement methods

Between the 1960s and the present, discharge of the Rangen spring complex has decreased in response to changes in the ESPA water budget. These changes include increased groundwater pumping, decreased incidental recharge associated with surface water irrigation, and changes in natural recharge derived from precipitation. Between 1966 and 2011, the average annual discharge at the Rangen spring complex decreased from 51 cfs to 15 cfs. Because the Rangen spring complex is hydraulically connected to the ESPA, it is clear that groundwater pumping has contributed to the decrease in discharge, but decreases in incidental recharge and natural recharge derived from precipitation have also contributed. The portion of the decrease that is attributable to groundwater pumping is more difficult to determine. ESPAM2.1 is a numerical groundwater model that was developed for the purpose of determining the effects of groundwater pumping on discharge to spring and river reaches, such as the Rangen spring cell.

Numerical models are recognized by the U.S. Geological Survey as the most robust approach for predicting the effects of groundwater pumping on surface-water discharge (Barlow and Leake, 2012). A numerical model is able to account for spatial variation in hydrogeologic features and aquifer stresses, and the temporal variation of aquifer stresses. ESPAM2.1 accounts for these features within the constraints of a one-square-mile model grid and one-month stress periods, which is superior to any other predictive method developed for the ESPA to date. Geologic controls on hydrologic responses to aquifer stress are reflected in the discharge and aquifer head data used to calibrate the model. ESPAM2.1, like all groundwater models, is an imperfect approximation of a complex physical system, but it is the best available scientific tool for predicting the effects of groundwater pumping on discharge at the Rangen spring cell and other spring and river reaches. ESPAM2.1 is a regional groundwater model and is suitable to predict the effects of junior groundwater pumping on discharge at the Rangen spring cell because the spring discharge responds to regional aquifer stresses, and junior groundwater pumping is a dispersed, regional aquifer stress.

The parties' experts disagree on whether or not ESPAM2.1 is capable of providing a reasonable prediction of the response to groundwater pumping at the model cell containing the Rangen spring complex. In the opinion of Brockway et al. (2012), the model is capable of predicting the response at the Rangen spring cell. In the opinion of Contor (2012), the model is only capable of providing a reasonable prediction of the response at the Buhl to Lower Salmon Falls reach. Brendecke (2012) appears to offer two opinions. Dr. Brendecke argues that the model prediction of the response at the Rangen spring cell is too uncertain to be used. He also argues that if IDWR uses ESPAM2.1, the steady state response functions, which are the model-predicted responses at the Rangen spring cell to curtailment within individual model cells, should be used to delineate a 10% trimline.

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IDWR staff recommend using ESPAM2.1 as a predictive tool to evaluate the effects of groundwater pumping and curtailment of groundwater pumping on discharge at the Rangen spring cell and to evaluate the portion of curtailed use that will accrue to the Rangen spring cell. ESPAM2.1 predicted responses to curtailment of junior groundwater pumping within various areas are summarized in Table 1. These areas were selected in response to areas or de minimis standards discussed in the parties' expert reports, and are not intended to convey an opinion regarding the use of a trimline and/or the area of common groundwater supply to limit the area of curtailment.

ESPAM2.1 may also be used to predict the effects on discharge in the Buhl to Lower Salmon Falls reach and the portion of curtailed use that will accrue to the reach, as suggested by Contor (2012a). If ESPAM2.1 is not used to predict to the spring cell, apportioning the change in reach gain to the Rangen spring cell would need to be accomplished using an alternative method. The parties' experts did not suggest methods for apportioning the change in reach gain to the Rangen spring complex. IDWR staff evaluated potential alternative methods for predicting effects at the Rangen spring cell, but note that the alternative methods consider fewer data and are less robust than the ESPAM2.1 numerical model.

ESPAM2.1 was developed in an open, collaborative environment, with guidance from the Eastern Snake Hydrologic Modeling Committee (ESHMC). During development of ESPAM2.1, the ESHMC provided a forum for discussing model design, providing parties to this water call (and other interested parties) the opportunity for technical review and input throughout the model development process. Decisions regarding the conceptual model, model grid size, drain elevations, locations of transmissivity pilot points, spring discharge and aquifer head targets, the location of general head boundaries, calibration bounds, and other model features were presented to the ESHMC with opportunity for committee members to provide comments and suggest alternative approaches.

Summary of IDWR staff conclusions

Use of ESPAM2.1 as a predictive tool

1. ESPAM2.1 is the best available scientific tool for answering the following questions that may be relevant to this water call.

    a. What is the effect of junior groundwater pumping within the ESPA on discharge at the Rangen spring cell?

    b. What portion of curtailed groundwater use will accrue to the Rangen spring cell?

    c. What portion of curtailed groundwater use will accrue to other spring cells and reaches of the Snake River?

    d. How long will it take for the effects of curtailment of junior groundwater pumping to reach the Rangen spring cell?

    e. What is the effect of junior groundwater pumping within the ESPA on discharge at the Buhl to Lower Salmon Falls reach?

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2. ESPAM2.1 incorporates the spatial distribution of aquifer recharge and discharge and regional-scale hydrogeology within the constraints of a one-mile square grid size and transmissivity pilot point spacing, which is approximately two to four miles in the vicinity of the Buhl to Lower Salmon Falls reach. The grid and transmissivity pilot point spacing allow ESPAM2.1 to reflect variations in aquifer stress and hydrogeologic properties with greater resolution than other available predictive methods.

3. Junior groundwater pumping within the ESPA occurs over an approximately 11,000 square mile area. The effect of this pumping on springs and river reaches is a regional-scale question that cannot be addressed with a small-scale, local model.

4. ESPAM2.1 was calibrated to over 43,000 observed aquifer water levels, over 2,000 monthly river gain and loss estimates, and over 2,000 monthly spring discharge observations collected from 14 different spring complexes, including 283 monthly spring discharge observations at the Rangen spring cell. These calibration targets reflect the impact of geologic features on hydrologic responses. Because the ESPAM2.1 calibration process considered such a large number of data, ESPAM2.1 is superior to other available predictive methods that consider significantly fewer data.

5. ESPAM2.1 was calibrated to observed monthly discharge data from May 1985 through October 2008 at the Rangen spring cell. The observed discharge is the response to regional aquifer stresses within the ESPA. ESPAM2.1 provides reasonable predictions of the response to changes in regional aquifer stress within the range of stress encountered during the May 1980 through October 2008 simulation period. The Rangen spring complex is the only spring complex in the Rangen model cell.

6. ESPAM2.1 was developed in an open, collaborative environment, with guidance from the Eastern Snake Hydrologic Modeling Committee (ESHMC). During development of ESPAM2.1, the ESHMC provided a forum for discussing model design, providing parties to this water delivery call (and other interested parties) the opportunity for technical review and input throughout the model development process. Decisions regarding the conceptual model, model grid size, drain elevations, locations of transmissivity pilot points, spring discharge and aquifer head targets, the location of general head boundaries, calibration bounds, and other model features were presented to the ESHMC with opportunity for committee members to provide comments and suggest alternative approaches. At the completion of ESPAM2.1, the ESHMC recommended, "*The Eastern Snake Hydrologic Modeling Committee recommends that the Department begin using ESPAM version 2.1 rather than ESPAM version 1.1 for ground water modeling.*" Two members of the committee (Mr. Sullivan and Dr. Brendecke) qualified this recommendation with, "*although other tools or models may be more appropriate in certain circumstances*." Two other members of the committee (Mr. Warner and Mr. Contor) dissented from the recommendation.

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7. The consumptive use of groundwater associated with irrigation water rights junior to July 13, 1962 within the ESPAM2.1 model boundary averages approximately 1.2 MAF/year. Curtailment of this use would increase net aquifer recharge to a volume within the range encountered during the model calibration period. For example, curtailment of this use during the years 2003-2007 (when average annual net ESPA recharge was approximately 4.4 MAF/year) would increase the net ESPA recharge to 5.6 MAF/year, which was the average annual net ESPA recharge during the years 1993-1997. Therefore, it is important that ESPAM2.1 was calibrated with equal consideration for each observed monthly value at the Rangen spring complex. It would not be appropriate to increase the weight of post-2000 observations during model calibration as suggested by Brendecke (2012, 2013) and Hinckley (2013).

8. Contor (2012a), Hinckley (2012, 2013), and Brendecke (2012, 2013) conclude that ESPAM2.1 does not include sufficient local-scale detail to be capable of providing a reasonable prediction of responses at the Rangen spring cell, but do not suggest alternative methods for estimating the response at the Rangen spring cell. If ESPAM2.1 is used to predict the response at the Buhl to Lower Salmon Falls spring reach, as suggested by Contor (2012a), then an alternative method for apportioning the reach response between the Rangen spring complex and other springs would need to be used. ESPAM2.1 incorporates the spatial distribution of recharge and groundwater pumping, a large number of water level and aquifer discharge observations, regional-scale hydrogeology, and the transient response of aquifer discharge to spatially and temporally distributed recharge and pumping. An alternative approach would likely neglect one or more of these factors and be inferior to using ESPAM2.1 to predict the response at the Rangen spring cell.

9. Steady state response functions for the Rangen spring cell consist of 11,236 model predictions of response at the Rangen spring cell to pumping in a single model cell. If ESPAM2.1 were not capable of providing a reasonable prediction of the effects of model-wide curtailment on discharge at the Rangen spring cell, it would also be incapable of reasonably predicting response functions for the Rangen spring cell and would not be able to provide a reasonable prediction of the location of the 10% trimline that Brendecke (2012) proposes.

10. Whether a trimline should be applied, and the basis for delineating a trimline, are policy and/or legal decisions. If a trimline is based on steady state response functions, as proposed by Brendecke (2012), the trimline delineates an area within which the portion of curtailed use that will accrue to the Rangen spring cell exceeds a given threshold percentage. Groundwater users outside of this area would be excluded from curtailment because the portion of their curtailed use that accrues to the Rangen spring cell is predicted to be less than the threshold percentage.

11. The ESPAM2.1 predicted response functions used to delineate the 10% trimline proposed by Dr. Brendecke are subject to the same types of model uncertainty as the ESPAM2.1 predicted response to model-wide curtailment. Use of the steady state response functions to delineate a trimline requires accepting that the ESPAM2.1 provides the best available prediction of response at the Rangen spring cell.

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12. Delineation of a trimline based on steady state response functions is a direct application of ESPAM2.1-predicted responses, and is not an "*adjustment to model predictions*" as suggested by Brockway et al. (2012, 2013).

13. ESPAM2.1 is an improvement to ESPAM1.1, which was used as a tool to predict the effects of groundwater pumping, curtailment, and mitigation practices for administration of previous ESPA water calls.

ESPAM2.1 predictions

1. ESPAM2.1 predicted responses to junior groundwater curtailment within various areas are summarized in Table 1. These areas were selected in response to areas or de minimis standards discussed in the parties' expert reports, and are not intended to convey an opinion regarding the use of a trimline and/or the area of common groundwater supply to limit the area of curtailment.

2. ESPAM2.1 predicts that a model-wide curtailment of groundwater irrigation junior to July 13, 1962 would increase discharge at the Rangen spring cell by 17.9 cfs and reach gains in the Buhl to Lower Salmon Falls reach by 242 cfs at steady state. It would take approximately 13 years to reach 90% of the steady state response. The simulated curtailment would affect approximately 565,000 acres and would increase net aquifer recharge by approximately 1.2 MAF/year (1,705 cfs). The benefit predicted at the Rangen spring cell is only 1% of the curtailed use. The other 99% of the benefit would accrue to other springs and reaches of the Snake River. The predicted benefit to the Buhl to Lower Salmon Falls reach is 14% of the curtailed use. This curtailment simulation includes areas located outside of the current area of common groundwater supply.

3. Based on comparison of the historic response of the Rangen spring complex to changes in net recharge to the ESPA, the ESPAM2.1 predicted response of 17.9 cfs to a 1.2 MAF/year increase in net recharge appears to be reasonable. Rangen discharge data indicate that spring discharge decreased approximately 35 cfs between 1966 and 2007, in response to a decrease in average annual net recharge of approximately 1.7 MAF. Linear regression of Rangen spring complex discharge with a 5-year trailing average of net ESPA recharge indicates that spring discharge has historically changed by approximately 13 cfs per MAF change in the ESPA water budget (Figure 1), indicating that the response to a 1.2 MAF decrease in consumptive groundwater use should result in an increase on the order of 16 cfs in spring discharge. IDWR staff consider this predictive method inferior to ESPAM2.1, but it does provide a "reality check" that indicates the ESPAM2.1 prediction is not unreasonable given historic responses observed at the Rangen spring complex.

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Area of curtailment	Predicted increase in discharge (cfs)			Portion of curtailed use accrued to reach (%)		
	Rangen spring cell	Buhl to Lower Salmon Falls reach[2]	Buhl to Lower Salmon Falls springs[3]	Rangen spring cell	Buhl to Lower Salmon Falls reach	Other reaches
Model domain	18	242	236	1%	14%	86%
Area of common groundwater supply (ACGW)	17	229	223	1%	15%	85%
10% trimline based on response at Buhl to Lower Salmon Falls reach (within ACGW)	15	198	193	3%	34%	66%
5% trimline based on response at Rangen cell	3.3	29	28	7%	59%	41%
10% trimline based on response at Rangen cell	0.01	0.08	0.08	13%	81%	19%

Table 1. Summary of ESPAM2.1 predicted responses to curtailment of groundwater irrigation junior to July 13, 1962.

[2] Includes increase in base flow modeled at general head boundaries.
[3] Excludes increase in base flow modeled at general head boundaries.

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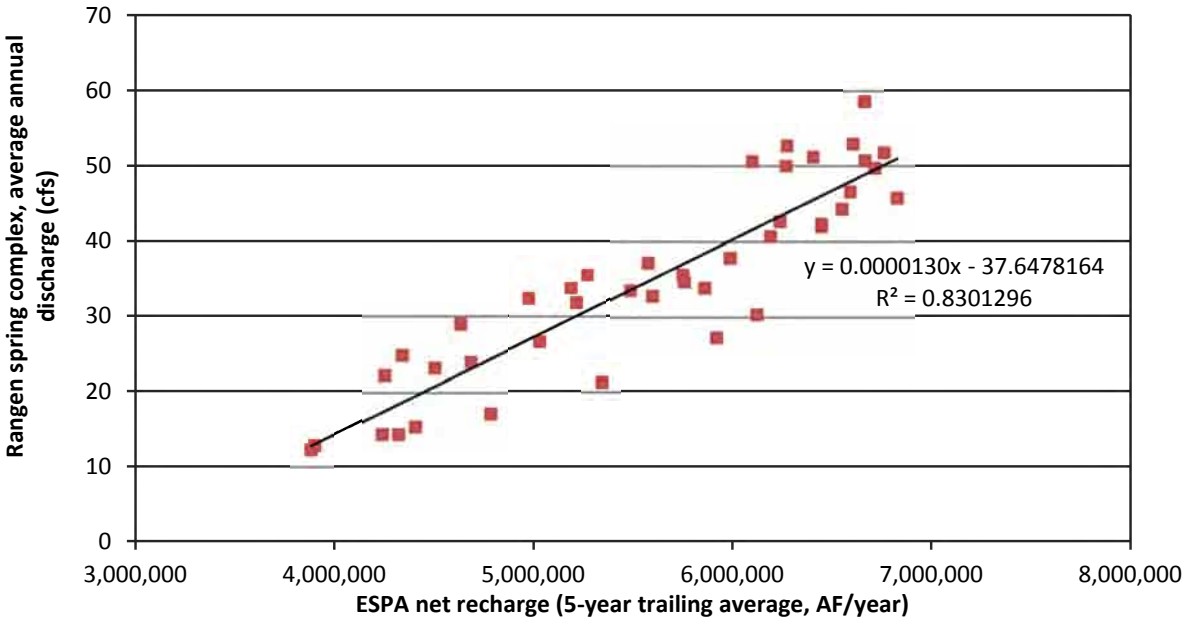

Figure 1. Comparison of average annual discharge at Rangen spring complex with net ESPA recharge.

4. ESPAM2.1 steady state response functions (Figure 2) indicate that discharge in the Rangen spring cell responds to stresses dispersed throughout the ESPA. Collectively, model-wide groundwater pumping has a significant effect on discharge at the Rangen spring cell, but more than 84% of the effects of groundwater pumping in any individual model cell propagate to other springs or reaches of the Snake River. The percentage of the effects of groundwater pumping that accrue to the Rangen spring cell generally decreases as distance from Rangen increases. Less than 1% of the effects of groundwater pumping east of the Great Rift[4] accrue to the Rangen spring cell.

5. If simulation of curtailment of groundwater irrigation is limited to the current area of common groundwater supply, ESPAM2.1 predicts that the benefit to the Rangen spring cell would be 16.9 cfs and the benefit to reach gains in the Buhl to Lower Salmon Falls reach would be 229 cfs. It would take approximately 11 years to reach 90% of the steady state response. The simulated curtailment would affect approximately 479,000 acres and would increase net recharge by approximately 1.1 MAF/year (1,509 cfs). The benefit predicted at the Rangen spring cell is only 1% of the curtailed use. The other 99% of the benefit would accrue to other springs and reaches of the Snake River.

[4] The Great Rift extends north to south across the plain from the Big Lost River Valley to just west of American Falls Reservoir. The transmissivity of the Great Rift is low relative to adjacent areas of the ESPA (IDWR, 2013).

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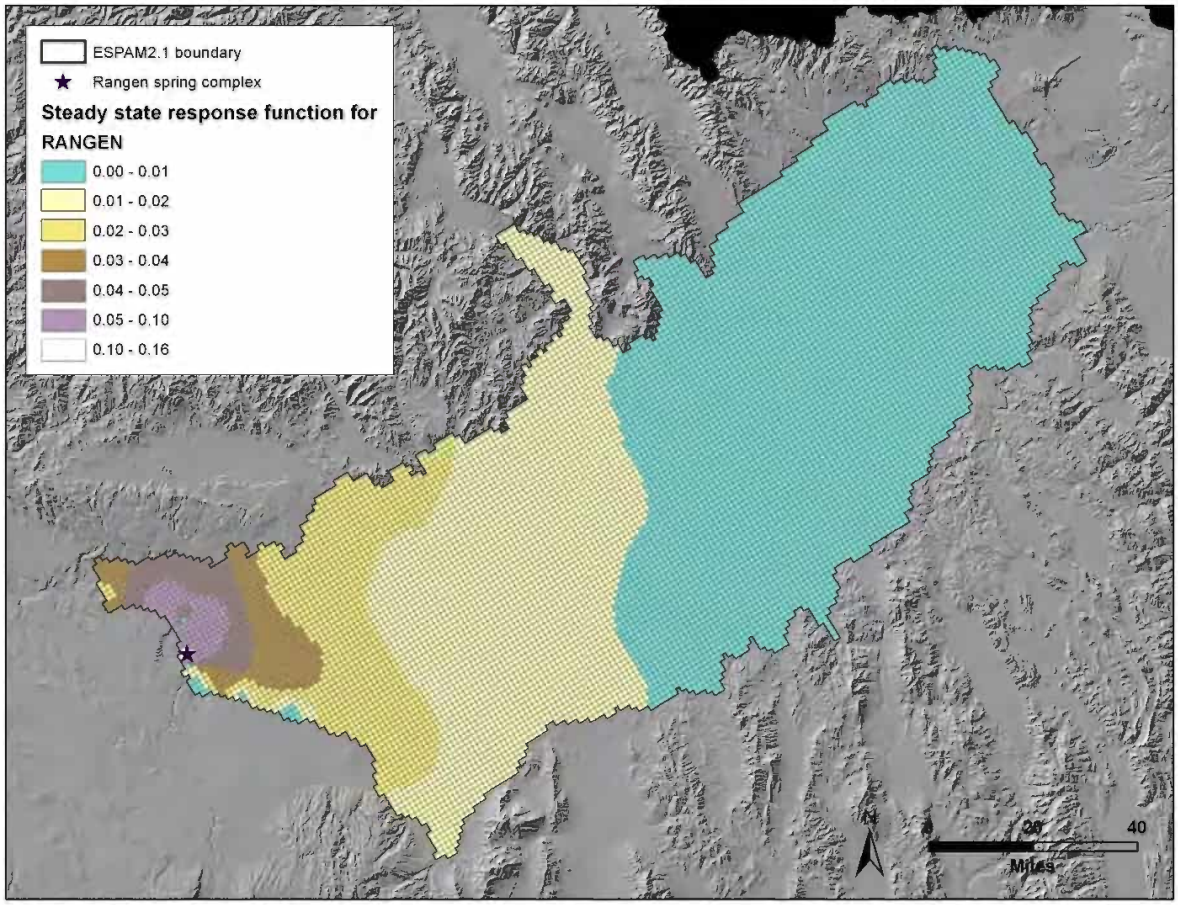

Figure 2. Steady state response functions indicating the portion of curtailed use that would accrue to the Rangen spring cell.

6. If simulation of curtailment of groundwater irrigation is limited to areas where at least 10% of the benefit is predicted to occur at the Rangen spring complex, ESPAM2.1 predicts that the benefit will be negligible (0.01 cfs).

7. If simulation of curtailment of groundwater irrigation is limited to areas where at least 5% of the benefit is predicted to occur at the Rangen spring complex, ESPAM2.1 predicts that the benefit would be 3.3 cfs. The simulated curtailment would affect approximately 12,300 acres and would increase net aquifer recharge by approximately 36,000 AF/year (49.6 cfs). Approximately 7% of the benefit would accrue to the Rangen cell, the other 93% would accrue to other springs and river reaches.

8. If simulation of curtailment of groundwater irrigation is limited to areas within the area of common groundwater supply where at least 10% of the benefit is predicted to occur at springs within the Buhl to Lower Salmon Falls reach, ESPAM2.1 predicts reach gains in the Buhl to Lower Salmon Falls reach would increase by 198 cfs and spring discharge at the Rangen cell would

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increase by 14.7 cfs. The simulated curtailment would affect approximately 169,000 acres and would increase net aquifer recharge by approximately 419,000 AF/year (578 cfs). Approximately 34% of the curtailed use would benefit the Buhl to Lower Salmon Falls reach, and approximately 2.5% would benefit the Rangen cell.

9. ESPAM2.1 was calibrated to total discharge at the Rangen spring cell, and is not capable of predicting the effects of curtailment on Curren Tunnel discharge and other spring discharge separately. If there is a need to predict the effects of curtailment on tunnel discharge, IDWR staff recommend using the slope of the linear regression of tunnel discharge with total spring complex discharge. This method indicates that the response at the tunnel will be 70% of the total response (i.e., the predicted response at the tunnel would be 12.5 cfs for model-wide curtailment, 11.9 cfs for the area of common groundwater supply, 2.3 cfs for a 5% trimline, and negligible for a 10% trimline).

Model uncertainty

1. The ESPAM2.1 predicted responses to curtailment at the Rangen spring complex and the Buhl to Lower Salmon Falls spring reach are the best available predictions. Because of predictive uncertainty associated with using the model, the actual response may be lower or higher than the prediction. Predictive uncertainty was evaluated by Wylie (2012a). Model uncertainty was evaluated Contor (2012a, 2012b), and Brendecke (2012).

2. Wylie (2012a) evaluated the uncertainty of the ESPAM2.1 calibration with respect to predictive uncertainty at the Clear Lakes spring cell. None of the analyses involving Clear Lakes resulted in significant uncertainty.

3. The ESPAM2.1 calibration procedure allowed adjustment of several components of the water budget (including evapotranspiration, tributary underflow, recharge on non-irrigated lands, canal seepage, and non-Snake River seepage) within ranges of uncertainty determined by the ESHMC. The IDWR predictive uncertainty analysis (Wylie, 2012a) incorporated the impact of uncertainty associated with these components of the water budget on predictive uncertainty.

4. Contor (2012a) concluded that model uncertainty is at least 17%, based on uncertainty of the water budget input data. IDWR staff note that not all sources of uncertainty significantly impact every prediction. This is illustrated by the IDWR predictive uncertainty analysis (Wylie, 2012a), which incorporated the uncertainty associated with many of the components of the water budget and indicated that predictive uncertainty is low with respect to the response at the Clear Lakes spring cell. Further, a 17% increase or decrease (as suggested by Contor, 2012a) in the predicted response to curtailment at the Rangen spring complex would only be a change of 3 cfs (i.e. 17.9 cfs $\pm$ 17% would be a range of 14.9 to 20.9 cfs).

5. Brendecke (2012) evaluated conceptual model uncertainty by developing two alternative models that he asserts better represent local conditions in the vicinity of the Rangen spring cell. IDWR staff simulated a model-wide curtailment with these models and found that the models

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predicted responses of 18.5 cfs and 18.0 cfs at the Rangen spring cell. These responses are less than 0.6 cfs different from the response of 17.9 cfs predicted by ESPAM2.1.

6. IDWR staff also used Dr. Brendecke's alternative conceptual model to simulate the response to curtailment within the four mile square area located within a 10% trimline defined using ESPAM2.1 predictions of responses at the Rangen spring cell. The response to this curtailment simulation was a negligible amount of water (0.01 cfs) using both alternative models and ESPAM2.1.

7. The evaluations of model uncertainty performed by Contor (2012a, 2012b) and Brendecke (2012) have not been subjected to peer review by the ESHMC, and IDWR staff disagree with some of the methods used and conclusions drawn by these parties.

8. The evaluations performed by IDWR and the parties' experts are partial evaluations of model uncertainty and do not fully explore or quantify all aspects of model uncertainty. These evaluations do not contradict IDWR's conclusion that ESPAM2.1 is capable of providing a reasonable prediction of the response to groundwater pumping at the Rangen spring cell. These evaluations also do not contradict IDWR's conclusion that ESPAM2.1 is the best available scientific tool to estimate the quantity of the response.

Consideration of alternative predictive methods

1. Contor (2012a), Hinckley (2012), and Brendecke (2012) conclude that ESPAM2.1 does not include sufficient local-scale detail to be capable of providing a reasonable prediction of responses at the Rangen spring complex, but do not propose alternative methods for predicting the effects of curtailment of junior groundwater pumping at Rangen. IDWR staff considered the following alternative predictive methods.

    a. Do not predict the effects of curtailment. This alternative provides the hearing officer with no information regarding the magnitude of effects of curtailment at Rangen or other springs and river reaches, no information for delineating an area of de minimis effects, and no information regarding potential mitigation requirements or the effects of proposed mitigation plans.

    b. Use ESPAM2.1 to predict the response at springs within the Buhl to Lower Salmon Falls reach and use an inferior method to estimate the portion of the reach gains that would benefit the Rangen spring complex.

        i. Use the Covington and Weaver ratio method previously used with ESPAM1.1 to apportion discharge to the Rangen spring complex. This method results in a predicted accrual of 2.9 cfs at the Rangen spring complex in response to model-wide curtailment, and 2.4 cfs in response to curtailment within a 10% trimline for the reach. This method is inferior to using the ESPAM2.1 prediction for the Rangen spring cell, because it considers fewer data than ESPAM2.1, neglects

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regional hydrogeologic conditions that are included in ESPAM2.1, neglects the spatial distribution of aquifer recharge and discharge, and neglects the sensitivity of higher elevation springs to changes in aquifer head.

ii. Use a linear regression of Rangen spring complex discharge with reach gain to predict change in Rangen spring discharge corresponding to the modeled change in reach gain. This method results in a predicted accrual of 6.8 cfs at the Rangen spring complex in response to model-wide curtailment and 5.5 cfs in response to curtailment within a 10% trimline for the reach. This method is inferior to using the ESPAM2.1 prediction for the Rangen spring cell, because it considers fewer data than ESPAM2.1, neglects regional hydrogeologic conditions that are included in ESPAM2.1, and neglects the spatial distribution of aquifer recharge and discharge.

c. Use ESPAM2.1 to predict the response at Well 989, which is the closest head target and water level change target to the Rangen spring cell, located approximately ½ mile northeast of the Rangen spring complex. Use a linear regression of observed Rangen spring complex discharge with observed water level elevation to evaluate the response at the Rangen spring complex to change in head at Well 989. This method predicts accrual of 16.5 cfs at the Rangen spring complex in response to model-wide curtailment. This method considers nearly all of the data used by ESPAM2.1, but the correlation between Well No. 989 and Rangen spring discharge does not consider the transient response time between the two locations.

d. Use a linear regression between observed Rangen discharge and the estimated annual net recharge to the ESPA to predict the response to curtailment. This method is inferior to ESPAM2.1 because it considers far fewer data than ESPAM2.1, neglects regional hydrogeologic conditions that are included in ESPAM2.1, and neglects the spatial distribution of aquifer recharge and discharge. This method predicts a response of 16.1 cfs to a model-wide curtailment of junior groundwater irrigation.

2. ESPAM2.1, like many other groundwater models, was developed as a tool to answer questions that could not be addressed adequately with other predictive methods. The groundwater model is able to incorporate more observed data than other predictive methods, and can calibrate hydrogeologic properties that cannot be measured to best fit the observed data. ESPAM2.1 is the best developed scientific tool for predicting the effects of junior groundwater pumping on the Buhl to Lower Salmon Falls spring reach and at the Rangen spring complex.

3. Numerical models are recognized by the U.S. Geological Survey as the best approach for predicting the effects of groundwater pumping on surface-water discharge. The U.S. Geological Survey states, "*Numerical models provide the most robust approach for determining the rates, locations, and timing of streamflow depletion by wells*." (Barlow and Leake, 2012). The use of a numerical model, like ESPAM2.1, is able to account for the irregular geometry of aquifer

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boundaries, irregular geometry of rivers and spring locations, heterogeneous aquifer properties, and time-varying aquifer stresses applied at various locations within a basin. ESPAM2.1 accounts for these features within the constraints of a one-square-mile model grid, the transmissivity pilot point spacing, and one-month stress periods, which is superior to any other predictive method developed for the ESPA to date.

Adequacy of Rangen discharge measurements

1. Rangen submitted annual water measurement reports directly to IDWR from 1995 through 2009, and to Water District 36A from 2010 to 2012. IDWR has accepted these annual water measurement reports during this period of record understanding that Rangen estimates hatchery diversions or flows using fish raceway check boards as non-standard weir measuring devices.

2. Check board weirs are not considered standard measurement devices. IDWR's *Minimum Acceptable Standards for Open Channel and Closed Conduit Measuring Devices* specify that construction, installation and operation of open channel measuring devices, including contracted rectangular weirs and suppressed rectangular weirs, should follow published guidelines such as those published by the United States Bureau of Reclamation (USBR, 1997).

3. Although the raceway check boards are not considered standard measuring devices, IDWR accepts measurements using these structures at Rangen and many hatcheries in the area because IDWR's standards allow an accuracy of +/-10 percent for open channel measuring devices when compared to measurements using standard portable measuring devices. Rangen likely under-measures actual flows, but an error up to -10% is acceptable pursuant to IDWR's *Minimum Acceptable Standards for Open Channel and Closed Conduit Measuring Devices.*

4. The calibration target used for ESPAM2.1 was submitted to the ESHMC for review and comment in the fall of 2009. ESHMC members were provided the opportunity to review and comment on the proposed calibration target during development of ESPAM2.1.

5. Systematic under-measurement of discharge at the Rangen spring cell by 10% would be expected to result in slightly lower model predictions of discharge and response to curtailment at the Rangen spring cell. This would favor the groundwater users, not Rangen.

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Summary of expert reports

This section summarizes and responds to the following expert reports submitted in the Matter of Distribution for Water to Water Right Nos. 36-02551 and 36-07964, hereafter referred to as the Rangen Delivery Call.

1. Brockway, C.E., D. Colvin, and J. Brannon, 2012. *Expert Report in the Matter of Rangen, Inc. – Availability of Spring Flow and Injury to Water Rights*, prepared for Rangen, Inc., December 20, 2012.
2. Smith, C. E., 2012. *Expert Report in the Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-02551 and 36-07694*, prepared for Rangen, Inc.
3. Hinckley, B., 2012. *Rangen Groundwater Discharge and ESPAM2.1 Hydrogeologic Investigation*, prepared for Racine, Olson, Nye, Budge, and Bailey, Chartered, December 20, 2012.
4. Brendecke, C.M., 2012. *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call*, prepared for Racine, Olson, Nye, Budge, and Bailey, Chartered, December 21, 2012.
5. Rogers, T.L., 2012. *Expert Witness Report by Thomas L. Rogers, Fisheries Biologist/Fish Culturist,* prepared on behalf of the Idaho Ground Water Appropriators, Inc., December 21, 2012.
6. Church, J.S., 2012. *Expert Witness Report by John S. Church, Economist*, prepared on behalf of the Idaho Ground Water Appropriators, Inc., December 21, 2012.
7. Contor, B.A., 2012a. *Technical Report on ESPAM2.0 Modeling Issues*, prepared for Fremont Madison Irrigation District, October 1, 2012.
8. Contor, B.A., 2012b. *Supplement to Technical Report on ESPAM2.0 Modeling Issues*, prepared for Fremont Madison Irrigation District, December 13, 2012.
9. Sullivan, G.K., 2012. *Spronk Water Engineers, Inc. Expert Report in the Matter of Distribution for Water to Water Right Nos. 36-02551 and 36-07694 (Rangen, Inc.)*, prepared for the City of Pocatello, December 21, 2012.

Summary of expert reports submitted on behalf of Rangen, Inc. (Rangen)

Brockway et al. (2012) provide brief descriptions of eastern Snake Plain aquifer (ESPA) geology and hydrogeology, the historical response of the ESPA to changing water use, the history of the Rangen Hatchery, and the history of Rangen's delivery calls. The report addresses historical water availability at the Rangen Hatchery, water measurement procedures, and provides a brief discussion of alternatives Rangen has evaluated for increasing water supply. The report discusses the development of ESPAM2.1, evaluates IDWR tools developed for simulating curtailment of junior groundwater pumping with ESPAM2.1, and evaluates the algorithm used to represent spring discharge in ESPAM2.1. The report also discusses incidental benefits to other water users resulting from the requested curtailment.

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Regarding adequacy of measurement, Brockway et al. (2012) state that Rangen applies a modified weir coefficient to calculate discharge from stage measured over 2-inch thick boards at the CTR raceways and Lodge Pond Dam. They state this is consistent with standard practice at aquaculture facilities.

Brockway et al. (2012) indicate that Rangen has evaluated six alternatives for increasing water supply to the hatchery. The first alternative, diverting water formerly used for agricultural irrigation, was implemented after construction of the Sandy Pipeline. The other alternatives considered included withdrawing water from vertical wells, constructing a horizontal well below the Curren Tunnel, diverting water from the Weatherby Springs/Hoagland Tunnel complex, reducing possible downward flow through existing wells upgradient of Curren Tunnel, treating and re-using hatchery tailwater. The report provides explanations for why these five alternatives are not considered feasible.

Brockway et al. (2012) present results of one modeling simulation performed using the ESPAM2.1. Input data were processed using tools and methodology developed by IDWR for simulating curtailment of groundwater irrigation. Curtailment of groundwater irrigation junior to July 13, 1962 was simulated using ESPAM2.1 in superposition mode. The simulation predicts 17.9 cfs will accrue to the Rangen spring complex at steady state, in response to curtailment of junior groundwater irrigation within the ESPAM2.1 model boundary.

Brockway et al. (2012) present correlations of the Rangen spring complex discharge with water levels measured in seven wells to demonstrate the relationship between aquifer head and spring discharge. They conclude that this analysis demonstrates that Rangen spring complex responds to regional aquifer head, and that this response supports use of ESPAM2.1 to predict responses to changes in aquifer head at the Rangen spring complex.

Brockway et al. (2012) provided sixteen statements of opinion on pages 26 and 27 of their report. Selected points are summarized in this paragraph. In their opinion, the exercise of Rangen's water rights has been impacted by junior groundwater rights, Rangen is appropriately measuring and using available spring flow, Rangen does not have feasible alternatives for increasing water flow through the hatchery via either alternative sources or reuse of hatchery tailwater, and curtailment to mitigate injury to a senior water right is not a waste of the water resource. In their opinion, ESPAM2.1 is the best available science and the IDWR tools and methodology developed for simulating curtailment are sufficient for calculating the impacts of curtailment on water levels and spring flows. Their simulation of curtailment of groundwater pumping junior to July 13, 1962 within the ESPAM2.1 model boundary resulted in a predicted steady state impact of 17.9 cfs at the Rangen spring complex. In their opinion, this prediction is the best available prediction and should not be modified or adjusted using estimates of model uncertainty.

Smith (2012) provided opinions on beneficial use of the water supply currently available to Rangen, and addressed Rangen's ability to put additional water to beneficial use. Mr. Smith visited the hatchery in July and October 2012, and stated that Rangen was using all of the available water to raise fish and conduct research. Mr. Smith stated that 20 of 20 small raceways, 21 of 30 large raceways, and 6 of 9 CTR raceways were unused because of insufficient water flow. Mr. Smith provides additional detail

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regarding Rangen's use of water to raise fish for research testing of fish feeds and for sale to Idaho Power Company. Mr. Smith states that Rangen currently orders eggs only three times per year because of low water flows, and that trout eggs must be ordered one to two years in advance. Mr. Smith states that fish production is constrained by fish loadings (lbs/gpm of water flow) and fish densities (lbs/ft^3 of space) and acknowledges that the allowable loading and density for rainbow trout currently raised for sale to Idaho Power Company are lower than required for fish sold to processors. Mr. Smith notes that Idaho Power Company pays a higher price per pound than local processors.

Mr. Smith states that water currently being used at the Rangen hatchery is of excellent quality, having optimum temperature for growth of rainbow trout (59-60° F), pH between 7.8 and 8.1, hardness of approximately 130 ppm as $CaCO_3$, and is saturated with dissolved oxygen. Mr. Smith concluded that Rangen is using all of the currently available water in a reasonable manner to raise fish, and that Rangen could raise more fish and/or conduct more research if more water was available.

Summary of expert reports submitted on behalf of Idaho Ground Water Appropriators, Inc. (IGWA)

Hinckley (2012) evaluates geology and hydrogeology in a study area encompassing Thousand Springs to Malad Gorge and the Wendell area and evaluates the ESPAM2.1 representation of this area. Mr. Hinckley concludes that ESPAM2.1 does not adequately represent the details and complexity of geologic and hydrogeologic conditions in his study area, and that there is "*considerable uncertainty in the use of the ESPAM2.1 to inform detailed hydrologic analyses of the groundwater discharges at Rangen*." Mr. Hinckley concludes that the Curren Tunnel is a horizontal flowing well that was not constructed to maximize sustainable, year-round production. Mr. Hinkley concludes that "*there are opportunities to develop substantially more robust access to quantities of groundwater to those historically measured at the Curren Tunnel*" by moving the point of diversion and constructing a vertical well above the rim in the area east of Rangen.

Brendecke (2012) discusses hydrology of the Eastern Snake Plain, water rights for the Rangen Hatchery, ESPAM development, simulation of curtailment of junior water rights, and model uncertainty. Dr. Brendecke provides 87 conclusions in Section 1.3 of his report; selected points are summarized in this paragraph. Dr. Brendecke concludes that the source for water rights 36-2551 and 36-7694 is the Martin-Curren Tunnel, which he argues meets the definition of a well, and implies that Rangen does not have a right to divert from the "*natural springs*" that have also historically supplied the hatchery. Dr. Brendecke concludes that water shortages should be evaluated with respect to historic flow in the Martin-Curren Tunnel, not historic diversions to the hatchery. Dr. Brendecke argues that ESPAM2.1 is not capable of separating the effects of groundwater pumping on flows from Martin-Curren Tunnel from other springs in the Rangen complex, and that ESPAM2.1 is not sufficiently detailed in its general formulation or its representation of hydrogeologic conditions at Rangen to be used reliably to predict effects of curtailment at Rangen. Dr. Brendecke presents two alternative calibrated models, which he asserts better reflect hydrogeologic conditions near Rangen. Dr. Brendecke claims that benefits predicted at Rangen using his alternative models are significantly less than predicted by ESPAM2.1, and

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argues these models illustrate the potential effects of conceptual model uncertainty on predicted responses at the Rangen spring complex. Although Dr. Brendecke argues that ESPAM2.1 is not sufficiently detailed to be used reliably to predict effects of curtailment at Rangen, Dr. Brendecke does not propose other tools, models, or methodology for predicting these effects. Dr. Brendecke concludes that "*application of ESPAM2.1 should at a minimum restrict curtailment to junior rights for which ESPAM2.1 predicts at least 10% of the curtailed water will accrue to Rangen*", and that any curtailment of groundwater is a waste of the water resource because the majority of the foregone use would not accrue to Rangen.

Rogers (2012) discusses fish hatchery operation, operations at the Rangen Hatchery, and hypothetical fish-rearing scenarios. Mr. Rogers notes the Rangen hatches eggs in incubators and the fry are reared in troughs until they are large enough to be moved to the small raceways. As the fish grow and approach maximum density or flow indices in the small raceways, they are transferred to the large raceways. According to Mr. Rogers, Rangen currently rears triploid (sterile) rainbow trout under contract to Idaho Power Company (IPCO). The fish are released for sport fishing. Mr. Rogers states that Rangen also continues to perform research related to fish feed, fish flesh, color development and disease, and that Rangen sells some excess rainbow trout on the spot market. Mr. Rogers states that the IPCO contract requires adherence to strict water flow and fish density guidelines, which is consistent with a conservation hatchery program because of the desire to produce good quality fish with increased ability to survive in the natural environment. Mr. Rogers also states that the IPCO contract, which requires fish be ready for release in the months of May and June, prevents Rangen from timing the production cycle to coincide with seasonal fluctuations in water flow. Mr. Rogers concludes that Rangen could raise more fish if flow and density standards, and timing of the production cycle, were not dictated by Rangen's contract with IPCO.

Rogers (2012) concludes that even with the density restraints imposed by the IPCO contract, Rangen could raise more fish with its current water flows. Mr. Rogers bases his analysis on one lot of fish reared in 2011-2012. He states that constraints on production due to water quality generally occur during final rearing, when the fish are largest in size. He also states that estimates at the end of the rearing cycle in the large raceways noted a Density Index of 0.295 and a Flow Index of 0.74, which were below the maximum levels of 0.3 and 0.8 required by the IPCO contract. Mr. Rogers also provides analyses of how many additional fish could be reared if less restrictive Density and Flow Indices were used.

Rogers (2012) offers two suggestions for maximizing water supply to the hatchery. These suggestions include pumping water from Rangen's lower diversion up to the small raceways and developing wells in the ESPA above the canyon rim.

Church (2012) discusses the economics of rearing trout for food, Rangen's grant applications under the Eastern Snake Plain Aquifer Assistance Grants program, grant applications from other spring users, and the economic impacts of curtailment of groundwater irrigation. He asserts that Rangen should have implemented some of the measures outlined in these grant applications. Mr. Church concludes, "*Clearly Rangen has not expended even a minimum effort…to more efficiently use or to augment the waters available to its facility*," and, "*it would be absurd to curtail ground water use in order to fractionally*

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increase water flows to Rangen, without first requiring Rangen to undertake efforts on its own to augment or more efficiently use its water supply by employing measures that are available and have been utilized at other aquaculture facilities."

Summary of expert reports submitted on behalf of Freemont Madison Irrigation District (FMID)

Contor (2012a) was submitted on October 1, 2012 and is based on analyses performed using ESPAM2.0. Mr. Contor states that the determination and application of a de minimis threshold is a policy question, and that a de minimis policy could be defined in terms of a threshold fraction below which propagating effects are considered de minimis, or in terms of a threshold total volume per time, below which effects are considered de minimis. Either approach could be implemented using ESPAM.

Contor (2012a) simulated benefits to the Buhl to Lower Salmon Falls reach from curtailment of groundwater irrigation on the Egin Bench using ESPAM2.0. Using ESPAM2.0, Mr. Contor predicted the cumulative benefit to the Buhl to Lower Salmon Falls reach from curtailment on the Egin Bench junior to July 13, 1962 is 1.90 AF after 150 years, or 0.04% of the curtailed volume. Contor (2012b) concludes that the differences between ESPAM2.0 and ESPAM2.1 do not appear to substantially change the model results relied upon in Contor (2012a). Mr. Contor did not submit an analysis using ESPAM2.1.

Contor (2012b) recommends that ESPAM results be applied using Administrative Reaches that are comprised of entire Calibration Reaches and are no smaller than the distance between nearby transmissivity pilot points. He asserts this will greatly reduce uncertainty (p. 7). He also recommends that administrative decisions that hinge on the timing of arrival of effects be strongly informed by both the short-term temporal performance of the model during calibration and that great caution be exercised whenever administrative outcome is sensitive to timing differences shorter than approximately four months.

Contor (2012b) provides discussions of temporal and spatial uncertainty, the effect of uncertainty, and potential sources of uncertainty. He concludes that the uncertainty arising from the water budget is likely at least 17%, and that overall uncertainty exceeds this estimate. Mr. Contor concludes that uncertainty will always decrease as questions are asked on larger spatial scales and longer cumulative time scales.

Summary of expert reports submitted on behalf of the City of Pocatello

Sullivan (2012) discusses the Rangen Hatchery facilities, water rights for the hatchery and other diversions from the Curren Tunnel, historical flow records, Rangen fish production data, and the City of Pocatello's water rights and water use.

Mr. Sullivan concludes that the Rangen facility has a capacity of slightly greater than 50 cfs, which is the combined flow rate of Rangen's 1957 and 1962 priority water rights. Mr. Sullivan notes that the decreed source of water for the Rangen water rights is the Martin-Curren Tunnel and does not include

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the spring sources below the tunnel. He concludes that it is not clear that Rangen can demand curtailment to satisfy deliveries associated with the springs below the tunnel.

Sullivan (2012) evaluates fish production data and concludes that the number of fish raised at the Rangen Hatchery is limited by density and flow indices in Rangen's contracts with Idaho Power. Mr. Sullivan suggests that Rangen could increase flow to their upper, small raceways by pumping water from above their lower diversion structure.

Mr. Sullivan identifies City of Pocatello water rights junior to July 13, 1962 that are within the current area of common groundwater supply and analyzes the effect of curtailment of these water rights on Rangen spring complex discharge using ESPAM2.1 response functions. His analysis indicates that the steady state response to curtailment of approximately 3,200 AF/yr would be 13.7 AF/yr (0.019 cfs) at the Rangen spring cell.

IDWR staff comments regarding expert reports

IDWR staff comments regarding expert reports submitted on behalf of Rangen

On page 5, Brockway et al. (2012) state, "*USGS records for Curren Tunnel indicate 50 cfs in 1902 and 96 cfs in 1917*", citing Nace et al. (1958) as a reference. IDWR staff disagrees with this statement. Published records referenced by Nace suggest that these are measurements of the flow in Billingsley Creek and may include discharge from other springs tributary to Billingsley Creek downstream from Curren Spring. Published records do not suggest these records represent the discharge from Curren Tunnel as stated by Brockway et al. (2012).

Nace et al. (1958) provided a compilation of historic spring measurements published by the USGS and the State of Idaho. In April 1902, J.D. Stannard measured and estimated seepage at 119 locations along the Snake River for the Idaho State Engineer. These measurements were first published by Ross (1902) and were referenced by Nace et al. (1958). In April 1902, Mr. Stannard measured 54.4 cfs in Billingsley Creek at a location described as "*4 miles below Salmon Falls*". Nace et al. (1958) states that the location of the measured section is not accurately determinable. In IDWR's opinion, it cannot be conclusively determined from the published information whether this measurement represents the discharge of only the Rangen spring complex, or includes contributions from other springs to Billingsley Creek. Because the Rangen spring complex is located approximately 2.5 miles east-northeast of Upper Salmon Falls and the mouth of Billingsley Creek is about 4.5 miles south of Upper Salmon Falls, it seems more likely that Stannard's measurement includes discharge from the Rangen spring complex and other springs tributary to Billingsley Creek.

The location of the 1917 measurement cited by Brockway et al. (2012) is also uncertain. Nace et al. (1958) cite USGS (1921), Meinzer (1927), and Stearns et al. (1938) as references for a 91.8 cfs measurement in September 1917. These three sources describe a measurement of Kearns Springs located in Section 36, Township 7 South, Range 13 East by the Twin Falls North Side Land and Water

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Company. Nace et al. (1958) state that Kearns was probably a misunderstanding of a vocal reference to Curran Spring and believe this measurement likely applies to Curran Spring. However, IDWR staff note the location described by USGS (1921), Meinzer (1927), and Stearns et al. (1938) is consistent with Billingsley Creek near the Vader Grade road, and the measurement may or may not include discharge from Spring Creek Spring.

On page 14, Brockway et al. (2012) state, "*ESPAM2.1 utilizes the MODFLOW Drain Package to represent 90 spring discharges from the aquifer*…" IDWR staff note that although ESPAM2.1 has 90 drains, many of the spring discharge targets used in model calibration are represented by two, three, or four drains located in one or two model cells. ESPAM2.1 represents spring discharge at 50 spring complexes or groups of springs. Fourteen of these had transient calibration targets (Group A & B springs), and 36 had a single, average calibration target. Individual drains do not explicitly represent a particular discharge point within a given spring complex.

On pages 21-23, Brockway et al. (2012) present results from a steady state ESPAM2.1 simulation of curtailment of groundwater irrigation within the model boundary junior to July 13, 1962. Their analysis predicts a benefit of 17.9 cfs at the Rangen spring complex. Their report states that curtailment results in "*a decrease in ESPA depletion of 1,456,405 acre feet per year*," but their model files indicate that the modeled stress was actually 1.24 MAF/year. This may be the result of misinterpreting the MKMOD output table values for "*total pumping*", which includes water that seeps back into the ESPA and is not equal to the net stress. The net stress is equal to the crop irrigation requirement, which is listed in the MKMOD output table as "*CIR*".

IDWR staff performed a steady state model simulation of the same curtailment to verify the results presented by Brockway et al. (2012). The IDWR analysis was performed using methodology described in Sukow (2012a, 2012b). IDWR's analysis predicts that curtailment within the model boundary will result in a 1.24 MAF/year reduction in depletions to the ESPA, while curtailing irrigation on approximately 565,000 acres. At steady state, this will result in a corresponding increase in gains to the Snake River and springs of 1,705 cfs, with 416 cfs predicted to accrue to springs and reach gains below Milner, 242 cfs predicted to accrue to the Buhl to Lower Salmon Falls reach, and 17.9 cfs predicted to accrue at the Rangen spring complex. IDWR's results are consistent with those presented in Dr. Brockway's Table 2, except for the totals presented at the bottom of his table, which are not consistent with his model files. Results of IDWR's analysis are provided in Attachment A.

It should be noted that the curtailment analysis performed by Brockway et al. (2012) includes curtailment in areas currently outside the area of common groundwater supply as defined by IDAPA 37.03.11.050. If the curtailment simulation is limited to the current area of common groundwater supply, curtailment is reduced to approximately 479,000 acres and the reduction in depletions to the ESPA is 1.09 MAF/year. At steady state, this will result in a corresponding increase in gains to the Snake River and springs of 1,509 cfs, with 392 cfs predicted to accrue to springs and reach gains below Milner, 229 cfs predicted to accrue to the Buhl to Lower Salmon Falls reach, and 16.9 cfs predicted to accrue at Rangen Spring. Results of IDWR's analysis are provided in Attachment A.

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On pages 25-26 and in Appendix C, Brockway et al. (2012) discuss the development of relationships between groundwater levels and discharge at the Rangen spring complex as an alternative method. Dr. Brockway states that regression analyses indicate that over 88% of the variability in Rangen spring discharge can be explained by the water level variability in a predictor well. IDWR staff note that this approach generally appears to be valid, but that use of ESPAM2.1 or another method would still be required to predict the change in water level in the predictor well in response to curtailment.

IDWR staff agree with Brockway et al. (2012) that ESPAM2.1 is the best available science for predicting the response at Rangen Spring to curtailment of groundwater irrigation on the Eastern Snake Plain. IDWR staff also agree that measures of specific components of model uncertainty (uncertainty in model input data, uncertainty in measured observations used as calibration targets, uncertainty in calibrated aquifer parameters) are not equivalent to the uncertainty of a specific model prediction. Predictive uncertainty, as shown in Wylie (2012a), varies with the locations of stresses and responses and cannot be assigned a single numeric value. Regardless of the numeric value of uncertainty, the ESPAM2.1 prediction is currently the best available and most unbiased prediction.

IDWR staff comments regarding expert reports submitted on behalf of IGWA

On page 22 and Figure 12, Mr. Hinckley discusses a schematic MODFLOW model comparison developed by AMEC that is intended to illustrate the potential increase in discharge resulting from construction of Curren Tunnel. IDWR staff note that this model assumes there are no outlets for spring discharge other than the tunnel and thus does not illustrate the potential increase in total discharge to the Rangen spring complex. The lack of an alternative outlet for groundwater in the AMEC model is acknowledged by Mr. Hinckley on page 22.

On page 22, Hinckley (2012) states, "*The outlet elevation of Curren Tunnel has been variously reported as 3138 ft. (Covington and Weaver, 1990), 3145 ft. (Farmer, 2009) and 3150 ft. (IDWR, 2011).*" IDWR staff disagree with part of this statement. Covington and Weaver (1990) mapped "*Rangen Spring*" emerging from Malad Basalt pillow lava facies at an elevation of 3,138 feet, but did not suggest that this elevation represented the tunnel.

On page 24, Hinckley (2012) states, "*Farmer (2009) also rejects a multiple-pathways-through-the-talus interpretation…*" IDWR staff note that Farmer (2009) stated, "*One theory posed is that the actual spring discharge elevation from in-situ geology may be higher than where the spring is visible on the slope due the concept of water flowing out of the in-situ layer (buried beneath the slope material) and then flowing downward through talus and overburden slopes vertically in the subsurface, then flowing laterally again to where it daylights or is visible on the hillside. In my opinion, this phenomenon doesn't occur at Rangen or other springs north of Rangen up to Malad Gorge to as great of a degree as other upriver springs such as Crystal or Clear Springs because of the presence of the GFF in this reach and less overburden and talus*." Mr. Farmer did not reject the possibility of discharge pathways through the talus. He stated that he believes it is not as significant at Rangen spring as at Crystal or Clear Springs. IDWR staff agree that Mr. Farmer identifies two discrete geologic contacts that may control a substantial portion of the discharge to the Rangen spring complex (see Figure 24 in Farmer, 2009), but IDWR staff note that this is

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a conceptual model that is intended to describe apparent major pathways for spring discharge, not all potential pathways for discharge.

On pages 26-27 and Figure 16, Hinckley (2012) criticizes the groundwater elevation contours published in Farmer and Blew (2012), and provides an alternative interpretation of groundwater elevation contours in an approximately 3.5 square mile area adjacent to the Rangen spring complex. The Farmer and Blew (2012) elevation contours were compiled based on water levels measured in 196 wells and 39 springs during November 2011. Mr. Hinckley contoured groundwater elevations in a smaller area based on 18 water level measurements. Mr. Hinckley removed three measurements from the Farmer and Blew dataset and added three measurements taken during different time periods. The measurements collected by Mr. Hinckley included a measurement from November 2007, from well T7S R14E 28DCB1. Measurements collected from the same well in October 2008 and February 2010 indicate water levels 9 to 12.5 feet lower than the November 2007 measurement selected by Mr. Hinckley. IDWR staff disagree with Mr. Hinckley's use of any measurements from well T7S R14E 28DCB1, because none of the measurements are representative of conditions during the November 2011 mass measurement.

Farmer and Blew (2012) contoured groundwater elevations with Surfer software using the Kriging option. This procedure has the advantage of being objective, and does not represent details that are not explicitly defined by the available data. Mr. Hinckley appears to have contoured groundwater elevations using Kriging, then manually adjusted some of the contours based on professional judgement and his interpretation of local conditions. This procedure has the advantage of incorporating geologic knowledge, but also has the disadvantage of incorporating bias based on interpretations that may not accurately reflect the complexity of local conditions. For example, Mr. Hinckley argues on page 26, "*the contouring* [of Farmer and Blew, 2012] *includes a closed contour approximately 1 mile northeast of Rangen. This represents a depression in the potentiometric surface, an unlikely occurrence in a prolific aquifer outside the active irrigation season*." IDWR staff note that the November 2011 synoptic measurement occurred shortly after the end of the irrigation season and that residual transient effects of irrigation well pumping and recharge from surface water irrigation activities may still have resulted in local water level variations, such as depressions or mounds in the potentiometric surface.

On page 27, Mr. Hinckley concludes based on his Figure 16, "*A groundwater divide to the south distinguishes the local Rangen system from the Thousand Springs area. A groundwater divide to the north distinguishes the local Rangen system from rim springs between Rangen and the Malad River*." IDWR staff are unclear what Mr. Hinckley means by "*distinguishes from*" or why Mr. Hinckley believes the existence of these local groundwater divides is significant. Groundwater divides are relevant in controlling contaminant transport, but do not result in hydraulic disconnection nor prevent responses to aquifer stress such as recharge or pumping. Well pumping results in drawdown that propagates radially in all directions (Figure 3). In a finite aquifer without unlimited recharge, drawdown will occur throughout the aquifer. The reduction in aquifer head will be largest near the well and may be very small in distant parts of the aquifer. A groundwater divide is not a hydraulic disconnection, unless caused by a continuous impermeable barrier. A stress applied on one side of a groundwater divide will affect aquifer heads on the other side of the divide and may affect the presence or location of a groundwater divide, which may change seasonally with changes in aquifer stresses. While Hinckley

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(2012) and Farmer and Blew (2012) provide different interpretations of head contours in this area, the presence or absence of these groundwater divides is not relevant to the hydraulic connectivity of the Rangen spring complex to the larger ESPA. As shown in Hinckley (2012) Figure 7, the area contoured in his Figure 16 extends less than two miles from the rim. The extent of the groundwater divides shown by Mr. Hinckley is small relative to the area contoured by Farmer and Blew (2012). Regardless of the precise details of preferred flow pathways and direction in the immediate vicinity of the rim, spring discharge responds to head in the aquifer, and head in the aquifer responds to stresses applied throughout the aquifer.

On page 27, Hinckley (2012) states, "*Groundwater gradients also determine the discharge rates of springs and drainage tunnels. Given an opportunity for discharge, discharge rate is a function of the gradient*." IDWR staff note that this is only partially true, the discharge rate is the product of the gradient and the conductance of the feature (spring or tunnel) at which the discharge occurs. A site with a low gradient may have high discharge if conductance is high, conversely a site with a high gradient may have low discharge if conductance is low. Because spring conductance is a lumped parameter that incorporates all of the head loss between the drain and the point where aquifer head is known or modeled, values for conductance vary over a large range. Conductance depends on the characteristics of the convergent flow pattern toward the drain, as well as on the characteristics of the drain and its immediate environment (Harbaugh, 2005; McDonald and Harbaugh, 1988). Conductance may be influenced by flow turbulence, the size of the drain feature, the size and interconnectivity of fractures or pore spaces, and other physical properties that are difficult or impossible to measure. Because of the number of factors that influence conductance, and the large natural variability in each of these factors, the large range in drain conductance modeled by ESPAM2.1 is realistic.

On page 27 and Figure 17, Hinckley (2012) presents the relationship between discharge of the Rangen spring complex and groundwater level measurements collected in a domestic well (07S 14E33 BBB1) located approximately one mile east-northeast of the Rangen spring complex. Water level measurements from this well were collected approximately bi-monthly by the USGS from 1985 to 2009, and by IDWR beginning in 2009. Mr. Hinckley asserts there is considerable uncertainty in the relationship between aquifer head and spring discharge. IDWR staff disagree, because Mr. Hinckley is not comparing spring discharge with aquifer head immediately adjacent to the spring complex his analysis ignores other factors, such as localized water level responses to nearby pumping wells or recharge sources, potential measurement error in both water level and spring discharge, and transient timing of responses to stress. Figure 4 shows a time-series graph of water level in well 07S 14E BBB1 and discharge at the Rangen spring complex. Figure 5 shows a graph of the relationship between measured water level and spring discharge. Note that much of the scatter discussed by Mr. Hinckley is associated with points in Figure 5 that appear to be outliers occurring when water levels above 3,166 feet were measured in mid-summer. These spikes in the water level measurements suggest that the well is responding to changes in nearby stresses. Changes in aquifer head immediately adjacent to the spring complex will be a function of the transient response time to these and other aquifer stresses.

On page 28 and Figure 18, Hinckley (2012) presents the relationship between discharge of the Curren Tunnel and groundwater level measurements collected in a monitoring well located approximately 600

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feet east of the Rangen spring complex. The monitoring well was installed by the Idaho Water Resource Board (IWRB) in 2008, and daily water level measurements were collected by IDWR beginning in October 2009. In Figure 18, Mr. Hinkley compares daily measurements of water level and Curren Tunnel discharge. Mr. Hinkley asserts that this relationship indicates there is considerable uncertainty in the relationship between aquifer head and Curren Tunnel discharge, again ignoring potential measurement error and transient timing of spring responses to aquifer stresses. Further, linear regression of this relationship (Figure 6) indicates that 85% of the variability in the tunnel discharge during this 3-year period can be explained by a linear relationship with head in the monitoring well (Figure 5). Because the monitoring well was not installed until 2008, these data do not provide sufficient information to evaluate the response to water level changes that would be expected to occur if the aquifer water budget was changed by a model-wide curtailment of groundwater irrigation junior to 1962.

A more representative comparison of aquifer head and Rangen spring complex discharge would be comparison with IDWR Well No. 989, which is located approximately ½ mile northeast of the Rangen spring complex. This well is closer to the Rangen spring complex than well 07S 14E 33 BBB1 and has a longer record of water level measurements than the IWRB monitoring well. Well No. 989 has a record of 68 water level measurements collected between March 1998 and October 2008, representing a broader range of aquifer water budget conditions than the IWRB monitoring well. Well No. 989 was also used as a water level change calibration target in ESPAM2.1 (Figure 7). Comparison of measured water levels with spring discharge indicates that linear regression explains approximately 91% of the variability in the relationship between aquifer head at this location and discharge at the Rangen spring (Figure 8). These data indicate that there is a strong relationship between the change in discharge at the Rangen spring complex and change in aquifer head at the location of Well No. 989, with the discharge increasing by approximately 3.7 cfs per foot of increase in head.

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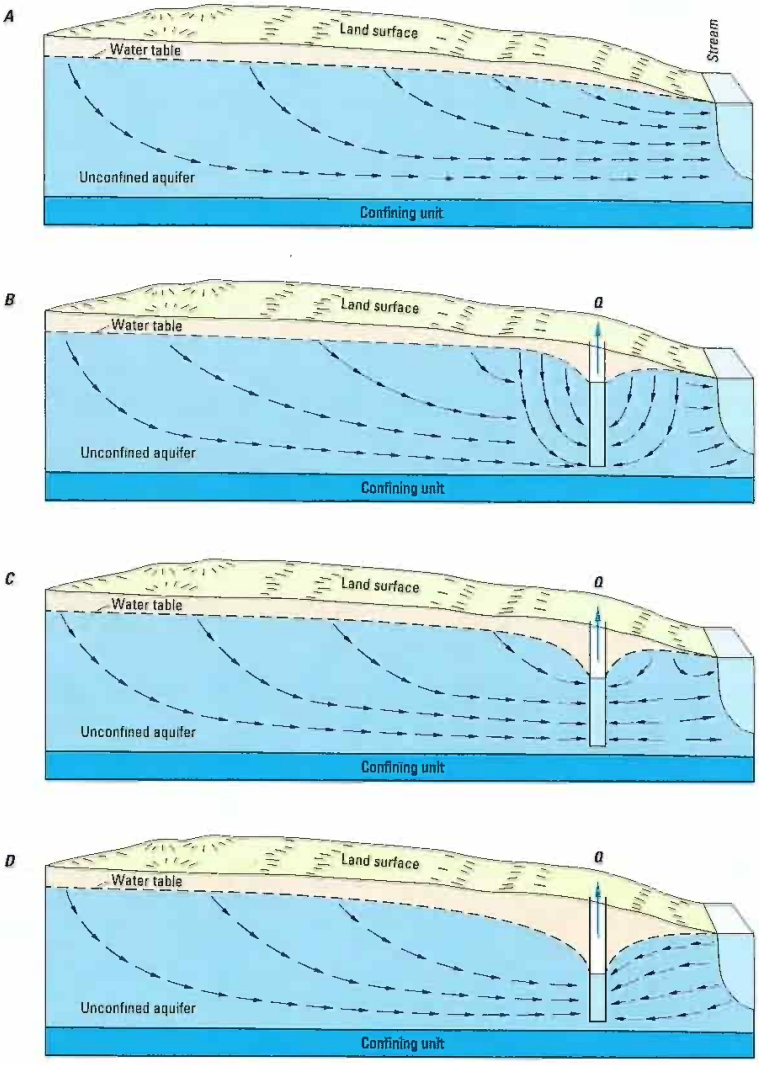

Figure 7. Effects of pumping from a hypothetical water-table aquifer that discharges to a stream. *A*, Under natural conditions, recharge at the water table is equal to discharge at the stream. *B*, Soon after pumping begins, all of the water pumped by the well is derived from water released from groundwater storage. *C*, As the cone of depression expands outward from the well, the well begins to capture groundwater that would otherwise have discharged to the stream. *D*, In some circumstances, the pumping rate of the well may be large enough to cause water to flow from the stream to the aquifer, a process called induced infiltration of streamflow. Streamflow depletion is equal to the sum of captured groundwater discharge and induced infiltration (modified from Heath, 1983; Alley and others, 1999). [*Q*, pumping rate at well]

Figure 3. Effects of well pumping on aquifer head and surface water discharge (from Barlow and Leake, 2012).

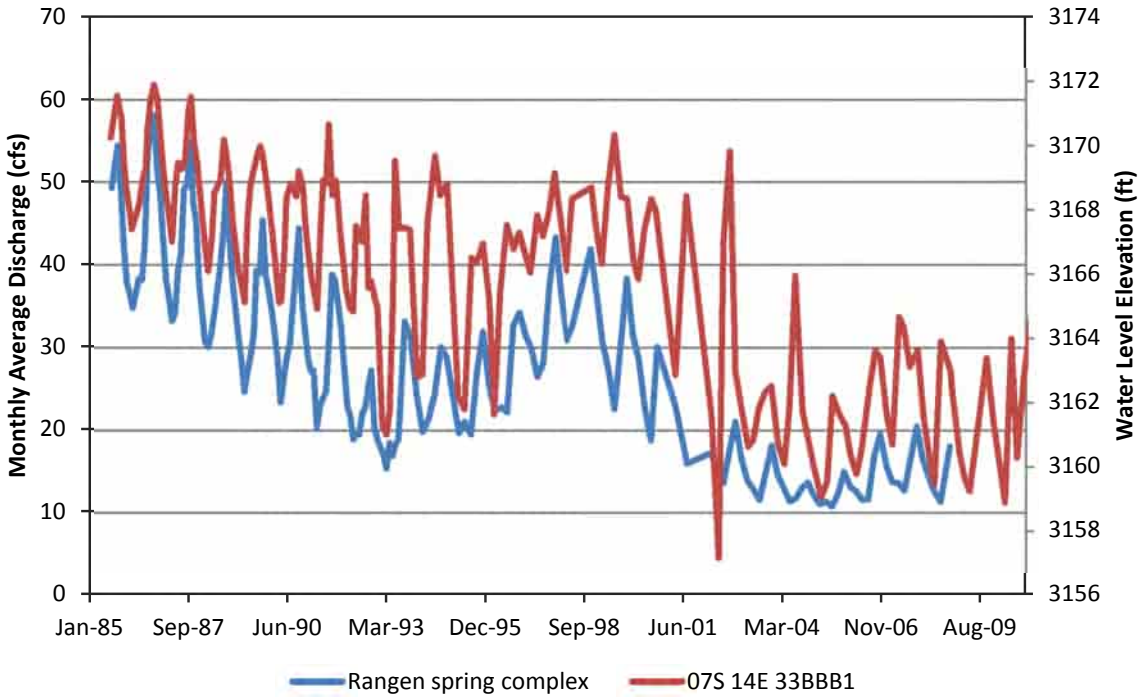

Figure 4. Measured water level in well 07S 14E 33 BBB1 and monthly average discharge at Rangen spring complex.

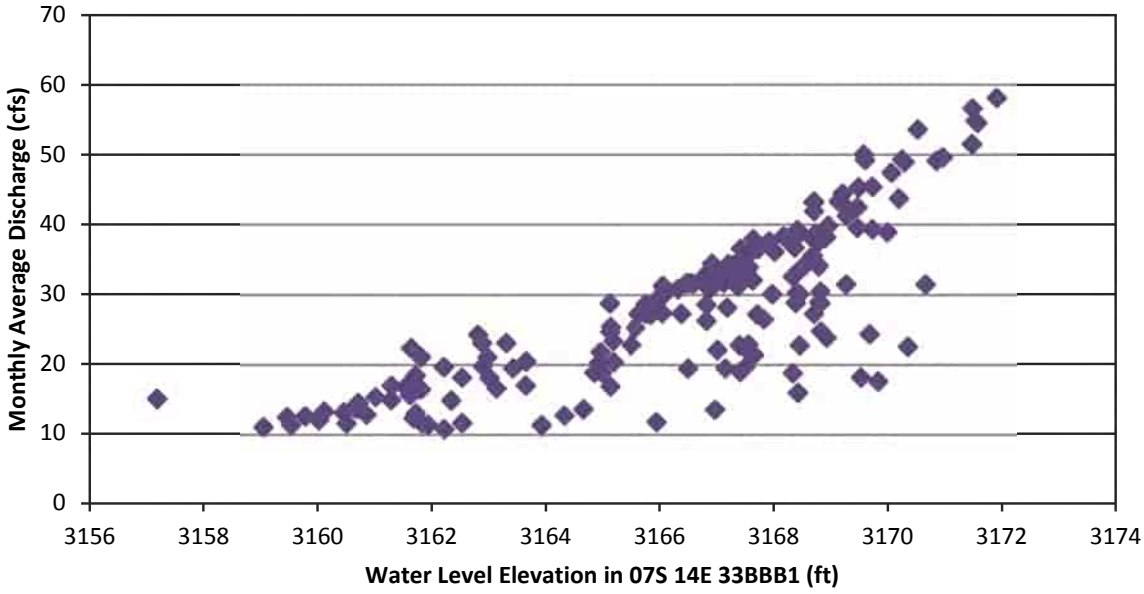

Figure 5. Relationship between measured water level in well 07S 14E 33 BBB1 and monthly average discharge at Rangen spring complex.

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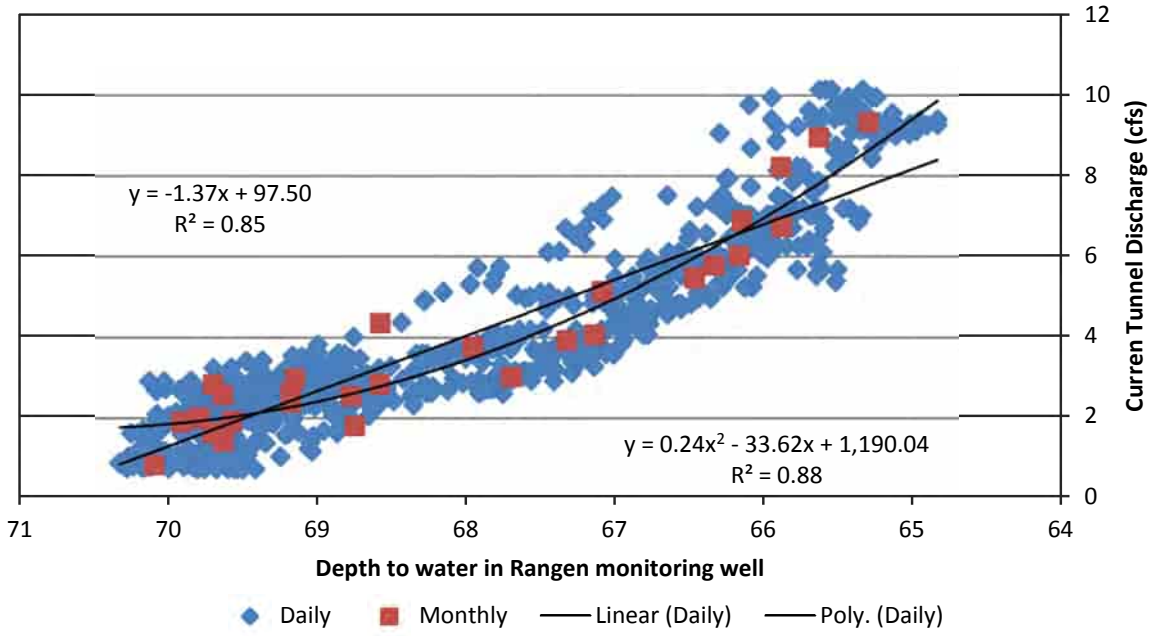

Figure 6. Relationship between Curren Tunnel discharge and water level in Rangen monitoring well, August 2008 to January 2012.

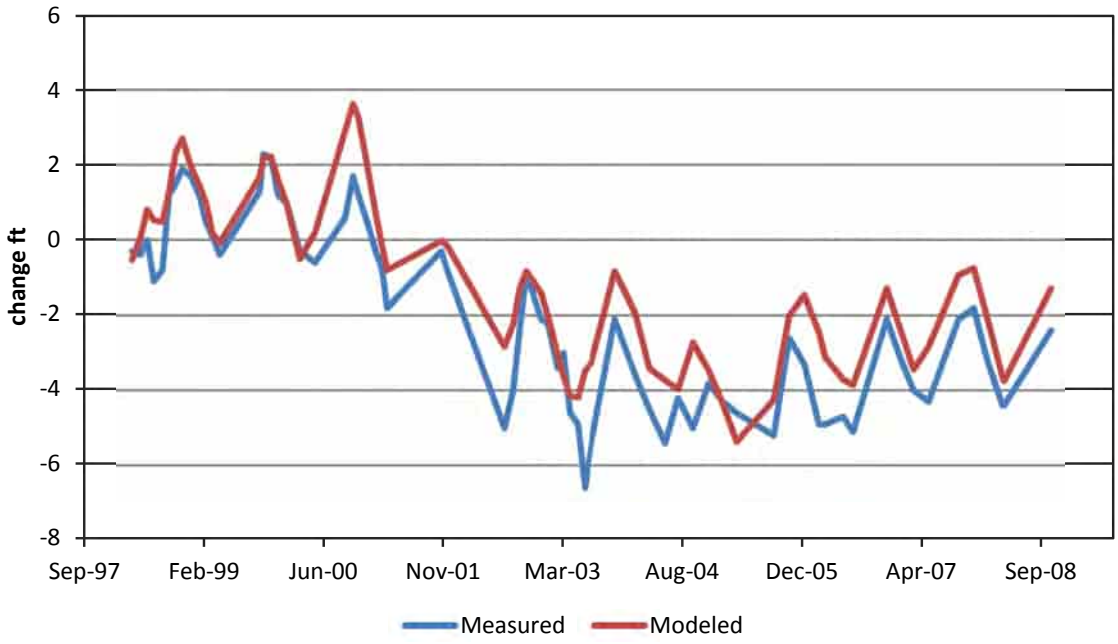

Figure 7. ESPAM2.1 calibration to water level change in IDWR Well No. 989.

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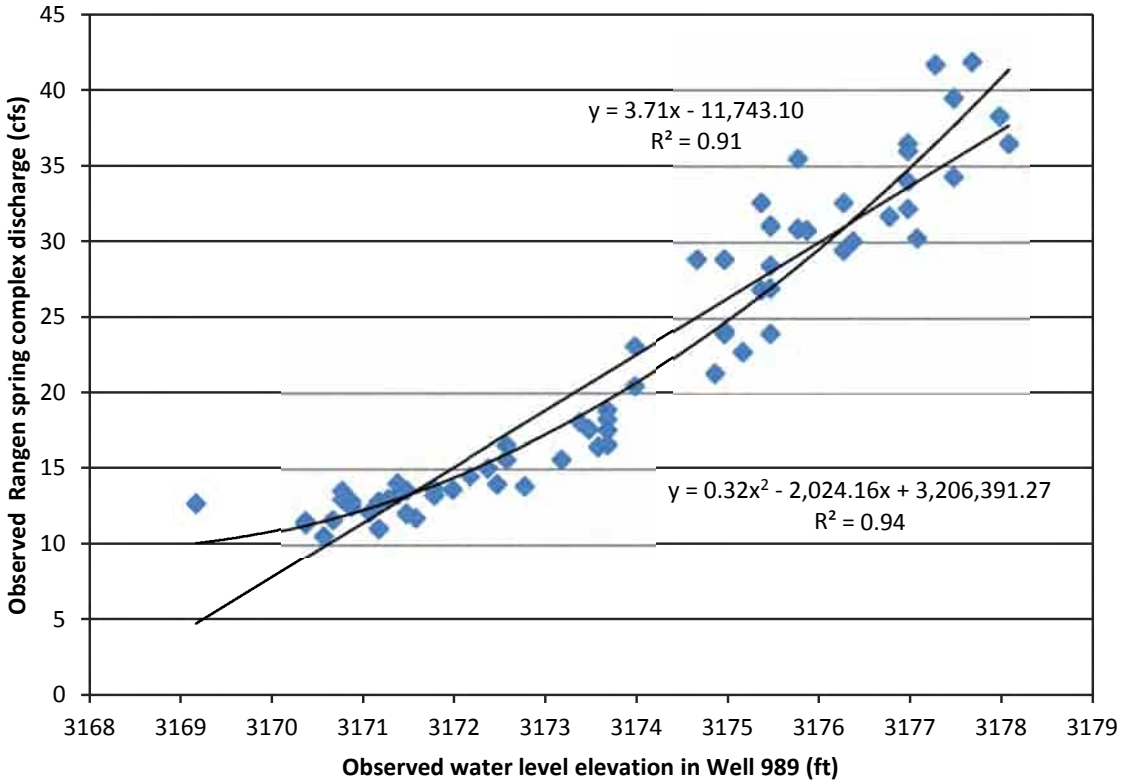

Figure 8. Relationship between Rangen spring complex discharge and aquifer head at IDWR Well No. 989.

On pages 30-45, Mr. Hinckley evaluates the ESPAM2.1 representation of the area between Thousand Springs and Malad. IDWR staff agree with some of Mr. Hinkley's points, but disagree with his conclusion that ESPAM2.1 cannot provide a reasonable prediction of the response at the Rangen spring cell to groundwater pumping in the ESPA. Because ESPAM2.1 is discretized into one-square-mile grid cells, it does not represent detailed topographic and geologic features that are smaller than one-mile in scale. However, ESPAM2.1 does represent regional topography and hydrogeologic features within the constraints of the one-square-mile model grid and the spacing of transmissivity pilot points, which is generally two to four miles in the vicinity of the Buhl to Lower Salmon Falls reach. This provides a better representation of the spatial and hydrogeologic relationships than is available in any other predictive model or method available for evaluating the effects of groundwater pumping within the ESPA on spring and river flows. On a local scale it is not possible to model the complexity of the aquifer with one-square-mile grid cells, however, on a regional scale, the response of head-dependent discharges to springs and rivers is dependent on aquifer head responses to recharge and well withdrawals. This allows responses to regional-scale stresses, such as groundwater pumping throughout the plain to be modeled with less uncertainty than responses to stresses applied in a small area located immediately adjacent to the spring or river.

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IDWR staff agree with Mr. Hinckley that ESPAM2.1 is a linear approximation of a non-linear system, and does not reflect non-linear relationships between aquifer head and spring discharge. IDWR staff note that comparison of aquifer head and discharge (Figures 6 and 8) indicate that a linear regression does provide a reasonable approximation of the relationship, explaining 85 to 91% of the variability in these examples. Non-linear, polynomial regressions of these data only improve this correlation slightly, explaining only an additional 3% of the variability.

As stated by Mr. Hinckley, the model does not allow transmissivity to vary with time. Time-constant transmissivity models of unconfined systems are common in practice, because calibrating models with variable transmissivity is generally not feasible with automated parameter adjustment. Although IDWR staff agree that ESPAM2.1 is a linear approximation of a non-linear system and that this contributes to model uncertainty, IDWR staff do not agree with Mr. Hinckley's conclusion that ESPAM2.1 is not suitable for evaluating the response to aquifer stresses at the Rangen spring cell. ESPAM2.1 is the best available scientific tool for predicting responses to curtailment of groundwater pumping or other changes in regional aquifer stresses within the ESPA. The model was calibrated to spring and river responses to a range of aquifer stresses applied over a 23.5-year period, with net aquifer recharge ranging from 3.2 MAF/year to 6.3 MAF/year and measured discharge at the Rangen spring complex ranging from 11 to 58 cfs. The model calibration targets reflect geologic controls on hydrologic responses to a range of aquifer stresses. ESPAM2.1 provided reasonable approximations of measured discharge at the Rangen spring complex within this range of stresses and responses, and is expected to provide a reasonable approximation of the response to curtailment, which falls within the range of the calibration data set.

On pages 40-41, Hinckley argues, "*ESPAM2.1 is structurally incapable of modeling the relationships shown on Figures 17 and 18. Figure 28, for example, presents the data of Figure 18, expressed as deviations from an ideal linear model as required by ESPAM2.1. The average error in the predicted discharge is 20% of the average discharge, and deviations as large as 50% are not uncommon. Because Figure 28 uses well-measured, paired daily data (e.g. rather than monthly averages), and because the monitor well and discharge points are in near proximity, the relationship presented should be well controlled with respect to data-collection and location based errors.*" IDWR staff disagrees with these statements. The IWRB well referred to by Mr. Hinckley in Figure 28 is located approximately 600 feet from the Rangen spring complex. His comparison of paired daily data ignores transient timing of spring responses to changes in aquifer head, magnifies the impact of measurement error, and results in overestimation of deviations from a linear relationship. Because ESPAM2.1 calculates discharge at the Rangen spring complex to aquifer head at the Rangen spring complex, it is not appropriate to quantify deviations from linearity based on comparisons with aquifer head at a well any distance from the spring complex. As shown in Figure 6, a linear relationship explains approximately 85% of the variability between Curren Tunnel discharge and aquifer head at the IWRB well. Transient response time, measurement error, and physical non-linearity are factors in the other 15% of the variability. It is not appropriate for Mr. Hinckley to attribute all of the variability to physical non-linearity.

On page 42, Hinckley (2012) argues that the use of general head boundaries along the Hagerman rim effectively reverses the removal of the Hagerman Valley from the ESPAM2.1 model domain. IDWR staff disagree with this statement. The general head boundaries were added along the Hagerman rim to

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allow discharge from the ESPA to Billingsley Creek and/or the Snake River via one of several pathways that may include talus flow that does not daylight as spring discharge, discharge from the ESPA to Tertiary sediments to Billingsley Creek, or discharge from the ESPA to Tertiary basalts to the Snake River as conceptualized by Farmer, 2009 (Figure 9). The general head boundaries were added to provide an outlet for ESPA discharge that reaches Billingsley Creek or the Snake River without surfacing as springs. This does not reverse the removal of the Hagerman Valley from the ESPAM2.1 model domain, because there is no modeled aquifer recharge or discharge occurring in the Hagerman Valley, and elevations of the general head boundary were selected to be low enough that there was not any flux modeled from the Snake River into the ESPA in the reaches below Milner.

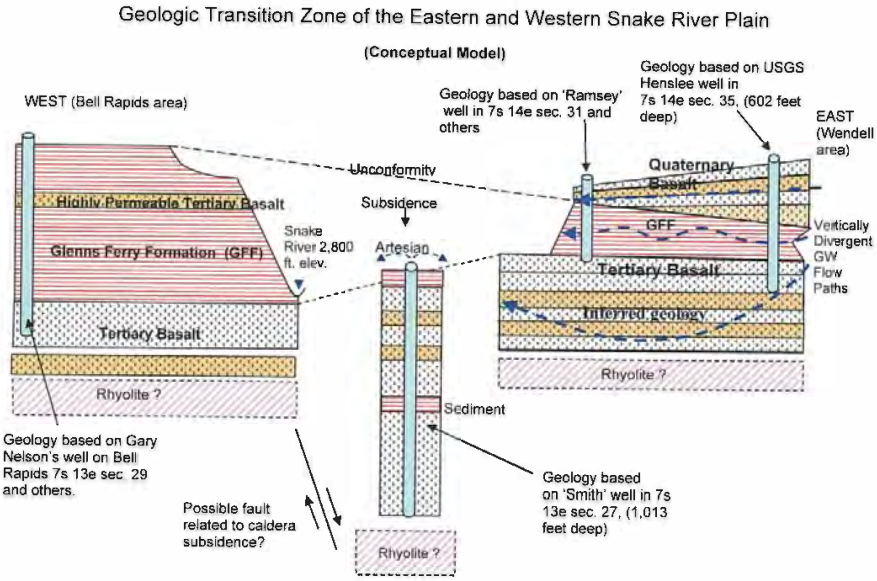

Figure 20. Conceptual model of Hagerman Valley (not to scale).

Figure 9. Farmer (2009) conceptualization of potential groundwater flow from ESPA to Tertiary sediments and basalts.

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The locations of general head boundaries used to model base flow below Milner were discussed by the ESHMC, including Dr. Brendecke on December 12, 2011 and the committee agreed that a general head boundary "*would be assigned to cells with springs that butt against the river, and for cells along the edge of the Hagerman Valley*" (Raymondi, 2011). IDWR staff note that the analyses submitted by Leonard Rice Engineers, Inc. with Rangen's December 13, 2011 Petition for Delivery Call was performed using a preliminary calibration of ESPAM2 that pre-dated addition of the general head boundaries to the model. The results of their analysis (McGrane, et al., 2011) were similar to the results predicted by ESPAM2.1, suggesting that the addition of the general head boundaries along the Hagerman rim had little effect on model predictions of response at the Rangen spring complex.

On page 43, Hinckley (2012) claims that the ESPAM2.1 calibration targets for the general head boundary base flow were "*a constant, average value…despite the fact that the total gains through this reach have declined over the period, and include seasonal fluctuations of 700 cfs.*" This claim is false. In ESPAM2.1, each base flow reach was calibrated to an average value for the calibration period, not a constant value. During calibration, the average of model-calculated discharge from May 1985 through October 2008 was computed and compared to the target average value from Wylie (2012b). The model calibration is only constrained by the average value for the calibration period, and is still allowed to vary the base flow discharge with time to match fluctuations in the transient reach gain targets.

Brendecke (2012) concludes that observed flows of Billingsley Creek have not been high enough to provide any water to water right 36-7964 since October 1976, a date which precedes the water right's 4/12/1977 priority date. This is consistent with IDWR's previous review of this water right. Dreher (2005), stated "…*Rangen may be entitled to divert water under this right when such water is physically available. However, because water was not available to appropriate on the date of appropriation for right no. 36-07694, Rangen may not be entitled to have a delivery call recognized against junior priority rights*." From a practical standpoint this is not relevant, because the predicted benefit from curtailing all groundwater users junior to the 7/13/1962 priority date of water right 36-2551 is only 17.9 cfs, and curtailment is not expected to provide more water than Rangen is entitled to divert under water right 36-2551. Between 2002 and 2011, annual average spring discharge ranged from 12 to 16 cfs, and monthly average spring discharge ranged from 11 to 22 cfs (Sullivan, 2012, Table 2-2). Based on 2002 to 2011 conditions, the predicted total annual average spring discharge would be between 30 and 34 cfs with curtailment.

Brendecke (2012) concludes that the source for water right 36-2551 is the Martin-Curren Tunnel and that flows from the tunnel have never been high enough to deliver the maximum diversion rate authorized under water right 36-2551. IDWR staff agree that the SRBA partial decree for water right 36-2551 lists the source as Martin-Curren Tunnel and describes the 10-acre tract containing the tunnel. A cursory review of the water right file indicates that the water right was licensed with the source described as "*underground springs tributary to Billingsley Creek*" and the point of diversion is located in the 40-acre tract containing both Curren Tunnel and Rangen's diversion at the head of the creek. The water right file also contains two survey drawings showing the point of diversion from the creek and the 36-inch pipe to the large raceways. The licensed priority date was July 31, 1962. The files reviewed did not indicate why the source, point of diversion, and priority date were changed in the SRBA.

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Brendecke (2012) concludes that the Martin-Curren Tunnel meets the physical definition of a well contained in Idaho Code 42-230(b), which states, *"'Well' is an artificial excavation or opening in the ground more than eighteen (18) feet in vertical depth below land surface by which ground water of any temperature is sought or obtained*." The partial decree lists the source for water right 36-2551 as "*Martin-Curren Tunnel*", not "*Ground Water*". Whether the tunnel is considered a well or a developed spring for administration of water right 36-2551 is a legal, not a technical, question.

Brendecke (2012) concludes that much of the change in spring discharge in the Milner to King Hill reach since 1960 can be attributed to reduction in incidental recharge from surface water irrigation. IDWR staff acknowledge that reduction in incidental recharge from surface water irrigation has contributed significantly to reductions in spring discharge. Spring flows respond to changes in various types of aquifer stress, including changes in incidental recharge from surface water irrigation, well pumping, and infiltration of precipitation. ESPAM2.1 was calibrated with all of these stresses, and then the calibrated model was used to calculate the response to a change in well pumping while other stresses were held constant. ESPAM2.1 provides a method for determining the portion of the water shortage at the Rangen hatchery that can be attributed to junior groundwater pumping, rather than holding junior groundwater users accountable for the entire decrease in spring discharge. Spring discharge records indicate that the annual average spring discharge was 51 cfs in 1966 and 14 cfs in 2008 (Sullivan, 2012, Table 2-2). The steady state impact of junior groundwater pumping predicted by ESPAM2.1 is less than half of the total decrease in spring discharge between 1966 and 2008. Note that spring discharge in 1966 would have already been reduced to some extent by junior groundwater pumping developed between 1962 (the priority date for water right 36-2551) and 1966.

Brendecke (2012) states that "*The 1992 moratorium on new irrigation wells suggests that decreases in discharge after the mid-1990s are not the result of groundwater pumping*." IDWR staff note that groundwater pumping junior to July 13, 1962 has resulted in depletions to spring discharge every year since 1962. While the rate of depletion due to groundwater pumping may not have increased significantly since 1992, the depletions continue to occur. These depletions are superimposed on decreases in spring discharge resulting from changes in surface water irrigation practices and natural recharge derived from precipitation. Even if the rate of depletion due to groundwater pumping has been approximately constant since 1992, groundwater pumping continues to contribute to removal of water from aquifer storage, declines in ESPA water levels, and decreases in spring discharge.

Brendecke (2012) mentions that former Director Dreher found that curtailment of water rights junior to July 13, 1962 would not result in a meaningful increase in the quantity of water discharge from springs in the Thousand Springs to Malad Gorge spring reach, which includes the Curran Spring from which Rangen diverts surface water. Dreher (2005) indicates that this conclusion was based on simulations using ESPAM1.1. During development of ESPAM2.1, IDWR discovered that values from Covington and Weaver (1990) that were used to estimate discharge for Thousand Springs and springs in the Thousand Springs to Malad spring reach for calibration of ESPAM1.1 were inaccurate. These values were corrected in the calibration targets used for ESPAM2.1. These corrections included a significant decrease in the spring discharge target at Thousand Springs and a significant increase in spring discharge targets in the Billingsley Creek area (Table 2). ESPAM2.1 calibration targets also provided the model

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with information regarding transient changes in spring discharge in the Billingsley Creek area. Because ESPAM2.1 incorporates these and other improvements to ESPAM1.1, ESPAM2.1 model predictions are an improvement to analyses performed using ESPAM1.1.

ESPAM1.1 Spring Reach	ESPAM1.1 Discharge Target (cfs)	ESPAM1.1 Proportion of Milner to King Hill Discharge	Sum of Average ESPAM2.1 Discharge Targets (cfs)	ESPAM2.1 Proportion of Milner to King Hill Discharge
Devil's Washbowl to Buhl	1,002	0.18	840	0.14
Buhl to Thousand Springs	1,584	0.28	1,431	0.24
Thousand Springs	1,749	0.31	811	0.13
Thousand Springs to Malad (Billingsley Creek)	77	0.01	223	0.04
Malad	1,117	0.20	1,070	0.18
Malad to Bancroft	91	0.02	103	0.02
Baseflow, Kimberly to King Hill (ESPAM2.0 only)	--	--	1,537	0.26
Sum	5,620	1.00	6,015	1.00

Table 2. Comparison of calibration targets for springs below Milner.

Brendecke (2012) mentions that approximately 24,000 linear feet of lateral off the W-Canal in the area west of Wendell have been lined or placed in pipe since the 1990s, reducing incidental recharge. IDWR staff note that ESPAM2.1 does model this reduction in incidental recharge, because the sum of incidental recharge and canal seepage in the North Side Canal Company service area is equal to recorded diversions less crop irrigation requirement and return flow. IDWR staff also acknowledge that, while the volume of recharge reflects the canal lining/piping projects, the spatial distribution of the recharge does not reflect this change. The pre-processing tools developed for use with ESPAM2.1 have the ability to reflect changes in canal seepage rates with time, and this improvement could likely be incorporated into future versions of ESPAM2 if proposed to the ESHMC for consideration.

On page 4-4 Brendecke (2012) states that in ESPAM2.1 "*canal seepage losses are still considered to be constant throughout the model study period*." IDWR staff would like to clarify that canal seepage rates in ESPAM2.1 were calculated as a constant percentage of diversions. Canal seepage losses vary with time, because diversions vary with time.

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On page 4-6, Brendecke (2012) states that the number of adjustable parameters in ESPAM2.1 model calibration increases the likelihood that the model is not linear. Dr. Brendecke appears to misinterpret a quote from Doherty (2005). This quote refers to the linearity of the model calibration process, not the linearity of the calibrated MODFLOW model. IDWR addressed the non-linearity of the calibrated MODFLOW model in Sukow (2012c) with respect to the use of superposition to perform curtailment simulations.

On page 4-9, Brendecke (2012) states that water levels in the ESPA near Rangen vary seasonally by about 5 feet and that "*These changes are nearly 100% of the saturated thickness above the Tunnel and about 10% of the thickness above the lower springs, further indicating that the requirements for superposition are not met at Rangen*." Dr. Brendecke appears to be referring to the guidelines for using a time-constant representation of transmissivity, not requirements for superposition. As stated in the ESPAM2.1 model documentation (IDWR, 2013), "*The generally considerable saturated thickness of the ESPA supports a time-constant representation of transmissivity, because drawdown is generally expected to be less than 10% of total saturated thickness (Anderson and Woessner, 1992)*." Note that this guideline applies to water level change as a percentage of the total saturated thickness. The portion of the saturated thickness that is above the tunnel elevation is not relevant, because the tunnel is not located at the base of the aquifer. If the lower springs are assumed to be located at the base of the aquifer, the water levels changes would be about 10% of the total saturated thickness, as acknowledged by Dr. Brendecke. Therefore, the conditions described by Dr. Brendecke are at the limit of the standard cited in IDWR (2013), but do not exceed this standard.

Brendecke (2012) indicates that ESPAM2.1 is not capable of separating the effects of groundwater pumping on flows from the Martin-Curren Tunnel from the effects on other springs in the Rangen complex. IDWR staff agree with this statement. Even in other spring cells where ESPAM2.1 has two drains, the model is calibrated to target data that reflect the total flow of all springs in the cell. Apportioning the predicted response between the tunnel and other springs in the Rangen complex, could done by applying a post-model calculation to the model prediction. The methodology should consider the amplitude of observed changes in the tunnel discharge and discharge from other springs, not the average magnitude of the discharges. Observed data (Figure 10) indicate that Curren Tunnel discharge is more responsive than discharge from other springs in the complex to changes in aquifer head. Linear regression of Curren Tunnel discharge with total Rangen spring complex discharge (Figure 11) indicates that the change in discharge at Curren Tunnel will be approximately 70% of the change in total spring complex discharge.

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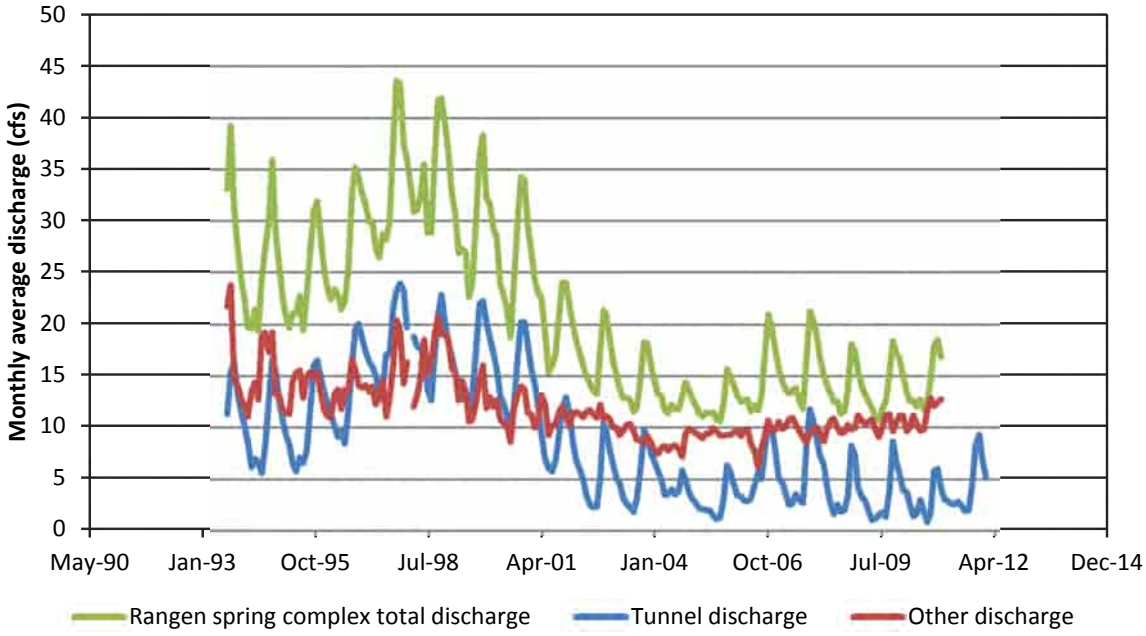

Figure 10. Observed monthly average discharge at Rangen spring complex and Curren Tunnel.

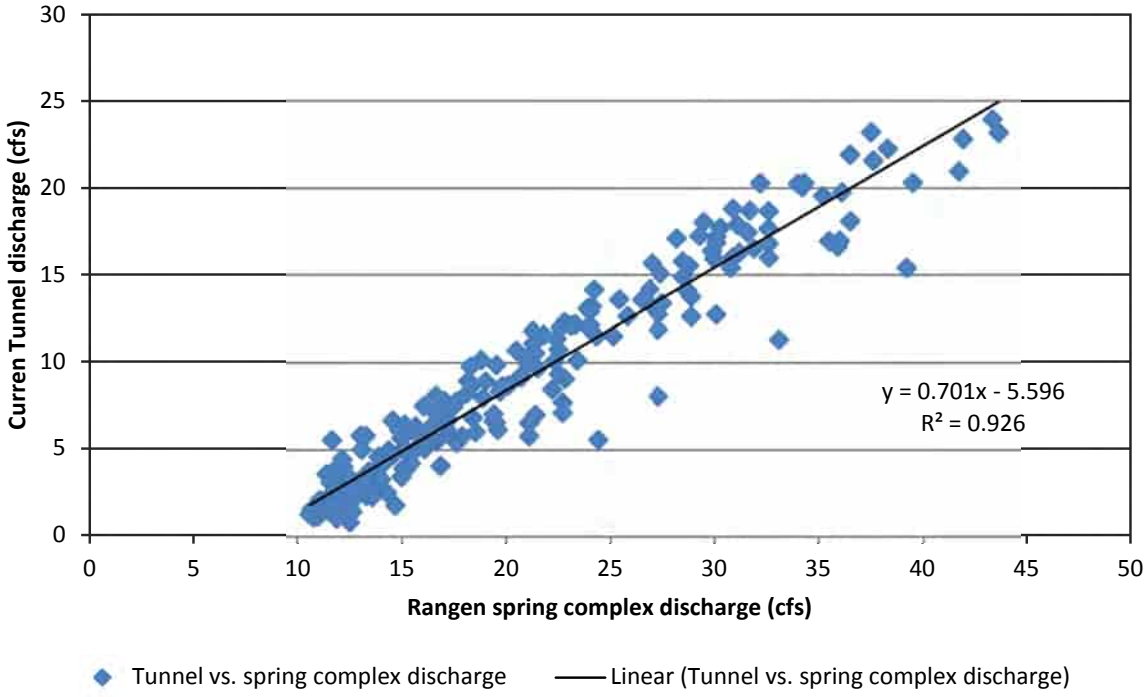

Figure 11. Relationship between Curren Tunnel discharge and total Rangen spring complex discharge, September 1993 to December 2010.

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Brendecke (2012) and Hinckley (2012) suggest that ESPAM2.1 would better represent the Rangen spring complex if two drains with different elevations were assigned to the model cell. IDWR staff agree that adding a second drain to the model cell would provide PEST with an additional tool and would likely improve the match to the Rangen calibration target. This improvement has been suggested for ESPAM2.2 (for Rangen and several other spring cells), and could likely be incorporated into future versions of ESPAM if proposed to the ESHMC for consideration. Although IDWR staff agree that adding a second drain to the model cell would be appropriate, IDWR staff disagree that the drains could be used to calculate the response at Curren Tunnel separately from other springs in the Rangen complex. In ESPAM2.1, spring cells with two drains are calibrated to a single set of discharge data representing discharge occurring throughout the model cell. The use of two drain cells allows PEST to find an effective elevation (Equation 1) between the upper and lower drain elevation that allows the best linear approximation of the relationship between aquifer head and observed spring discharge. Because the elevation or range of elevations at which the spring discharge loses hydraulic connection with the aquifer are unknown, using two drain elevations provides PEST the opportunity to find the best estimate for the effective elevation (within the assigned range) based on available head and discharge data. Provided aquifer head remains above both drain elevations throughout the simulation period, total drain discharge in the model cell can be represented by Equation 2.

$$z_{eff} = (C_1 z_1 + C_2 z_2)/(C_1 + C_2) \quad \text{(Equation 1)}$$

where:
z_{eff} = effective drain elevation (ft)
C_1 = conductance of upper drain (ft^2/day)
z_1 = elevation of upper drain (ft)
C_2 = conductance of lower drain (ft^2/day)
z_2 = elevation of lower drain (ft)

$$Q_d = C_1(z_1 - h_{aq}) + C_2(z_2 - h_{aq}) = (C_1 + C_2)(z_{eff} - h_{aq}); \text{ if } h_{aq} > z_1 \text{ and } h_{aq} > z_2 \quad \text{(Equation 2)}$$

where:
Q_d = total drain discharge (ft^3/day) in model cell, negative values indicate flux out of the aquifer
h_{aq} = aquifer head at center of cell containing the drain (ft)

Hinckley (2012) and Brendecke (2012) argue that representing the Rangen spring discharge with a single drain at elevation 3,138 feet in ESPAM2.1 resulted in a drain conductance that is unrealistically high. Brendecke (2012) explored the effects of representing the Rangen spring discharge with two drains in his alternative models, AMEC Model 1 and AMEC Model 2. Dr. Brendecke's drain file for AMEC Model 1 show that his model has a drain conductance of 11,307 ft^2/day at an elevation of 3,100 feet and a drain conductance of 363,270 ft^2/day at an elevation of 3,152 feet. In this model, the Rangen spring discharge is represented by an effective conductance of 374,577 ft^2/day at an effective elevation of 3,150.4 feet. AMEC Model 2 has a drain conductance of 23,862 ft^2/day at an elevation of 3,100 feet and a drain conductance of 357,756 ft^2/day at an elevation of 3,148 feet. In this model, the Rangen spring discharge

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is represented by an effective conductance of 381,618 ft^2/day at an effective elevation of 3,145.0 feet. The effective response to a unit change in head in Dr. Brendecke's alternative models is only 9-11% lower than in ESPAM2.1, contradicting Mr. Hinckley and Dr. Brendecke's assumptions that the ESPAM2.1 drain conductance value is unreasonable.

Brendecke (2012) said that the predictive uncertainty analysis of ESPAM2.1 carried out by IDWR explores only a limited aspect of model uncertainty, and that conceptual model uncertainty is fundamental to overall model uncertainty. Dr. Brendecke presents two alternative conceptual models, AMEC Model 1 and AMEC Model 2, which he uses to explore conceptual model uncertainty. Dr. Brendecke asserts that these alternative models better represent local conditions in the vicinity of Rangen through the following modifications to ESPAM2.1:

1. A horizontal flow barrier was added to represent a geologic discontinuity between the Rangen spring complex and the Tucker spring complex.
2. The Rangen spring complex was represented by two drains. The lower drain was assigned an elevation of 3,100 feet in both alternative models. The upper drain was assigned an elevation of 3,152 in AMEC Model 1 and 3,148 feet in AMEC Model 2.
3. General Head Boundaries assigned to four cells along the Hagerman rim were removed.
4. In AMEC Model 2, the calibration weights for Rangen spring discharge observations after the year 2000 were increased to encourage the model to concentrate on matching those observations at the expense of earlier observations.
5. Water level data from an additional well were added to the calibration targets.

IDWR staff note that several of the conceptual model decisions implemented in ESPAM2.1, including the use of a single drain with an elevation based on Covington and Weaver (1990), the assignment of General Head Boundaries to model cells along the Hagerman Rim, and calibration weights were discussed with the ESHMC. Items 2 and 5 could likely be implemented in calibration of future versions of ESPAM if proposed to the ESHMC for consideration. Item 4 is an inappropriate change. Encouraging the model to match observations during a particular time period at the expense of other time periods results in a poorer representation of physical conditions. Items 1 and 3 are based on subjective geologic interpretations that would need to be presented to the ESHMC for review and discussion.

Dr. Brendecke evaluates the calibration quality of his alternative models by comparing the model and observed values for only three calibration targets, the Rangen spring complex discharge and aquifer head elevation in two wells. IDWR staff did not perform an extensive review of the alternative models, but did note that the contributions to the objective function shown in Dr. Brendecke's calibration files indicate both AMEC models had a poorer match to observed discharges at the nearby Three/Weatherby springs complex. These files and Dr. Brendecke's Figure 6.4b indicate that the improved match to the last eight years of observed Rangen complex discharge in AMEC Model 2 was achieved at the expense of the overall match to discharge observed during the other 20 years of the ESPAM2.1 simulation period. The contribution of residuals at the Rangen spring complex to the objective function is approximately 60% larger in AMEC Model 2 than in ESPAM2.1.

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On pages 6-7 and 6-8, Dr. Brendecke explores the conceptual model uncertainty by performing analyses of curtailment of junior groundwater use within an area defined by a 10% trimline using AMEC Model 1 and AMEC Model 2. IDWR staff analyses indicate that Dr. Brendecke overstates the uncertainty illustrated by these alternative models for several reasons:

1. It appears that Dr. Brendecke did not use the correct 10% trimline in his analysis performed with ESPAM2.1. AMEC's model files show that pumping was applied in model cells 1041014 and 1043013, which both have steady state response functions of 9.53% with respect to the Rangen spring complex. IDWR analysis using ESPAM2.1 indicates that the response to curtailment within the 10% trimline, which only consists of four model cells (a four-square-mile area), is negligible (0.01 cfs) because the simulated curtailment volume is negligible.
2. It appears that Dr. Brendecke did not use the correct 10% trimline in his analysis performed with AMEC Model 1. AMEC's model files show that pumping was applied in model cell 1041014, which has a steady state response function of 9.74% in AMEC Model 1.
3. An analysis of model uncertainty should be performed by comparing responses to the same stress. Dr. Brendecke uses a different stress file in each of his three simulations, with total stress applied ranging from 0.1 to 2.0 cfs. This comparison does not illustrate uncertainty in the ESPAM2.1 MODFLOW model; it illustrates uncertainty in delineating the area subject to curtailment. In Dr. Brendecke's example, mistakes in delineating the 10% trimline appear to be the primary source of the uncertainty cited by Dr. Brendecke on pages 6-7 and 6-8.
4. IDWR compared model predictions made by AMEC's alternative models with ESPAM2.1 predictions applying consistent stress files. Table 3 shows the results of these comparisons, which indicate that the predictions made by AMEC's alternative models are very similar to predictions made by ESPAM2.1.

Curtailed area	ESPAM2.1 prediction (cfs)	AMEC Model 1 prediction (cfs)	AMEC Model 2 prediction (cfs)
Model extent	17.9	18.5	18.0
Four cells in ESPAM2.1 10% trimline for Rangen	0.01	0.01	0.01

Table 3. IDWR comparison of predicted responses at the Rangen spring cell to curtailment junior to July 13, 1962 using ESPAM2.1 and AMEC's alternative models.

The results shown in Table 3 indicate that the conceptual model changes implemented by Dr. Brendecke in AMEC Model 1 and AMEC Model 2 did not significantly affect the prediction of responses to curtailment within a given area. For the model extent, the responses predicted by AMEC's alternative models were slightly (0.6% to 3.5%) larger than those predicted by ESPAM2.1. For the area delineated

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by the four cells in the ESPAM2.1 10% trimline for the Rangen spring cell, the response is negligible using all three models.

Brendecke (2012) said that ESPAM2.1 mischaracterizes the physical relationship between water levels and flows at Rangen, resulting in over-sensitivity of the change in drain flow to a simulated change in water level due to curtailment. Dr. Brendecke asserts that changes in spring flows are over-predicted by nearly a factor of 4 (page 1-6 and 4-9). IDWR staff disagree with this conclusion. Dr. Brendecke compares the calibrated drain conductance in ESPAM2.1 with the relationship between the discharge of Curren Tunnel and water level in a monitoring well located about 600 feet east of the Rangen spring complex (Hinckley, 2012, Figure 18). This is not a valid comparison because the ESPAM2.1 drain conductance is calibrated to the total discharge of the Rangen spring complex, not the discharge from Curren Tunnel, and because the data available for the comparison in Hinckley (2012) only represent a limited time period between August 2008 and January 2012. These data do not represent the range of responses included in the calibration data set for ESPAM2.1, which extended from May 1985 to October 2008. Further, simulations performed with Dr. Brendecke's alternative models, which he asserts better characterize the physical relationship between water levels and flows at Rangen, provide similar predictions to ESPAM2.1 (Table 3).

Dr. Brendecke also concludes that the representation of the Rangen spring complex as a single drain with an elevation of 3,138 feet and ESPAM2.1's over-prediction of spring complex discharge in recent years result in over-prediction of responses to curtailment. Dr. Brendecke explored these issues in his alternative models AMEC Model 1 and AMEC Model 2. As shown previously in Table 3, analyses performed using these alternative models predict responses similar to ESPAM2.1. In simulations of curtailment of junior groundwater pumping over the model extent, Dr. Brendecke's alternative models predict slightly larger responses, even in AMEC Model 2, which concentrated on matching Rangen spring discharge observations after the year 2000. These results contradict Dr. Brendecke's conclusion.

Brendecke (2012) compares the area encompassed by a 5% trimline to the Rangen spring complex in ESPAM2.1 to ESPAM2.0, and concludes that the ESPAM2.1 5% trimline has expanded to include areas "*on the opposite side of the Malad Gorge from Rangen, which are hydrogeologically disconnected from Rangen Spring*." IDWR disagrees with Dr. Brendecke's assertion that this is "*evidence of unexpectedly large changes in ESPAM2.1*" for two reasons. First, the changes in the delineation of a 5% trimline are the result of response functions in cells changing from slightly less than 5% (4.822% to 4.997%) in ESPAM2.0 to slightly greater than 5% (5.0004% to 5.118%) in ESPAM2.1. Stresses applied in areas outside the 5% trimline will still result in a response at the Rangen spring complex; the response will be less than 5%, but will not be zero. Second, the area on the opposite side of the Malad Gorge is hydraulically connected to the Rangen spring complex via the ESPA aquifer to the east of Malad Gorge. This is acknowledged by Hinckley (2012), who notes that, "*If the aquifer is severed by the gorge…any impacts to groundwater levels on the north side can only be communicated to the south side via the continuously saturated portions of the primary aquifer further east, or through the lower aquifer*…" IDWR staff analyses also indicate that the predicted response at the Rangen spring complex to curtailment within the area delineated by the ESPAM2.1 5% trimline is 3.35 cfs, nearly identical to the prediction calculated using ESPAM2.0.

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On page 4-11, Brendecke (2012) states that ESPAM2.1 is "*called upon to represent highly localized conditions such as those governing discharge from specific outlets of a specific spring complex*." IDWR staff would like to clarify that ESPAM2.1 does not represent specific spring outlets. In no case does it represent or predict discharge at a scale smaller than a one-square-mile model cell. In the case of the Rangen spring complex, which is the only spring complex in its model cell, ESPAM2.1 is calibrated to the total discharge of the spring complex. It is not calibrated to, and cannot predict discharge from specific outlets within the spring complex.

Brendecke (2012) concludes that ESPAM2.1 is a linear representation of a non-linear physical system. IDWR staff agree with this conclusion and acknowledge that ESPAM2.1, like all models, is an approximation of the physical system. Although there is uncertainty associated with using a model to approximate a physical system, it is the opinion of IDWR staff that ESPAM2.1 is the best available scientific tool for predicting the response at the Rangen spring complex to regional curtailment of groundwater. Based on IDWR's analyses, ESPAM2.1 predicts a response of 17.9 cfs to curtailment within the model boundary, 16.9 cfs to curtailment within the area of common groundwater supply, and 0.01 cfs to curtailment within the area delineated by a 10% response function. While there is uncertainty in these predictions, it is likely that the response to curtailment within the model boundary or the common groundwater area will be a measurable amount of water, and that the response to curtailment in an area delineated by a 10% response function will be a negligible amount of water.

Brendecke (2012) concludes that ESPAM2.1 predicts a benefit of 0.19 cfs will accrue to the Rangen spring complex if a 10% trimline is applied. IDWR analyses indicate that Dr. Brendecke did not use the correct area for the 10% trimline, and that the predicted benefit using ESPAM2.1 is 0.01 cfs if a 10% trimline is applied. Review of Dr. Brendecke's model files also indicates that he applied a stress equal to total pumping, rather than applying a stress equal to the crop irrigation requirement or net pumping. Total pumping includes some water that is pumped from wells, but is returned to the aquifer as recharge. IDWR staff recommend modeling a stress equal to the crop irrigation requirement to represent the long term effects of groundwater use. IDWR staff also note that delineation of a trimline based on response functions for the Rangen spring complex is a direct application of ESPAM2.1-predicted responses at the Rangen spring cell, which Dr. Brendecke argues are unreliable predictions. If, as argued by Dr. Brendecke, ESPAM2.1 "*cannot be relied upon to accurately predict changes in flow at Rangen*" because it is a regional model then it would be more appropriate to use predictions of steady state response functions for the Buhl to Lower Salmon Falls reach, as suggested by Contor (2012a).

On pages 1-2, Table 5.2 and Table 6.1, Brendecke (2012) asserts that less than 3% of the curtailed groundwater rights within a 10% trimline would accrue to the Rangen spring complex. IDWR staff disagree with this statement. By definition, a 10% trimline is the area within which 10% or greater of the effect of an applied stress will accrue to the Rangen spring complex. In Tables 5.2 and 6.1, Dr. Brendecke compares the change in flow at the Rangen complex to a typical maximum water right diversion rate of 0.02 cfs per irrigated acres. The maximum diversion rate is considerably greater than the actual curtailed groundwater use. Dr. Brendecke should have compared the change in flow at the Rangen complex to the curtailed groundwater use in the fourth column of Table 5.2 and fifth column of Table 6.1. The resulting increase as a percentage of the curtailed groundwater use for Dr. Brendecke's

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simulations is 10.5% for his ESPAM2.1 simulation, 10.8% for his Alternative Model #1 simulation, and 11.6% for his Alternative Model#2 simulation. IDWR's analysis performed using ESPAM2.1 with the correct 10% trimline indicates that the response at Rangen is 12.8% of the curtailed groundwater use.

On page 1-7, Dr. Brendecke quantifies the effects of curtailing all junior groundwater irrigation within the model domain as modeled by ESPAM2.0. Dr. Brendecke provides an incorrect value for the volume of curtailed consumptive use and did not update the results using ESPAM2.1. IDWR's analyses with ESPAM2.1 indicate that there are approximately 565,026 acres within the model domain irrigated with groundwater rights junior to July 13, 1962. The estimated consumptive use (net withdrawal from the aquifer) associated with this irrigation is 1.24 MAF per year. At steady state, ESPAM2.1 predicts curtailment will result in an increase of 17.9 cfs at the Rangen spring complex. The model predicts that it will take approximately 13 years for the response to reach 90% of the steady state increase.

On page 4-10, Brendecke (2012) states that the comparison of ESPAM2.1 with ESPAM1.1 performed by IDWR "*highlights the sensitivity of ESPAM2 results to conditions in particular years*." This is not a valid interpretation of the results. Changes in estimates of irrigated acreage between ESPAM1.1 and 2.1 are the result of improvements in GIS technology and methodology used to delineate irrigated lands, not sensitivity to conditions in particular years. Changes in estimates of crop irrigation requirements result largely from changing from 1971-2000 average precipitation used with ESPAM1.1 to a November 1998 to October 2008 average precipitation with ESPAM2.1. The 1971-2000 period used to estimate precipitation with ESPAM1.1 curtailment simulations resulted in estimates of precipitation higher than the long term average from 1934 through 2008. Average precipitation from the 1998-2008 period used with ESPAM2.1 curtailment simulations is closer to the long term average.

On page 4-13, Brendecke (2012) claims that the IDWR predictive uncertainty analysis "*assumed that pumping stress for entire Water Districts could be applied at the centroids of each District without loss of accuracy*." IDWR staff would like to clarify that IDWR did not make such an assumption. The predictive uncertainty analysis was not intended to model the impacts of Water Districts on spring discharge or reach gains. The centroids of Water Districts were used to select representative points for the analyses that were distributed throughout the model domain in areas where irrigated lands are present.

On page 4-14, Brendecke (2012) states "*While it is clearly an improvement over its predecessor, several important features are the same in ESPAM1.1 and ESPAM2.1. The two are still conceptually the same regional model. Differences between them are largely the result of differences in input data and in values of calibration parameters resulting from use of that input data. Both models represent the details of the Rangen spring complex and the surrounding geology in highly simplified form, omitting several key features that would make significant differences in predicted benefits of curtailment*." IDWR staff note the differences between these models' predictions of response to curtailment at springs tributary to Billingsley Creek are largely the result of the use of calibration targets in ESPAM1.1 that were not representative of discharge at springs tributary to Billingsley Creek and at Thousand Springs. The ESPAM2.1 calibration targets were a significant improvement over ESPAM1.1. ESPAM2.1 was also calibrated with more closely spaced transmissivity pilot points than ESPAM1.1, allowing more local-scale variation in transmissivity than ESPAM1.1. IDWR staff also note that Dr. Brendecke assumes that details

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not included in the ESPAM2.1 representation of the Rangen spring complex and surrounding geology "*would make significant differences in predicted benefits of curtailment*," but does not provide evidence supporting this statement. Dr. Brendecke's exploration of conceptual model uncertainty shows that the predicted benefits of curtailment at Rangen made by his alternative models are less than 3.5% different than the prediction made by ESPAM2.1.

On page 4-14, Brendecke (2012) states that curtailment of large amounts of junior groundwater pumping would results in water use conditions "*that are radically different from those extant in the model calibration period*." IDWR staff disagree with this statement. As shown in Figure 12, when the simulated curtailment volume is added to the 2002-2007 average annual net recharge, the net ESPA recharge is within the range of net recharge during the model calibration period and is closest to conditions that occurred in the late 1990s.

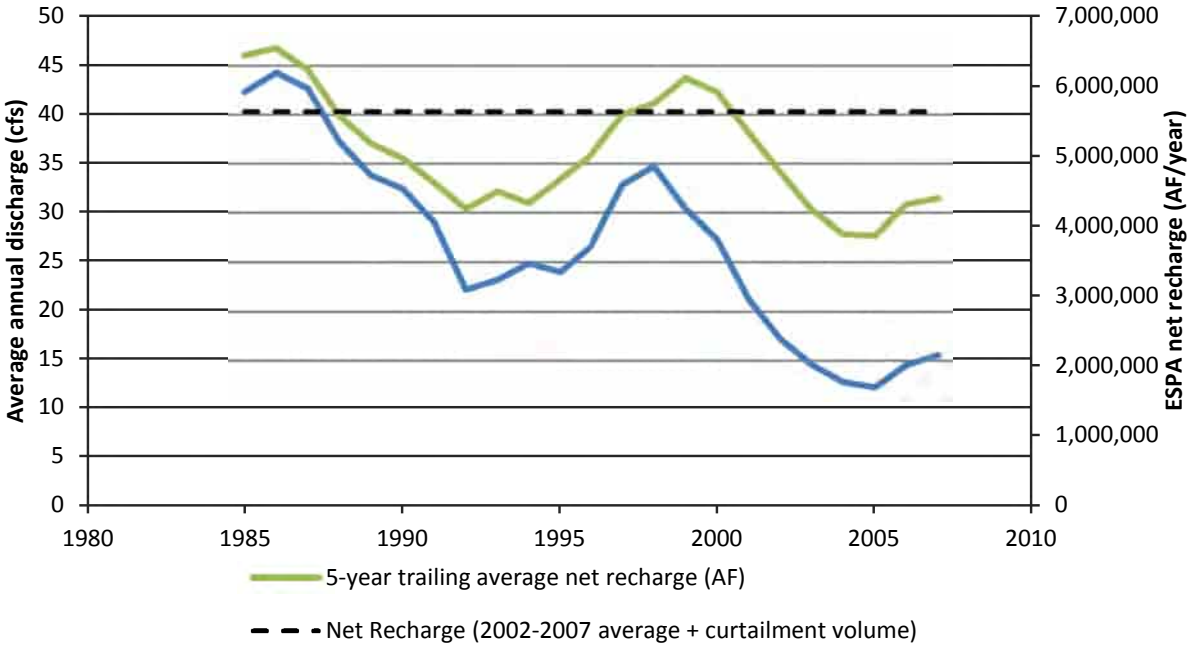

Figure 12. Comparison of net ESPA recharge during model calibration period and simulation of curtailment to July 13, 1962.

On page 5-1, Brendecke (2012) mentions that IDWR provided a superposition version of ESPAM2.1 and states that "*a superposition model can introduce significant error into the analysis of effects of stress changes*." IDWR staff note that the fully populated model files are also available to Dr. Brendecke and

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the public[5]. Dr. Brendecke could have simulated the curtailment using the fully populated version of the model to explore any potential difference in the prediction at the Rangen spring complex. IDWR staff explored the difference between predictions made using fully populated and superposition versions of ESPAM2.0 and found that there was not a significant difference in predicted responses to curtailment at the Rangen spring cell (Sukow, 2012c). Because the model structure and degree of model linearity did not change between ESPAM2.0 and ESPAM2.1, the conclusions of Sukow (2012c) apply to ESPAM2.1. IDWR staff did not perform the curtailment simulation for this water delivery call with the fully populated version, because IDWR staff are confident the predicted response would not be significantly different from the results of the superposition version.

On page 9, Church (2012) states, "*assuming a diversion rate of 0.02 cfs per acre, the curtailment of 479,200 groundwater irrigated acres would immediately eliminate beneficial use of 9,584 cfs. By this comparison, Rangen would receive less than two-tenths of 1% (0.0018) of the curtailed water*." IDWR staff disagree with Mr. Church's assumption that the curtailed use will be 0.02 cfs per acre, because this is the typical maximum authorized diversion rate. Mr. Church assumes that irrigators would be diverting the maximum diversion rate 24 hours per day, 7 days a week, 365 days per year and significantly overestimates their water use. The actual curtailed use would be significantly less. Attachment A shows IDWR's analysis of curtailment of 479,200 acres of junior groundwater irrigation within the current area of common groundwater supply. The volume of curtailed consumptive use would be approximately 1.09 MAF/year, an average rate of 1,509 cfs. ESPAM2.1 predicts that 16.9 cfs, which is approximately 1.1% of the curtailed use, would accrue to the Rangen spring cell.

IDWR staff comments regarding expert reports submitted on behalf of FMID

Contor (2012a, p. 5) states, "*The determination and application of a Deminimus* (sic) *effect is a policy question that will not be addressed in this report. The concept of uncertainty may be considered in making this policy determination, and uncertainty will be addressed. A Deminimus* (sic) *policy could be defined in terms of Capture Fraction, specifying a threshold fraction below which propagating effects are considered Deminimus* (sic). *This is essentially the definition of a Trim Line which has been applied in administration of water calls using ESPAM1.1. The policy could also specify a threshold total volume or volume per time, below which effects are considered Deminimus* (sic). *This is the concept that has been applied in use of ESPAM1.1 for water-right transfers. ESPAM2.0 can be operated to calculate either of these potential Deminimus* (sic) *thresholds*." IDWR staff agree that ESPAM2.1 can be used to calculate either of these types of de minimis thresholds, but do not recommend attempting to quantify model uncertainty to make a de minimis policy determination. As noted by Contor (2012a), model uncertainty is generally greater when smaller areas of the regional ESPA model are considered. Therefore, the uncertainty associated with predicting the response to curtailment within a small area defined by a trimline is likely to be greater than the uncertainty associated with predicting the response to curtailment throughout the ESPA. Further, uncertainty does not mean that it is uncertain whether or not there will be a response to curtailment, it means there is uncertainty in the magnitude of the

[5] http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/meetings/2012_ESHMC/11_9_2012/E121025A001_spresdsheets.zip/mudflow (last visited February 20, 2013.

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response. As shown in the IDWR predictive uncertainty analysis (Wylie, 2012) and the alternative conceptual models developed by Brendecke (2012), ESPAM2.1 appears to do a good job of predicting whether or not curtailment will result in a measurable amount of water at a given spring or river reach.

On page 24, Contor (2012a) states "*The IDWR Predictive Uncertainty work indicates that the difference between two Calibrated ESPAM2.1-framework models can exceed 500% for some questions, though it is generally much smaller*." IDWR staff disagree with this statement. The IDWR Predictive Uncertainty work does not indicate predictive uncertainty exceeding 500%. Further, high percentage differences in predictive uncertainty are misleading in cases where the predicted response is small. For example, if ESPAM2.1 predicts a response of 0.02 cfs at a given location, and the alternative model calibration predicts a response of 0.04 cfs at the same location, the percentage difference would be 100%, but both models indicate that the response at that location is insignificant.

On page 24, Contor (2012a) state, "*For any particular questions, quantity uncertainty is probably at least in the range of the 17% result obtained from the water-budget analysis*." IDWR staff have not conducted a detailed review of Mr. Contor's analysis, but note that this range of uncertainty does not prevent the model from providing a useful prediction of whether or not curtailment will result in a measurable amount of water at a given spring or river reach. For example, if a range of ±20% is applied to the ESPAM2.1 predicted responses to curtailment within the model domain, a response between 14.3 and 21.5 cfs would be expected at the Rangen spring cell and a response between 194 and 291 cfs would be expected at the Buhl to Lower Salmon Falls reach. Even with this range of uncertainity, the model tells us that a model-wide curtailment would result in a measurable amount of water at the Rangen spring complex and the Buhl to Lower Salmon Falls reach. The model also tells us that only a very small fraction (approximately 1%) of the benefit of a model-wide curtailment would accrue to the Rangen spring complex. The majority of the curtailed water use would benefit other springs and reaches of the Snake River.

On pages 5-6, Contor (2012a) presents results of simulating curtailment of groundwater use junior to July 13, 1962 within the Egin Bench area of the Freemont Madison Irrigation District. Mr. Contor used ESPAM2.0 to perform this analysis and did not update the analysis with ESPAM2.1. Mr. Contor estimated that curtailment of groundwater use within the Egin Bench would reduce pumping by 4,730 acre feet per year and that after 150 years, the cumulative benefit to the Buhl to Lower Salmon Falls reach would be 1.90 acre feet (0.04% of the curtailed use), in response to a single year of curtailment. It is not clear how Mr. Contor estimated the volume of curtailed use. Mr. Contor did not simulate continuous curtailment, thus this simulation does not represent conditions that would occur if these groundwater users were curtailed for multiple years in response to an ongoing spring delivery call. IDWR staff review indicates that steady state response functions in model cells containing points of diversion for FMID groundwater irrigation rights range from 0.004% to 0.05% with respect to the Rangen spring cell, and 0.05% to 0.78% with respect to the Buhl to Lower Salmon Falls springs. The average response function, weighted by irrigation diversion rate, is 0.04% with respect to the Rangen spring cell and 0.55% with respect to the Buhl to Lower Salmon Falls springs. This indicates that Mr. Contor's methods underestimate the fractional response to a continuous curtailment at the Buhl to Lower Salmon Falls reach by an order of magnitude. Although the steady state response predicted by

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ESPAM2.1 at the Buhl to Lower Salmon Falls springs is not as small as indicated by Mr. Contor's analysis, it is still a small fraction of the curtailed use, with greater than 99% of the curtail use accruing to other reaches of the Snake River.

On pages 8 and 23, Contor (2012a) recommends that ESPAM2.1 not be used to predict responses at reaches smaller than the distances between nearby transmissivity pilot points. Figure 13 shows the ESPAM2.1 transmissivity pilot points in the vicinity of the Rangen spring cell and Buhl to Lower Salmon Falls reach. The Rangen spring cell is a one-square-mile model cell. The Buhl to Lower Salmon Falls reach is comprised of 24 model cells. The spacing between pilot points in the vicinity of the Buhl to Lower Salmon Falls reach is generally between two and four miles. If Mr. Contor's recommendation is applied, ESPAM2.1 would be used to predict the response at the Buhl to Lower Salmon Falls reach, because it is the smallest calibration reach that is greater than four miles in length.

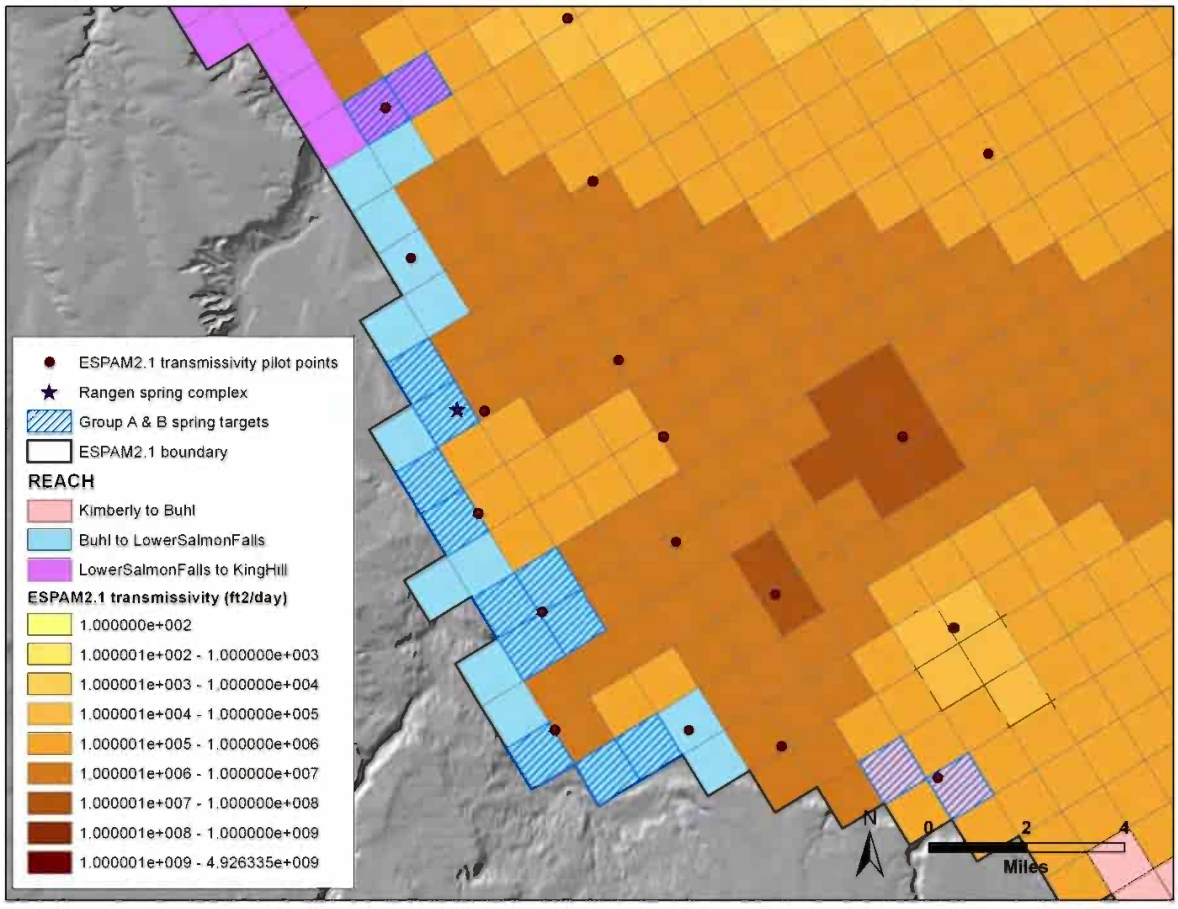

Figure 13. ESPAM2.1 transmissivity pilot points in the vicinity of the Buhl to Lower Salmon Falls reach.

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Mr. Contor does not recommend a method for apportioning the ESPAM2.1-predicted response at the Buhl to Lower Salmon Falls reach to the Rangen spring cell, stating on page 6, "*However, no attempt has been made to apportion these benefits to individual diversions*." If Mr. Contor's recommendation is applied, a method for apportioning the reach benefit to spring cells would be needed to predict the response at the Rangen spring cell. In response to Mr. Contor's recommendation, IDWR staff performed analyses using ESPAM2.1 to predict the response at the Buhl to Lower Salmon Falls reach to curtailment of groundwater irrigation junior to July 13, 1962. IDWR analyses indicate that the response at the reach would be 242 cfs in response to curtailment within the entire model domain, 229 cfs in response to curtailment within the current area of common groundwater supply, and 198 cfs in response to curtailment within the area delineated by a 10% steady state response (Figure 14) and the area of common groundwater supply. Model results are provided in Attachment B.

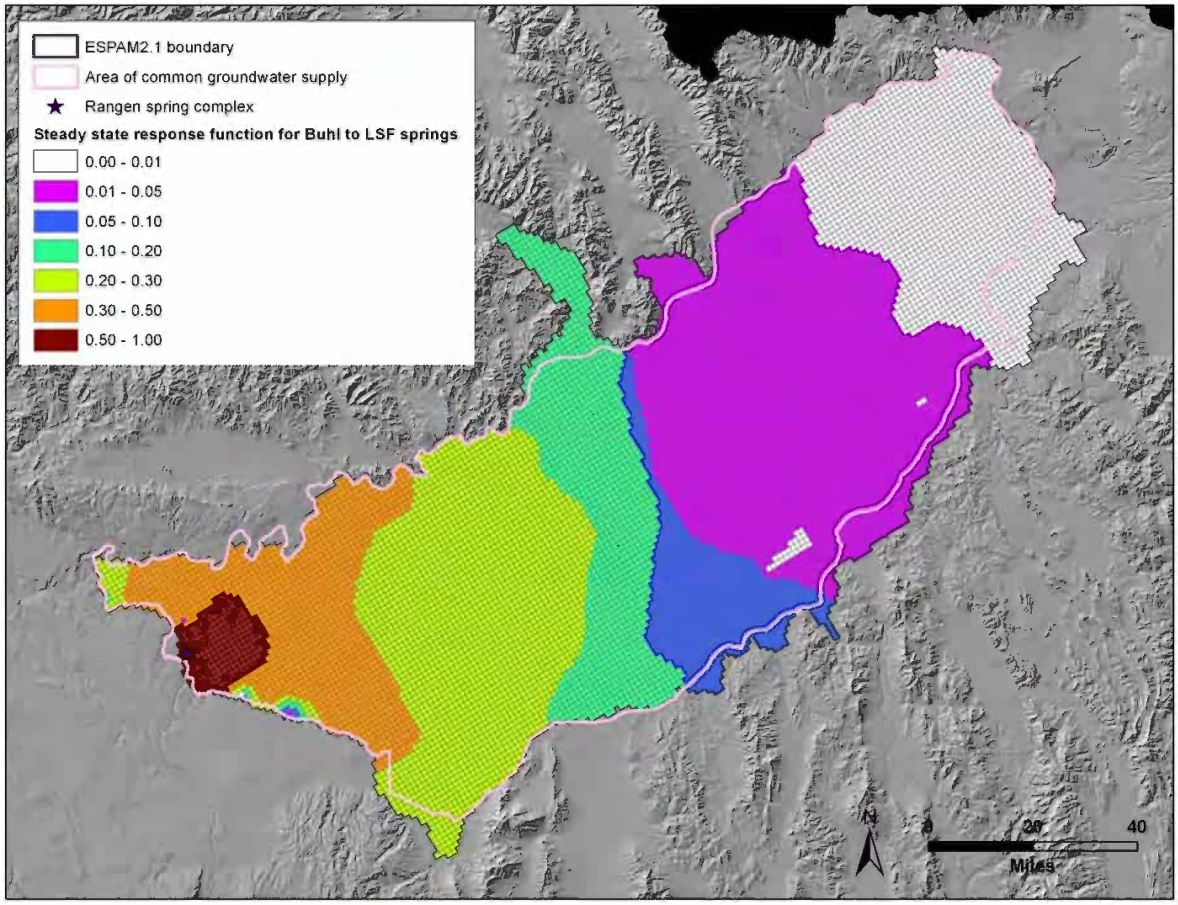

Figure 14. Steady state response functions indicating portion of curtailed use that would accrue to springs in the Buhl to Lower Salmon Falls reach.

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IDWR staff considered two methods for apportioning the response at the reach to the Rangen spring cell. IDWR staff consider both of these methods to be inferior to using ESPAM2.1 directly to predict the response at the Rangen spring cell.

1. Use the Covington and Weaver ratio method previously used with ESPAM1.1 to apportion discharge to the Rangen spring complex. This method is identical to the method used with ESPAM1.1 except that the Covington and Weaver discharge values for Thousand Spring and the Three/Weatherby spring complex were updated[6]. Based on the Covington and Weaver discharge estimates of 35.5 cfs for the Rangen spring complex and 2,852 cfs for all spring in the reach, a ratio of 0.0124 was multiplied by the ESPAM2.1-predicted response at springs within the reach. This method results in a predicted accrual of 2.9 cfs at the Rangen spring complex in response to model-wide curtailment and 2.4 cfs in response to curtailment within a 10% trimline for the reach. This method is inferior to using the ESPAM2.1 prediction for the Rangen spring cell, because it considers fewer data than ESPAM2.1, neglects regional hydrogeologic conditions that are modeled in ESPAM2.1 at a scale smaller than the 24 cell reach, neglects the spatial distribution of aquifer recharge and discharge, and neglects the sensitivity of higher elevation springs to changes in aquifer head. Figure 15 illustrates how this method provides a poorer prediction of discharge at the Rangen spring complex than ESPAM2.1. Use of this method with ESPAM1.1 was necessary because the discharge data compiled for calibration of ESPAM2.1 were not available for use with ESPAM1.1. The additional data currently available allow development of better methods for predicting the response at the Rangen spring cell.

[6] See attribute field ESPAM2_cfs in http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/monitoring_data/Springs/Covington_Weaver_Spgs.zip/Covington_Weaver_Spgs.shp (last visited February 20, 2013).

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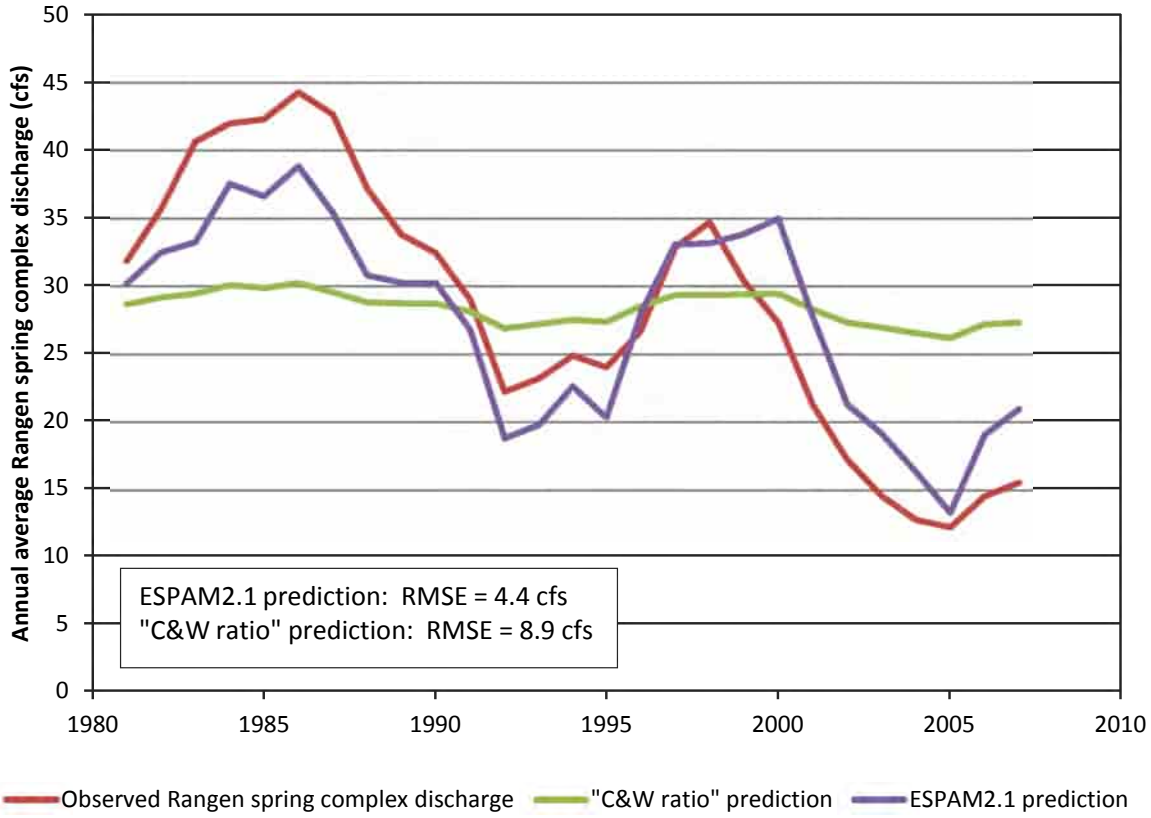

Figure 15. Comparison of Covington and Weaver ratio prediction method and ESPAM2.1 prediction of discharge at Rangen spring cell.

2. Use a linear regression of Rangen spring complex discharge with reach gain to predict change in Rangen spring discharge corresponding to the modeled change in reach gain (Figure 16). This method predicts a 0.028 cfs change in Rangen spring complex discharge per unit cfs change in reach gain, resulting in a predicted accrual of 6.8 cfs at the Rangen spring complex in response to model-wide curtailment and 5.5 cfs in response to curtailment within a 10% trimline for the reach. This method is inferior to using the ESPAM2.1 prediction for the Rangen spring cell, because it considers fewer data than ESPAM2.1, neglects regional hydrogeologic conditions that are modeled in ESPAM2.1 at a scale smaller than the 24 cell reach, and neglects the spatial distribution of aquifer recharge and discharge. This method is a slight improvement over the Covington and Weaver ratio method, because it incorporates some consideration of the sensitivity of higher elevation springs to changes in aquifer head. Figure 17 illustrates how this method provides a poorer prediction of discharge at the Rangen spring complex than ESPAM2.1, but a better prediction than the Covington and Weaver ratio method.

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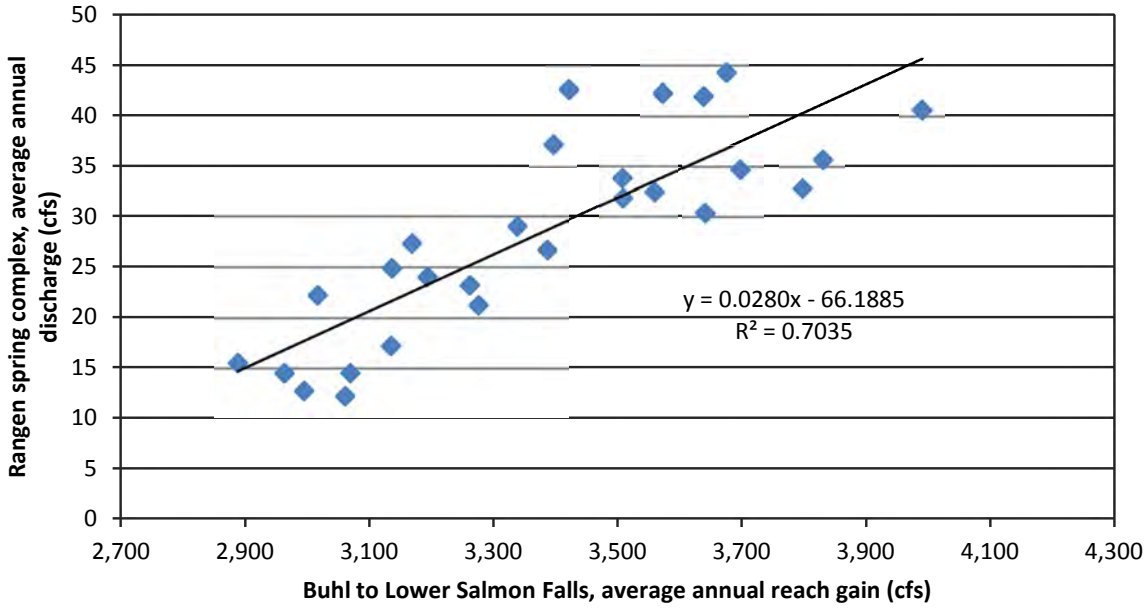

Figure 16. Linear regression of Rangen spring complex discharge with reach gain.

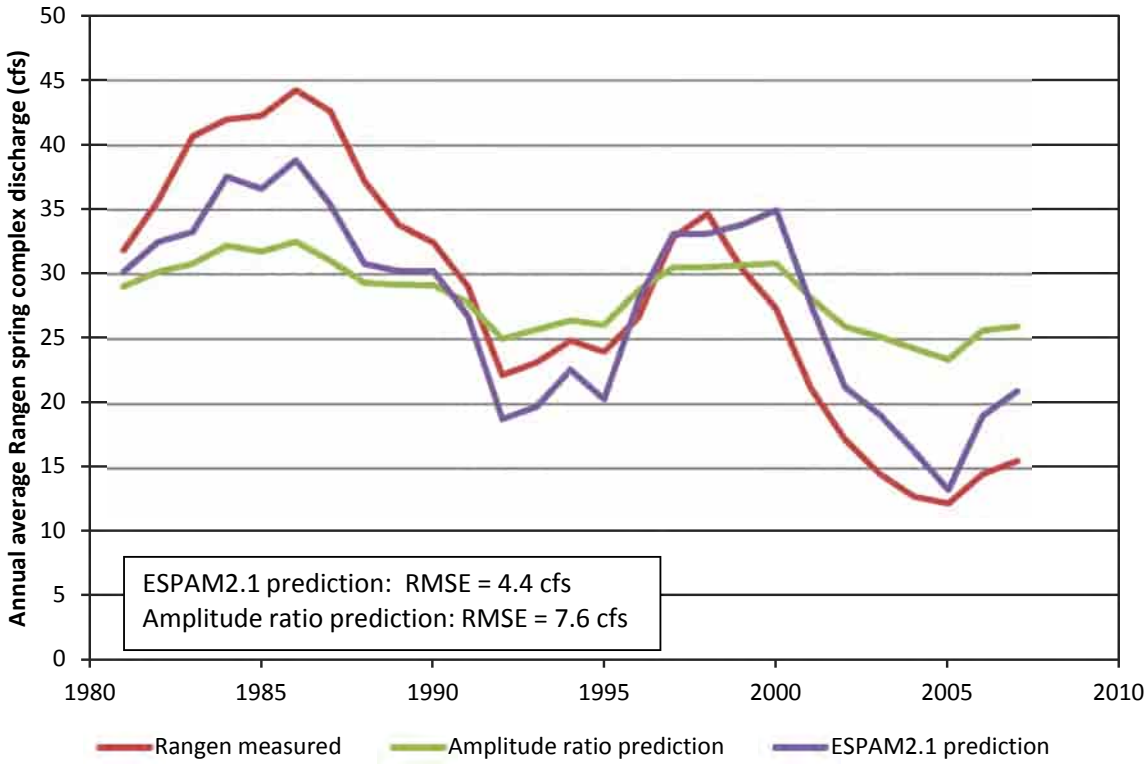

Figure 17. Comparison of amplitude ratio prediction method and ESPAM2.1 prediction of discharge at Rangen spring cell.

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IDWR staff comments regarding expert reports submitted on behalf of the City of Pocatello

IDWR staff review indicates that ESPAM2.1 steady state response functions for model cells containing groundwater points of diversion for the City of Pocatello range from 0.37% to 0.47% with respect to the Rangen spring cell. Based on the response functions, IDWR staff agrees with Sullivan (2012) that curtailment of the City of Pocatello's groundwater use will result in a negligible increase in discharge at the Rangen spring complex. ESPAM2.1 predicts that more than 99.5% of the curtailed use would benefit other springs and reaches of the Snake River.

Sullivan (2012) provided a copy of the results of an IDWR analysis of the response at the Rangen spring cell to curtailment within various areas defined by steady state response functions. These analyses limited the area of curtailment to areas where the fraction of curtailed use accruing to the Rangen spring cell exceed values ranging from 0.2% to 10%. The results of the analyses performed by IDWR and submitted by Mr. Sullivan were calculated with ESPAM2.0 and were not updated using ESPAM2.1. IDWR staff updated these analyses with ESPAM2.1 in response to Mr. Sullivan's submittal. The results are provided in Table 4 and Figure 18. These results supersede the results presented by Mr. Sullivan in his Figure 8-4.

Area of curtailment[7]	Curtailed groundwater irrigation (ac)	ESPAM2.1 predicted response at Rangen spring cell (cfs)	Acres curtailed per cfs of benefit at Rangen spring cell (ac/cfs)
Model Boundary	565,026	17.89	31,591
Area Common Ground Water Supply (CGW)	479,203	16.94	28,296
CGW 0.2% trim line	257,673	16.15	15,956
CGW 1% trim line	160,389	14.55	11,022
CGW 1.5% trim line	154,270	14.32	10,774
CGW 1.7% trim line	108,543	11.84	9,167
CGW 2% trim line	67,093	9.31	7,210
CGW 3.5% trim line	26,694	5.71	4,678
CGW 5% trim line	12,346	3.35	3,689
CGW 10% trim line	24	0.01	1,868

Table 4. IDWR analysis of response to curtailment within various areas.

[7] Trim lines used to define the area of curtailment were delineated to include model cells where greater than a given percentage of the curtailed use will accrue to the Rangen spring cell. This method relies on ESPAM2.1 predictions of response at the Rangen spring cell. The area within the trim line was also clipped to exclude areas outside of the current area of common groundwater supply.

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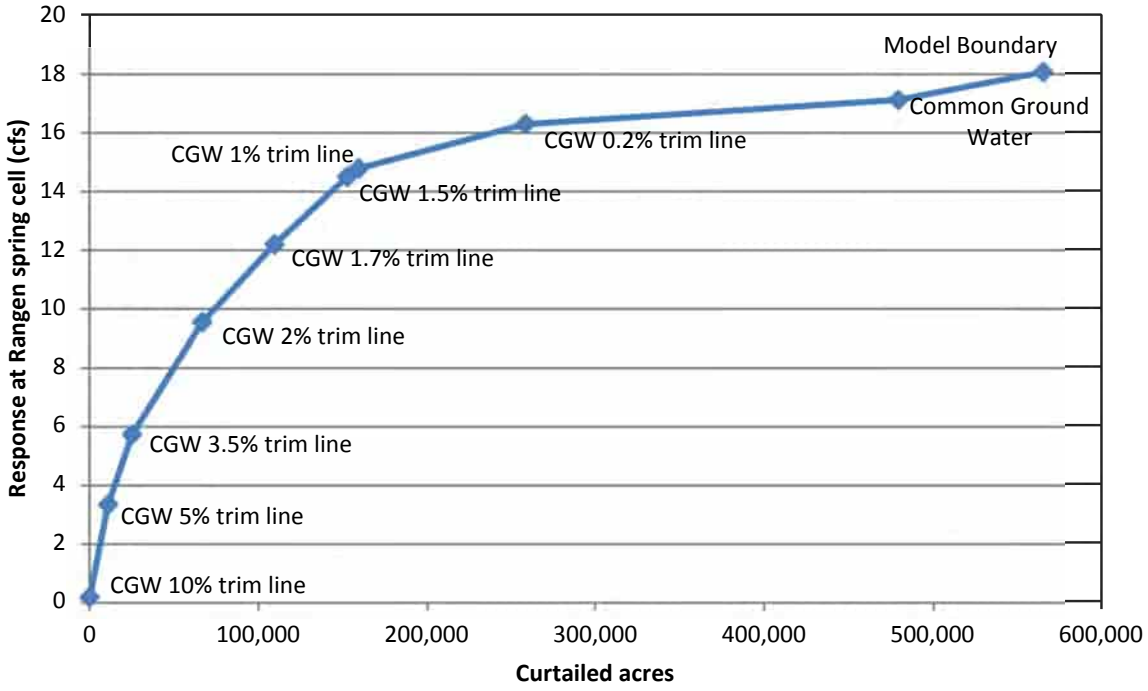

Figure 18. Comparison of predicted response and acres curtailed.

Summary of expert rebuttal reports

This section summarizes and responds to the following expert rebuttal reports submitted in the Rangen Delivery Call. No expert rebuttal reports were submitted on behalf of FMID.

1. Brockway, C.E., D. Colvin, and J. Brannon, 2013a. *Rebuttal Report in the Matter of Rangen, Inc. – Availability of Spring Flow and Injury to Water Rights*, prepared for Rangen, Inc., February 8, 2013.
2. Brockway, C.E., D. Colvin, and J. Brannon, 2013b. *Rebuttal Report by Bryce Contor in the Matter of Rangen, Inc. – Availability of Spring Flow and Injury to Water Rights*, prepared for Rangen, Inc., February 8, 2013.
3. Smith, C. E., 2013. *Rebuttal Expert Report in the Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-02551 and 36-07694*, prepared for Rangen, Inc.
4. Green, G., 2013. *Rebuttal Report in the Matter of Distribution to Water Right Nos. 36-02551 and 36-07694*, prepared for Brody Law Offices, PLLC.
5. Brendecke, C.M., 2013. *Review of Expert Report in the Matter of Rangen, Inc. – Availability of Spring Flow and Injury to Water Rights by Charles E. Brockway, David Colvin, JimBrannon*, prepared for Racine, Olson, Nye, Budge, and Bailey, Chartered, February 8, 2013.

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6. Hinckley, B., 2013. *Review of "Expert Report in the Matter of Rangen, Inc. – Availability of Spring Flow and Injury to Water Rights", December 20, 2012 by Charles E. Brockway, David Colvin, and Jim Brannon*, prepared for Racine, Olson, Nye, Budge, and Bailey, Chartered, February 8, 2013.
7. Rogers, T.L., 2013. *Rebuttal Report by Thomas L. Rogers,* prepared on behalf of the Idaho Ground Water Appropriators, Inc., February 8, 2013.
8. Sullivan, G.K., 2013. *Spronk Water Engineers, Inc. Expert Rebuttal Report in the Matter of Distribution of Water to Water Right Nos. 36-02551 and 36-07694 (Rangen, Inc.)*, prepared for the City of Pocatello, February 8, 2013.
9. Woodling, J.D., 2013. *Expert Rebuttal Report in the Matter of Distribution of Water to Water Right Nos. 36-02551 and 36-07694*, prepared on behalf of the City of Pocatello.

Summary of rebuttals on behalf of Rangen

Brockway et al. (2013a) respond to the expert reports submitted on behalf of IGWA by Brendecke (2012), Hinckley (2012), Rogers (2012) and the expert report submitted on behalf of the City of Pocatello by Sullivan (2012). Brockway et al. (2013a) "*assert that the water rights issued by IDWR for the Rangen facility and the administration of those define and treat the entire Range Spring as a single source*." Brockway et al. (2013a) reiterate their opinions that ESPAM2.1 is the best available scientific tool for evaluation of responses to changes is ESPA water use and that uncertainty analyses performed on ESPAM2.1 and other ESPA groundwater models do not support the use of the trimline proposed by Brendecke (2012).

Brockway et al. (2013a, p. 2) criticize the alternative conceptual models presented by Brendecke (2012), stating, "*Hypothetical interpretations of the Rangen Spring geology offered by IGWA consultants Hinckley and Brendecke are not justified and different conceptual models, as proposed by IGWA consultants, are incorrect*," and "*These expert reports can be characterized as a sudden reversal of a decade of open and collaborative ESPAM model development led by IDWR and with the cooperation and oversight of the members of the ESHMC, including Brendecke and Sullivan*." Brockway et al. (2013a, p. 17) also note that Dr. Brendecke's alternative models predict similar responses to curtailment at the Rangen spring complex and state, "*The similarities between the results from alternative models presented by Brendecke and results from ESPAM2.1 prove that ESPAM2.1 is a robust model. Even when inappropriate changes are made to the conceptualization of the model, it predicts virtually the same Rangen Spring response to full ESPA curtailment of junior ground water pumping*."

Brockway et al. (2013a) provide additional discussion of Rangen's water measurement methods and reiterates their opinion that historic flow measurements at the Rangen facility are accurate and adequate for the purposes for which they have been used, including calibration of ESPAM2.1. Brockway et al. (2013a) criticizes the Sullivan (2012, p. 6) analysis of Rangen's beneficial use and efficiency of water use, stating, "*This assumption reflects an un-familiarity with the operation of aquaculture facilities which require periodic harvesting and movement of stock within the facility which results in temporary non-use of specific raceways or rearing facilities*.

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Brockway et al. (2013b) respond to the expert reports submitted on behalf of FMID by Contor (2012a, 2012b). Brockway et al. (2013b) criticize the Contor (2012a) analysis of model uncertainty, and disagree with Mr. Contor's conclusion that transmissivity uncertainty is approximately equal to water budget uncertainty. They also question how Mr. Contor calculated the 17% estimate of water budget uncertainty, and criticize statements made by Mr. Contor regarding the results of IDWR's uncertainty analysis.

Smith (2013) responds to expert reports submitted on behalf of IGWA by Church (2012) and Rogers (2012) and on behalf of the City of Pocatello by Sullivan (2012). Mr. Smith states that pumped water and reused water are less desirable than first use spring water because of dissolved oxygen concentrations, concentration of waste, and potential failure due to loss of power. Mr. Smith asserts that the hatcheries using pumped water and recycled water mentioned by Rogers (2012) are federal or state hatcheries that do not have to make a profit to operate. Mr. Smith asserts that pumped water is too unreliable for large commercial hatcheries and that recirculation hatcheries are subject to catastrophic losses of fish to pumping failures, nitrite toxicity and disease outbreaks such as infectious hematopoietic necrosis (IHN). Mr. Smith submitted a copy of an expert report submitted by John R. MacMillan on behalf of Clear Springs Foods in a previous proceeding and stated that he is in general agreement with Dr. MacMillan's report. Smith (2013) also discusses errors in calculations presented by Rogers (2012).

Smith (2013) reiterates his conclusions that the flow indices and density indices used by Rangen for the purpose of raising fish for Idaho Power Co. are reasonable, the Rangen hatchery is currently beneficially using all available water and not wasting water, and that the hatchery could use more water to raise fish if it was available.

Green (2013) responds to Church (2012) and states, "*My opinion of Mr. Church's analysis is that his analysis is incomplete and inaccurate*." Mr. Green states that Idaho farm raised trout is a multi-million dollar business and that Idaho trout production capacity is a substantial portion of the U.S. total trout production, and that the U.S. trout producing industry is not in decline. Mr. Green criticizes Mr. Church's assertion that Rangen should use their own money to make efforts to remedy a problem caused by junior groundwater pumping. Mr. Green concludes, "*Ronald Coase, a Nobel Prize winning economist, suggests the persons' imposing an externality, ground water farmers, on other property owners, Rangen, can and should compensate the damaged party, Rangen*."

Summary of rebuttals on behalf of IGWA

Hinckley (2013) responds to Brockway et al. (2012). Mr. Hinckley reiterates his opinion that ESPAM2.1 does not adequately represent aquifer geometry and hydrogeologic conditions in the area of the Rangen spring complex. Mr. Hinckley also reiterates his opinion that Rangen should obtain additional water by constructing a vertical well in the ESPA, or by developing another horizontal tunnel below Curren Tunnel.

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Brendecke (2013) responds to Brockway et al. (2012) and reiterates his opinions that ESPAM2.1 is a regional model that cannot be relied upon to accurately predict effects at Rangen from curtailment of junior groundwater rights, that Rangen consistently underestimates available flows, that Rangen could pump additional water to its small raceways, and that Rangen should make improvements to Curren Tunnel or construct a vertical well. Dr. Brendecke states that the Brockway et al. (2012) simulation of curtailment throughout the model domain ignores the statutory definition of the area of common groundwater supply, and that "*delivery of less than 1% of the curtailed use to the calling water right constitutes a waste of water by any reasonable definition*."

Rogers (2013) responds to Smith (2012), Brockway et al. (2012), and Sullivan (2012) and reiterates his opinions that Rangen does not maximize fish production, is not using water efficiently, and is wasting water currently available to the hatchery. Mr. Rogers also reiterates his opinion that Rangen should consider pumping systems, reuse of water, and developing new wells to enhance flows.

Summary of rebuttals on behalf of the City of Pocatello

Sullivan (2013) responds to Brockway et al. (2012) and Smith (2012). Mr. Sullivan provides a detailed discussion regarding the accuracy of Rangen flow measurement procedures and concludes that "*significant under-measurement of the flows during the calibration period calls into question the model calibration to the Curren spring flows, and would likely require that the model be re-calibrated*." Mr. Sullivan points out that he and Chuck Brendecke qualified the ESHMC recommendation for ESPAM2.1 with "*although other tools or models may be more appropriate in certain circumstances*." Mr. Sullivan argues that Rangen has not shown material injury and states, "*No data or analyses were provided to support the opinion that Rangen would increase fish production with additional flow*," and, "*An overarching implication in the Brockway Report is that depletions predicted by the ESPAM2.1 model from junior ground water users equals injury. This is not how the prior versions of the ESPAM have been used in delivery calls. Only after it has been proven that a senior water user is suffering material impacts due to water shortages…has the Department used the ESPAM to assess the magnitude of the shortage…*"

IDWR staff comments regarding rebuttals on behalf of Rangen

On page 4, Brockway et al. (2013a) state "*The best estimate of the impact of junior groundwater pumping on Rangen spring is the unmodified output from ESPAM2.1. Utilization of a trimline of any percentage magnitude, justified by an unsubstantiated estimate of ground water model uncertainty, arbitrarily limits the true hydraulic impact of junior pumping and is not hydraulically or statistically supported. There has never been an uncertainty analysis performed on ESPAM2.1 or any ESPA ground water model to support the use of a trimline as currently configured*." IDWR staff agree that ESPAM2.1 provides the best prediction of the impact of junior groundwater pumping on spring discharge in the Rangen spring cell. This conclusion applies both to the ESPAM2.1-predicted response to model-wide curtailment and to the ESPAM2.1-predicted steady state response functions. These response functions provide the best prediction of the percentage of curtailed groundwater use that would accrue to the Rangen spring cell, and the percentage of curtailed use that would accrue to other springs and reaches

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of the Snake River. This information can be used to delineate a trimline, if the Director finds it is not appropriate to curtail groundwater users if less than a certain percentage of their curtailed use would accrue to the Rangen spring cell.

On page 14, Brockway et al. (2013a) provide results of curtailment simulations performed using the alternative models presented by Brendecke (2012). Their results are identical to those obtained by IDWR and presented previously in the section "IDWR staff comments regarding submittals on behalf of IGWA".

On page 15, Brockway et al. (2013a) provide a table of response functions for seven model cells in the Rangen area. Their results are identical to those obtained by IDWR and discussed previously in the section "IDWR staff comments regarding submittals on behalf of IGWA".

IDWR staff comments regarding rebuttals on behalf of IGWA

On page 1, Hinckley (2013) asserts that ESPAM2.1 represents the aquifer "*as a single, 4,000-ft. thick layer*". IDWR staff disagree with this comment. ESPAM2.1 represents the aquifer using time-constant transmissivity. Transmissivity, which is the product of hydraulic conductivity and saturated thickness, is adjusted during model calibration to obtain the best fit to observed data. Neither hydraulic conductivity nor saturated thickness is explicitly represented in the ESPAM2.1, and their individual contributions to transmissivity are not relevant in a time-constant transmissivity model.

On page 1, Hinckley (2013) asserts that "*characterization of aquifer geometry is important*" and that ESPAM2.1 "*models the aquifer as being laterally continuous in all directions from the Rangen discharge points*." IDWR staff disagree with Mr. Hinckley's assertions that ESPAM2.1 ignores aquifer geometry and represents the aquifer as laterally continuous in all directions. ESPAM2.1 models the aquifer geometry and the geometry of spring discharge locations along the Snake River and Hagerman rims within the constraints of a one-square-mile model grid. While the ESPAM2.1 representation does not allow delineation of details smaller than one mile, it does provide a better representation of aquifer geometry than other available models or predictive methods.

Hinckley (2013) discusses water levels in Well No. 797 on pages 5-6 and in Figure 2. He inappropriately compares the slope of a linear regression of data collected only in the 2000s with the linear slope of water levels modeled by ESPAM2.1. It is not appropriate to use data collected only in the 2000s to evaluate ESPAM2.1, which was calibrated to data collected between 1985 and 2008. The data collected in the 2000s represents a period of relatively low net ESPA recharge, and do not reflect the range of conditions that occurred between 1985 and 2008 or the volume of net ESPA recharge that would occur if groundwater pumping junior to 1962 was curtailed. As shown previously in Figure 12, curtailment of groundwater pumping junior to 1962 would result in net ESPA recharge similar to the late 1990s. Further, IDWR staff disagree with the use of Well No. 797 by both Brockway et al. (2012) and Hinckley (2013) for prediction of impacts at the Rangen spring complex. This well is located approximately 6.5 miles north of the Rangen spring complex and has a significantly different spatial relationship to junior irrigated lands in this area. Well No. 989 would be a more appropriate well to use for prediction of

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impacts at the Rangen spring complex, as discussed previously in the section "IDWR staff comments regarding submittals on behalf of IGWA."

Hinckley (2013) discusses water levels in Well No. 991 on page 6 and in Figures 3a and 3b. This well was not used to calibrate ESPAM2.1, because water levels and the well driller's report indicate that it is not completed in the ESPA. The maximum water level elevation in this well is approximately 3,007 feet, more than 80 feet lower than the elevation of Spring Creek Spring, which is the lowest elevation spring in the same model cell. This well is not included in the shapefile, Wells.shp[8], which shows the wells used as calibration targets. Water level measurements for this well are included in the spreadsheet ESPAM2_ESPAM21.xlsm[9], but all measurements are weighted zero, indicating that they were not used to calibrate the model.

On page 2-2, Brendecke (2013) compares historic measurements of 50 cfs in April 1902 and 96 cfs in September 1917 and suggests the difference between these measurements may be seasonal variation in discharge from the Rangen spring complex. As previously discussed in response to Brockway et al. (2012), IDWR staff review of these historic records indicates that these measurements were likely collected at two different locations along Billingsley Creek, and it is likely both measurements include more than just the discharge from the Rangen spring complex.

On page 4-1, Brendecke (2013) states, "*There is nothing in the Department's report on this comparison that attributes the increase in curtailed consumptive use to 'increased confidence in model inputs and calibration targets'. Most changes in model inputs were associated with extension of the model period and disaggregation to monthly stress periods. The curtailment difference is largely due to the use of different time periods to represent current conditions.*" This statement does not reflect the conclusions presented by IDWR in Sukow (2012a), which stated that most of the increase in junior irrigated land area resulted from improvements in GIS methods used to delineate irrigation lands. Sukow (2012a) also stated that changes in estimates of crop irrigation requirements result largely from changing from 1971-2000 average precipitation used with ESPAM1.1 to a November 1998 to October 2008 average precipitation with ESPAM2.1. The 1971-2000 period used to estimate precipitation with ESPAM1.1 curtailment simulations resulted in estimates of precipitation higher than the long term average from 1934 through 2008. Average precipitation from the 1998-2008 period used with ESPAM2.1 curtailment simulations is closer to the long term average.

On page 4-2 and Table 4.1, Brendecke (2013) states that differences between ESPAM2.0 and ESPAM2.1 predictions of responses to curtailment differed by up to 30%. IDWR staff note that the prediction which changed by up to 30% was the prediction of the response at the Ellison spring cell, which is a Group C spring and had an insignificant response (0.115 cfs in ESPAM2.0 and 0.162 cfs in ESPAM2.1).

[8] Available at http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/meetings/2012_ESHMC/11_9_2012/E121025A001_spreadsheets.zip in the gis folder (last visited February 20, 2013).

[9] Available at http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/meetings/2012_ESHMC/11_9_2012/E121025A001_spreadsheets.zip (last visited February 20, 2013).

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Model calibration with respect to Group C springs is not well constrained, because the Group C springs do not have transient calibration targets. The difference between the ESPAM2.0 and ESPAM2.1 predictions of response at the Rangen spring cell was only approximately 1%, suggesting that the Group B transient target for the Rangen spring cell adequately constrains model calibration with respect to the Rangen spring cell.

On page 4-3, Brendecke (2013) states, "*seasonal water level fluctuations and predicted water level changes (due to curtailment) are nearly 100% of the saturated thickness above the Tunnel and about 10% of the thickness above the lower springs at Rangen."* He states that the use of time-constant transmissivity in ESPAM2.1 was not justified. As stated in the ESPAM2.1 final report (IDWR, 2013), "*The generally considerable saturated thickness of the ESPA supports a time-constant representation of transmissivity, because drawdown is generally expected to be less than 10% of total saturated thickness (Anderson and Woessner, 1992)*." Note that this guideline applies to water level change as a percentage of the total saturated thickness, which Dr. Brendecke acknowledges is about 10%. The portion of the saturated thickness that is above the tunnel elevation is not relevant, because the tunnel is not located at the base of the aquifer. The conditions described by Dr. Brendecke are at the limit of the standard cited in IDWR (2013), but do not exceed this standard.

On page 4-3, Dr. Brendecke asserts, "*The curtailment scenario discussed by Rangen represents a 'new distribution of stress' as described by Reilly (1987)*." As shown previously in Figure 12, curtailment of groundwater use junior to 1962 would result in net ESPA recharge within the range that occurred during the model calibration period. Because the model is calibrated using net recharge, not the groundwater pumping portion of net recharge, the comparison made by Dr. Brendecke in Figure 4-1 is not relevant.

On page 4-6, Dr. Brendecke states, "*The consistent over-prediction of low flow values in recent years is problematic because this is the starting point for any changes due to curtailment*." Dr. Brendecke again overstates the importance of conditions during recent drought conditions. The best modeled representation of a system is obtained with calibration to a range of conditions. This was accomplished with ESPAM2.1 by calibration during a 23.5-year period that included both wet and dry years. Low flow values in recent years are not more important than flow values in the 1980s or 1990s. For predicting the response to curtailment, it is the difference between low flow values and historic values that is most important. Over-prediction of low flow values in recent years and under-prediction of flows in the 1980s likely results in slightly lower predictions of the response to curtailment. This is illustrated by Dr. Brendecke's alternative model (AMEC Model 2), which Brendecke (2012) states "*appears to resolve the overprediction problem noted for ESPAM2.1 in recent years*." AMEC Model 2 predicts a response of 18.0 cfs in response to curtailment within the model domain, which is slightly higher than the ESPAM2.1-predicted response of 17.9 cfs.

On page 4-7, Brendecke (2013) states, "*…the inability to quantify uncertainty does not disprove its existence or demonstrate that it should be ignored*." IDWR staff agree that model uncertainty exists and do not suggest that it should be ignored. However, there is no evidence to support Dr. Brendecke's assumption that model uncertainty is so high that ESPAM2.1 cannot reliably predict whether or not the response to curtailment at the Rangen spring complex would be a measurable amount of water.

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Accepting the predictions made by ESPAM2.1 as the best available prediction is not ignoring model uncertainty. Actual responses may be higher or lower than the prediction, so adjusting a model prediction in one direction would favor one party over another. IDWR staff also note that delineation of a trimline using ESPAM2.1-predicted response functions is not a "*modification of the output*" as stated in the Brockway et al. (2012) quote that Brendecke (2013) is responding to on page 4-7. Delineation of a trimline using ESPAM2.1-predicted response functions is a direct application of unmodified ESPAM2.1 predictions of response at the Rangen spring complex. The steady state response functions are subject to the same types of uncertainty as the predicted response to model-wide curtailment. Use of the steady state response functions to delineate a trimline requires accepting that the ESPAM2.1 provides the best available prediction of response at the Rangen spring cell.

On page 4-7, Brendecke (2013) states regarding the 2009-2010 validation scenario, "*This is important since curtailment would begin with present, rather than historical, aquifer conditions*." IDWR staff disagree with this statement. Curtailment of groundwater use would increase the net ESPA recharge to historic conditions reflected during the calibration period in the 1990s (Figure 12). Present conditions are not more relevant than historic conditions.

On page 7-1, Brendecke (2013) states, "*Relatively modest changes to the model demonstrate quite different model results*." IDWR staff review of Dr. Brendecke's modified alternative models indicates that his models actually demonstrate quite similar results, as presented previously in the section "IDWR staff comments regarding expert reports on behalf of IGWA".

On page 7-3, Brendecke (2013) states, "*Good model calibration is a necessary but not sufficient condition for reliable model prediction. Reliable prediction also requires accurate model representation of hydrologic and hydrogeologic conditions in the area of the prediction. ESPAM2.1 does not contain this detailed representation*." In the opinion of IDWR staff, ESPAM2.1 is capable of providing a reasonable prediction of the response at the Rangen spring cell to regional stresses in the ESPA, such as curtailment of groundwater use. ESPAM2.1 does represent the aquifer geometry and regional hydrogeologic conditions within the constraints of a one-square-mile model grid and the transmissivity pilot point spacing, which is generally two to four miles in the vicinity of the Buhl to Lower Salmon Falls reach. ESPAM2.1 considers more hydrologic and hydrogeologic data than any other method available for predicting the response at the Rangen spring cell.

IDWR staff comments regarding rebuttals on behalf of the City of Pocatello

On pages 5-14, Sullivan (2013) discusses the accuracy of Rangen's flow measurements and rebuts statements made by Brockway et al. (2012). IDWR staff have reviewed Rangen's flow measurement methods during previous proceedings and have a number of comments in response to Sullivan (2013) and Brockway et al. (2012, 2013).

Rangen submitted annual water measurement reports directly to IDWR from 1995 through 2009, and to Water District 36A from 2010 to 2012. IDWR has accepted these annual water measurement reports

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during this period of record understanding that Rangen estimates hatchery diversions or flows using fish raceway check boards as non-standard weir measuring devices.

Based on the IDWR memorandum dated December 4, 2003 from Jennifer Berkey to Tim Luke (Berkey, 2003), reported measurement data submitted to IDWR by Rangen from 1995 through 2002 for the hatchery diversion (IDWR diversion number 410089) are the sum of the CTR raceway measurements and the measurement at the dam on Billingsley Creek (also known as the "Lodge dam"). IDWR understands that the Rangen measurement reports submitted to IDWR after 2002 are also based on the sum of the CTR raceways and the Lodge dam. The CTR raceway measurements include all water flowing through the hatchery, including the water diverted from Billingsley Creek and water diverted from the Curren Tunnel to the hatchery lab and upper raceways. Water diverted from the Curren Tunnel to the lab and upper raceways is re-diverted to the lower raceways (Large and CTR raceways). Water measured over the Lodge dam in the creek is water that bypasses the hatchery. The hatchery diversions and layout are described in the IDWR memo from Cindy Yenter to Director Karl Dreher, dated December 15, 2003 (Yenter, 2003).

Measurement of flow through the hatchery using 2-inch rectangular stop logs or check dam boards[10] (check boards) is not considered a standard methodology of measurement because the check board weirs are not considered standard measurement devices. IDWR's *Minimum Acceptable Standards for Open Channel and Closed Conduit Measuring Devices* specify that construction, installation and operation of open channel measuring devices, including contracted rectangular weirs and suppressed rectangular weirs, should follow published guidelines such as those published by the United States Bureau of Reclamation (USBR, 1997).

Although the raceway check boards are not considered standard measuring devices, IDWR accepts measurements using these structures at many hatcheries in the area given that IDWR's standards allow an accuracy of +/-10 percent for open channel measuring devices when compared to measurements using standard portable measuring devices. Many of the area hatcheries have long used raceway check board structures for measuring devices out of convenience and lack of any other installed standard type devices. Some hatchery operators have not installed standard measuring devices due to lack of suitable measurement locations and added costs associated with installing standard devices. IDWR has not calibrated or compared the Rangen raceway check board measurements against standard portable measuring device measurements due to the lack of suitable locations within the hatchery where flows can be measured with portable measuring equipment. However, IDWR staff has compared portable discharge measurements against check board structures at other hatchery and irrigation diversions in both the Hagerman area and other locations in Idaho. IDWR has found those check board measurements, when used with the standard suppressed rectangular weir equation[11] and acceptable

[10] IDWR has observed that the check boards used at the Rangen Hatchery and other area hatcheries are standard 2" x 4" boards in which the actual thickness measures 1-1/2 inches, or 0.125 ft.

[11] The Francis equation for a standard suppressed rectangular weir is $Q = 3.33 L H^{1.5}$ where Q = discharge, L = weir crest length, and H = head of water above the weir crest, and the value 3.33 is a constant coefficient (US BOR, 1997, p 7-19)

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head measurements are typically within +/- 10 percent of standard portable flow meter measurements. In her memo dated December 15, 2003, Cindy Yenter, Water District 130 watermaster, states the following:

> *"My experience has been that measurements taken at flat-crested dam boards are generally less accurate than those taken at sharp crested weirs, and that flat crested dam measurements return indications of flow which are typically 5-10% lower than actual flow, when checked against other methods of measurement."*

The Yenter memo further states that the sum of the IDWR staff measurements of the CTR raceways and Lodge dam on November 25, 2003 was 10 percent higher than the measurements taken by the Rangen staff a day earlier[12]. The memo was the basis for of Finding of Fact No. 76 in the May 19, 2005 Second Amended Order issued by Director Dreher which states in part that "*…measurement of flows through hatchery raceways reported by Rangen may be systematically about 10 percent lower than actual flows*." The Yenter memo suggests that the difference may be due largely to methods in measuring the head above the weir crest between IDWR and hatchery staff. Yenter notes that the proper location for measurement of head is upstream from the weir crest. Sullivan (2013, p. 11-12) correctly states that the head measurement for a standard weir should be upstream of the weir crest a distance of at least four times the maximum head on the crest. Yenter (2003) states that if it is not possible to obtain a proper upstream head measurement, "*the proper technique for using a hand held staff gage directly on the crest is to turn the surface of the gauge into the flow slightly, to overcome the drawdown (over the crest) and simulate a true head reading*." This method of measuring head on a weir is described in more detail in Brockway (2013) on pages 4-5. The description provided by Brockway is consistent with the methodology used by IDWR staff. IDWR rarely finds that staff gages are installed in the proper location for either standard or non-standard weirs. The method described by Yenter and Brockway therefore is used extensively by IDWR staff when measuring head at weirs found in the field where no staff gage is installed or gages are not installed in the proper location.

The other source of discrepancy between the IDWR and Rangen staff measurements noted in Yenter (2003) is the use of different weir equations or rating tables. IDWR used the standard suppressed weir equation (Francis equation), $Q = 3.33\ L\ H^{1.5}$, where Rangen used a rating table based on a modified weir equation. The table used by Rangen is found in Appendix A of the Brockway report dated December 20, 2012. This same table was also found in IDWR's records (attached) and appears to have been faxed to the IDWR Southern Region office on December 18, 2003 by Rangen staff. The table includes a rating for the Large raceways, the CTR raceways and the Lodge dam. The Large and CTR raceway ratings employ a fixed length weir crest even though the crest lengths at individual raceways vary slightly in size.

[12] IDWR staff measured a total of 18.97 cfs at the Rangen hatchery based on sum of the Large raceways + Lodge Dam, or a total of 18.69 cfs based on sum of CTR raceways and Lodge dam. The 2003 measurement report submitted to IDWR by Rangen reports a total of 17.51 cfs on November 24, 2003, which is a difference of either 1.46 or 1.18 cfs, or a difference of -7.7% and -6.31% respectively. IDWR measured 0.48 cfs at the Lodge dam on November 25, 2003.

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When using the IDWR head measurements from November 25, 2003 with the Rangen discharge table, the flow at the Large raceways is 16.9 cfs and the flow at the CTR raceways is 16.2 cfs. The Yenter memo states that Rangen staff measured 16.6 cfs and 15.9 cfs at the Large and CTR raceways respectively on November 24, 2003, a difference of only 0.3 cfs between IDWR and Rangen when using the Rangen discharge table, or a difference of less than 2 percent at each set of raceways. The relatively minor differences between the IDWR and Rangen measurements when using the Rangen discharge tables indicates that the differences in flow measurements between IDWR and Rangen on November 25th and 24th, 2003, was due mostly to the use of different weir equations or rating tables, rather than differences in head measurements.

Page 9 of Brockway (2012) indicates that the Rangen rating table "appears to match most closely with a standard rectangular contracted weir formula with a coefficient of 3.09 rather than the typical 3.33 coefficient." IDWR staff note that use of this formula with the 3.09 coefficient yields values that are slightly different than the values in the Rangen table. Columns 5 and 6 of Tables 1-3 through 1-5 in the SWE rebuttal report show the coefficients derived from both the suppressed weir and contracted weir equations using the Rangen rating table. As seen in Tables 1-3 through 1-5 the coefficients used in the Rangen rating table range from 2.85 to 3.20.

Brockway (2012) states that the Rangen rating tables "*are likely to be more accurate*" than a standard rectangular weir discharge using USBR weir flow calculations, but the report does not provide an explanation for the improved accuracy. Brockway (2013) on page 5 states the following:

> *"Studies conducted on flow over check boards at the ends of raceways on aquaculture facilities indicate that the weir coefficient that should be used for flow over check boards, is near 3.09 as compared to the standard Francis formula, which assumes a sharp crested weir with a coefficient of 3.33 (USBR Water Measurement Manual, 1967). King and Brater, (Appendix A), 1967 compiled research on broad crested weir coefficients which shows a weir coefficient for use on a broad crested weir of approximately 2-inch width of 3.08. This would be applicable to flow over check boards with heads between 3 and 4.5 inches (0.25 to 0.38 ft.)"*

Sullivan (2013, p. 7) cites King and Brater, 1976, whereby the standard suppressed rectangular weir equation with a coefficient of 3.09 is used as the standard broad crested weir equation.

The statements from Dr. Brockway above with respect to use of a standard contracted weir equation with a 3.08 coefficient that is more appropriate for a broad crested weir raise the following concerns:

1) IDWR's review of the 1984, 1997 and 2001 editions of the USBR Water Measurement Manual confirm that a coefficient of 3.33 is used for standard sharp crested thin plate weirs. However, IDWR's review of the USBR manuals found no mention or reference to studies conducted on flow over check boards in aquaculture raceways and the recommended use of a coefficient of either 3.09 or 3.08 when using 2-inch thick check boards.

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002011

2) As shown in Table 1-1 of Sullivan (2013), which is taken from King and Brater, 1976, a broad crested weir coefficient of 3.08 corresponds to a crest breadth (or width) of 0.5 ft. and head of 0.6 ft., as well as a crest breadth of 1.0 ft. and head of 1.2 ft. The 2-inch thick check boards used at the Rangen facility represents a crest width of about 0.17 ft. As stated on page 7-2 of the USBR Water Measurement Manual, 1997, "true broad crested weir flow occurs when upstream head above the crest is between the limits of 1/20 and 1/2 the crest length in the direction of flow" (between 0.05 and .50). Additionally, Bos (1989) states that for use of broad crested weirs, the length of the weir crest in the direction of flow (L) should be related to the total energy head (H) over the weir crest as: $0.07 \leq H/L \leq 0.50$. A crest width of 2 inches (0.17 ft) and a head of 4.5 inches (0.38 ft.) referenced by Dr. Brockway results in the ratio H/L being equal to 2.24, thereby exceeding the recommended ratio provided in both Bos (1989) and the USBR (1997). Moreover, a description of a broad crested weir provided in Sullivan (2013, p. 9) notes that "*a weir will function as broad crested when the width (aka breadth) exceeds twice the measured head*." Using a 2-inch check board as a broad crested weir provides a crest width of only 1.5 inches, which is less than one-half the typical measured head of 4.5 inches cited by Dr. Brockway, not two times the measured head.

3) Bos (1989) states that where a broad crested weir with ratio of H/L > 1.5, "*the nappe may separate completely from the crest and the weir in fact acts as a sharp crested weir. If H/L becomes larger than 1.5 the flow pattern becomes unstable and is very sensitive to the 'sharpness' of the upstream weir edge*". Column 7 of Tables 1-3 through 1-5 in Sullivan (2013) show that H/L (or H/B) for the Large, CTR and Lodge weirs is 1.5 or greater starting at a head of 3 inches. Mr. Sullivan also notes in his rebuttal report on page 9 that "when the measured head exceeds 1 to 2 times the width of the crest, the nappe will ordinarily spring clear and the weir will hydraulically operate as sharp-crested (Chow, 1964, King, 1976)."

4) Although Rangen has apparently used a rating table that more closely approximates a broad crested weir equation and coefficient, IDWR staff note that every annual measurement report submitted by Rangen to IDWR from 1995 through 2009 states that standard suppressed rectangular weirs are used (see Section III A of the IDWR annual report forms). Section III C of the IDWR annual report forms asks that copies of measuring device rating tables be attached to the report unless previously supplied to IDWR. None of the annual reports submitted to IDWR by Rangen include copies of rating tables used by Rangen. IDWR records do not show that the rating table identified in Appendix A of the December, 2012 Brockway report was received by IDWR until December 18, 2003. IDWR had assumed that Rangen was using standard rectangular suppressed weir tables from 1995 through 2002.

Tables 1-3 through 1-5 in Sullivan (2013) show computed discharges at the Large raceways, CTR raceways and the Lodge dam for what Mr. Sullivan calls "'*Hybrid Weirs' based on their function as broad crested weirs at low heads and sharp crested weirs at higher flows*." Also included in column 1 of Tables 1-3 through 1-5 are the corresponding discharges from the Rangen rating tables. As seen on page 11 of Sullivan (2013), the range of differences between the Hybrid Weir discharges and the Rangen rating

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002012

table discharges is +0.8% to 10.2% for the Large Raceways, +1.1% to 10.9% for the CTR Raceways, and -6.4% to 20.2% for the Lodge Dam. Other than the Lodge Dam, the range of differences is within +/- 10 percent except for several head measurements on the Large Raceways with heads between 0.28 and 0.31 ft., where the differences are between 10.2% and 10.9%.

Column 8 of Tables 1-3 through 1-5 in Sullivan (2013) show the discharge coefficients used in Mr. Sullivan's Hybrid Weir equation. It is noted that for heads greater than 0.25 ft (3 inches), the coefficient is 3.32, or essentially the same as the coefficient used in the standard rectangular contracted and suppressed weir equations. Mr. Sullivan uses lower Hybrid Weir coefficients which approximate coefficients used for broad crested weirs for heads at 0.25 ft and less. It is important to note that head measurements above weir crests should exceed 0.2 ft. for sharp crested weirs as per USBR published guidelines (USBR, 1997). Use of a broad crested weir equation with coefficients of about 3.08 or 3.09 may be more appropriate for heads that measure 0.2 ft or less. At such heads, the ratio H/L is less than 1.50.

Based on review of the expert reports, IDWR staff provides the following opinions:

1. IDWR concurs with the Brockway (2013, p. 5) that the difference in weir coefficients between the standard suppressed rectangular weir with C=3.33 and use of the contracted rectangular weir with C=3.09 results in a difference of about 8%. IDWR also agrees with the statement on p. 9 of Brockway (2012), that "*the standard rectangular weir discharge using USBR weir flow calculations were within 8% of the Rangen staff reported flows*." (Note: The Rangen staff reported flows were -8% as compared to the same measurements using the USBR rating table for a standard contracted rectangular weir).

2. IDWR concurs with the Brockway rebuttal (2013, p. 5) that "standard weir formulas assume a sharp crested weir is in place and not a 2-inch board." However, the typical measured head at the Rangen raceways exceeds one to two times the 2-inch width weir crest such that the nappe separates from the crest and the weir more closely approximates a sharp crested weir where C = 3.33, which is the coefficient used with standard rectangular and suppressed weir equations.

3. IDWR concurs with both the Brockway (2013) and Sullivan (2013) rebuttal reports that the raceway check boards do not constitute standard suppressed rectangular weirs because the check boards are not sharp crested. It should also be noted that "*suppressed weirs must have proper ventilation of the cavity underneath their nappes. This ventilation is commonly done by installing properly sized pipes in the walls to vent the cavity under the nappe. Standard equations and tables are valid only when sufficient ventilation is provided. The weir will deliver more water than indicated by the tables and equations when ventilation is inadequate*." (USBR, 1997, p. 7-41).

4. IDWR concurs with the Brockway (2013, p. 5) that the differences in measurements between IDWR staff and Rangen staff are not due to differences in measurements of head at the weirs.

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002013

IDWR concludes that the differences are due mostly to the use of different rating tables and weir coefficients.

5. IDWR does not concur with Brockway (2013, p. 5) that finds concern with IDWR's comparison of IDWR staff measurements with Rangen staff measurements "*because IDWR staff utilized the discharge rating curve for a standard sharp crested weir when in fact the flow was over dam boards, which is best represented by a modified weir coefficient resulting in a discharge rating similar to that utilized by Rangen personnel*." IDWR disagrees with this statement because the discharge rating used by Rangen uses coefficients that more closely approximate the standard coefficient used with a broad crested weir. As stated in item 2 above, the typical flow conditions for the Rangen check boards do not approximate conditions for a broad crested weir. Rather, typical flow conditions more closely resemble those for a rectangular sharp crested weir. IDWR maintains that without the installation of a standard measuring device, it is more appropriate to use the USBR sharp crested weir formula with a coefficient of 3.33 for estimating flows over the Rangen raceway check boards.

6. IDWR concurs with Sullivan (2013, p. 8) that the Rangen check boards do not conform to specifications of sharp crested weirs, contracted rectangular weirs, suppressed rectangular weirs or broad crested weirs. IDWR further concurs with Mr. Sullivan that use of the standard weir equation to compute flow does not result in the most accurate measurement of raceway discharges and that "it is appropriate to calibrate the weirs based on flow measurements to establish empirical rating tables that describe the relationship between discharge and measured head." However, IDWR continues to recommend the use of the standard suppressed weir equation at raceway check board dams with a coefficient of 3.33 since neither weir calibrations nor standard measurement devices exist at the Rangen Hatchery. If Mr. Sullivan recommends use of the Hybrid weir equation and coefficients, then IDWR notes that there is no difference in discharges between the Hybrid and standard suppressed weir equations for heads greater than 0.25 ft. Similarly, there is very little difference in discharge between the Hybrid Weir and the Rangen discharge tables for heads less than 0.25 ft (differences are between +0.8 to -6.8 % for CTR and Large Raceways).

7. IDWR does not concur with Sullivan (2013, p. 13) that the extent of under-measurement at the Rangen hatchery may be as high as 30 to 40 percent or more. SWE has not explained how or why the error may be this large unless they are merely adding the largest percent errors found in column 11 of Tables 1-3 through 1-5 for the CTR and Large Raceways, and the Lodge Dam, or they are merely relying on the example cited by the USBR in which a 0.1 ft. error in head measurement for a head of 0.45 ft. over a 6 ft. long rectangular weir results in an under-measurement of 2 cfs or 35 percent (USBR, 1997, p. 5-9). As described in these comments, the difference in head measurements between IDWR and Rangen staff on November 24 and November 25, 2003 appear to be relatively minor, and IDWR measured heads in a manner that minimized error.

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8. IDWR accepted the measurements submitted by Rangen that are based on head measurements over raceway check boards and use of the Rangen rating tables because such measurements should be within a +/- 10 percent range of accuracy. The measurements likely under-measure actual flows, but an error up to -10% is acceptable pursuant to IDWR's *Minimum Acceptable Standards for Open Channel and Closed Conduit Measuring Devices.*

On page 13, Sullivan (2013) argues, "*The actual amount of any under-measurement of flow can be determined by conducting discharge measurements in the raceways and in Billingsley Creek using a current meter at various discharges to establish a calibrated rating table for each structure*." In the opinion of IDWR staff, it is difficult to obtain good, accurate measurements of discharge at or near the Rangen facility for calibrating the check board measurements, because flow and/or cross-sectional conditions are less than ideal. The USGS periodically measures the discharge in Billingsley Creek just downstream of the Rangen hatchery, but subjectively rates most of the measurements "fair" or "poor" indicating that USGS water measurement experts also found that flow and/or cross-sectional conditions in Billingsley Creek are not ideal and contribute to measurement error.

On page 14, Sullivan (2013) argues that "*under-measurement of the flows during the calibration period calls into question the model calibration to the Curren Spring flows, and would likely require that the model be re-calibrated*." The calibration target used for ESPAM2.1 was submitted to the ESHMC for review and comment in the fall of 2009. ESHMC members, including Mr. Sullivan and Dr. Brendecke, had more than two years to review the proposed calibration target and did not object to its use in ESPAM2.1. IDWR staff note that systematic under-measurement of discharge at the Rangen spring complex would be expected to result in lower model predictions of discharge and response to curtailment at the Rangen spring cell. This would favor the groundwater users, not Rangen.

On page 16, Sullivan (2013) points out that the ESHMC recommendation, "*The Eastern Snake Hydrologic Modeling Committee recommends that the Department begin using ESPAM Version 2.1 rather than ESPAM Version 1.1 for groundwater modeling*," was qualified by Mr. Sullivan and Dr. Brendecke with, "*although other tools or models may be more appropriate in certain circumstances*." IDWR staff note that neither Mr. Sullivan nor Dr. Brendecke proposed other tools or models that would be more appropriate for making a prediction in this circumstance.

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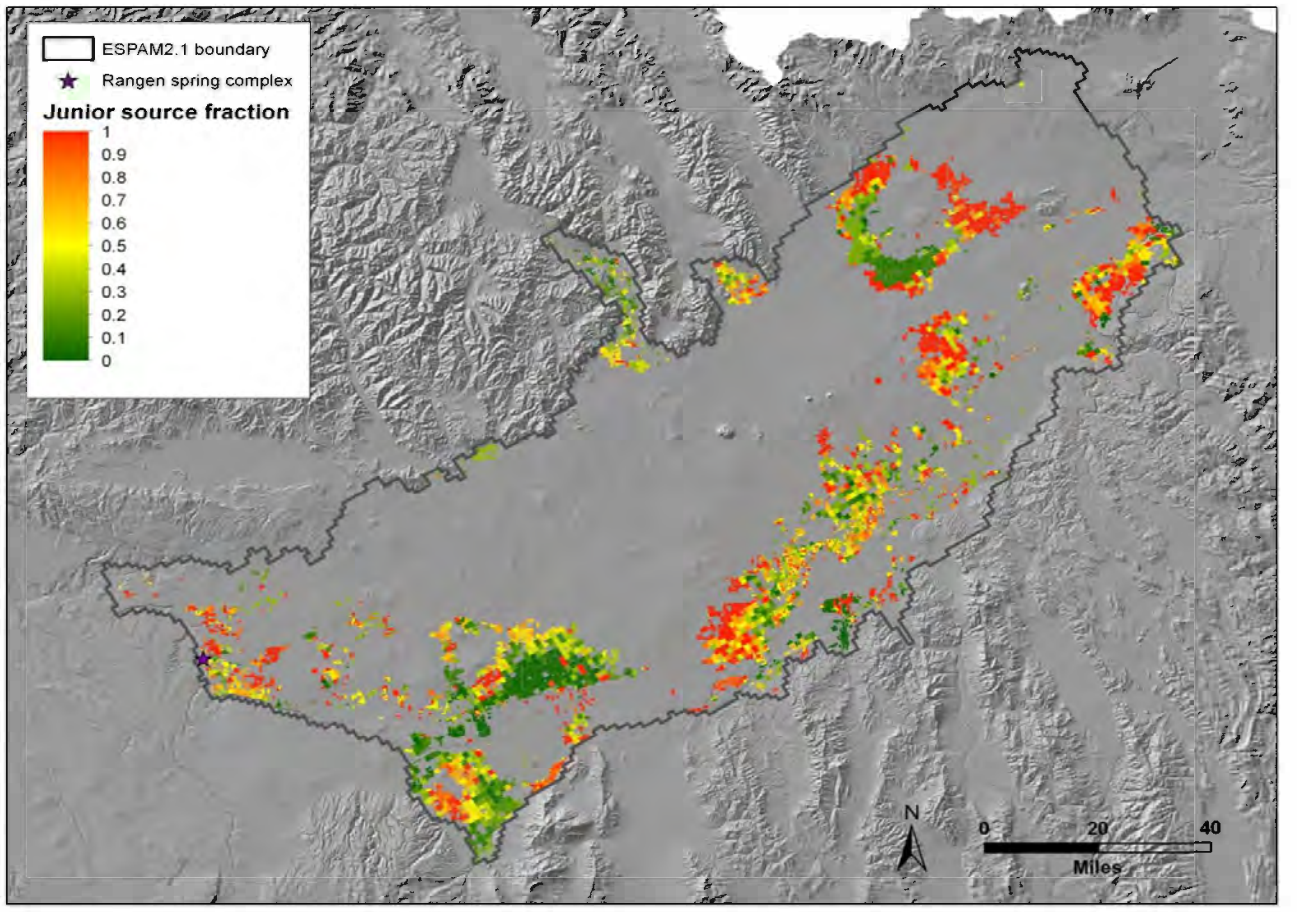
ATTACHMENT A. IDWR SIMULATIONS OF CURTAILMENT
JUNIOR TO JULY 13, 1962

Simulated curtailment junior to July 13, 1962 within ESPAM2.1 model boundary



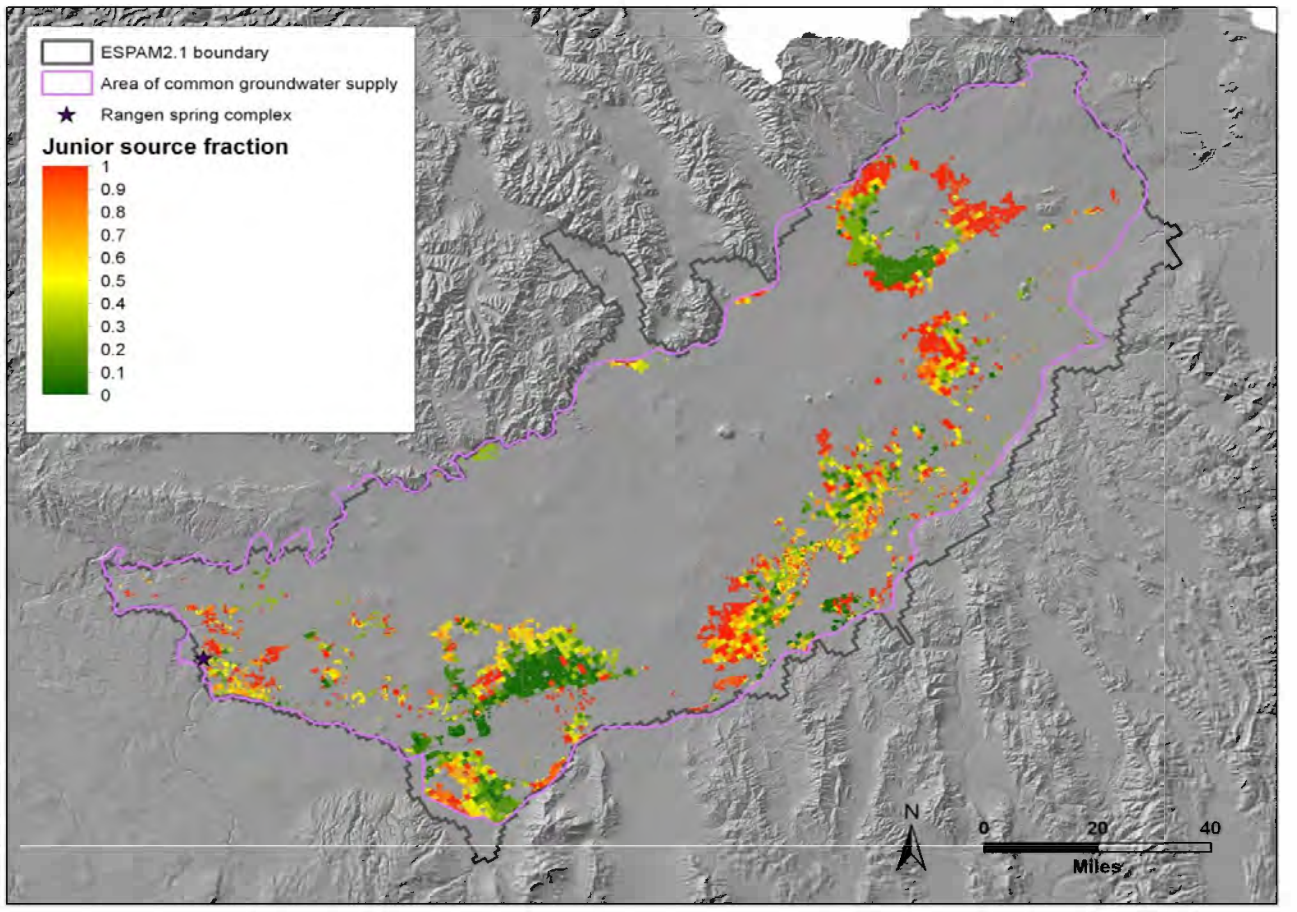
Simulated curtailment:

565,026	acres	
1,235,157	AF/yr	crop irrigation requirement
1,704.93	cfs	crop irrigation requirement
2.19	AF/ac/yr	crop irrigation requirement

Predicted response:

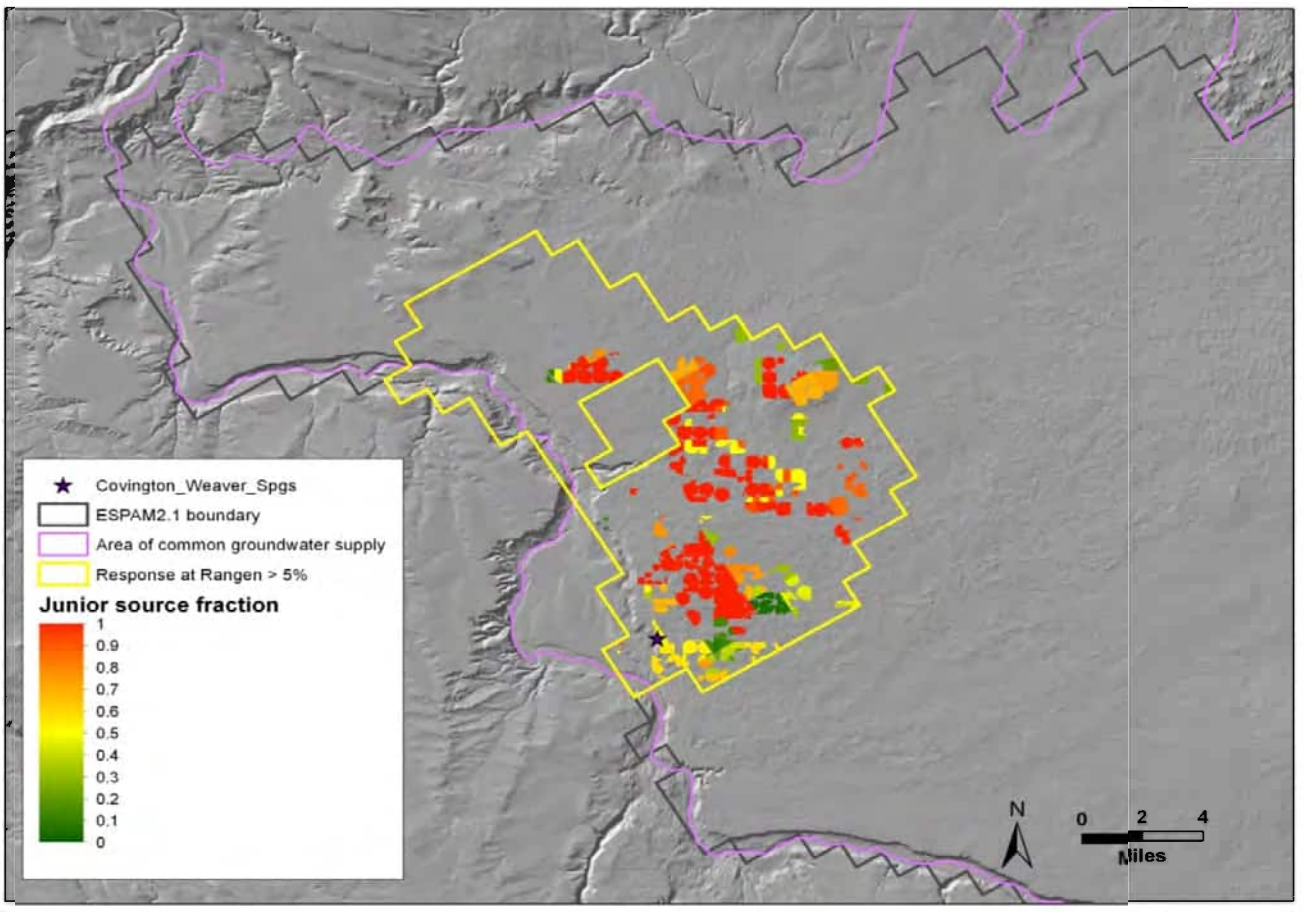
	Reach	Response (cfs)	Response (AF/yr)
	Ashton to Rexburg	157.79	114,312
	Heise to Shelley	206.50	149,598
	Shelley to Near Blackfoot	229.60	166,335
	Near Blackfoot to Minidoka	695.22	503,664
	Kimberly to Buhl	121.67	88,148
	Buhl to Lower Salmon Falls	242.40	175,610
	Lower Salmon Falls to King Hill	51.75	37,492
	Total	1,704.93	1,235,158
	Group A&B Spring Reaches		
	Devil's Washbowl	5.67	4,107
	Devil's Corral	7.39	5,354
	Blue Lakes	20.02	14,501
	Crystal	45.75	33,141
	Niagara	31.98	23,167
	Clear Lake	41.84	30,310
	Briggs	1.14	822
	Box Canyon	68.74	49,801
	Sand	18.33	13,281
	Thousand	50.06	36,269
	National Fish Hatchery	11.37	8,237
	Rangen	17.89	12,957
	Three	13.03	9,439
	Malad	43.95	31,839
Reach of interest:	Rangen	17.89	12,957
	Response/simulated stress	1.0%	
	Time to reach 90% steady state	13 years	
Response at other reaches:		1,687.04	1,222,200
	Response/simulated stress	99.0%	

Simulated curtailment junior to July 13, 1962 within area of common groundwater supply



Simulated curtailment:		479,203	acres	
		1,092,938	AF/yr	crop irrigation requirement
		1,508.62	cfs	crop irrigation requirement
		2.28	AF/ac/yr	crop irrigation requirement
Predicted response:	**Reach**	**Response (cfs)**		**Response (AF/yr)**
	Ashton to Rexburg	111.43		80,730
	Heise to Shelley	160.20		116,056
	Shelley to Near Blackfoot	209.31		151,636
	Near Blackfoot to Minidoka	635.93		460,705
	Kimberly to Buhl	113.33		82,100
	Buhl to Lower Salmon Falls	228.90		165,829
	Lower Salmon Falls to King Hill	49.53		35,882
	Total	1,508.62		1,092,938
	Group A&B Spring Reaches			
	Devil's Washbowl	5.15		3,732
	Devil's Corral	6.72		4,869
	Blue Lakes	18.39		13,326
	Crystal	42.99		31,148
	Niagara	30.13		21,827
	Clear Lake	39.44		28,572
	Briggs	1.07		775
	Box Canyon	64.78		46,934
	Sand	17.29		12,523
	Thousand	47.35		34,304
	National Fish Hatchery	10.76		7,798
	Rangen	16.94		12,269
	Three	12.34		8,940
	Malad	42.00		30,431
Reach of interest:	Rangen	16.94		12,269
	Response/simulated stress	1.1%		
	Time to reach 90% steady state	11	years	
Response at other reaches:		1,491.68		1,080,669
	Response/simulated stress	98.9%		

Simulated steady state curtailment junior to July 13, 1962 within area where response at Rangen cell is greater than 5%



Simulated curtailment:

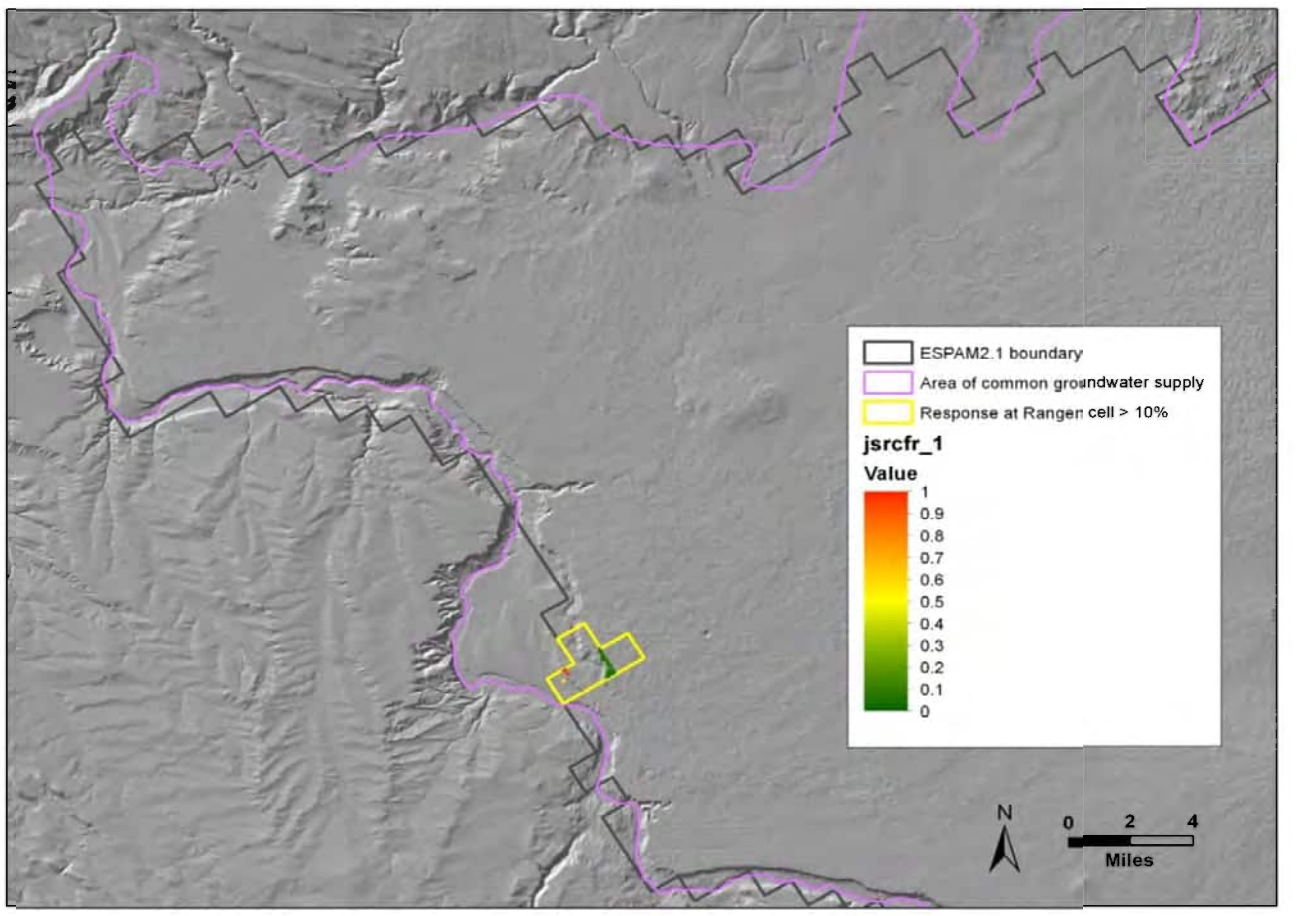
12,346	acres	
35,957	AF/yr	crop irrigation requirement
49.63	cfs	crop irrigation requirement
2.91	AF/ac/yr	crop irrigation requirement

Predicted response:

Reach	Response (cfs)	Response (AF/yr)
Ashton to Rexburg	0.0599	43.38
Heise to Shelley	0.1754	127.07
Shelley to Near Blackfoot	0.5253	380.58
Near Blackfoot to Minidoka	1.7553	1,271.65
Kimberly to Buhl	5.0987	3,693.79
Buhl to Lower Salmon Falls	29.1239	21,099.16
Lower Salmon Falls to King Hill	12.8946	9,341.65
Total	49.6330	35,957.28
Group A&B Spring Reaches		
Devil's Washbowl	0.0558	40.43
Devil's Corral	0.0758	54.94
Blue Lakes	0.3567	258.41
Crystal	2.2504	1,630.34
Niagara	2.1947	1,589.96
Clear Lake	3.1098	2,252.92
Briggs	0.0861	62.35
Box Canyon	5.6407	4,086.47
Sand	1.6911	1,225.13
Thousand	7.4121	5,369.78
National Fish Hatchery	2.0780	1,505.42
Rangen	3.3467	2,424.56
Three	2.4990	1,810.42
Malad	11.0826	8,028.93

Reach of interest:	Rangen	3.35	2,424.6
	Response/simulated stress	6.7%	
Response at other reaches:		46.29	33,532.7
	Response/simulated stress	93.3%	

Simulated steady state curtailment junior to July 13, 1962 within area where response at Rangen cell is greater than 10%

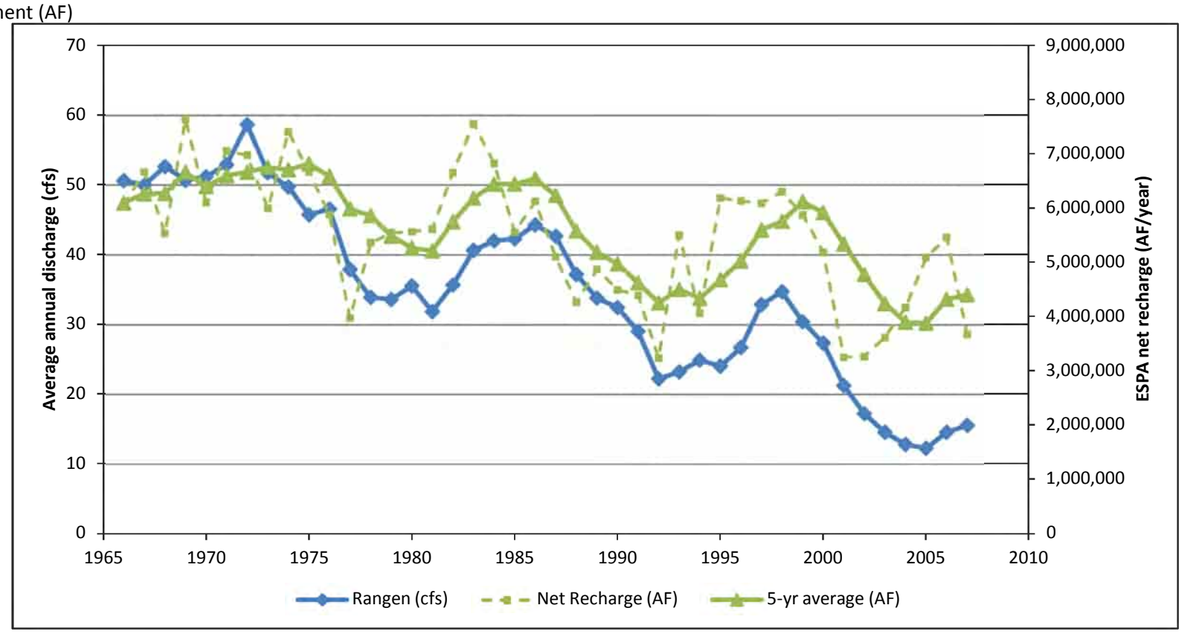


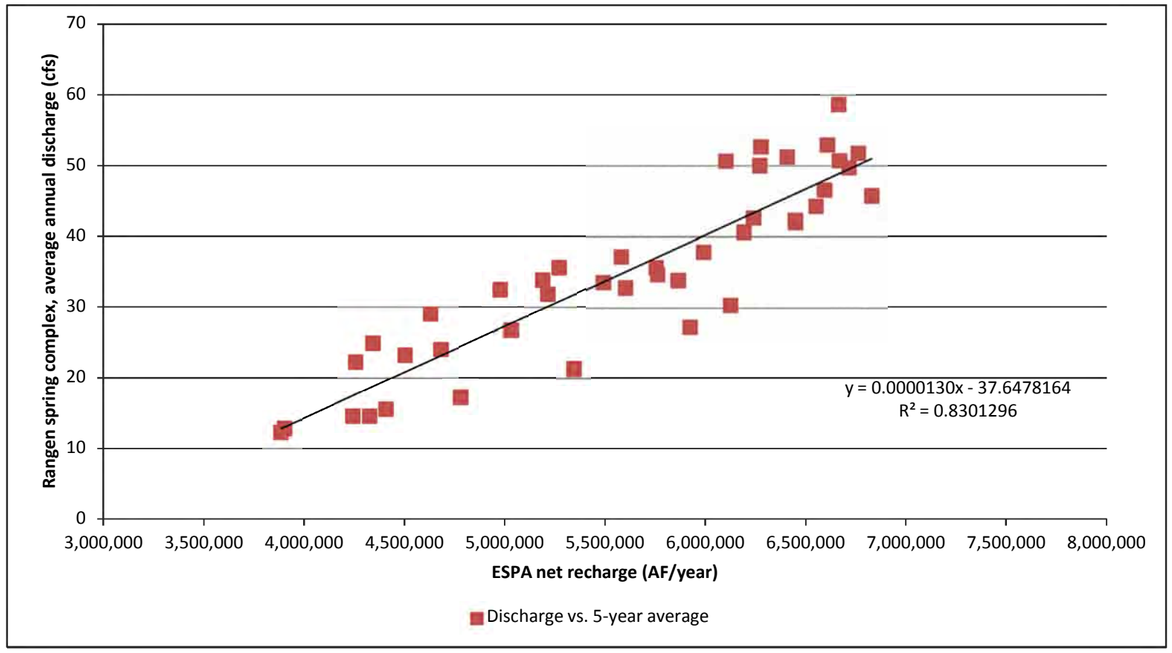
Simulated curtailment:		24	acres	
		73	AF/yr	crop irrigation requirement
		0.10	cfs	crop irrigation requirement
		3.03	AF/ac/yr	crop irrigation requirement

Predicted response:	**Reach**	**Response (cfs)**	**Response (AF/yr)**
	Ashton to Rexburg	0.0001	0.04
	Heise to Shelley	0.0002	0.12
	Shelley to Near Blackfoot	0.0005	0.37
	Near Blackfoot to Minidoka	0.0017	1.24
	Kimberly to Buhl	0.0055	4.00
	Buhl to Lower Salmon Falls	0.0814	58.95
	Lower Salmon Falls to King Hill	0.0111	8.02
	Total	0.1004	72.75
	Group A&B Spring Reaches		
	Devil's Washbowl	0.0001	0.04
	Devil's Corral	0.0001	0.05
	Blue Lakes	0.0004	0.26
	Crystal	0.0024	1.76
	Niagara	0.0024	1.76
	Clear Lake	0.0036	2.62
	Briggs	0.0001	0.07
	Box Canyon	0.0072	5.22
	Sand	0.0024	1.73
	Thousand	0.0291	21.07
	National Fish Hatchery	0.0129	9.33
	Rangen	0.0128	9.31
	Three	0.0050	3.63
	Malad	0.0097	7.03
Reach of interest:	Rangen	0.01	9.3
	Response/simulated stress	12.8%	
	Time to reach 90% steady state	5 months	
Response at other reaches:		0.09	63.4
	Response/simulated stress	87.2%	

ATTACHMENT B. ALTERNATIVE PREDICTIVE METHODS

Year	Rangen (cfs)	Net Recharge (AF)	5-year average net rec	Net Recharge with Curtailment (AF)
1962		5,830,000		
1963		5,510,000		
1964		5,690,000		
1965		7,410,000		
1966	50.65	6,060,000	6,100,000	5,642,712
1967	50.01	6,670,000	6,268,000	5,642,712
1968	52.67	5,540,000	6,274,000	5,642,712
1969	50.70	7,640,000	6,664,000	5,642,712
1970	51.21	6,110,000	6,404,000	5,642,712
1971	52.93	7,060,000	6,604,000	5,642,712
1972	58.67	6,980,000	6,666,000	5,642,712
1973	51.77	6,000,000	6,758,000	5,642,712
1974	49.74	7,410,000	6,712,000	5,642,712
1975	45.76	6,670,000	6,824,000	5,642,712
1976	46.57	5,890,000	6,590,000	5,642,712
1977	37.89	3,980,000	5,990,000	5,642,712
1978	33.92	5,370,000	5,864,000	5,642,712
1979	33.62	5,550,000	5,492,000	5,642,712
1980	35.55	5,570,000	5,272,000	5,642,712
1981	31.87	5,616,920	5,217,384	5,642,712
1982	35.69	6,660,929	5,753,570	5,642,712
1983	40.65	7,555,369	6,190,644	5,642,712
1984	42.00	6,829,733	6,446,590	5,642,712
1985	42.29	5,562,063	6,445,003	5,642,712
1986	44.28	6,131,979	6,548,015	5,642,712
1987	42.66	5,108,736	6,237,576	5,642,712
1988	37.22	4,273,605	5,581,223	5,642,712
1989	33.82	4,876,753	5,190,627	5,642,712
1990	32.47	4,495,566	4,977,328	5,642,712
1991	29.04	4,398,489	4,630,630	5,642,712
1992	22.25	3,243,850	4,257,653	5,642,712
1993	23.23	5,506,157	4,504,163	5,642,712
1994	24.93	4,072,345	4,343,281	5,642,712
1995	24.05	6,194,348	4,683,038	5,642,712
1996	26.73	6,139,823	5,031,305	5,642,712
1997	32.87	6,095,010	5,601,537	5,642,712
1998	34.73	6,305,636	5,761,432	5,642,712
1999	30.42	5,883,367	6,123,637	5,642,712
2000	27.35	5,189,381	5,922,643	5,642,712
2001	21.27	3,256,481	5,345,975	5,642,712
2002	17.26	3,270,479	4,781,069	5,642,712
2003	14.59	3,620,557	4,244,053	5,642,712
2004	12.82	4,174,080	3,902,196	5,642,712
2005	12.29	5,096,649	3,883,649	5,642,712
2006	14.57	5,466,940	4,325,741	5,642,712
2007	15.57	3,679,551	4,407,555	5,642,712

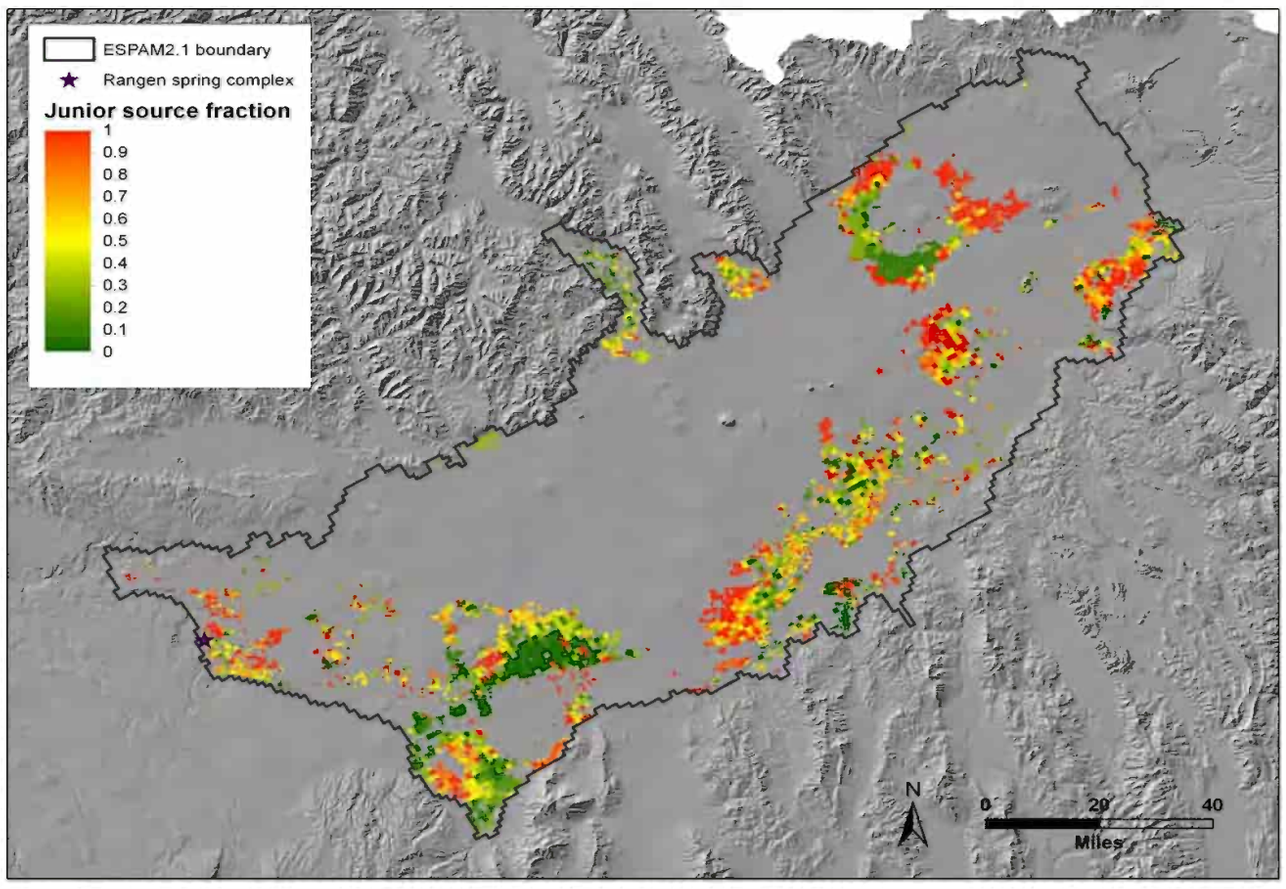




Curtailment volume	1,235,157	AF/yr
Change in discharge/change in recharge	0.0000130	cfs/AF
Predicted change in discharge	16.1	cfs

IDWR staff consider this prediction inferior to the ESPAM2.1-predicted response at the Rangen spring complex. This prediction method neglects the spatial distribution of all components of historic net recharge and of junior groundwater irrigated lands.

Simulated curtailment junior to July 13, 1962 within ESPAM2.1 model boundary



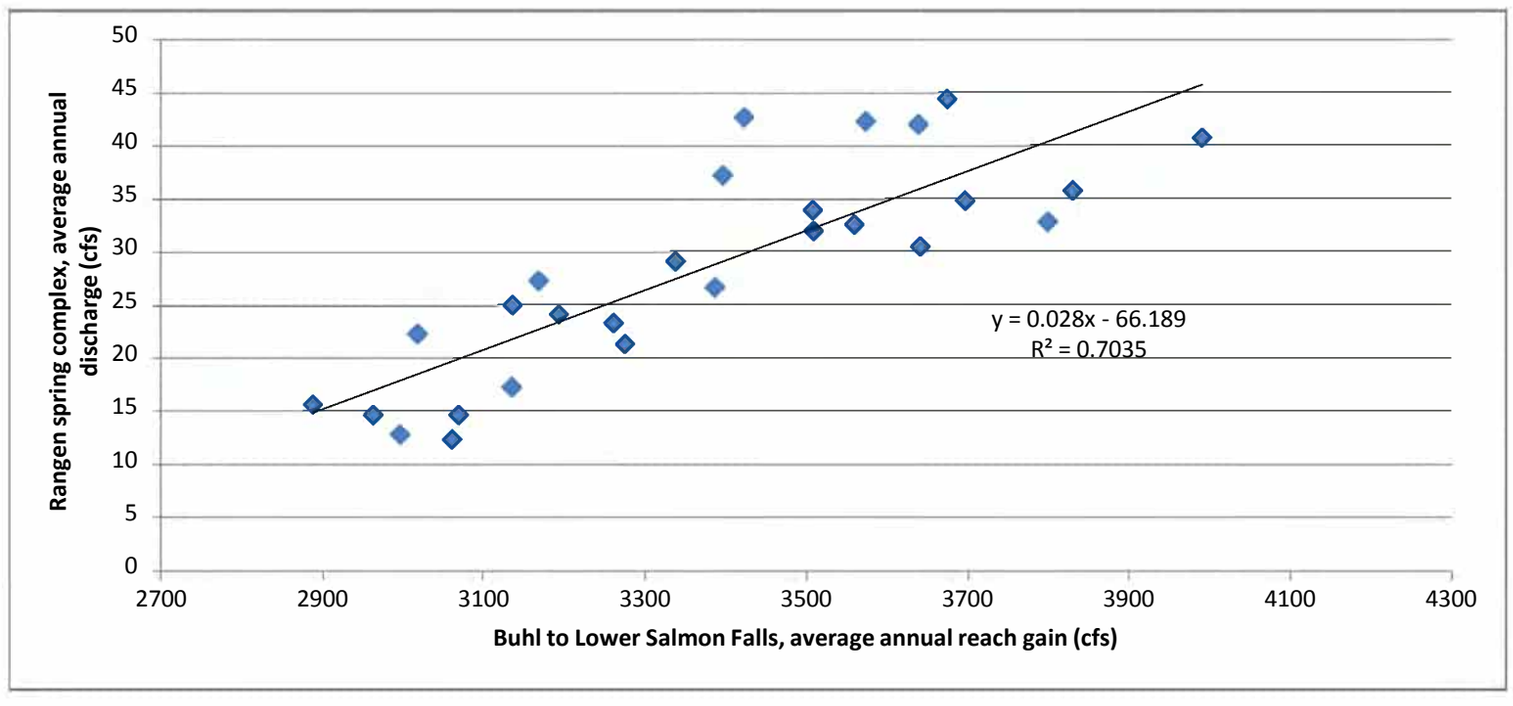
Simulated curtailment:	565,026 acres		
	1,235,157 AF/yr	crop irrigation requirement	
	1,704.93 cfs	crop irrigation requirement	
	2.19 AF/ac/yr	crop irrigation requirement	

Predicted response:	**Reach**	**Response (cfs)**	**Response (AF/yr)**
	Ashton to Rexburg	157.79	114,312
	Heise to Shelley	206.50	149,598
	Shelley to Near Blackfoot	229.60	166,335
	Near Blackfoot to Minidoka	695.22	503,664
	Kimberly to Buhl	121.67	88,148
	Buhl to Lower Salmon Falls	242.40	175,610
	Lower Salmon Falls to King Hill	51.75	37,492
	Total	1,704.93	1,235,158
Reach of interest:	Buhl to Lower Salmon Falls	242.40	175,610
	Response/simulated stress	14.2%	
Response at other reaches:		1,462.53	1,059,548
	Response/simulated stress	85.8%	

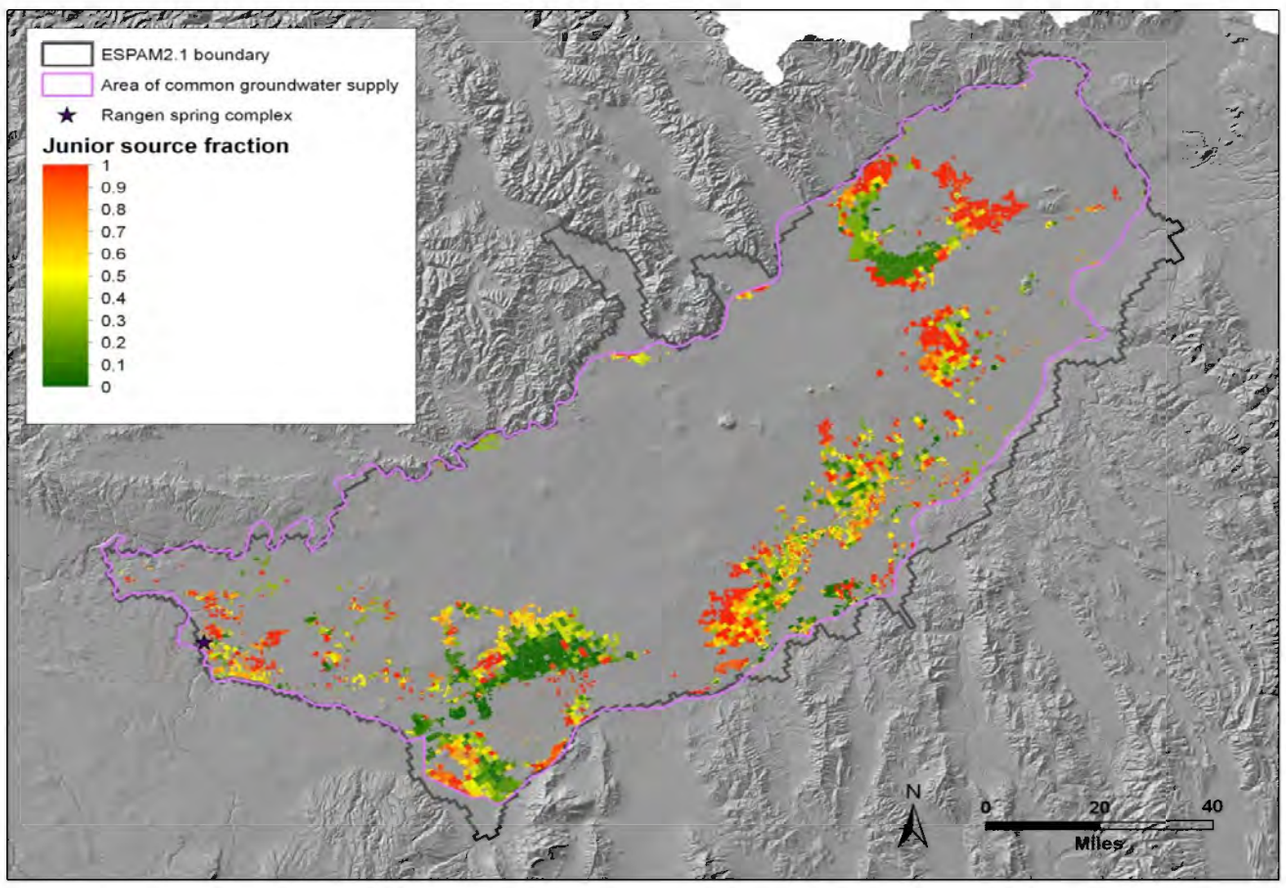
Apportionment of reach gains:

Observed Amplitude Ratio	2.80%	
Portion of reach response assigned to Rangen spring complex	6.8	cfs

IDWR staff consider this prediction inferior to the model-predicted response at the Rangen spring complex.
This prediction method neglects spatial relationships between the springs within the reach and junior irrigation lands, and numerous other data used to calibrate ESPAM2.1.
ESPAM2.1 predicts a response of 17.9 cfs at the Rangen spring complex for this simulation.



Simulated curtailment junior to July 13, 1962 within area of common groundwater supply



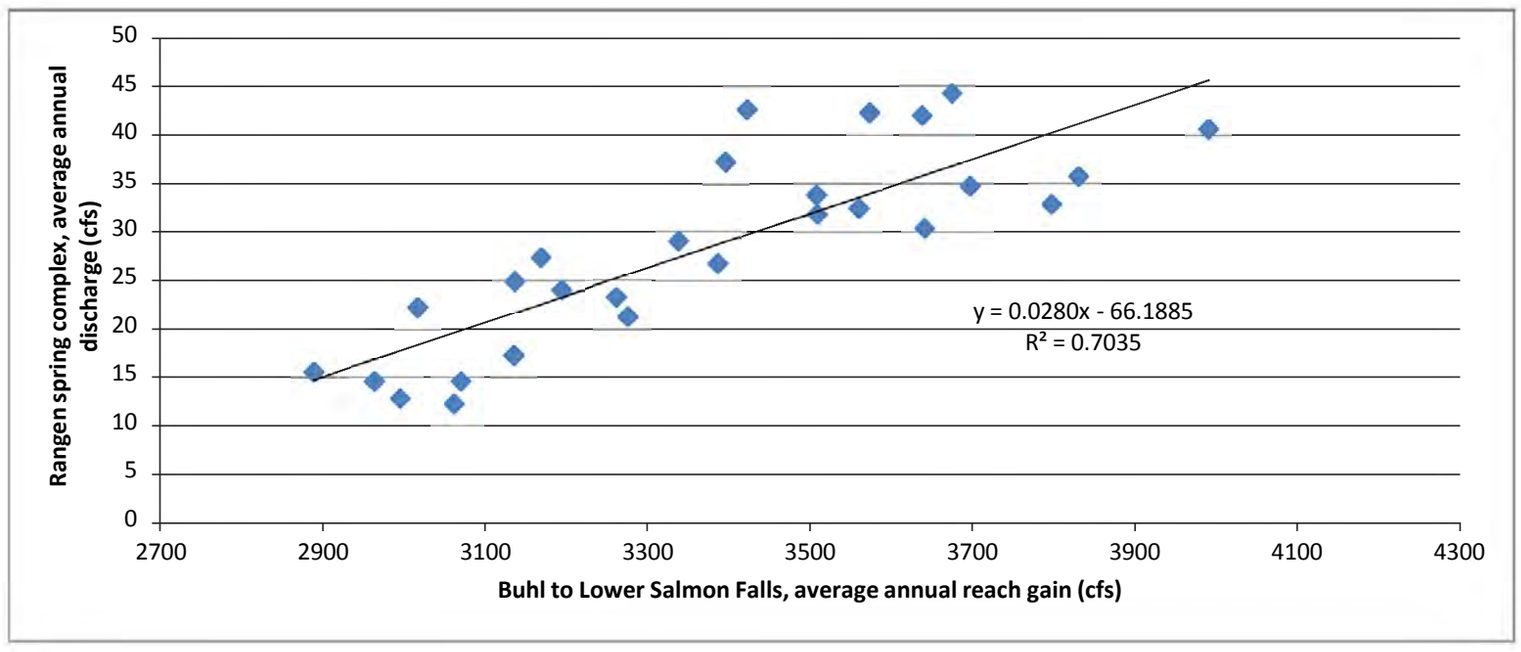
Simulated curtailment:		479,203	acres	
		1,092,938	AF/yr	crop irrigation requirement
		1,508.62	cfs	crop irrigation requirement
		2.28	AF/ac/yr	crop irrigation requirement

Predicted response:	**Reach**	**Response (cfs)**	**Response (AF/yr)**
	Ashton to Rexburg	111.43	80,730
	Heise to Shelley	160.20	116,056
	Shelley to Near Blackfoot	209.31	151,636
	Near Blackfoot to Minidoka	635.93	460,705
	Kimberly to Buhl	113.33	82,100
	Buhl to Lower Salmon Falls	228.90	165,829
	Lower Salmon Falls to King Hill	49.53	35,882
	Total	1,508.62	1,092,938
Reach of interest:	Buhl to Lower Salmon Falls	228.90	165,829
	Response/simulated stress	15.2%	
Response at other reaches:		1,279.72	927,109
	Response/simulated stress	84.8%	

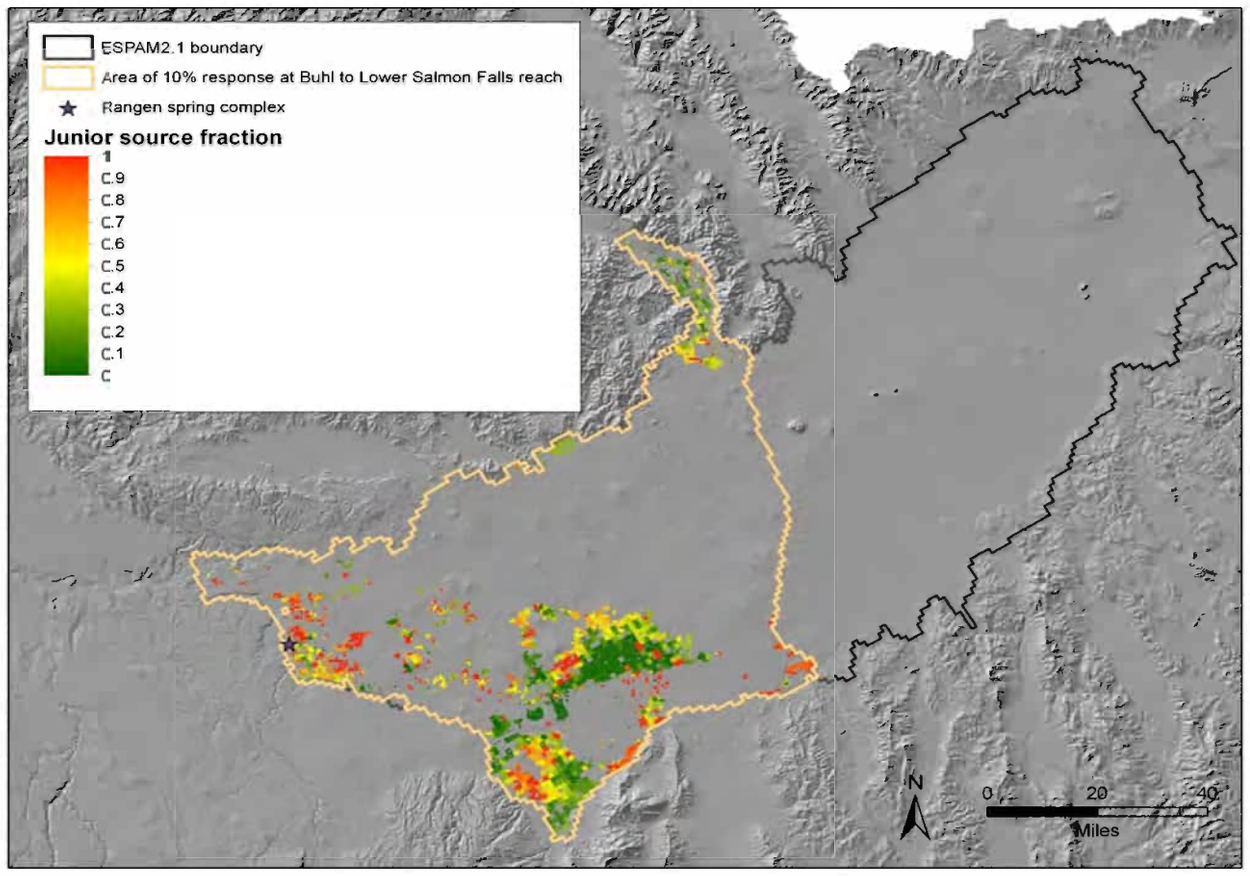
Apportionment of reach gains:

Observed Amplitude Ratio	2.8%	
Portion of reach response assigned to Rangen spring complex	6.4	cfs

IDWR staff consider this prediction inferior to the model-predicted response at the Rangen spring complex.
This prediction method neglects spatial relationships between the springs within the reach and junior irrigation lands, and numerous other data used to calibrate ESPAM2.1.
ESPAM2.1 predicts a response of 16.9 cfs at the Rangen spring complex for this simulation.



Simulated curtailment junior to July 13, 1962 within area of 10% response at Buhl to Lower Salmon Falls Reach



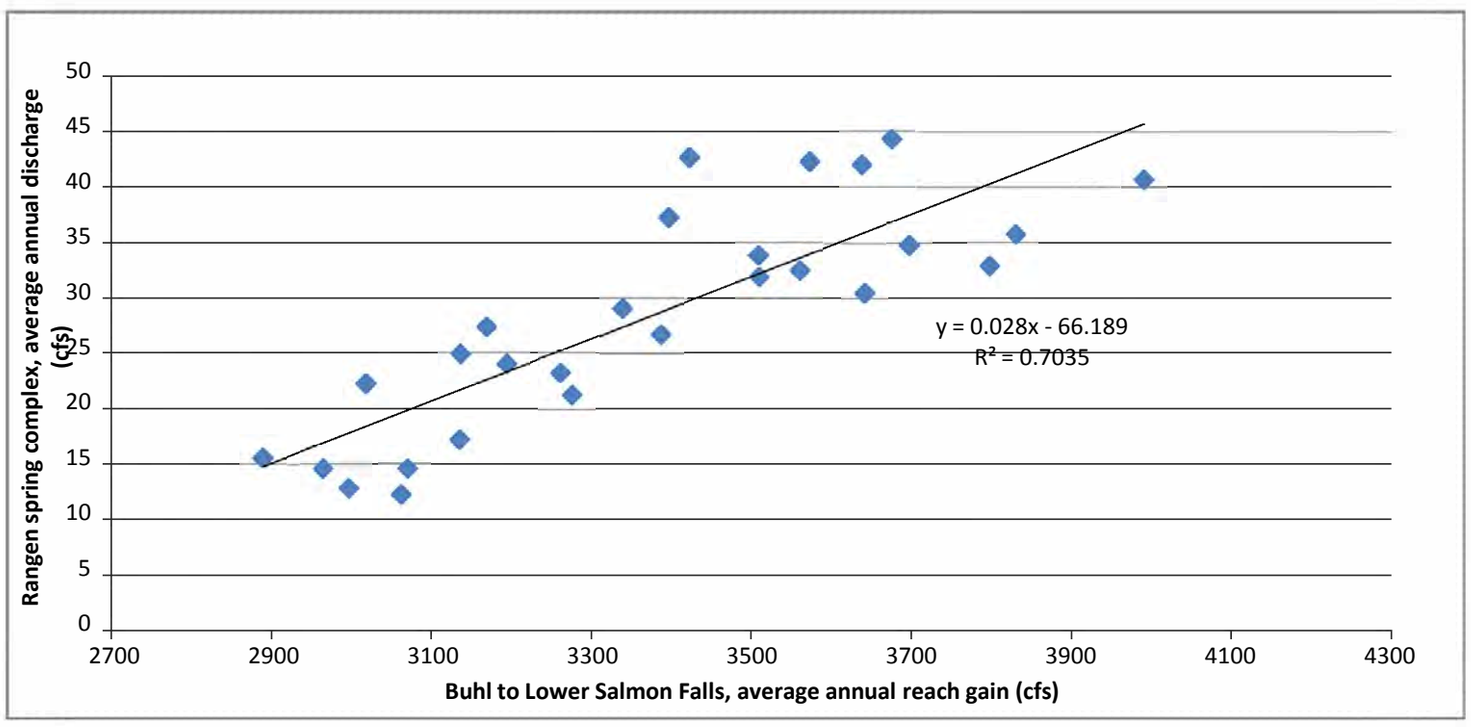
Simulated curtailment:		184,941	acres	
		454,737	AF/yr	crop irrigation requirement
		627.69	cfs	crop irrigation requirement
		2.46	AF/ac/yr	crop irrigation requirement

Predicted response:	**Reach**	**Response (cfs)**	**Response (AF/yr)**
	Ashton to Rexburg	6.33	4,588
	Heise to Shelley	18.52	13,419
	Shelley to Near Blackfoot	55.40	40,135
	Near Blackfoot to Minidoka	189.38	137,195
	Kimberly to Buhl	102.89	74,538
	Buhl to Lower Salmon Falls	209.08	151,472
	Lower Salmon Falls to King Hill	46.09	33,390
	Total	627.69	454,737
Reach of interest:	Buhl to Lower Salmon Falls	209.08	151,472
	Response/simulated stress	33.3%	
Response at other reaches:		418.61	303,265
	Response/simulated stress	66.7%	

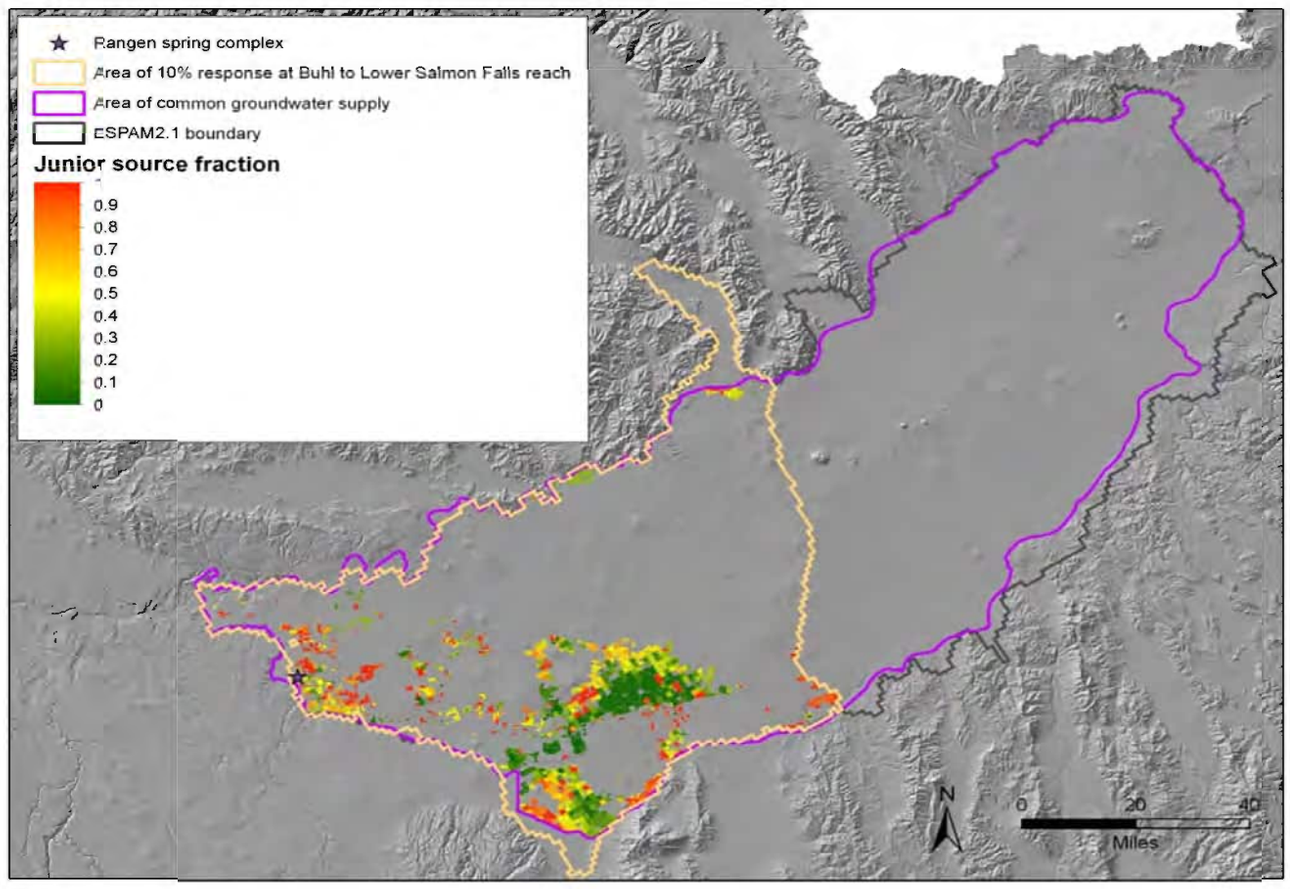
Apportionment of reach gains:

Observed Amplitude Ratio	2.8%	
Portion of reach response assigned to Rangen spring complex	5.9	cfs

IDWR staff consider this prediction inferior to the model-predicted response at the Rangen spring complex.
This prediction method neglects spatial relationships between the springs within the reach and junior irrigation lands, and numerous other data used to calibrate ESPAM2.1.
ESPAM2.1 predicts a response of 15.5 cfs at the Rangen spring complex for this simulation.



Simulated curtailment junior to July 13, 1962 within area of 10% response at Buhl to Lower Salmon Falls Reach and area of common groundwater supply



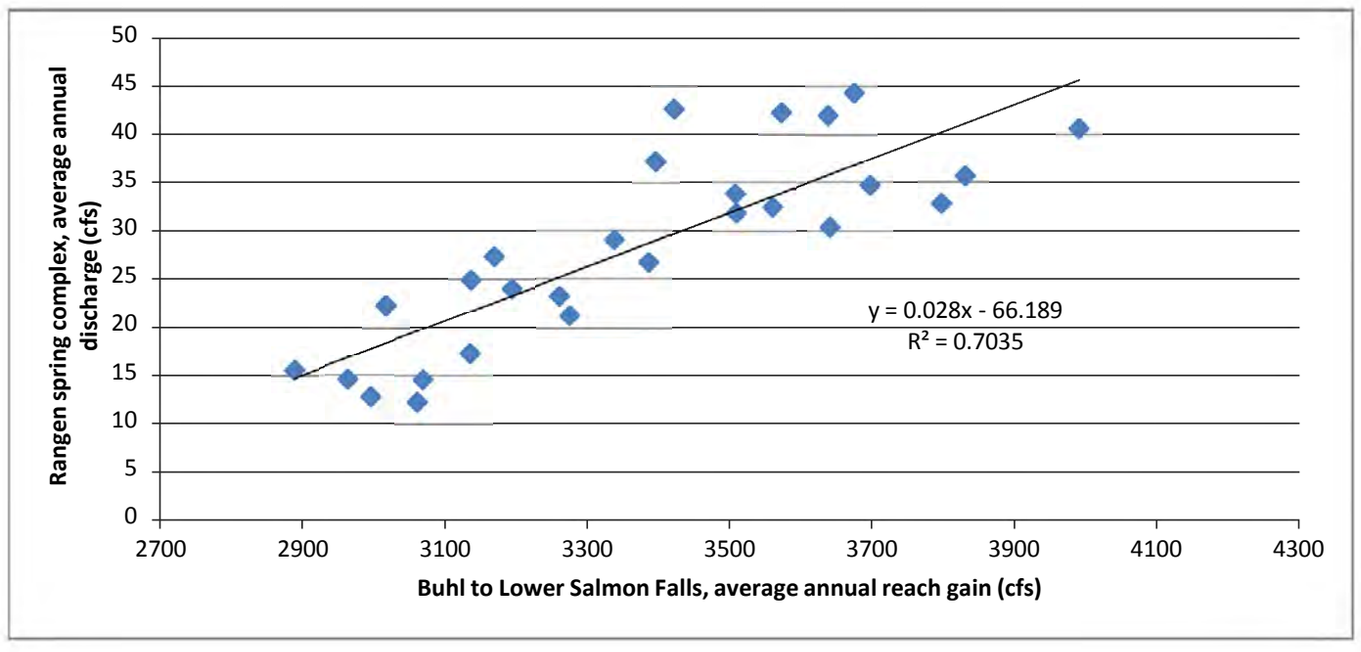
Simulated curtailment:		168,559	acres	
		418,575	AF/yr	crop irrigation requirement
		577.77	cfs	crop irrigation requirement
		2.48	AF/ac/yr	crop irrigation requirement

Predicted response:	**Reach**	**Response (cfs)**	**Response (AF/yr)**
	Ashton to Rexburg	5.60	4,055
	Heise to Shelley	16.40	11,881
	Shelley to Near Blackfoot	49.12	35,587
	Near Blackfoot to Minidoka	168.68	122,201
	Kimberly to Buhl	95.80	69,406
	Buhl to Lower Salmon Falls	197.92	143,384
	Lower Salmon Falls to King Hill	44.26	32,062
	Total	577.77	418,575
Reach of interest:	Buhl to Lower Salmon Falls	197.92	143,384
	Response/simulated stress	34.3%	
Response at other reaches:		379.86	275,191
	Response/simulated stress	65.7%	

Apportionment of reach gains:

Observed Amplitude Ratio	2.8%	
Portion of reach response assigned to Rangen spring complex	5.5	cfs

IDWR staff consider this prediction inferior to the model-predicted response at the Rangen spring complex.
This prediction method neglects spatial relationships between the springs within the reach and junior irrigation lands, and numerous other data used to calibrate ESPAM2.1.
ESPAM2.1 predicts a response of 14.7 cfs at the Rangen spring complex for this simulation.



DESCRIPTION OF THE IDWR/UI SNAKE RIVER PLAIN AQUIFER MODEL (SRPAM)

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by
Donna M. Cosgrove
Gary S. Johnson
Sherry Laney
University of Idaho

and
John Lindgren
Idaho Department of Water Resources

for the
U.S. Bureau of Reclamation
Snake River Resources Review



by
Idaho Water Resources Research Institute
University of Idaho
Moscow, Idaho 83844-3011

May, 1999

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Page No. 1 of 101

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ABSTRACT

The water resources of the eastern Snake River Plain are often at the forefront of water issues in Idaho. The Snake River Plain aquifer, underlying the eastern Snake River Plain, is hosted in layered basalts and interbedded sediments and is an integral part of the basin water resources. In some places, the flow of the Snake River is composed predominantly of aquifer discharge. Aquifer water levels and spring discharges increased through the first half of the century, but have been declining in the past several decades. The long-term changes are in response to changes in recharge and discharge associated with surface and ground-water irrigation. These changes are driving conjunctive management of surface and ground-water resources and the use of a numerical ground water model to understand and help manage the aquifer.

The University of Idaho and the Idaho Department of Water Resources developed a two-dimensional finite difference model of the Snake River Plain aquifer in the 1970s. That model has evolved into the model documented in this report. Most recently, the model has been adapted to use the U.S. Geological Survey's MODFLOW code and the domain has been expanded to include the northeastern part of the aquifer system. The model has been calibrated to a one-year period from April 1980 to March 1981. The transient calibration was conducted in two parts. The first part was the original model domain, calibrated by the Idaho Department of Water Resources. The second part, the area near and including the extended domain in the northeast, was calibrated by the University of Idaho. Extending the domain resulted in revisions to the model water budget and created a discrepancy between estimated recharge and discharge components. Further work should be performed to improve the model's reliability. Priority should be given to improving the conceptual understanding and quantitative behavior of the interaction with the Snake River.

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INTRODUCTION

BACKGROUND

The water resources of the eastern Snake River Plain are often at the forefront of water issues in the State of Idaho. The high profile is due largely to intensive water use in the area by irrigated agriculture, hydropower, and aquaculture. These uses may sometimes be in conflict with environmental and recreation interests. This area is also underlain by the Snake River Plain aquifer (Figure 1), which is the water source for nearly all municipal and domestic needs in the area as well as for irrigation, aquaculture, and industrial needs.

Numerical ground-water flow models of the Snake River Plain aquifer have been developed and applied by state and federal agencies, universities, and private interests. The models vary in purpose, extent, and the computer code employed. The first numerical model of the aquifer was developed by the University of Idaho for the Idaho Department of Water Resources (IDWR) and the U.S. Bureau of Reclamation (deSonneville, 1974). The model has undergone multiple revisions and improvements. This report, together with Johnson and others (1999) documents another step in the evolution of the model.

The finite-difference model code developed by the University of Idaho and evolved by the University and the IDWR will be referred to as the IDWR/UI Ground Water Flow Model Code. The application of this code to the Snake River Plain aquifer

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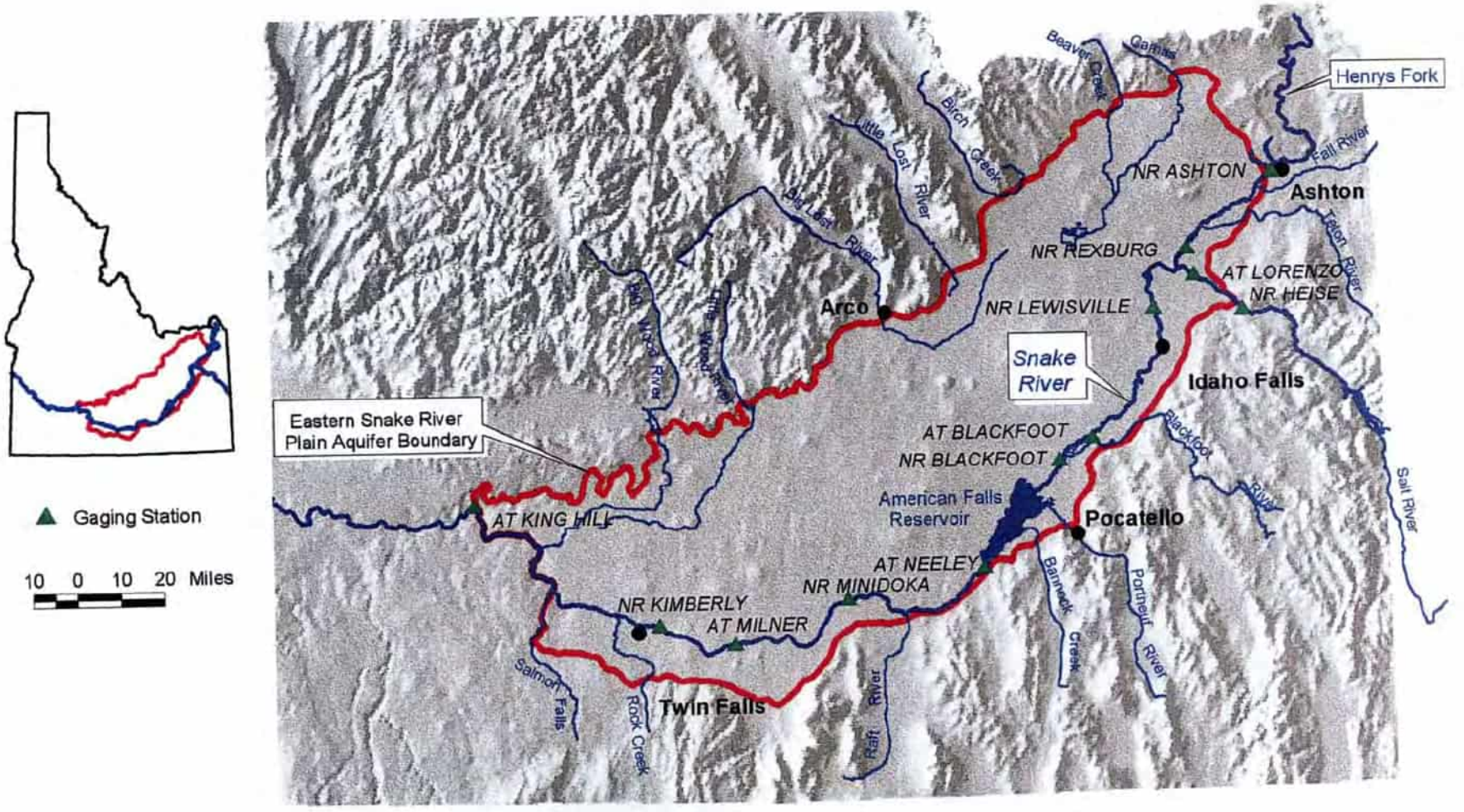

Figure 1. Snake River Plain Aquifer.

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will be referred to as the IDWR/UI Ground Water Flow Model, following the convention established by the IDWR (IDWR, 1997). The IDWR has applied some version of this model as a planning and management tool for over two decades.

As part of this project, the IDWR/UI Ground Water Flow Model was converted to use one of the most widely used and accepted ground-water modeling codes, MODFLOW (McDonald and Harbaugh, 1988). The conversion to MODFLOW is not intended to create a new model, but to develop an equivalent model using a different code. The MODFLOW application to the Snake River Plain aquifer will be referred to as the Snake River Plain Aquifer Model (SRPAM), with the most recent version being SRPAM1.1. There are several benefits from conversion to the MODFLOW code including: a) the MODFLOW code is accepted as an industry standard, b) MODFLOW includes algorithms that simulate physical processes and have been verified against analytical solutions, c) MODFLOW is more familiar to a wider group of scientists and engineers, d) numerous user interfaces have been developed for MODFLOW, e) MODFLOW capabilities are continuously increasing, f) MODFLOW has a significant capability for treating more advanced features such as three-dimensional flow and variable grid spacing, and g) the MODFLOW code is well documented.

In addition to conversion of the IDWR/UI Ground Water Flow Model to the MODFLOW code, this project was established to improve model representation of the real system. This was achieved primarily by expansion of the model domain to include segments of the Snake River and tributaries in the northeast portion of the plain that were not previously simulated.

This report is one of two reports documenting work done on this project. This report provides a comprehensive documentation of the SRPAM1.1 model, along with comparisons between the SRPAM1.1 model and a model of the eastern Snake River Plain aquifer developed by the USGS during the 1980s, the USGS Snake River Plain Model. The reader should keep in mind that many of the assumptions made in early model development and evolution were not fully documented, so in many cases, this report records how the numerical model represents the physical system and not necessarily the rationale behind model design decisions. Detailed descriptions of model design decisions and calibration statistics from previous work are often not available. The *Recommendations* section addresses possible model enhancements to further improve the model. The companion report, "Conversion of the IDWR/UI Ground Water Flow Model to MODFLOW: The Snake River Plain Aquifer Model (SRPAM)" (Johnson and others, 1999), documents the conversion of the IDWR/UI Ground Water Flow Model to MODFLOW, the expansion of the model domain to include the Henrys Fork and South Fork region, and the localized calibration of the extended model.

These reports are the result of a combined effort of the U.S. Bureau of Reclamation, the University of Idaho, and the Idaho Department of Water Resources. The model described in the reports is intended to be a planning and management tool for use by both agencies. It is also intended that the model will evolve as further fiscal and data resources become available. Model refinements are suggested in the section on *Recommendations For Future Work*. The U.S. Bureau of Reclamation's Snake River Resources Review program provided funding for this project.

PURPOSE AND SCOPE

The purpose of this project was to improve capabilities and documentation of the IDWR/UI Ground Water Flow Model. Objectives include:

1) Conversion of the model to a more widely used and versatile code that will readily accommodate future enhancements,
2) Verification that model conversion creates no significant changes in model results,
3) Modification of the model to include those refinements deemed most significant to the predictive capabilities on a regional scale,
4) Providing the IDWR and USBR with a model that both agencies accept as suitable for planning and management,
5) Improve model documentation.

This project was conducted as part of the U.S. Bureau of Reclamation's Snake River Resources Review. The Snake River Resources Review project is attempting to define all of the interests in the Snake River and develop models that will describe the impact of river operation options on the various interests. The inclusion of ground water components in the program is a response to the increasing awareness of the interaction of ground water and surface water. The model described in these reports will be used subsequently to develop analytical expressions (response functions) relating aquifer recharge and discharge at specific locations to spring discharge and flow in the Snake River. It is anticipated that these relationships will become elements of the array of water management tools forming the decision support system being developed under the Snake River Resources Review program. These products also will provide a means to further

educate the public on surface and ground water relationships and assist in the development of mitigation plans between ground water and surface water users.

The IDWR's use of this model will be primarily for planning and management of the Snake River Plain aquifer. Increased ground water pumping and changes in surface irrigation practices in the last few decades have caused declines in ground-water levels and spring flows, sometimes impacting more senior surface water rights. The Department will increasingly be called upon to arbitrate in conjunctive management disputes and evaluate mitigation plans. The Department also is engaged in planning managed recharge efforts on the Snake River Plain. The model resulting from this effort, the Snake River Plain Aquifer Model (SRPAM) will be one of the tools employed to resolve these problems.

DESCRIPTION OF THE SNAKE RIVER PLAIN AQUIFER

GENERAL FEATURES

The Snake River Plain extends in an arcuate shape across most of southern Idaho and into eastern Oregon. The plain is divided into eastern and western portions based primarily on ground-water hydrology. The eastern Snake River Plain is the focus of this report and occupies an area of about 10,000 square miles extending northeast from King Hill to near Ashton (Figure 1). The boundaries of the plain, shown in Figure 1, were defined by the U.S. Geological Survey's Regional Aquifer- System Analysis (RASA) program (Lindholm, 1993). Elevation of the eastern plain varies from about 2600 feet above sea level in the southwest to over 5000 feet in the northeast.

Population within the plain is generally sparse, with most of the population residing along the eastern and southern margins of the plain in an agriculturally productive band near the Snake River. Much of the remainder of the plain is federal land managed primarily by the U.S. Bureau of Land Management. Portions of the plain are covered by rugged basalt outcroppings that include the Craters of the Moon National Monument.

The Snake River Plain enjoys an arid to semi-arid temperate climate. Precipitation ranges from about 8 to 14 inches per year, falling predominantly in the colder months. Irrigation is required for agricultural production. The crops grown vary with location; the major crops throughout the plain include potatoes, wheat, barley,

alfalfa, and sugar beets. Dry edible beans and peas are grown in the southwestern part of the valley.

Irrigation on the eastern Snake River Plain began in the late 1800s using water from the Snake River and its tributaries. Garabedian (1992) describes changes in surface-water and ground-water irrigated areas on the eastern Snake River Plain that are shown graphically in Figure 2. Acreage irrigated by surface water has been declining since the mid-1940s. Since the onset of ground-water irrigation in the 1950s, the number of acres irrigated by ground water has been increasing steadily.

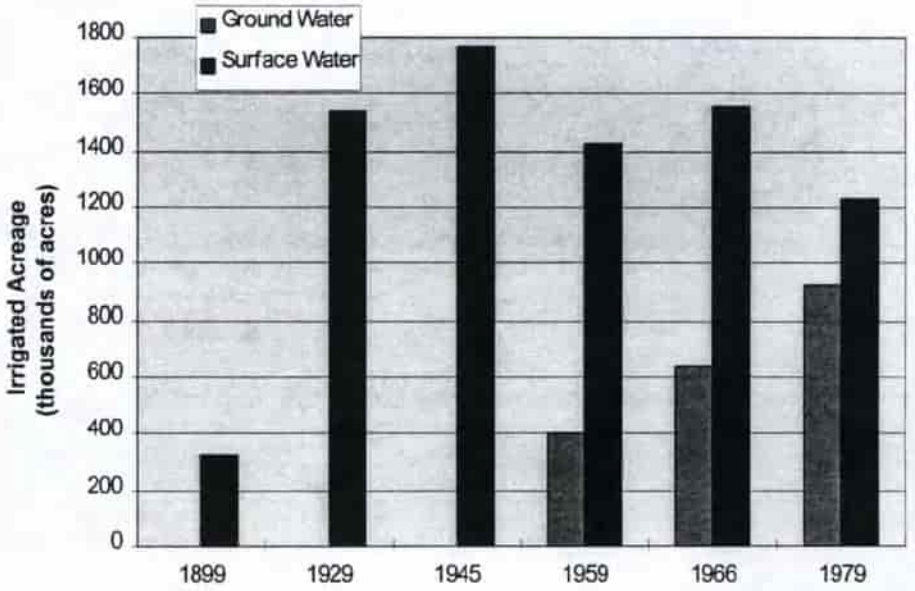

Figure 2. Changes in Surface and Ground Water Irrigated Acres on the eastern Snake River Plain. (After Garabedian, 1992.)

Irrigation practices are continually changing in response to technology and economic factors. Furrow, flood, and sub-irrigation were the dominant methods of water application into the second half of the twentieth century. In the 1980s and 1990s

sprinklers commonly have replaced surface application methods, with a resulting decrease in the amount of water diverted per acre of agricultural land.

Recent changes in Idaho water law have dramatically affected water use and expansion of irrigation development on the Snake River Plain. A basin-wide adjudication of water rights was initiated in 1992 (Idaho Water Resources Board, 1996). Expansions of irrigated acreage before 1987 that were not within the requirements of the Prior Appropriation Doctrine were forgiven in legislation passed in 1996. A moratorium on expansion of irrigated acreage has been in effect for the Snake River Basin since 1992. The moratorium includes both surface and ground water irrigated lands within the basin (Idaho Water Resource Board, 1996). Conjunctive management rules were promulgated by the IDWR in 1996, essentially linking administration of ground and surface water right priorities. Water measurement districts were established in 1997 to provide records of ground-water pumpage for irrigation. Managed recharge of the Snake River Plain aquifer has been supported by the Idaho Legislature. Managed recharge, which has occurred at various locations through existing irrigation facilities, was estimated at 180,000 acre-ft (AF) in 1995, 169,000 AF in 1996, and 230,000 AF in 1997 (Idaho Water District #1 records).

GEOLOGIC SETTING

The surface of the Snake River Plain consists primarily of volcanic rocks, which, in most areas, are covered by a veneer of windblown or fluvial sediments. Exposed volcanic rocks are predominantly basalt, which in places such as the Craters of the Moon

National Monument, cover expansive areas. Sediment deposits overlying the basalt vary in thickness from zero to tens of feet.

The eastern Snake River Plain is composed of a series of relatively thin basalt flows and interbedded sediments. Flows range in thickness from a few feet to tens of feet. Welhan and Funderberg (1997) report median flow thickness near the Idaho National Engineering and Environmental Laboratory ranging from about 7 to 25 feet. Individual flows typically have a rubble or clinker zone at the top and bottom with a more massive interior containing fewer vesicles. Vertical fractures in the flow interiors form columnar basalt in places (Garabedian, 1992). Individual basalt flows generally are not areally extensive (Welhan and Funderberg, 1997). The collective thickness of basalt flows of the eastern Snake River Plain are estimated to exceed several thousand feet in places (Whitehead, 1986). More detailed descriptions of the geology of the eastern Snake River Plain are provided by Anderson (1991), Whitehead (1986), and Kuntz and others (1992).

The eastern plain is bounded structurally by faulting on the northwest and downwarping and faulting on the southeast (Whitehead, 1986). The plain is bounded by Yellowstone Group rhyolite in the northeast and Idavada volcanics in the southwest. Granitic rocks of the Idaho batholith, along with pre-Cretaceous sedimentary and metamorphic rocks, border the plain to the northwest (Garabedian, 1992).

SURFACE-WATER HYDROLOGY

The Snake River passes along the southern margin of the eastern Snake River Plain and is the exclusive surface water discharge mechanism for the eastern plain.

Ground water underflow out of the eastern plain is assumed to be minimal, making the flow of the Snake River at King Hill the approximate equivalent of basin discharge, excluding evaporation. Annual discharge of the Snake River at King Hill is shown in Figure 3. The cumulative discharge line in Figure 3 shows little change in slope. This indicates that despite significant changes in water use during the last several decades, there has been little change in basin outflow. A possible reason for the stability of the slope of the cumulative graph in Figure 3 is that human activities have apparently had a greater temporary impact on aquifer storage than on basin outflow.

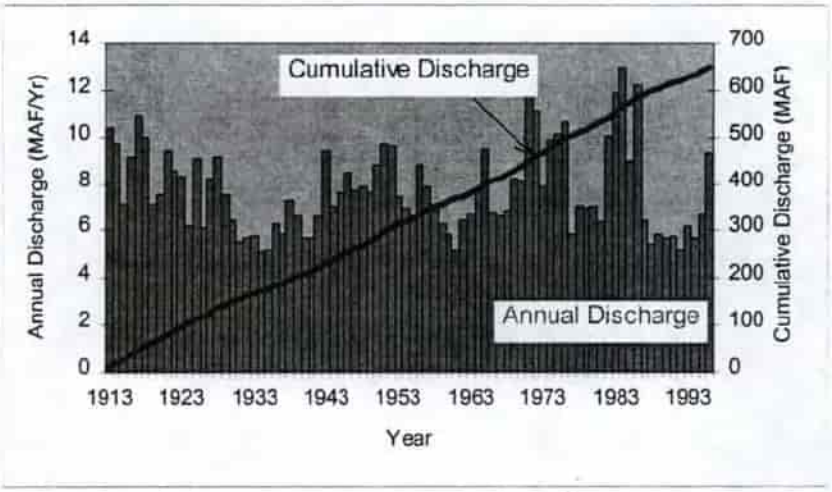

Figure 3. Annual and Cumulative Discharge of the Snake River near King Hill (U.S. Geological Survey data).

The Snake River is intensively managed for irrigation and hydropower generation. The average annual flow, major inflows and diversions at different points within the system are illustrated by river width in Figure 4. The flow in the Snake River is noticeably depleted at Milner Dam where substantial diversions are made for irrigation. A gradual increase in river flow below Milner Dam is due largely to aquifer discharge in

the form of springs emitting from the wall of the Snake River canyon. North of Idaho Falls, in the eastern part of the plain, the Henrys Fork (locally referred to as the North Fork) joins the Snake River, locally referred to as the South Fork, shortly downstream from Lorenzo. The origin of the Henrys Fork is in the Island Park area to the northeast of the Snake River Plain. Headwaters of the Snake River are in Yellowstone Park in Wyoming. On average, yield of the Snake River at Lorenzo is about twice the yield of the Henrys Fork near Rexburg.

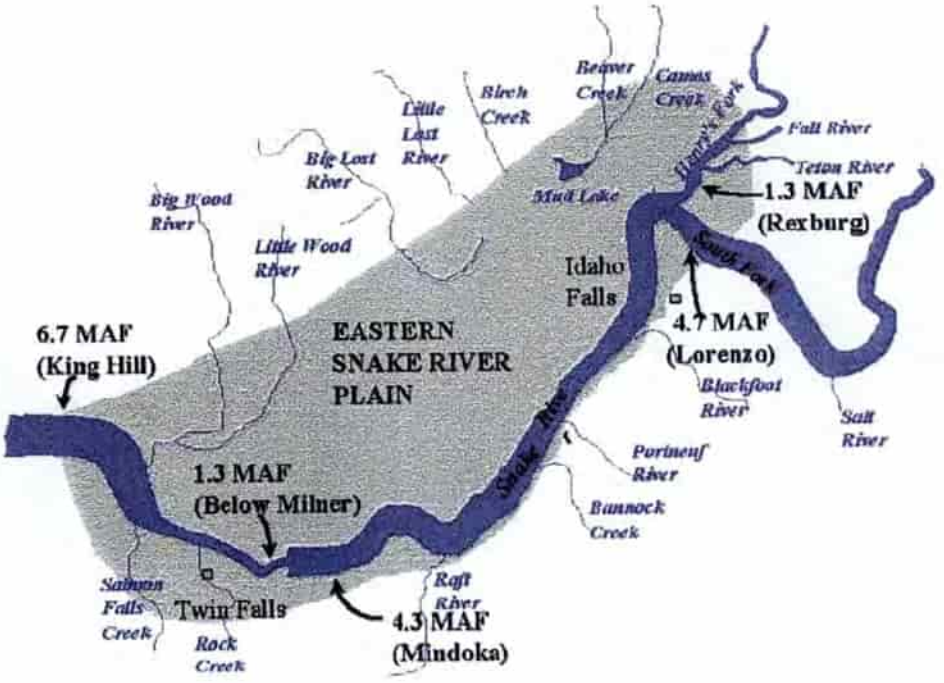

Figure 4. Conceptual Illustration of Variation in Average Annual Flow of the Snake River (after the U.S. Bureau of Reclamation, 1996).

Several reservoirs have been constructed on the Snake River and its tributaries for the purposes of irrigation, flood control, hydropower generation, and recreation. In some

years, spring snowmelt exceeds system storage capacity and irrigation demands and water is spilled past Milner Dam. On average, about two million AF of water are discharged annually past Milner Dam (Figure 5). Some of this discharge is provided to meet downstream water rights and environmental needs.

Direct tributaries to the Snake River occur primarily from the east and south sides of the basin. Several streams along the northern margin disappear through seepage before flows can reach the Snake River (Figure 4). Only flows of the Big and Little Wood Rivers, Silver Creek, and Camas Creek may eventually reach the Snake River from the northern margin of the plain. Other streams on the northern margin of the plain, such as the Big and Little Lost Rivers, contribute recharge to the Snake River Plain aquifer, but do not directly discharge to the Snake River.

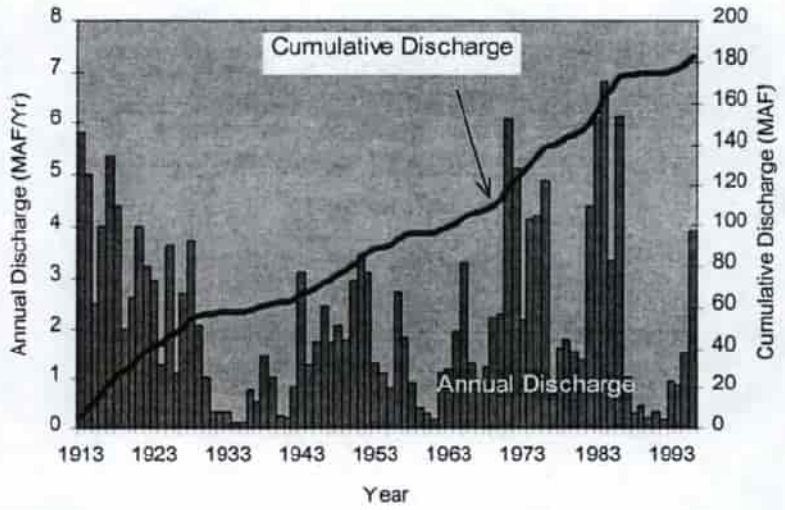

Figure 5. Historic Discharge of the Snake River at Milner Dam (U.S. Geological Survey Data).

An extensive network of irrigation canals provides water for over one million acres of irrigated land on the eastern Snake River Plain. Different reports provide

different estimates of surface water irrigated land due to: 1) differences in the area being evaluated, 2) difficulties discriminating between ground-water and surface-water irrigated land in some places, and 3) the application of adjustments for non-productive lands (e.g. homesteads, roads, ditches) within an area that appears irrigated in satellite images. In 1980, the U.S. Geological Survey reported 2.1 million acres of irrigated land on the eastern Snake River Plain (Garabedian, 1992) within the boundaries shown in Figure 1. The IDWR estimated 1.4 million acres of irrigated land in 1992 (IWDR, 1997); however, the IDWR estimate did not include the south side of the Snake River near Twin Falls, nor most of the Henrys Fork area, which accounts for several hundred thousand acres.

Irrigation diversions consume a large proportion of the flow of the Snake River during irrigation season. Diversions of surface water for irrigation in the eastern Snake River Plain (including all tributaries) have diminished by about 20 percent from the nearly eight million AF/yr diverted in the early 1970s (see IDWR, 1997, Figure 16). Irrigation diversions have a significant impact on flow of the river; however, some of the diverted water returns to the river as either surface or ground water return flows. In addition, surface water diverted for irrigation also has a major effect on recharge of the Snake River Plain aquifer as will be discussed in the following section.

GROUND-WATER HYDROLOGY

The Snake River Plain aquifer underlies the eastern Snake River Plain. This highly productive aquifer is hosted in fractured basalts and interbedded sediments. The primary conduit for ground-water flow appears to be the highly permeable rubble zones

that formed at the tops of the numerous basalt flows which comprise the Snake River Plain. Garabedian (1992) reports median specific capacity on a county basis for 176 wells across the eastern plain. The median values ranged from 4 to 950 gallons per minute per foot of drawdown, with the largest values occurring in counties near the center of the plain where Quaternary basalts are thickest. The lower values were found near the margins of the plain where Tertiary basalts and sediments predominate.

Although the collective thickness of the basalt flows may be in excess of several thousand feet in places, the active portion of the aquifer often is thought to be limited to the upper several hundred feet of saturated thickness. Robertson (1974) states that "Although the real aquifer system is probably more than 1,000 feet thick, a thickness of 250 feet is used in this study based on the apparent layering effects of the aquifer." Based on the presence of low permeability sedimentary layers encountered in a well drilled on the Idaho National Engineering and Environmental Laboratory, Mann (1986) suggests that the aquifer is 450-800 feet thick. Model studies by the U.S. Geological Survey (Garabedian, 1992) represent the aquifer as four layers with a collective thickness ranging from 500 to over 3,000 feet. Modeling by the IDWR and the University of Idaho (deSonneville, 1974; Newton, 1978; IDWR, 1997) represents the aquifer as a single layer ranging from 200 to 1,700 feet thick.

The Snake River Plain aquifer generally is considered unconfined; however, in some locations and under certain conditions the aquifer responds as a confined system. In some areas, low permeability lakebed sediments create local confining layers (Spinazola, 1994). The layered basalts and interbedded sediments also may produce

conditions that appear locally confined, at least when subjected to short duration stress (Frederick and Johnson, 1996).

The Snake River Plain aquifer is recharged by irrigation percolation; canal, stream, and river losses; subsurface flow from tributary valleys; and precipitation directly on the plain. The aquifer discharges to the Snake River, to Snake River tributaries, springs along the Snake River and to ground-water pumping, primarily for irrigation. The relative magnitudes of the recharge and discharge components were evaluated by the USGS (Garabedian, 1992) and, more recently, by the IDWR (1997). Estimates from the USGS represent conditions in 1980 for the entire Snake River Plain (Figure 6). Estimates from the IDWR represent a projection to near equilibrium conditions (e.g. negligible change in storage) with the level of irrigation development that existed in 1992 (Figure 7). The IDWR work applied weather conditions that were averaged for 1950 to1981 and surface water diversions that were averaged for the period of 1982 to 1992. In the context of this report, evapotranspiration (ET) is used to describe the consumption of water by agricultural crops and not ground-water discharge via stream-bank or wetland plants. The USGS estimates include portions of the plain not included in the IDWR estimate due to differences in model boundaries (model extent is discussed in a later section). A comparison of Figures 6 and 7 shows several components (ET, pumpage and canal losses) which are explicitly shown in one of the water budget analyses but are embedded within other components in the other analysis. This is due to different presentation selections for the two water budgets. All of the components have been accounted for in both of the water budgets.

Incidental aquifer recharge from irrigation is a significant component of the water budget and has varied as irrigation practices have evolved. The 1980 water budget of the USGS (Garabedian, 1992), shown in Figure 6, shows that surface water irrigation contributes more than 50 percent of the total recharge to the aquifer. Historically, recharge from surface water irrigation increased as more land was brought into production up to the 1970s. Since the 1970s, a gradual conversion to sprinkler irrigation methods reduced the amount of incidental recharge from irrigation. In addition, ground-water use for irrigation has increased during the past several decades.

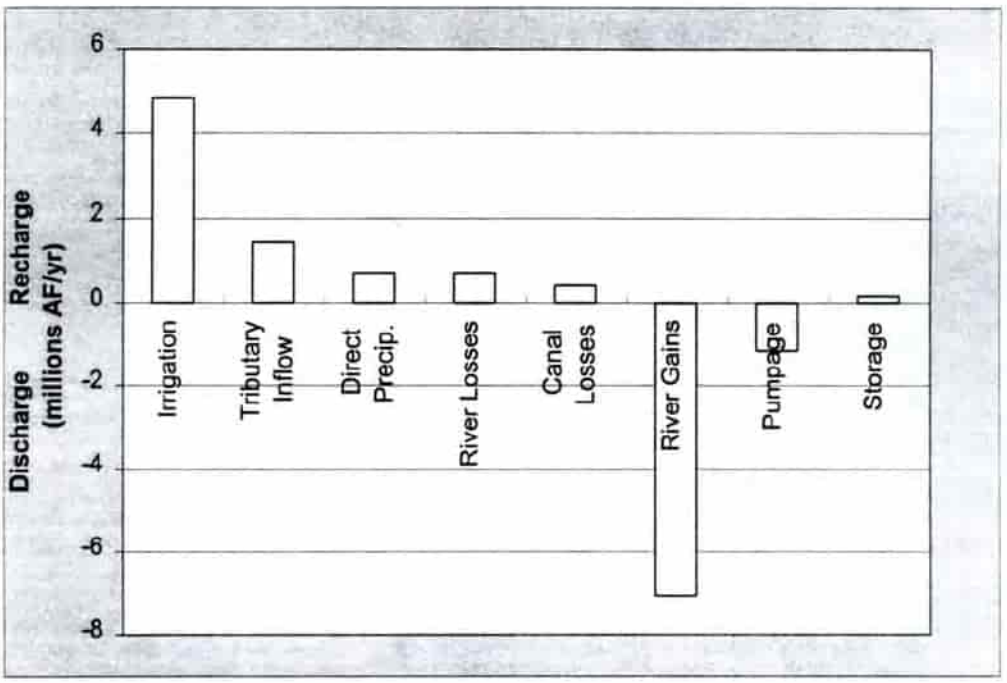

Figure 6. Snake River Plain Aquifer Estimated Annual Recharge and Discharge from April 1980 through March 1981 (after Garabedian, 1992).

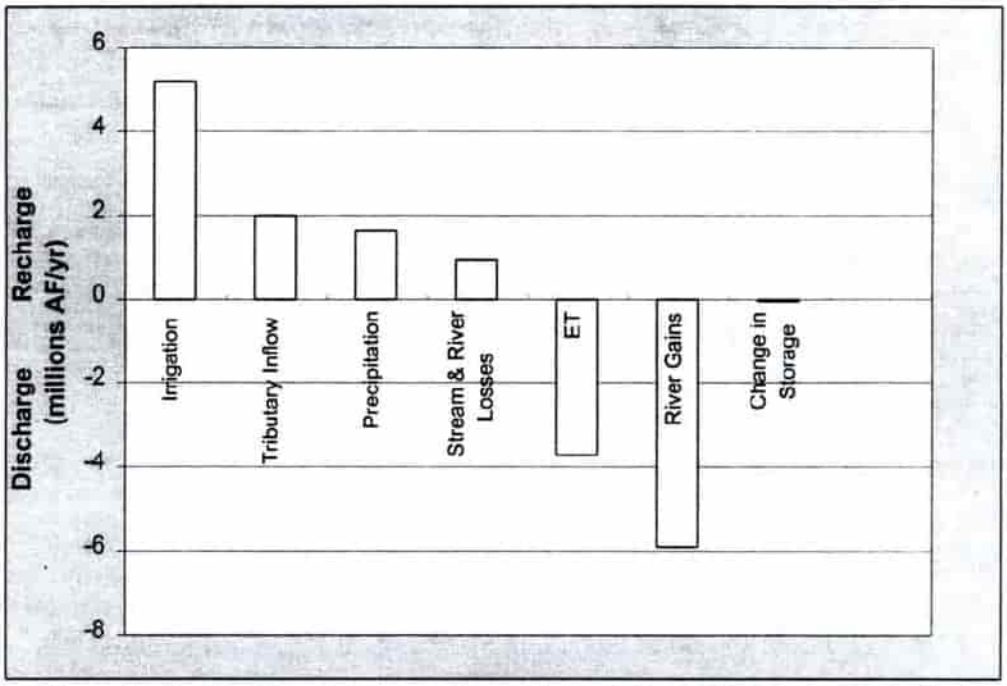

Figure 7. Snake River Plain Aquifer Estimated Annual Recharge and Discharge Assuming the Irrigation Development Level of 1992 and Near Equilibrium Conditions in the Aquifer (after IDWR, 1997).

Natural discharge from the Snake River Plain aquifer is primarily to the Snake River along two reaches: Kimberly to King Hill, and Blackfoot to Neeley. These reaches are defined by gaging stations shown in Figure 1. Spring discharge has varied in response to changes in weather, irrigated acreage, and irrigation practices. Discharge in the Kimberly to King Hill reach appears to have been impacted more than in the Blackfoot to Neeley reach (Figure 8). The effects of weather variation and irrigation recharge are apparent from the short-term variation of spring discharge. Maximum discharge occurs around October, near the end of irrigation season. The seasonal variation in the Blackfoot to Neeley and Milner to King Hill reaches is about 15 and 20 percent of the respective maximum reach gains (from interpretation of Kjelstrom, 1995).

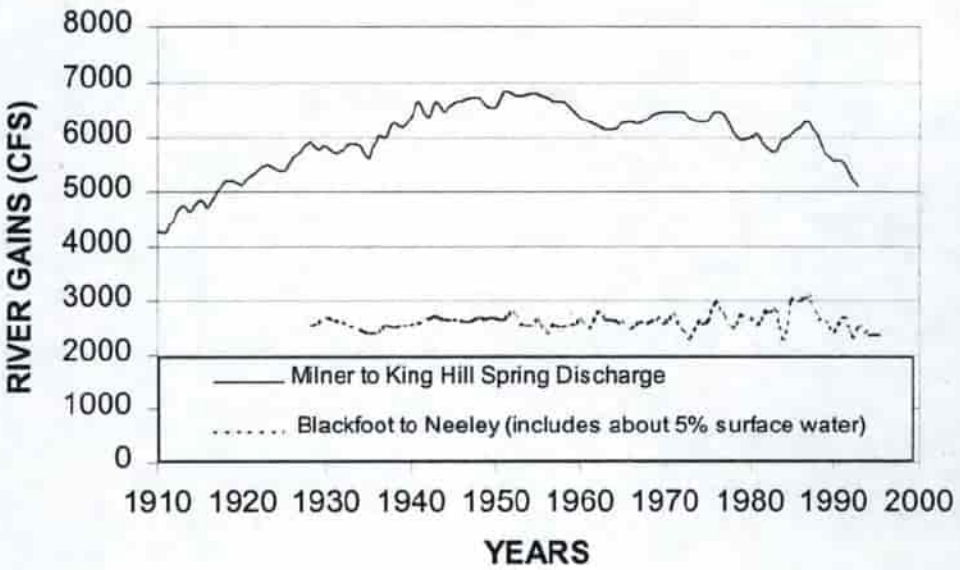

Figure 8. Average Annual Snake River Gains in the Milner to King Hill and Blackfoot to Neeley Segments. (From IDWR data.)

Other reaches of the Snake River also are hydraulically connected to the aquifer. In these segments, the river may gain or lose water, depending on river stage and the water level in the aquifer. The Neeley to Minidoka reach both gains and loses water, with gains generally exceeding losses. Further upstream, between Heise and Lorenzo, the South Fork of the Snake River is a seasonally losing stream (Kjelstrom, 1995). Average annual loss of this reach was 150 cfs in the 1980 water year. During that same period, the Lorenzo to Lewisville reach of the main stem of the Snake River and the lower Henrys Fork reach were estimated to have gained 290 and 120 cfs, respectively (Garabedian, 1992).

Contours of the potentiometric surface indicate that ground-water flow direction generally is parallel to the axis of the plain (Figure 9). Steep hydraulic gradients are apparent near the margins of the plain due to tributary valley inflow and lower transmissivity relative to the center of the plain. Steep gradients also are apparent near the Kimberly to King Hill discharge area due to convergence of flow lines and probable aquifer thinning. Near the center of the plain and near Mud Lake, steeper gradients presumably result from decreased transmissivity due to the volcanic rift zone and thick sediment deposits, respectively.

Aquifer water levels have changed significantly over the past several decades in response to changes in irrigation and variations in weather (Figure 10). The greatest changes in water level appear in a band traversing the south-central portion of the plain. Water level declines between 1980 and 1996 are as large as 15 feet in this area. Some portions of the Snake River Plain aquifer have experienced little decline or slight increases in water level.

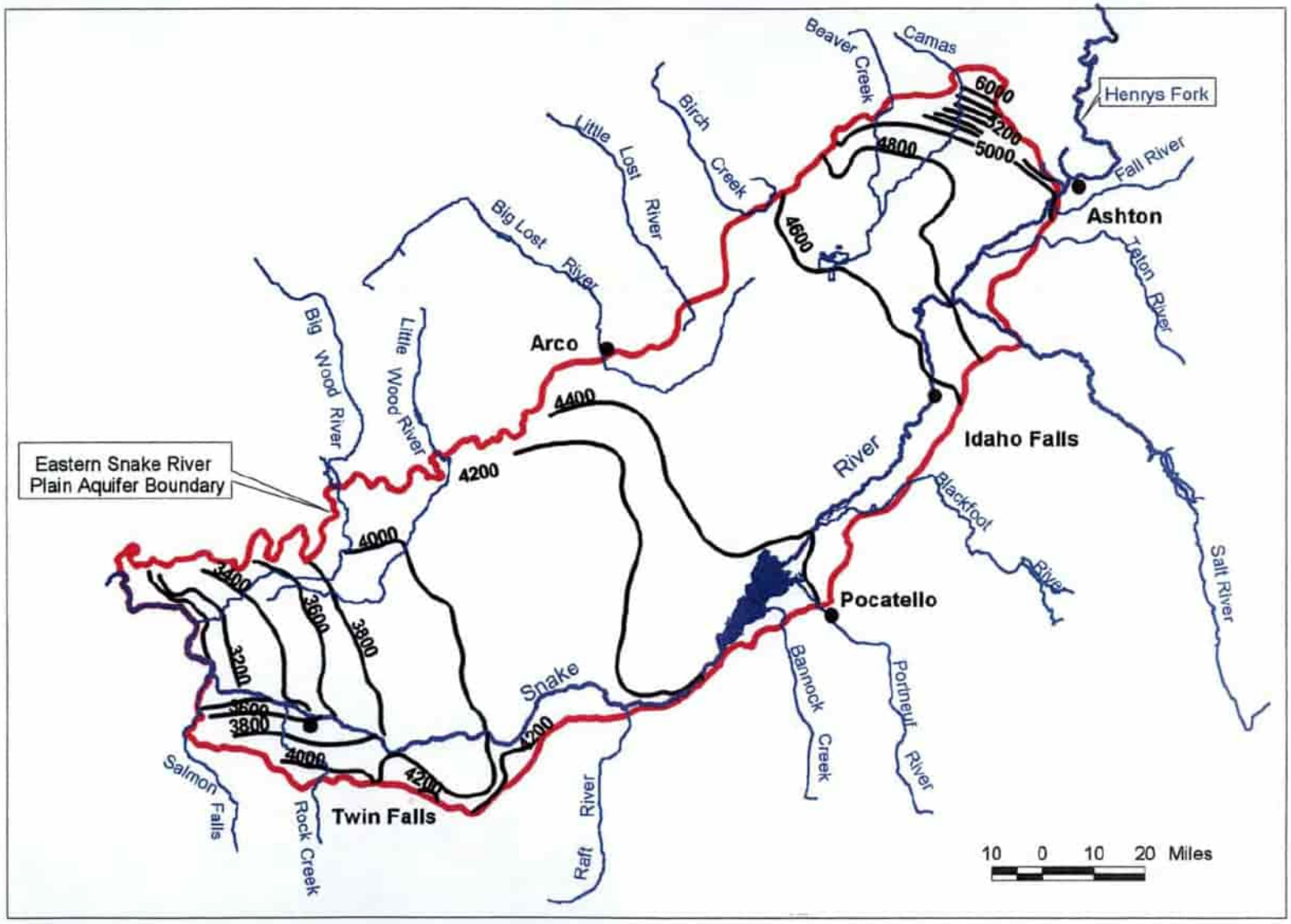

Figure 9. Potentiometric Surface of the Snake River Plain Aquifer, Water Table Contour Interval 200 ft. (after IDWR, March 1980).

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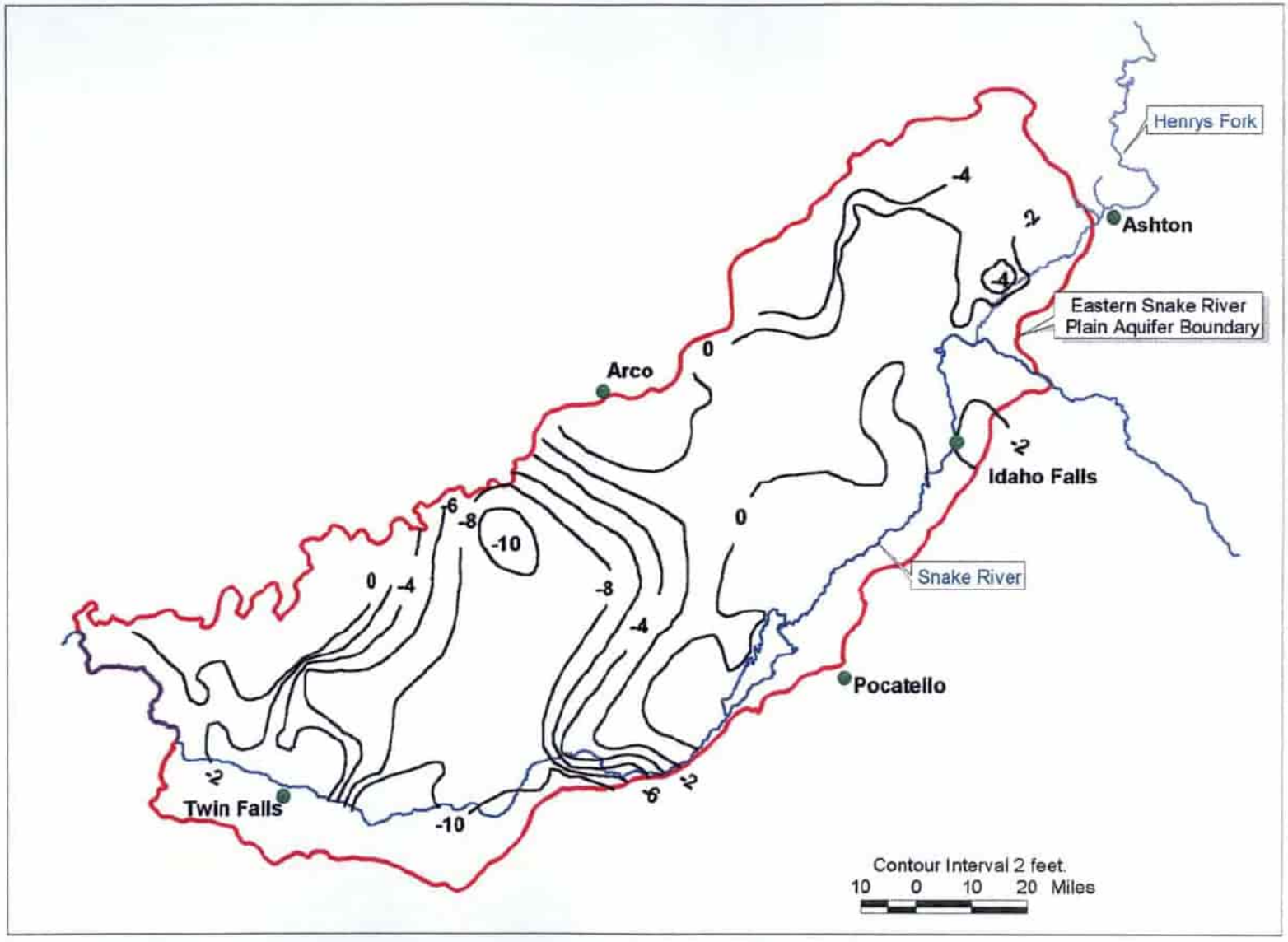

Figure 10. Water Level Changes in the Snake River Plain Aquifer from Spring 1980 to Spring 1998 (after unpublished map from S. Bendixsen, IDWR).

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SRPAM1.1 MODEL DESCRIPTION

This section provides a consolidated description of the SRPAM1.1 model. A brief model history is presented. The model grid and boundaries are described, including the representation of rivers, tributary valley underflow and aquifer bottom, recharge and discharge, and aquifer properties. The appendix contains comparisons between the SRPAM1.1 model and the USGS Snake River Plain Model (Garabedian, 1992) to provide an understanding of the degree to which model construction and input are affected by interpretation and methods of the modeler.

BRIEF MODEL HISTORY

The first numerical model of the aquifer was developed by the University of Idaho for the Idaho Department of Water Resources (IDWR) and the U.S. Bureau of Reclamation (deSonneville, 1974). The model has undergone multiple revisions and improvements. The IDWR has applied some version of this model as a planning and management tool for over two decades. For the past decade, the model has been referred to as the IDWR/UI Ground Water Flow Model. As part of this project, the IDWR/UI Ground Water Flow Model was converted to use the MODFLOW code and the model domain was expanded to include the Henrys Fork and South Fork of the Snake River (Johnson and others, 1999). The converted and expanded model, referred to as SRPAM1.1, is the model documented in this report.

MODEL FEATURES

MODFLOW Packages Used in SRPAM1.1

The SRPAM1.1 implementation uses six MODFLOW packages: the BAS package, the BCF3 package, the Well package, the River package, the SIP package and the Output Control Package. The SRPAM implementation of these packages is briefly described below.

- The MODFLOW Basic Package contains grid and time characteristics of the model and the starting head array.
- The MODFLOW BCF3 input contains aquifer bottom, hydraulic conductivity, and specific yield arrays. Input in this file also sets the model domain as unconfined and applies the logarithmic interblock transmissivity averaging.
- The MODFLOW Well Package is used to represent the net recharge and discharge (non-head dependent) to each cell. The net recharge is determined using the RECHARGE Program (Johnson and Brockway, 1983). All recharge/discharge due to precipitation, canal seepage, tributary underflow, irrigation application, evapotranspiration and groundwater withdrawals is calculated for each model cell in the RECHARGE Program. The net recharge/discharge for each model cell is then represented as an injection or withdrawal from the aquifer using the MODFLOW Well package.
- The MODFLOW River Package is used to simulate those reaches of the Snake River that are modeled as head-dependent, as described above.
- The MODFLOW SIP Package was selected as the numerical solver. The closure criterion was set at 0.01 feet.

- A MODFLOW Output Control file is used to acquire the detailed output at specified stress periods.

Inter-block transmissivities in the SRPAM1.1 model are averaged using a logarithmic mean. In contrast, most other model applications use the harmonic mean for interblock averaging of transmissivity. The harmonic mean was the only option available in the original version of MODFLOW. MODFLOW routines have been modified in recent years, however, to include an optional logarithmic averaging method (Goode and Appel, 1992) identical to that employed by IDWR/UI Ground Water Flow Model. The revision is included in the BCF3 package that replaces the original MODFLOW BCF package (LAYAVG=20, LAYCON=21).

Model Grid

The SRPAM1.1 model grid consists of one unconfined layer of uniform 3.1 mile (5 km) square grid cells with 48 rows, numbered progressively from south to north, and 63 columns, numbered from west to east (Figure 11). The origin, in the southwest corner of the grid, is at latitude 42.28721696° and longitude 115.19637586° (location of the southwest corner of model cell 1,1). The Universal Transverse Mercator (UTM) zone 12 grid coordinates of the origin are a northing of 4,689,986.00 meters by an easting of 153,994.094 meters. The grid columns are oriented parallel to the central meridian of UTM Zone 12 (111°00'00"). SRPAM1.1 uses a block-centered grid with node points in the center of cells.

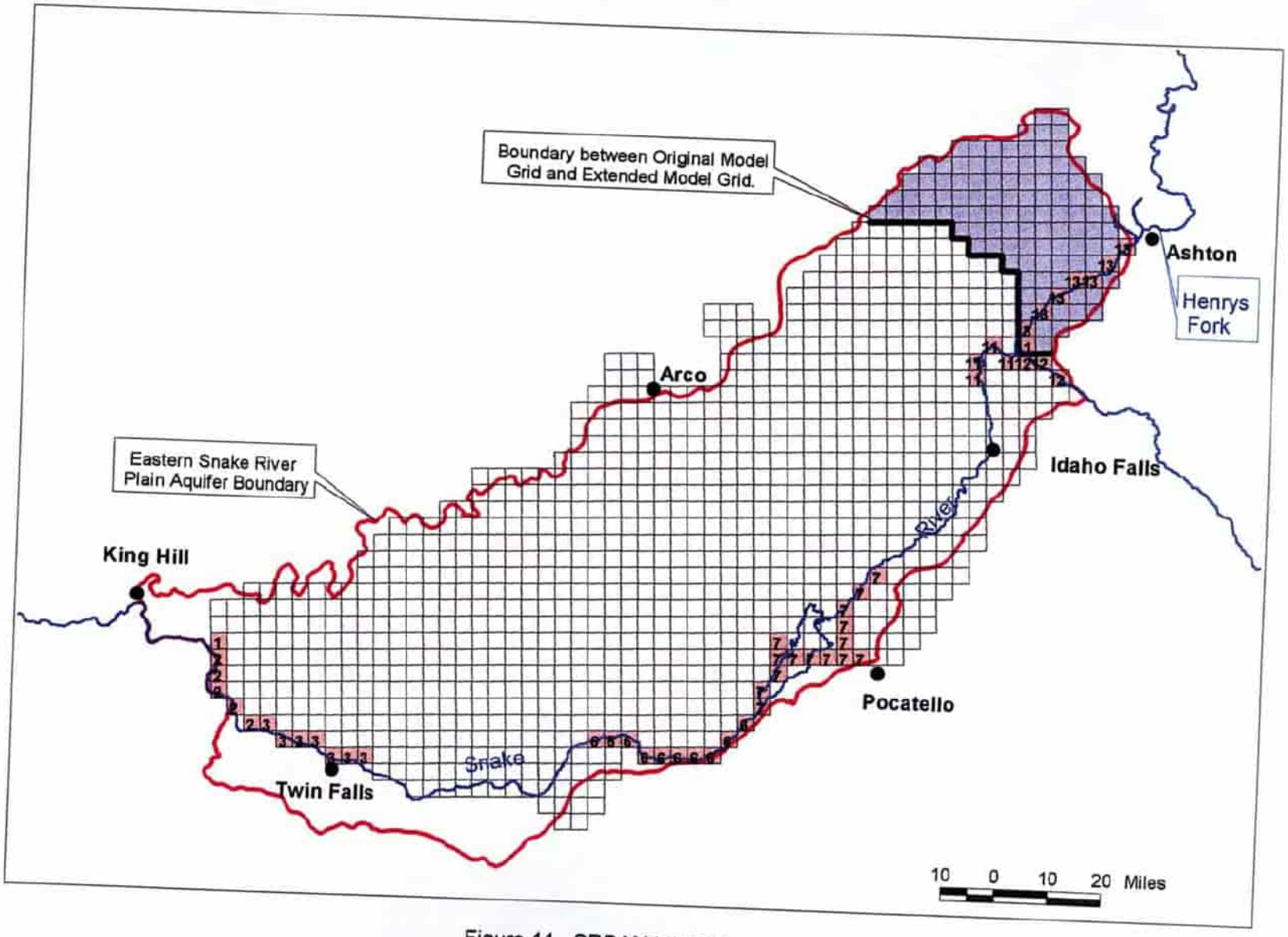

Figure 11. SRPAM1.1 Grid.
(Note: Reach Numbers are cited in Table A2.)

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Model Boundaries and Tributary Underflow

Model boundaries include no flow and specified-flux (underflow) along the margins of the plain and a head-dependent representation of some segments of the Snake River. Specified flux boundaries are used to represent underflow from surrounding tributary valleys including the Big Lost River, the Little Lost River, Warm Springs Creek, Deep Creek, Medicine Lodge Creek, Beaver Creek and Camas Creek, the Teton River, Big Bend Ridge, the Rexburg Bench, the South Fork of the Snake River, and the Portneuf River. Figure 12 shows the locations of model cells containing specified flux values representing underflow at tributaries. Table 1 lists the tributaries represented in SRPAM1.1 model (for the 1980 calibration year) and those used in the U.S. Geological Survey model (Garabedian, 1992) is presented in the Appendix. Specified flux is incorporated into the net recharge for each boundary cell with modeled underflow in the RECHARGE Program (Johnson and Brockway, 1983) which is described in the section *Calculation of Recharge and Discharge for SRPAM1.1*. Tributary valley specified flux is modeled as time-invariant; that is, the underflow values are constant throughout the entire simulation.

Representation of River Reaches

Some segments of the Snake River are treated as head-dependent flux boundaries, while others are represented as specified flux boundaries with recharge rates specified as input to the RECHARGE Program. The RECHARGE Program is not interactive with the

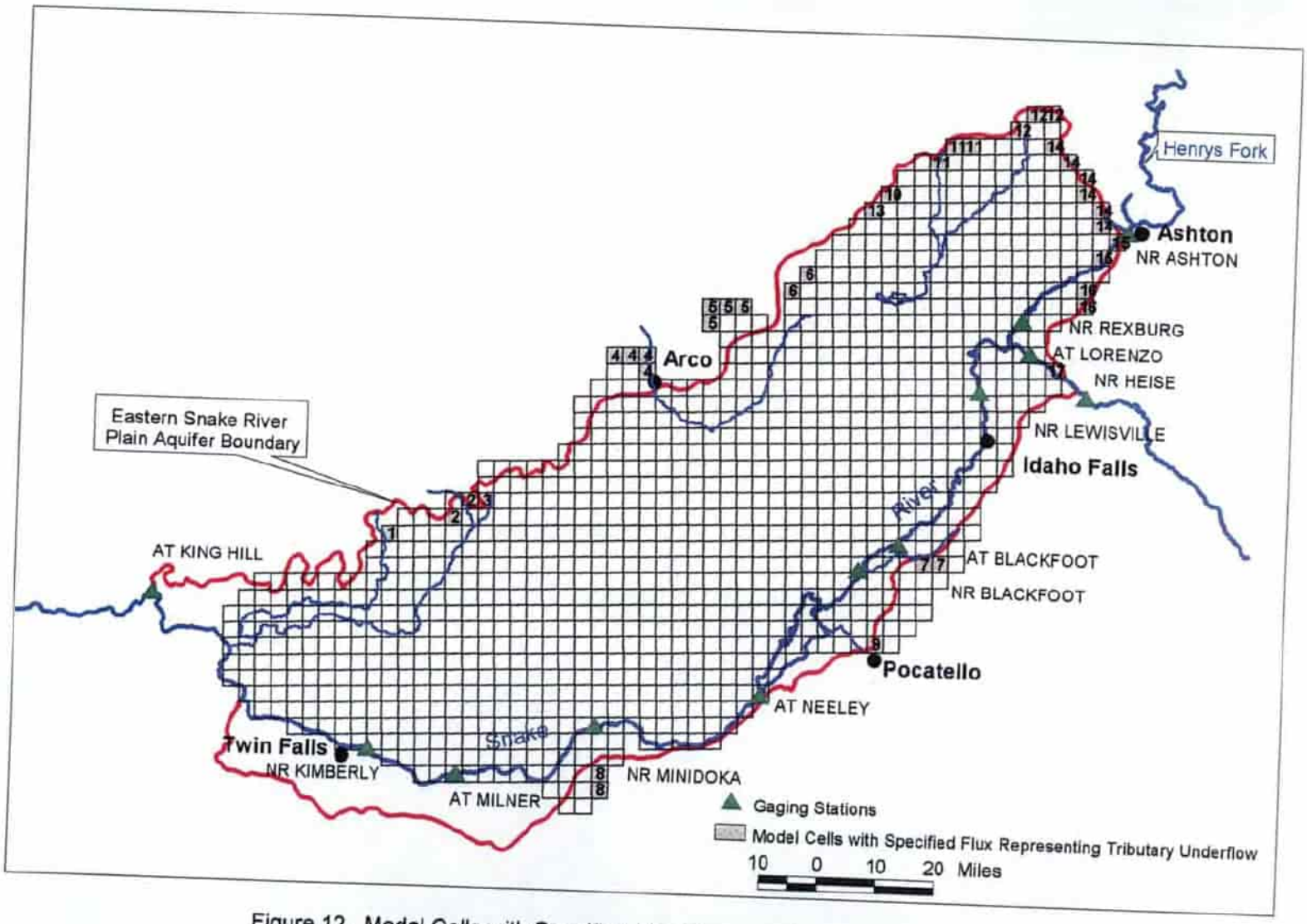

Figure 12. Model Cells with Specified Flux Representing Tributary Underflows.
(Note: Specified Flux Cell Numbers are cited in Table 1.)

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Table 1. SRPAM1.1 Tributary Names and Assigned Numbers.

Tributary Name	Tributary Number
Big Wood River	1
Silver Creek	2
Little Wood River	3
Big Lost River	4
Little Lost River	5
Birch Creek	6
Blackfoot River	7
Raft River	8
Portneuf River	9
Medicine Lodge, Deep Creek & Warm Springs Creek	10,13
Beaver Creek	11
Camas and Big Bend Creeks	12,14
Henrys Fork	15
Other Reaches	16

ground water model, therefore only recharge and discharge components that are independent of aquifer head can be included in the RECHARGE Program calculations.

Non-head dependent, or perched, river segments are simulated in the Lewisville to Blackfoot and the Minidoka to Kimberly segments of the Snake River. In these segments, river losses are considered independent of aquifer head and are specified as time-variant input to the RECHARGE Program. The estimated magnitude of the river

losses for the model calibration year are discussed in the section *Calculation of Recharge and Discharge for SRPAM1.1*. The assumption that these reaches are independent of aquifer water level is a simplifying assumption. Kjelstrom (1995) indicates that seepage in these reaches is to some degree dependent on aquifer water levels. However, the relatively small gains and losses in these reaches may have justified the simplifying assumption at the time the model was developed.

Head dependent, or hydraulically connected, river representation was limited to specific segments of the Snake River shown in Figure 11. Those segments, as bounded by gaging stations include:

Henrys Fork from Ashton to Rexburg
South Fork from Heise to Lorenzo
Henrys Fork (from Rexburg) and South Fork (from Lorenzo) to Lewisville
At Blackfoot to Neeley
Neeley to Minidoka
Kimberly to King Hill

In these river segments, simulated river gains and/or losses are partially controlled by simulated water-table elevations. Other features such as Camas Creek and Mud Lake may be in hydraulic communication with the aquifer but have not been represented as head-dependent features in the model.

Simulated river gains and losses in head-dependent river segments are controlled by input values of river stage, riverbed conductance, and elevation of riverbed bottom (for details see McDonald and Harbaugh, 1988). The values input for these items vary with location.

In the Kimberly to King Hill river segment, the river stage is used to represent average elevations of springs along the canyon wall. A very high aquifer stress in this area could cause water levels to drop sufficiently to cause a reversal in the direction of

spring flow. Although such a large change in aquifer water levels is unlikely, the representation of springs in this area should be considered for modification in future versions of the model. In other segments the river stage is representative of the elevation of the river surface. In the Blackfoot to Neeley segment, river stage is simulated as time-variant during the 1980 calibration year. This was probably done to reflect high fluctuations in river stage due to operations at American Falls Dam. In all other segments, river stage is less variable and, therefore, is simulated as a constant value representing a time-averaged water level.

River conductance is a term used to represent the collective effects of river dimensions within a model cell and the hydraulic conductivity of riverbed and bank materials. In SRPAM1.1, river conductance is set to an arbitrarily large value in all river segments below Blackfoot. This results in river gains and losses being controlled by hydraulic conductivity of the model cells in which the river is represented. This was done to maintain consistency with earlier model versions (see Johnson and others, 1999 for more detail). In the river reaches upstream from Lewisville, including the Henrys Fork and South Fork, river conductance was calibrated to reproduce estimated river gains and losses during the calibration year.

Riverbed bottom elevation is a threshold where a river transitions between hydraulically connected and perched. In earlier model versions, the river reaches below Blackfoot were modeled as fixed head. By using a high river conductance value and a low river bottom elevation for these river reaches, the river gains simulated with the SRPAM1.1 version were consistent with the river gains simulated in earlier model

versions. In the river reaches above Lewisville, the riverbed bottom elevation is set to about 30 feet below river stage.

Aquifer Bottom

The aquifer bottom was modeled at a uniform elevation of 3100' above sea level throughout most of the SRPAM1.1 model area. In the model cells approaching the Kimberly to King Hill segment of the Snake River, the modeled elevation of the aquifer bottom slopes gradually to approximately 2550' elevation. This slope in elevation is effected across approximately six model cells or 19 miles. This configuration was adapted to be consistent with the IDWR/UI Ground Water Flow Model. Reliable data on the elevation of the bottom of the aquifer were not available when the model was developed, so the choice of the elevation of the bottom of the aquifer was somewhat arbitrary. The uniform elevation of 3100' feet was probably selected to be lower than the deepest known wells in the aquifer. During the model calibration, the hydraulic conductivities would have compensated for the unknown saturated thickness to achieve the desired simulated water levels.

MODEL CALIBRATION

The SRPAM1.1 model contains a combination of aquifer parameters previously calibrated for the IDWR/UI Ground Water Flow Model and aquifer properties calibrated during a localized calibration of the expanded model area (grayed cells in Figure 11) during the conversion to SRPAM1.1. Both areas were calibrated to transient conditions for the April 1, 1980 through March 31, 1981 period, using 24 stress periods of 15.2 days.

The model domain of the IDWR/UI Ground Water Flow model was calibrated and documented most recently in IDWR (1997). An automatic calibration routine was used to assist in the calibration of transmissivity and specific yield in the original model domain. Comparisons between simulated and measured values of aquifer head were made in the 11th (mid September) and 24th (end of March) stress periods. The calibrated aquifer properties were carried forward during the conversion to SRPAM1.1.

A localized calibration of hydraulic conductivities and specific yields in the expanded model area (the Henrys/South Fork region) was done as part of the conversion to SRPAM1.1. As part of the localized calibration of the Henrys/South Fork area, aquifer properties in the original model domain in the extreme northeast portion of the original model also were changed. Model cells approximately 6 rows into the original model domain were re-calibrated along with model cells in the expanded portion of the model. Additionally, river conductances in the expanded model domain were calibrated as part of the localized calibration. This model calibration was performed by a trial and error process of adjusting aquifer hydraulic conductivity, specific yield and river conductance to achieve a reasonable match between simulated and measured aquifer water levels and river gains and losses. For further details on model calibration, the reader is referred to IDWR (1997) and Johnson and others (1999). The following sections describe the water budget for the calibration period, the generation of initial conditions, and the estimation of recharge and discharge for the same period (April 1, 1980 through March 31, 1981).

Water Budget

Table 2 shows the water budget for the April 1, 1980 through March 31, 1981 period. Aquifer recharge and discharge during this period provided input for model calibration and is the base from which data sets for different time periods or development scenarios are developed.

The water budget for the model domain illustrates the relative magnitude of the major recharge and discharge components. It also provides an indication of the legitimacy of the conceptual model, based on how well independently derived terms balance. River gains and losses are based primarily on streamflow and diversion measurements. Changes in aquifer storage are based on estimates of specific yield and measured changes in water level. The net recharge component is estimated by the RECHARGE Program from data characterizing the irrigation systems, streams, and climate. The discrepancy is the difference between net recharge and discharge. Ideally, the discrepancy should be zero; however, the estimation of individual components of the water budget all contain some degree of error and the collective error is reflected by the discrepancy.

Initial Conditions

Initial estimates of the distribution of aquifer head are required for the transient model calibration period. Starting heads for the SRPAM1.1 model were derived from two sources. For the portion of the model that was converted from the original IDWR/UI Ground Water Flow Model, starting heads were taken from the original model starting heads. These initial heads were derived using RASA water level measurements from

Table 2. Conceptual Water Budget (1980-81 Calibration Year).

Component	Estimated Magnitude (AF/year)[1]
Net Recharge	**6,640,000**
Hydraulically Connected River Gains and Losses	
Above Lewisville[2]	-191,000
At Blackfoot to Neeley[2]	-1,706,000
Neeley to Minidoka[2]	-130,000
Milner to King Hill (North Side)[2]	-4,362,000
Total River Gains	**-6,389,000**
Change in Aquifer Storage[2]	**100,000**
Discrepancy	**351,000**

[1]positive value indicates recharge, negative value indicates aquifer discharge
[2]from Garabedian (1992)

early April, 1980 which were then interpolated to model cell centers. The specific set of water level measurements which were used to derive starting heads for the IDWR/UI Ground Water Flow Model is no longer available.

For the expanded portion of the model in the Henrys/South Forks area, 1980 RASA water-level measurements were contoured, the contours were adjusted to fit with contours published for that area by Wytzes (1978) and the contour interval was extrapolated to the RASA contours to the north which were published in Garabedian (1992). Contours representing the starting head conditions of April 1980 are available in Johnson and others (1999). Contouring of the measured starting heads introduces some error in the early stress periods of the model. However, a similar degree of error would

be introduced by any other method of generation of starting heads. The reader is referred to Johnson and others (1999) for more details on generation of starting heads in the expanded model region.

Calculation of Recharge and Discharge for SRPAM1.1

Aquifer recharge and discharge for the April 1980 through March 1981 period were estimated using the RECHARGE Program (Johnson and Brockway, 1983) for mechanisms that are independent of aquifer head. The program calculates the net recharge resulting from irrigation diversions and pumping; evapotranspiration from irrigated and non-irrigated land; canal, river, and stream seepage that are not dependent on aquifer head; and underflow from tributary valleys. The program computes the net recharge to every cell within the model domain based on inputs provided for each of the twenty-four 15.2-day stress periods. Boundary underflow, although computed as part of the RECHARGE Program, was discussed in the previous section on model boundaries. The other components of recharge and discharge estimation are discussed in the following sections.

Surface Water Diversions and Irrigation

Diversion and application of surface water for irrigation is one of the dominant contributors to recharge of the Snake River Plain aquifer. For the 1980 model calibration year (April 1, 1980 through March 31, 1981), the estimated surface water diversions totaled 9.5 million AF. Only irrigation companies with service area within the active model domain are included in this total. This water was distributed to about 1.6 million acres of surface water irrigated land on the eastern Snake River Plain. A cell by cell map of surface water irrigated areas is shown in Figure 13. A small fraction of these total

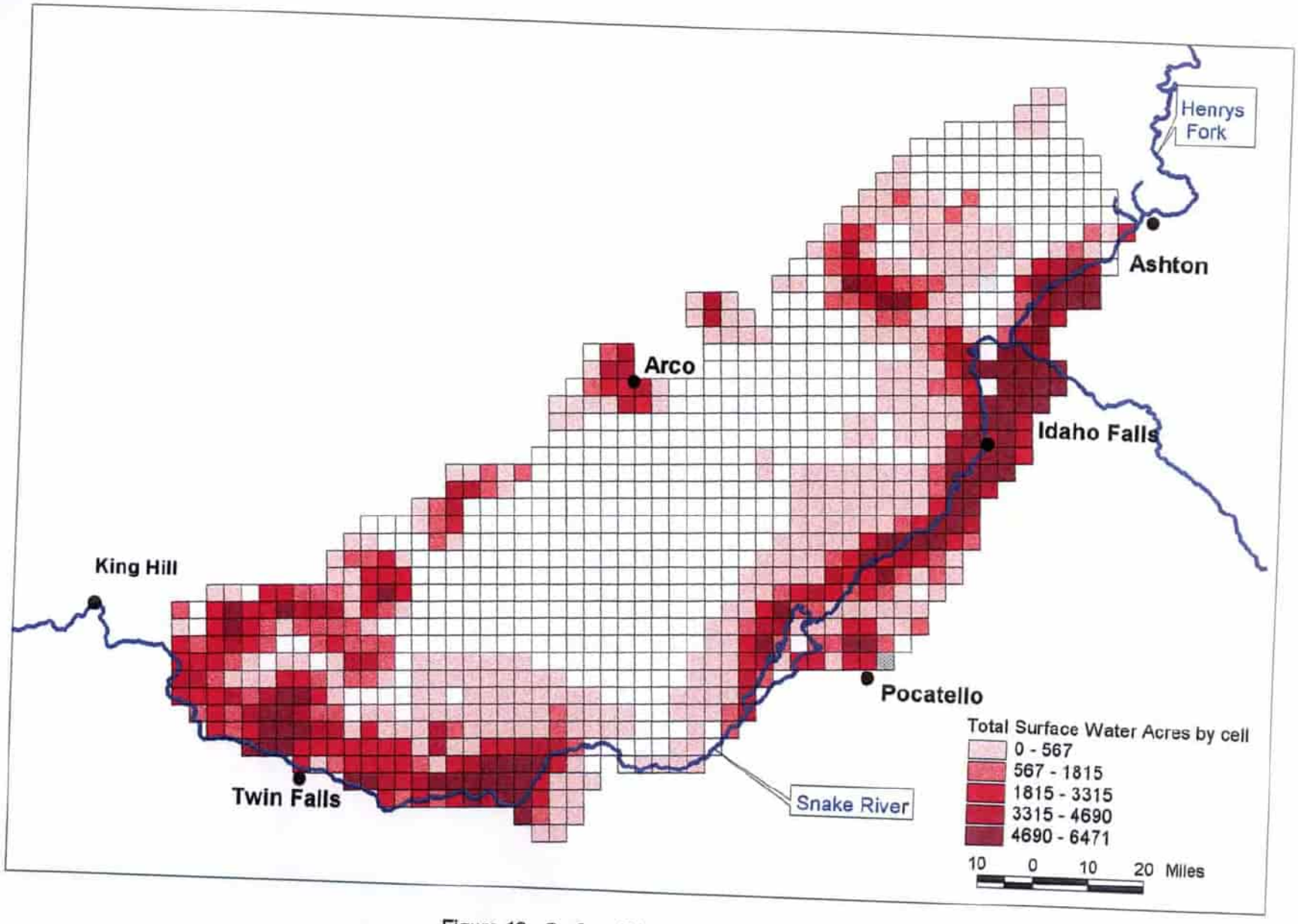

Figure 13. Surface Water Irrigated Acres.

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diversions actually represent ground water pumping, so a small number of ground water irrigated acres is included for some of the irrigation units. Cell dimensions are 5 km square, with each cell containing a total of about 6,150 acres. It is apparent from Figure 13 that most of the surface water irrigated areas lie in close proximity to the Snake River.

Irrigation applications were determined as the difference between irrigation diversions and return flows, divided by the number of irrigated acres. Computations of irrigation application were performed for each 15.2-day stress period and for each of 69 irrigation units. Irrigation units may contain multiple canal companies and include canal companies that pump ground water such as those near Mud Lake (Table 3). Irrigation diversions for each 15.2-day stress period and each irrigation unit were determined from IDWR records. Return flows were estimated from records when available. Irrigated area information was developed from Landsat MSS data, as described in Anderson (1983). Canal and lateral seepage is included in the irrigation application calculated by this method. Consequently, canal seepage is distributed in proportion to the irrigated area present in each model cell. The net diversion (minus surface return flow), irrigated area, and application rate (including canal seepage losses) for each irrigation unit are presented in Table 4. Irrigation companies with unknown rates of diversion were grouped into Irrigation Unit #70 (Table 3). An average rate of application was assumed for lands associated with this unit.

Table 3. List of Irrigation Units.

Canal Company	No.	Canal Company	No.
Bannock Feeder Canal Co.	1	Roxanna Canal Co.	28
Texas Slough Irrigation and Canal	1	Saurey-Sommer Canal Co.	28
Liberty Park Irrigation Canal Co.	1	Wilford	28
Butte and Market Lake Canal	2	Westside Mutual Canal Co.	29
Butte and Market Lake & Grand	2	Martin Canal Co.	29
The Reid Canal	4	New Sweden Irr. District	29
Lenroot Canal Company	5	Woodvill Canal Co.	30
Sunnydell Irrigation District	5	Snake River Valley Irrigation Dist.	31
Parks and Lewisville Irrigation Co.	9	The New Lava Side Ditch	32
North Rigby Irrigation and Canal Co.	9	Riverside Ditch Co.	32
Rigby Canal and Irrigation Co.	9	Snake River Valley Irrigation Dist	32
Dilts Irrigation Co.	14	Danskin Ditch Co.	32
La Belle Irrigation	14	WearyRick Ditch Co.	32
Nelson-Corey Ditch	14	Trego Ditch Co.	32
Hill Petinger Ditch	14	Watson Slough Ditch and Irr.	32
Lowder Slough Canal Co.	14	Corbett Slough Ditch Co.	33
Burgess Canal and Irrigation Co.	15	Private Blackfoot River	33
Clark and Edwards Canal Co.	15	Blackfoot Irrigation Co.	33
Harrison Canal and Irrigation Co.	16	Last Chance	34
Rudy Irrigation and Canal co.	16	Twin Groves	34
Butler Island Canal Co.	16	Peoples Canal & Grndwtr.	35
Farmers Friend Irrigation Co.	18	Peoples Canal and Irrigation Co.	35
Enterprise Canal Co.	18	Aberdeen-Springfield Canal Co.	36
Falls River	21	Aberdeen-Springfield & Grndwtr.	36
East Teton Canal Co.	21	Bigler Slough	37
Teton Island Canal Co.	21	Pincock-Byington Ditch	37
Enterprise Irrigation District	21	Pincock-Garner Ditch	37
Teton Irrigation and Mfg. Canal Co.	21	City of Rexburg Canal Co.	38
Woodmansee and Johnson Canal	21	Rexburg Irrigation Co.	38
Progressive Irrigation Dist.	22	Fort Hall-Michaud Indian Service	42
Osgood Canal, Utah & Idaho	23	Fort Hall Indian Service	42
St. Anthony Union Canal Co.	24	Falls Irrigation District	43
Independent Canal Co.	24	Minidoka Irrigation District.	44
Egin Irrigation Dist.	24	Minidoka Irr. Dist. & Grndwtr.	44
Con Farmers & Island Ward	25	Burley Irrigation Dist. & Grndwtr.	45
Salem Union Co.	25	Burley Irrigation Dist.	45
Salem Irrigation Canal Co.	25	A&B Irrigation Dist.	46
Consolidated Farmers Canal Co.	25	A&B Irr. Dist. & Grndwtr.	46
Owners Mutual Irrigation Dist.	26	Milner Low Lift Irrigation Dist.	47
Idaho Irrigation Dist.	27	North Side Canal Co. & Grndwtr.	48

Table 3. List of Irrigation Units (concluded).

Canal Company	No.	Canal Company	No.
North Side Canal Co.	48	Bell Rapids Mutual Canal Co.	70
Poplar Irrigation District	49	Camas Creek	70
Big Wood Co, Am Falls#2, Pvt. L.	52	Mud Cr. Assoc. & Twin Falls Co.	70
Big Wood Canal Co. Dietrich	52	Medicine Lodge Creek	70
Big Wood (Dietrich) & Am. Falls	52	Mud Creek Water Users Assoc.	70
Big Wood Canal Co. N. Ritchfield	53	Beaver Creek	70
Big Wood Canal (N. Ritchf.) & Grndwtr.	53	Marsh Creek Water Users Assoc.	70
Big Wood Canal Co. N. Shoshone	54	Spring Slough	70
Big WoodCanal & Pvt. Little	54	Oakley Canal Co.	70
Carey Valley Reservoir Co.	55	Prvt. Sw, Tributary Valleys	70
Prvt. Little Wood Riv. & Tributaries	55	Twin Falls Canal Co.	70
Little Wood Canal Co.	56	Prvt. Snake River Tributaries	70
Little Wood Riv/Trib & Grndwtr.	56	Prvt. Blackfoot River Trib.	70
Little Wood Canal Co. & Grndwtr.	56	Prvt. Silver Creek and Tribs.	70
American Falls Res. Dist. #2	57	Prvt. Salmon Falls Cr. Diversions	70
American Falls Res. Dist. #2 & Grndwtr.	57	Magic Water Corp.	70
West Labelle & Long Island Co.	58	Prvt. Big Wood Tributaries	70
Island Irrigation co.	58	Thousand Springs Diversions	70
Level Canal Co.	61	North Side Pump Co.	70
Owsley Canal Co.	62	Private Big Wood River	70
Dobson and Stewart	63	Rock Ck. Dist. & Twin Falls Co.	70
Holly Water Users Assoc.	64	Private Malad River Diversion	70
Jefferson Irrigation Co.	65	Pearson Canal Co.	70
Jackett Canal Co.	66	District No. 45	70
Monteview Canal Co.	68	Salmon River Canal Co.	70
Producers	69	Baseline Canal Co.	70
Hamer Canal Co.	70		

Table 4. Summary of Irrigation Data for Irrigation Units for the 1980-1981 Calibration Year.

Project Number	Net Diversion ac-ft	Area ft^2	Application Rate ft/yr	Project Number	Net Diversion ac-ft	Area ft^2	Application Rate ft/yr
1	42118	9425	4.47	36	280500	65530	4.28
2	51331	20530	2.50	37	6498	889	7.31
3	51331	0	2.50	38	48182	5812	8.29
4	Not used			39	Not used		
5	69166	7664	9.02	40	Not used		
6	Not used			41	Not used		
7	Not used			42	19925	42043	0.47
8	8689	5148	1.69	43	19970	17317	1.15
9	143572	8991	15.97	44	303188	82051	3.70
10	Not used			45	271366	49334	5.50
11	Not used			46	50906	28176	1.81
12	Not used			47	60903	11219	5.43
13	Not used			48	1000571	159394	6.28
14	49780	6334	7.86	49	2838	2663	1.07
15	303105	21218	14.29	50	193600	13909	13.92
16	176734	17734	9.97	51	115800	13744	8.43
17	73930	4580	16.14	52	52400	17890	2.93
18	152679	19862	7.69	53	98400	28762	3.42
19	Not used			54	62200	15477	4.02
20	Not used			55	94000	15781	5.96
21	195554	32059	6.10	56	10500	24646	0.43
22	77820	26167	2.97	57	191300	36882	5.19
23	9294	8909	1.04	58	Not used		
24	431639	23031	18.74	59	Not used		
25	166983	14248	11.72	60	Not used		
26	3431	1268	2.71	61	6784	2234	3.04
27	242000	34527	7.01	62	46471	16697	2.78
28	66381	4506	14.73	63	1885	866	2.18
29	156291	28957	5.40	64	12284	4841	2.54
30	16776	2702	6.21	65	22890	10860	2.11
31	161100	22321	7.22	66	7122	2899	2.46
32	178500	18892	9.45	67	0	0	0.00
33	243000	23370	10.40	68	22887	5788	3.95
34	218500	23442	9.32	69	13132	3394	3.87
35	96000	12665	7.58	70	3033950	521379	5.82

The temporal variation of irrigation applications, including canal seepage and ground water pumping irrigation units near Mud Lake, is shown in Figure 14. It is apparent from the figure that most of the recharge to the system originates from irrigation applications and canal seepage. The maximum irrigation applications in the calibration year occurred in mid-July.

Ground Water Pumping

Ground water pumping was the dominant form of non-head dependent aquifer discharge during the 1980-1981 calibration year. The ground water pumping estimate generated by the RECHARGE Program (and ultimately input to the model) is equal to crop consumptive use minus precipitation on lands identified as ground water irrigated. It is assumed that all pumping in excess of crop demands returns to the aquifer. In most cases this is a reasonable assumption. It is also assumed, except in specially treated areas near Mud Lake, that ground water pumping occurs in the same cell in which the irrigated lands are present. Ground water irrigated areas (Figure 15) were determined from Landsat MSS data, similar to surface water irrigated acres. The calculation of crop consumptive use is described in the next section.

Consumptive Use and Evapotranspiration

Applied irrigation water is either consumed by the crop (ET) or results in aquifer recharge. Therefore, aquifer recharge from surface water irrigation is calculated as the difference between crop consumptive use and the sum of precipitation and irrigation applications. For ground water irrigated areas the difference between crop consumptive use and precipitation represents the net ground water use.

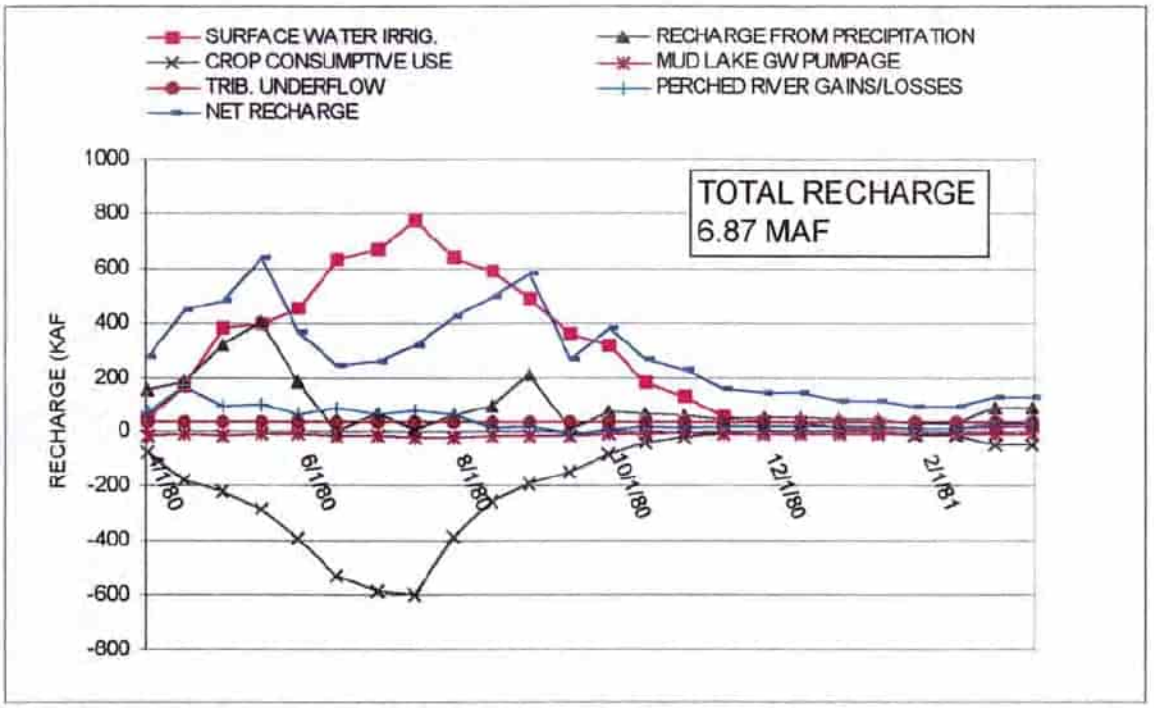

Figure 14. Time Distribution of Recharge for the 1980-1981 Calibration Data Set.

Crop consumptive use is estimated from measured climate data and crop distributions. The eastern Snake River Plain was divided into 12 climatic regions (Figure 16) for the original UI/IDWR Ground Water Flow Model; region 3 is located outside the ground water model area. These climatic regions extended far enough to cover the extended model boundaries, so no changes were made in assignment of climatic regions during model expansion. Weather conditions and crop distributions are determined for each region and control the evapotranspiration calculated for each region. Climate data are taken from nearby weather stations and crop distribution information was obtained from records of the USDA Agricultural Conservation and Stabilization Service. The annual crop consumptive use for the crop distribution of each region is color coded into Figure 16.

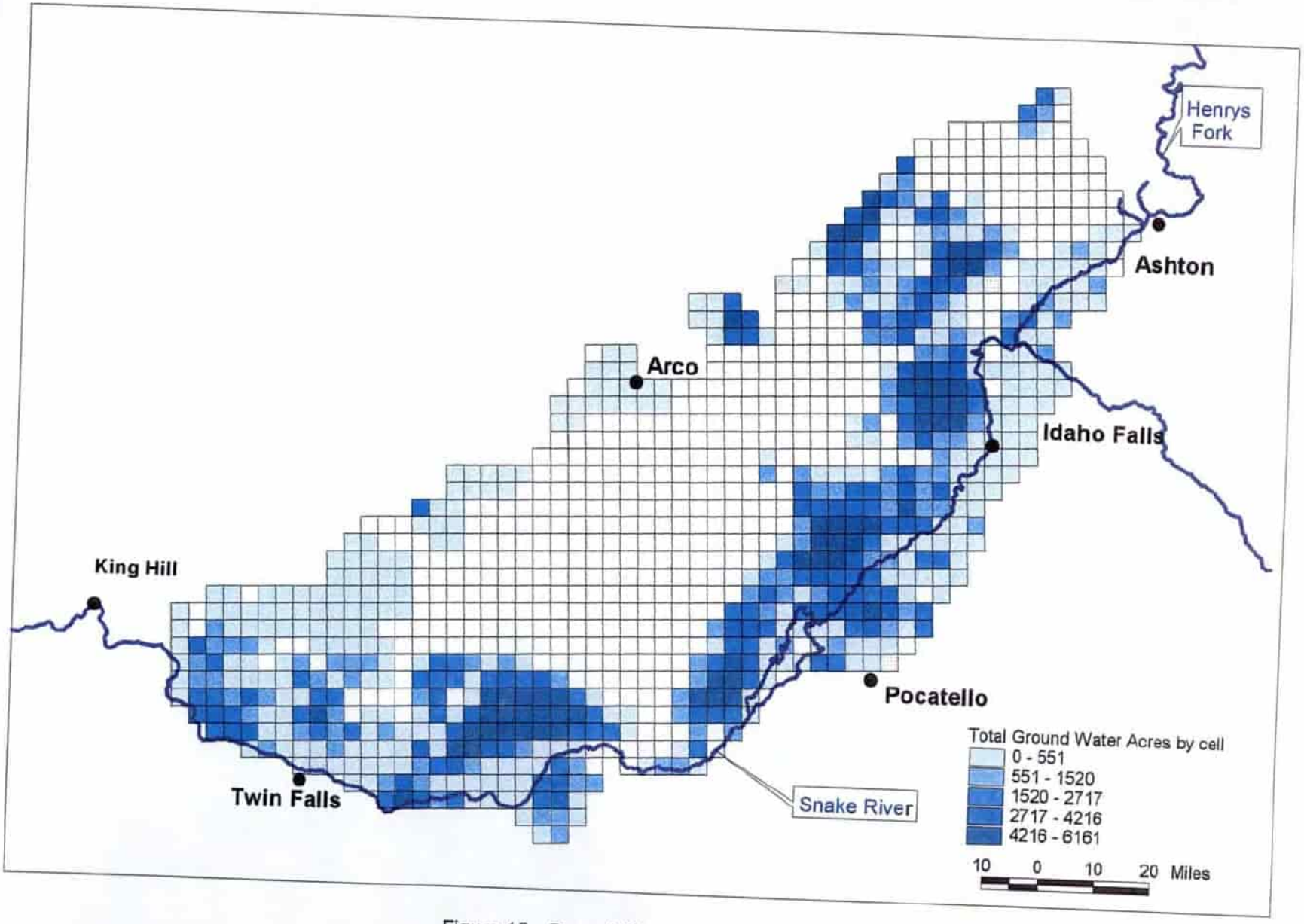

Figure 15. Ground Water Irrigated Acres.

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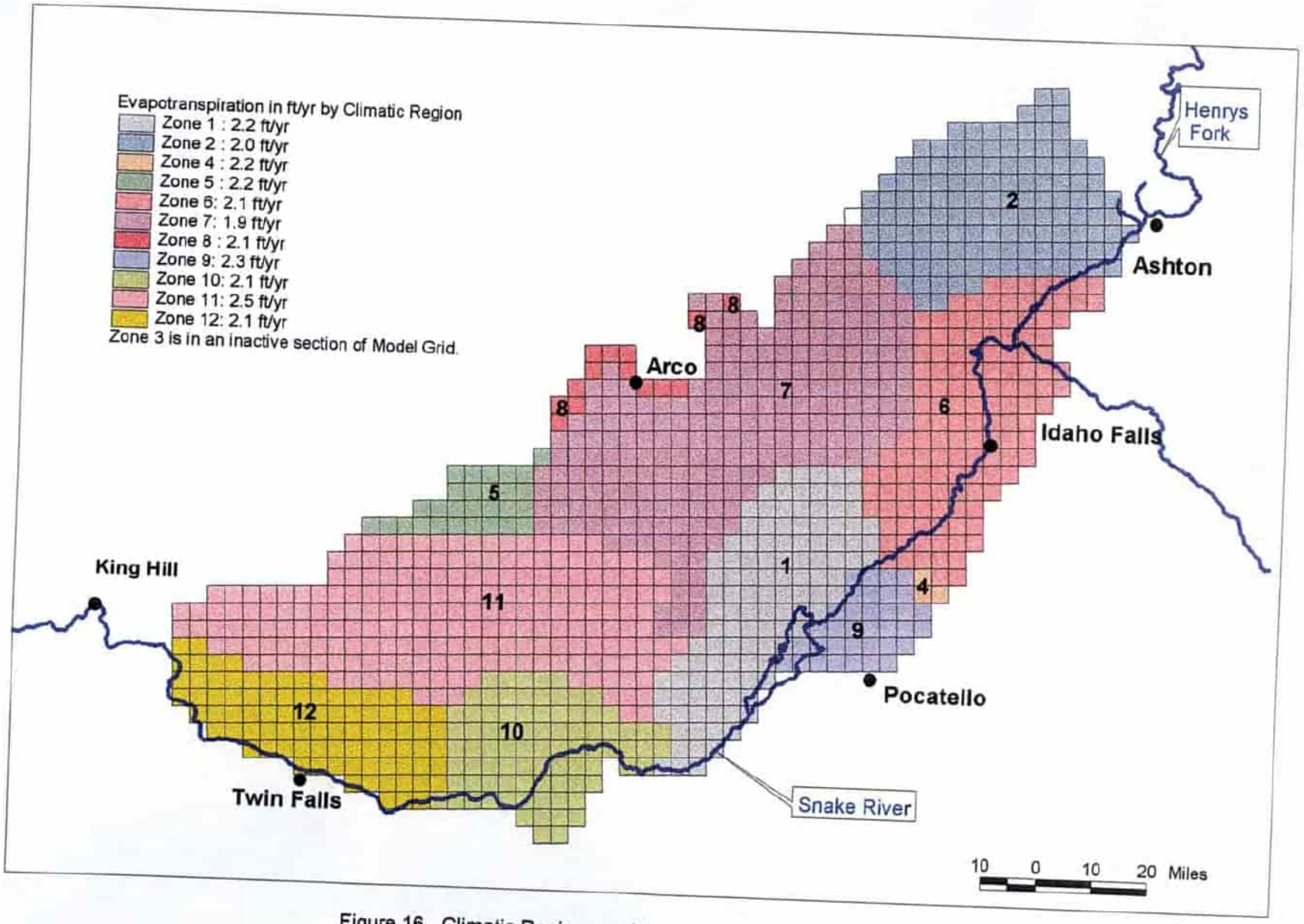

Figure 16. Climatic Regions and Annual Crop Consumptive Use.

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Crop consumptive use during the 1980 calibration year varies greatly with time of year. Figure 14 shows that crop consumptive use reaches a maximum of nearly 600,000 AF per 15.2-day stress period in mid-July. This corresponds well with the timing of the maximum irrigation diversions. The crop consumptive use is very significant in the overall water budget and is the principle negative component shown in Figure 14, indicating water leaving the system. The shape of the crop consumptive use graph, combined with the irrigation application largely controls the shape of the graph of net recharge in Figure 14.

Evapotranspiration from non-irrigated lands partially controls recharge from precipitation on these lands. Crop consumptive use from non-irrigated agricultural land was not evaluated because the total area of non-irrigated agricultural land is minimal relative to irrigated land. However, evaporation and transpiration on non-agricultural land controls the amount of recharge that results from precipitation on these lands. Recharge estimates for non-irrigated lands were based on the amount of non-irrigated land within a cell, the soil cover and vegetation and weather characteristics. Figure 17 shows the estimated recharge on non-irrigated lands within the modeled area. Seven model cells in Figure 17 show a negative value of recharge on non-irrigated land. These values are small and are the result of errors resulting from data processing. Recharge from precipitation is greatest in areas of high precipitation and little soil cover.

The temporal variation of recharge from precipitation on irrigated and non-irrigated lands was bi-modal during the 1980 calibration year (Figure 14). The maximum rate of recharge occurred in spring as expected. A second, smaller peak occurred in late summer of the calibration year and probably is atypical.

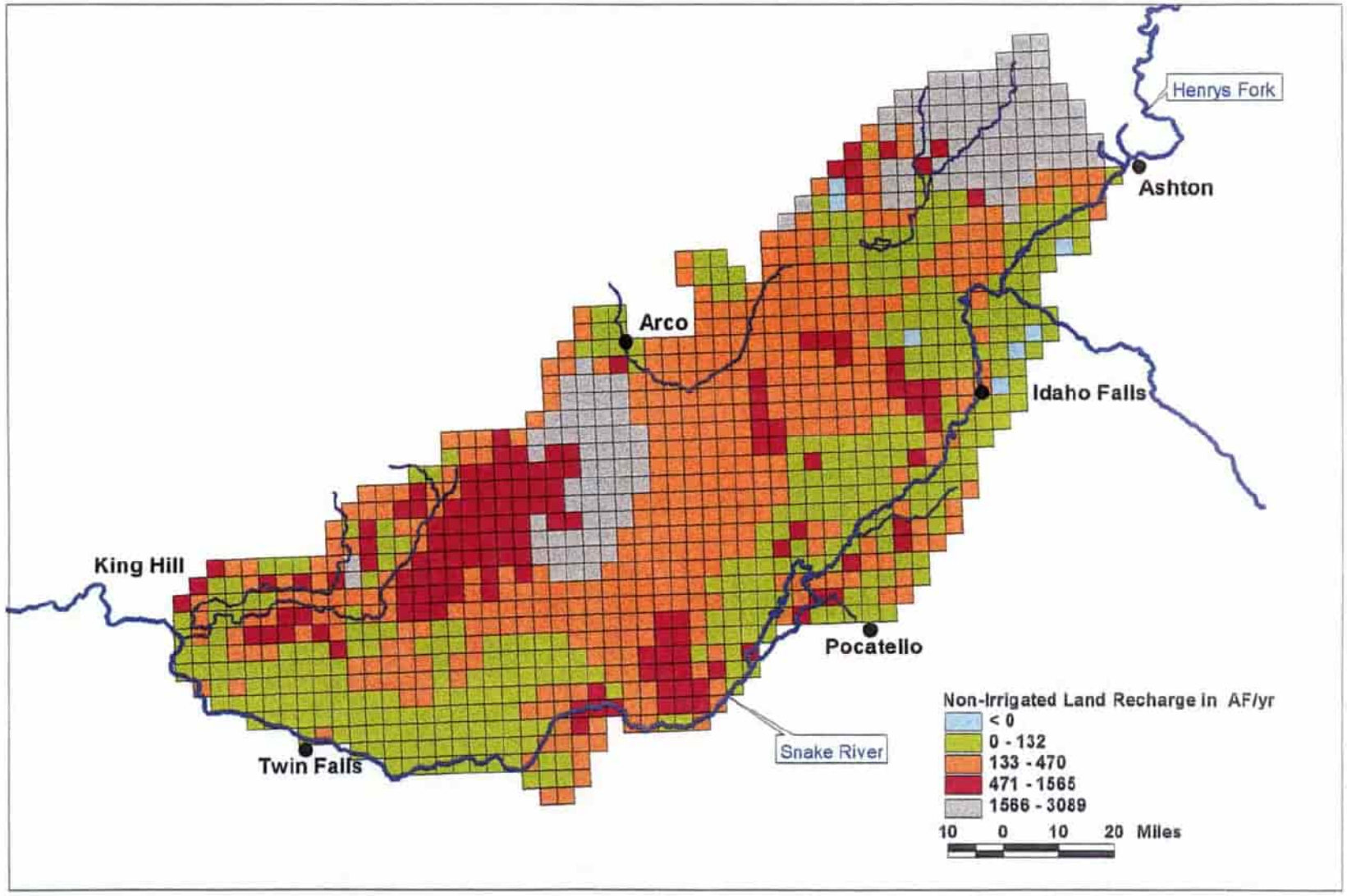

Figure 17. Estimated Recharge on Non-Irrigated Lands.

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River, Stream, and Canal Losses

Some streams emerging from the mountains surrounding the plain lose water to the aquifer through seepage. In most locations the aquifer is sufficiently far below land surface that the stream losses are unaffected by aquifer water level. In these situations, stream recharge is included in the calculations of the RECHARGE Program as a specified flux to the aquifer.

The location of specified flux river nodes representing recharge from stream seepage is shown in Figure 18. Each cell with specified seepage shown in Figure 18 is assigned to a stream reach number. Table 5 lists the rate of flux for each stream reach number shown in Figure 18. Flux is uniformly divided among the cells within a reach. The temporal variation in total stream seepage shows a maximum in mid-April, as can be seen in Figure 14. The magnitude of this component is small relative to other elements contributing to the net recharge.

Tributary Valley Underflow

Figure 12 shows the location of model cells with fixed tributary underflow entering the model area. Each model cell with tributary underflow is assigned to an underflow zone. The annual rate of underflow and the tributary basin assigned to each underflow zone are listed in Table 6. Underflow is uniformly divided among cells composing an underflow zone and is time-constant as evident from Figure 14.

Table 5. Fixed Stream Seepage Values.

Number	Description	Specified Flux(AF/Yr)
1	Snake River Below Milner	-23000
2	Snake River Minidoka to Milner	281400
3	Snake River Neeley to Minidoka	0[1]
4	Snake River Near Blackfoot to Neeley	0[1]
5	Snake River Shelley to Abv. Blackfoot	111350
6	Snake River Above Shelley	175800
7	Upper Big Wood River	52650
8	Middle Big Wood River	0
9	Lower Big Wood River	-20900
10	Upper Little Wood River	10600
11	Middle Little Wood River	26900
12	Lower Little Wood River	5900
13	Confluence of Big and Little Wood	7900
14	Malad River	0
15	Milner-Gooding Canal	146200
16	Big Lost River	51547
17	Little Lost River	47709
18	Medicine Lodge Creek	25992
19	Lower Beaver Creek	17532
20	Upper Camas Creek	32496
21	Camas Creek Below Confluence	4931
22	Mud Lake	16400
23	Snake River At Blackfoot to Near Blackfoot	140300
24	Upper Beaver Creek	12460

[1]simulated as hydraulically connected with the aquifer, therefore specified flux is not assigned.

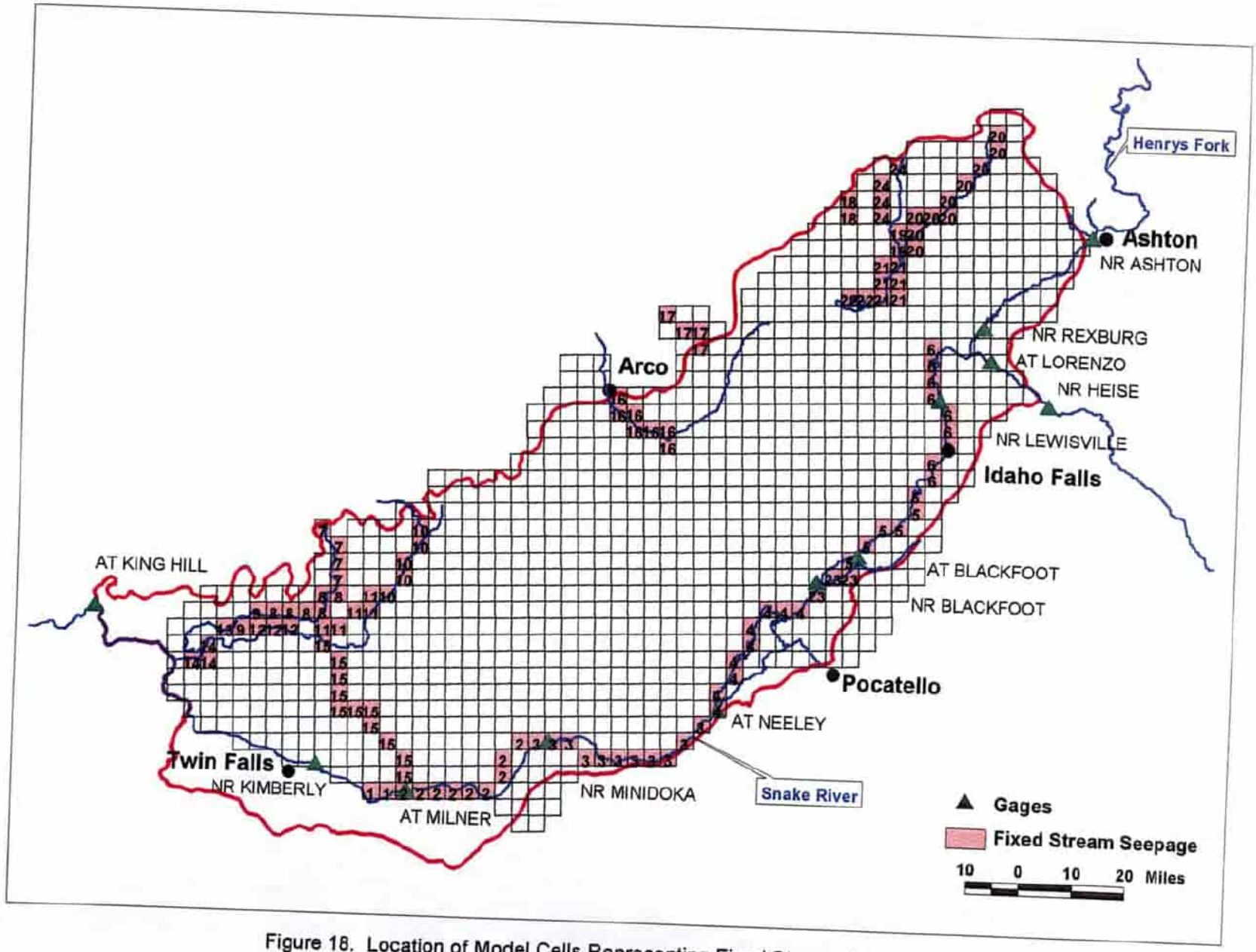

Figure 18. Location of Model Cells Representing Fixed Stream Seepage.

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Table 6 Tributary Underflow Annual Rates.

Tributary Name	Tributary Number	Underflow[1] AF/year
Big Wood River	1	0
Silver Creek	2	38,000
Little Wood River	3	24,000
Big Lost River	4	114,000
Little Lost River	5	100,000
Birch Creek	6	70,000
Blackfoot River	7	25,000
Raft River	8	63,000
Portneuf River	9	22,600
Medicine Lodge, Deep Creek & Warm Springs Creek	10	15,700
Beaver Creek	11	62,000
Camas and Big Bend Creeks	12.14	296,000
Henrys Fork	15	19,000
Other Reaches	16,17	10,000
Total		859,300

[1] From IDWR (1997).

Net Recharge

The net recharge computed by the RECHARGE Program involves all of the above components. It does not include river gains and losses that are affected by aquifer water level (head-dependent). These gains and losses are simulated by the model. The computed net recharge to the model domain varies temporally and areally. The temporal variation (Figure 14) shows net recharge is predominantly related to surface water application (diversions minus return flows), evapotranspiration, and precipitation patterns. Tributary valley underflow represents a relatively small and time constant contribution to recharge. Seepage from perched streams (non-head dependent) is also relatively small but varies seasonally. The line representing off-site well pumpage (Figure 14) refers to cases where several miles separate the point of ground water pumping and application of the same water, for example, in the Mud Lake area. In the 1980 calibration year, maximum recharge occurred in late May and early September, when diversions were large but evapotranspiration was less than the maximum. In this particular year, recharge in early September was supplemented by significant precipitation.

The areal distribution of recharge shows that recharge is greatest in surface water irrigated areas where recharge rates are positive (Figure 19). Large recharge rates also are associated with a relatively few cells representing underflow from tributary valleys. Discharge in excess of recharge associated with net ground-water withdrawals are

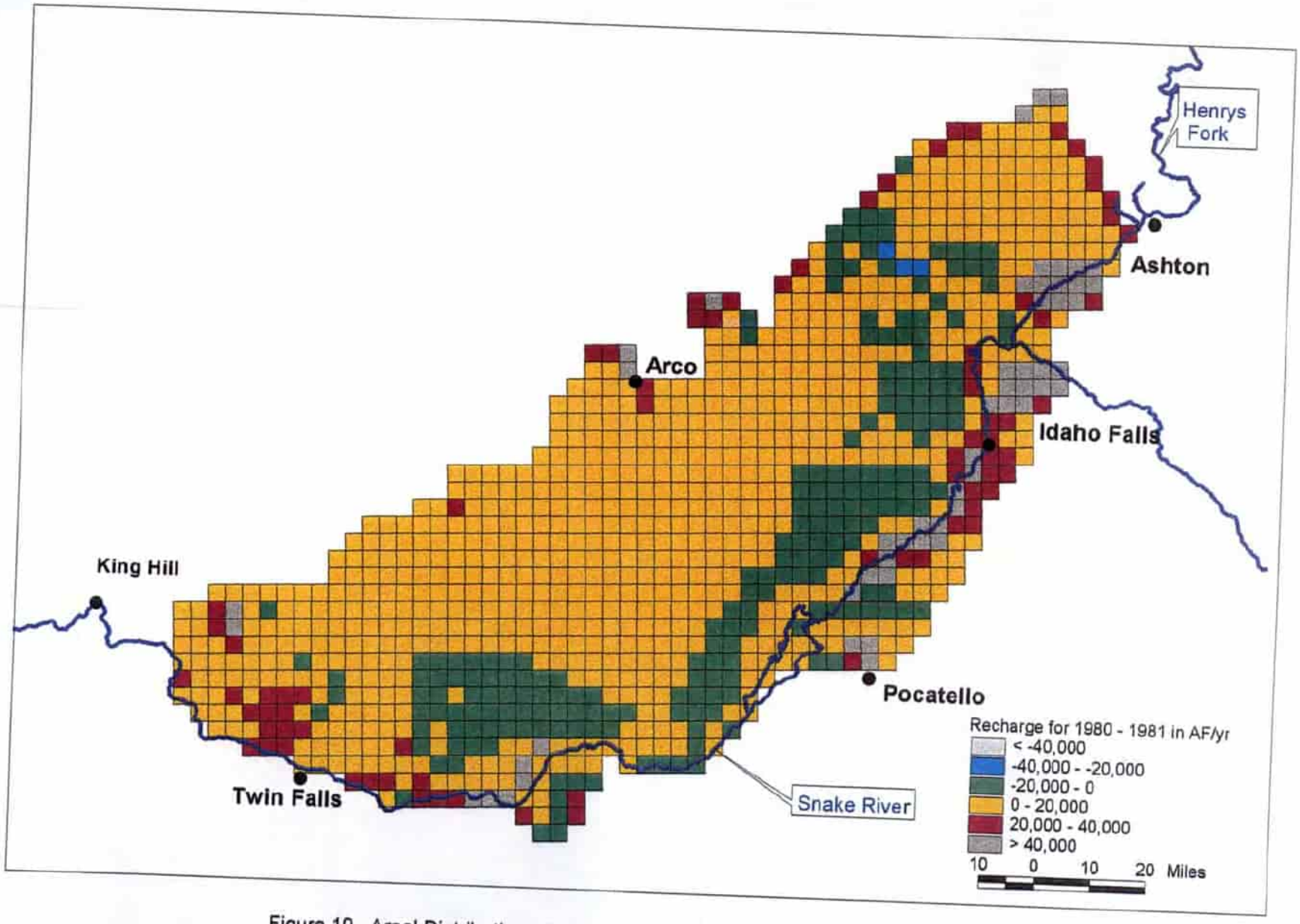

Figure 19. Areal Distribution of Recharge for 1980 - -1981 Calibration Data Set.

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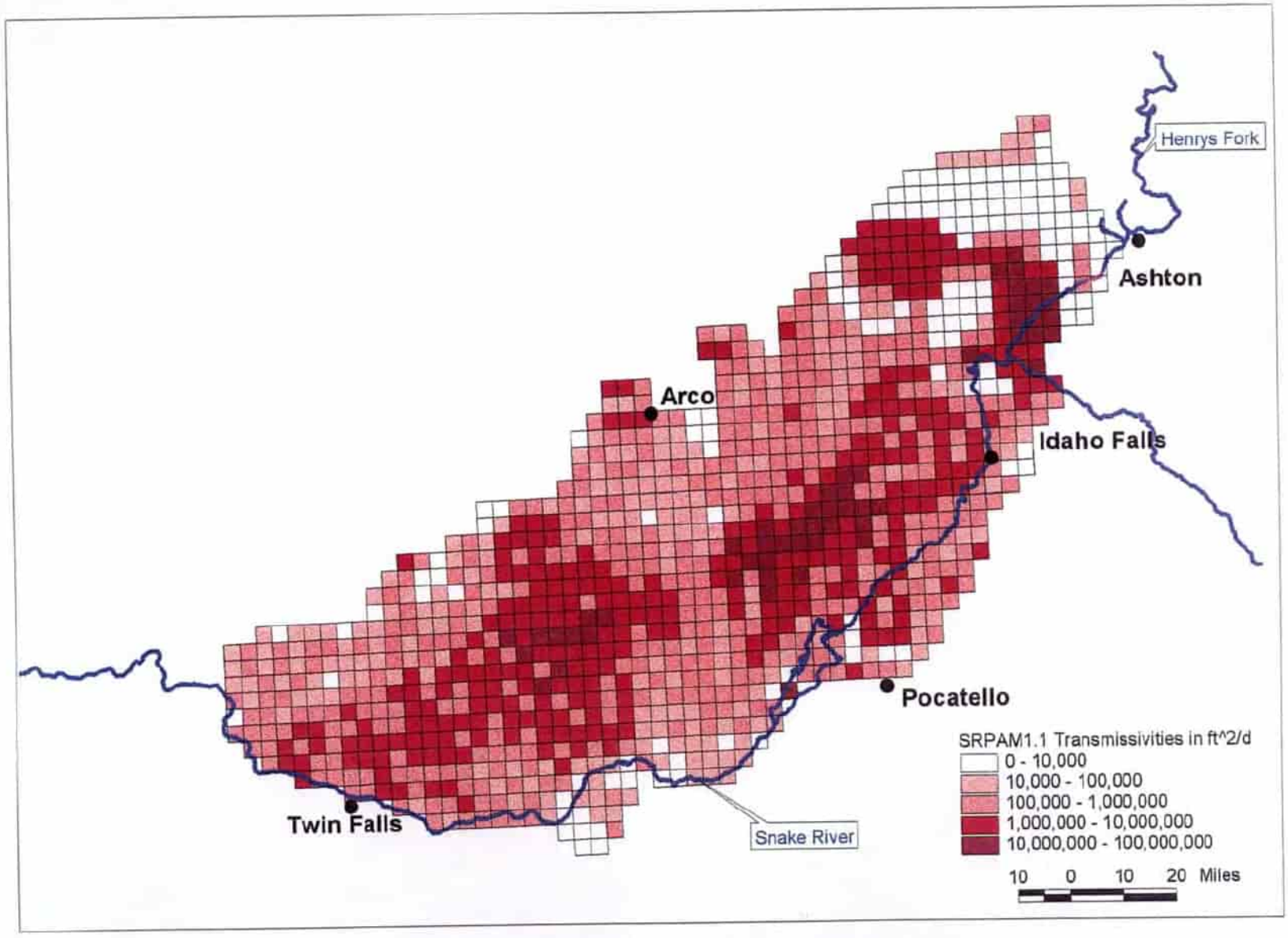

Figure 20. Areal Distribution of Calibrated Transmissivities for SRPAM1.1.

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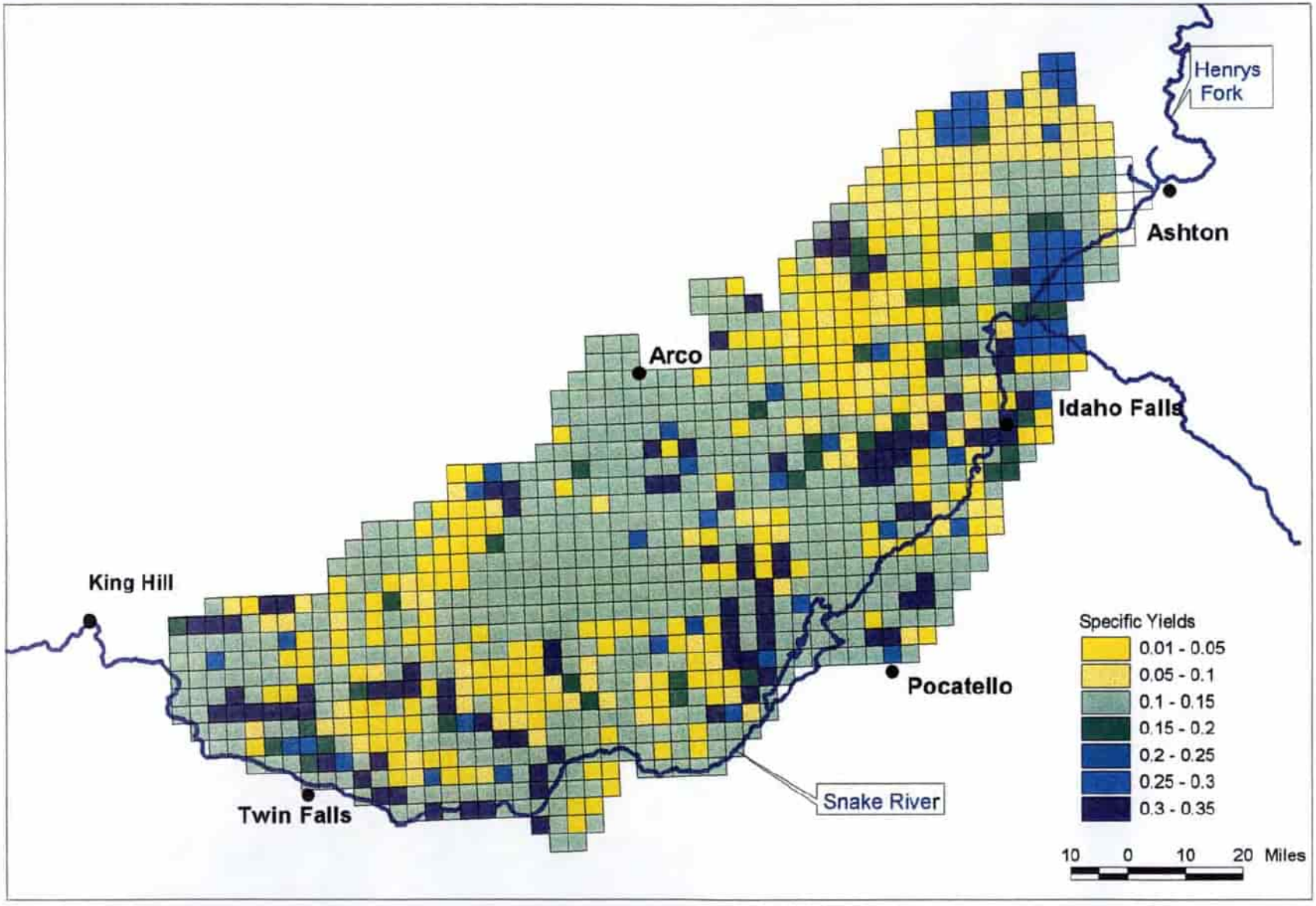

Figure 21. Areal Distribution of Calibrated Specific Yields for SRPAM1.1.

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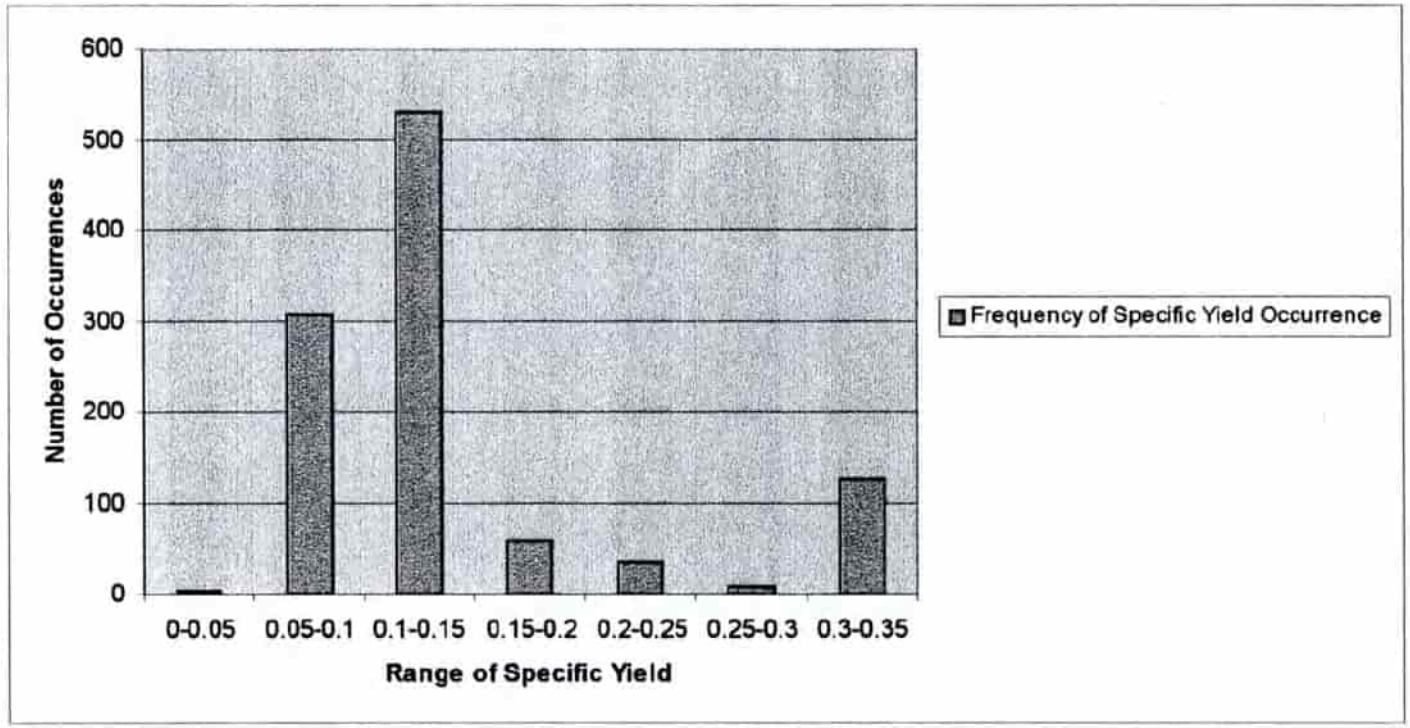

Figure 22. Histogram of Calibrated Specific Yields for SRPAM1.1.

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modal nature of the histogram differs from an expected distribution of specific yields which would occur naturally in an unconfined system. The high number of model cells with specific yields in the .3 to .35 range may be a relic of the automatic calibration process and may not accurately reflect the physical system.

A table which compares river cell properties for SRPAM1.1 and the USGS Snake River Plain Model is in the Appendix. This table contains the calibrated riverbed conductance values for both models.

LIMITATIONS OF SRPAM1.1

All model applications are imperfect representations of the real world and therefore they always can be improved. The improvement process should involve prioritizing the needs associated with the limitations of any application. Further work should then address the limitations of highest priority. This section outlines the major limitations of SRPAM1.1.

- The model does not represent the appropriate interconnection of all potential surface water features with the aquifer. The areas in which there is probably significant interconnection of surface and ground water that is not treated by the model include:
    1. the Snake River from Shelley to the At Blackfoot gage, and
    2. Camas and Beaver creeks in the vicinity of Mud Lake.
- The model boundary does not conform to the boundary of the aquifer in all areas. Figure 11 shows the SRPAM1.1 model grid and the conformance to the RASA-defined boundary of the aquifer. The USGS Snake River Plain (Garabedian, 1992) followed the RASA-defined boundary in most areas, but deviated by several miles in some locations.

  In most locations, differences between the RASA boundary and the boundary of SRPAM1.1 are of little regional significance and do not represent a need to adjust location of the model boundary. Differences in two areas deserve discussion: 1) the extreme western end near King Hill, and 2) the area south of the Snake River near Twin Falls and Burley. These areas are discussed below.

On the extreme western end of the model domain (Figure 11), the RASA-defined boundary extends about 12 miles further west than the SRPAM1.1 model boundary. This area includes a length of the Snake River. Where aquifer discharge is negligible relative to the section immediately upstream. Covington and Weaver (1990) identify about 48 cfs of spring discharge emanating from about 20 springs along the Snake River in the reach beyond the western-most extent of the SRPAM1.1 model boundary and within the RASA-defined boundary of the eastern Snake River Plain. This represents about one percent of the total spring discharge in the reach from Milner Dam to King Hill, and does not provide sufficient justification for extending the boundaries of the SRPAM1.1 model to the west.

The RASA boundary extends south of the Snake River in the area near Twin Falls and Burley in contrast to the SRPAM1.1 model which is bounded by the Snake River in this area. Downstream from approximately Milner Dam (below Burley) the Snake River flows through a deeply incised canyon that likely separates aquifers on the north and south sides of the rivers. Ground-water communication beneath the river is considered to be negligible in this reach (Cosgrove and others, 1998). The Twin Falls area is hydrologically isolated by the canyon and presents no urgent need for appending to the SRPAM1.1 model. Further upstream, near Burley, the RASA boundary includes a portion of the Oakley Fan. In this reach, ground water may flow north beneath the Snake River (Young and Newton, 1989). This hydrologic connection implies that water use in the Oakley Fan can impact aquifer water levels within the Snake River Plain aquifer. The SRPAM1.1 model boundary assigns a fixed rate of underflow to the boundary, implying that ground water on the south side

of the boundary is in a state of equilibrium. Although the assumption of equilibrium is not entirely valid, simulation conditions are similar for many of the tributary valleys. At some time in the future, it may be desirable to develop a basin-wide model representing the Snake River Plain aquifer and the major tributaries. This would allow prediction of impacts on the Snake River from scenarios incorporating changes in water management in both the plain and in tributary valleys.

- Aquifer and river characteristics near the Snake River have a significant influence on model results. Field studies and data analyses should be initiated to learn more about the interaction between the aquifer and the river. The results of these investigations would enable improvements to the conceptual model and to the numerical model, particularly in areas such as riverbed conductance and river gains and losses.
- The model is two-dimensional and not capable of representing vertical flow in areas of significant vertical hydraulic gradient. Vertical flow may be significant in areas such as the Henrys Fork and Rigby Fan, the Mud Lake area, the American Falls area, the Rupert area, and near the Milner to King Hill reach of the Snake River. A three-dimensional model may be warranted in these areas, but development of a valid model will require substantial effort and data.
- The model has been calibrated to limited changes in aquifer water level over a one-year period. An improved estimate of the distribution of aquifer properties could be developed from long-term calibration. The long-term calibration should include periods in which significant changes occurred in aquifer recharge, discharge and

water levels. Pre-development to current year (approximately 100 years) or the 1950s to current year may be appropriate calibration periods.

- Expansion of the model domain to include the Henrys/South Forks of the Snake River changed the original model water budget for the calibration year. Part of a re-calibration effort should include water budget refinement and calibration of model parameters to match the revised water budget.
- Other limitations exist relative to current knowledge of aquifer bottom, confined and unconfined conditions, non-laminar flow, recharge and discharge distribution, and other factors.

RECOMMENDATIONS FOR FUTURE WORK

This project represents one step in a series of efforts to continually improve and upgrade the Snake River Plain Aquifer Model. The conversion of the model to use the MODFLOW code has opened more possibilities for model enhancements. Some suggested improvements in the Snake River Plain aquifer modeling process are described below. The order of the items does not imply importance or priority.

1. Evaluation of spring discharge and the relation to water levels.

   Springs in the Kimberly to King Hill and Blackfoot to Neeley segments of the Snake River are of great significance to water users and exert a major control on aquifer simulations. Therefore, the ability to simulate the response of spring discharge in these reaches to changes in aquifer recharge or discharge is critical. Our understanding of how spring discharges respond to changes in aquifer water levels is inadequate. Springs at different elevations may respond to greatly different degrees to aquifer pumping. The treatment of this mechanism in the model is greatly oversimplified. Field investigations should be initiated to help further our understanding of this vital part of the hydrologic system.

2. Develop an improved method for aquifer recharge accounting.

   Net recharge to the Snake River Plain model must be input for every grid cell and stress period. Recharge is currently determined as the net of many inputs representing irrigation diversions and pumping, canal seepage, precipitation, evapotranspiration, and underflow. SRPAM currently relies on a Fortran program to perform the necessary calculations and determine net recharge. The program logic is valid; however, improved methods are available through the use of geographic

information systems and databases. Conversion to new methods should allow for cataloging and documenting all of the basic data that is used to generate model input data sets. A systematic method can improve quality control procedures and reduce time investments in future work.

3. Changes to the Snake River Plain Aquifer Model (SRPAM).

There are several changes that can be made to the SRPAM model to make it more representative of the real system. Those changes include:

a) Representation of all reaches of the Snake River as river cells in MODFLOW. This is especially important in reaches such as the Shelley to Blackfoot reach where Kjelstrom (1995) indicates the river may be hydraulically connected with the aquifer.

b) Verification, and possibly calibration, of the model to the time period from pre-development to current time. Model calibration should be performed over the widest possible ranges of stress. Such calibration provides greater confidence in model results, especially when model predictions are within the range of stress from recharge and discharge to which the model was calibrated. This calibration should include inverse modeling techniques to help understand uncertainties and guide future data collection.

c) Conversion of the model inter-block transmissivity averaging scheme from the logarithmic mean to the harmonic mean. This conversion would make the model compatible with a wider range of user interfaces. As time progresses, however, the user interfaces are

developing the capability to support the logarithmic mean and this need diminishes. Changing the averaging technique would probably require model re-calibration.

d) Inverting the rows in the existing SRPAM grid. Some user interfaces are not compatible with the bottom-up row numbering used in the SRPAM grid. Converting to the more widely used top-down row numbering will increase compatibility. This need will also diminish as user interfaces become more flexible.

e) Expansion of the model domain to include the area south of the Snake River. Ground water in the Twin Falls area is probably hydrologically separated from the rest of the Snake River Plain aquifer by the deeply incised Snake River canyon. The area south of the river is, however, the largest single tract of irrigated land in Idaho, and has an impact on flows and quality of the Snake River. Evaluations of basin-wide changes in agriculture practices, and the potential impacts on the Snake River, must include the Twin Falls tract. Inclusion of this area in the ground water model may enhance use of the model for system planning.

f) Area-specific refinements in the model. The conceptual and numerical model may be improved in specific areas through more detailed investigations. These investigations should focus on areas of greatest uncertainty in aquifer characteristics and in areas of greatest interest.

These efforts will probably result in a refinement of the model grid and layers in the selected areas.

Modeling of an aquifer system should be treated as a continuous and ongoing process, with the door always left open to make improvements. The above recommendations are provided as ideas to fuel the process of continued model evolution.

APPENDIX

This appendix provides a comparison of the SRPAM1.1 model with the USGS Snake River Plain Model (Garabedian, 1992). This comparison is provided to enable the reader to compare how two very similar models of the same region represent the physical characteristics of the area being modeled. The models were designed and implemented by different authors. The model boundaries are compared. Comparisons of physical properties such as transmissivity and specific yields are provided. A comparison is made of tributary underflow and distribution of aquifer recharge for the same water year. River representation in the two models also is discussed.

The reader should keep in mind that many of the decisions on SRPAM model design and generation of input data for the SRPAM model were made in the early 1970s. Evolution of the model since its development has not been fully documented, so the rationale behind many of the model assumptions is unknown. The following comparison is provided as a general guideline to the reader, for the purpose of demonstrating that two numerical models developed with different resources, by different modelers and at different times actually produce very comparable results.

COMPARISON OF MODEL BOUNDARIES FOR SRPAM1.1 VERSUS THE USGS SNAKE RIVER PLAIN MODEL

Both SRPAM1.1 and the USGS Snake River Plain Model generally conform to the RASA-defined boundaries of the Snake River Plain aquifer. SRPAM1.1 follows the RASA-defined boundary in most areas, but deviates by several miles in the extreme

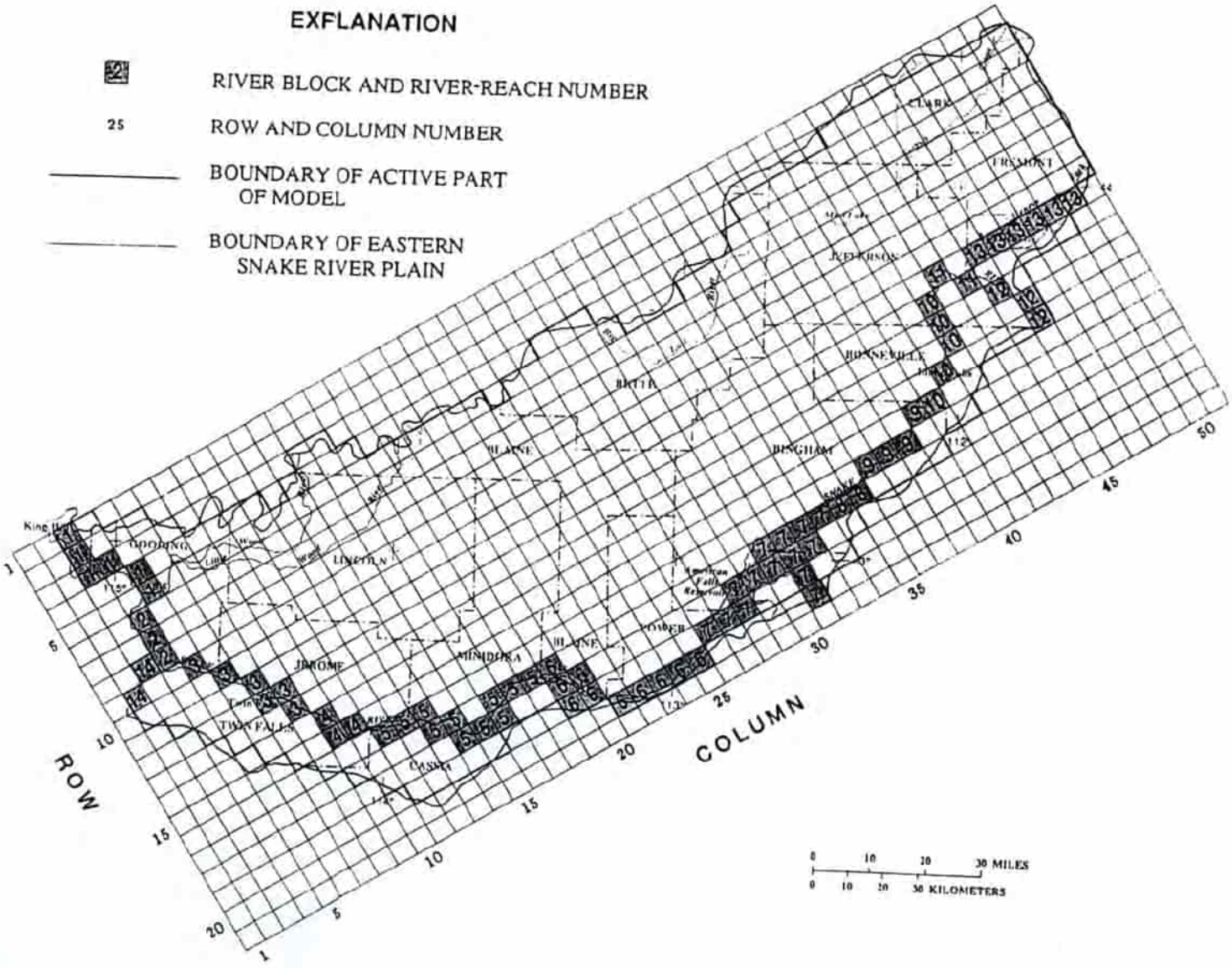
northeast near Ashton, Idaho and in the extreme southwest near King Hill, Idaho. Figure A1 (from Garabedian, 1992) shows the conformance of the USGS model to the RASA-defined aquifer boundary. Figure 11 shows the SRPAM1.1 grid and the conformance to the RASA-defined boundary of the aquifer.

In most locations, differences between the RASA boundary and the boundary of SRPAM1.1 are of little regional significance. Differences in two areas, the extreme western end near King Hill and the area south of the Snake River near Twin Falls and Burley are significant and are discussed in the main body of this report.

The USGS transient model is a three layer, three-dimensional model, versus the one layer, two-dimensional SRPAM1.1. The USGS model contains 21 rows and 51 columns compared with the 48 rows and 65 columns of SRPAM1.1. The USGS model cells are 4 miles square versus 3.1 miles square for the SRPAM1.1 model cells. The SRPAM1.1 grid is oriented approximately north-south/east-west; the USGS grid is oriented southwest-northeast more parallel to the axis of the Snake River Plain. Approximately the same hydrologic features are represented in both models. For more information concerning the USGS model grid, the reader is referred to Garabedian (1992).

COMPARISON OF TRIBUTARY UNDERFLOW FOR SRPAM1.1 VERSUS THE USGS SNAKE RIVER PLAIN MODEL

SRPAM1.1 and USGS model underflow estimates are very similar for many tributaries but differ greatly in some areas. Table A1 lists the estimated tributary



Finite-difference grid, river blocks, and river-reach numbers used for three-dimensional model.

Figure A1. USGS Model Grid (from Garabedian, 1992).

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Table A1. Estimated Tributary Underflow Values for the SRPAM1.1 and USGS Models.

Tributary Name	Tributary Number	SRPAM Underflow[1] (AF/year)	USGS Underflow[2] (AF/year)	Difference (Positive indicates SRPAM Underflow is Higher)
Big Wood River	1	0	10,000	-10,000
Silver Creek	2	38,000	53,000	-15,000
Little Wood River	3	24,000	18,000	6,000
Big Lost River	4	114,000	295,000	-181,000
Little Lost River	5	100,000	155,000	-55,000
Birch Creek	6	70,000	78,000	-8,000
Blackfoot River	7	25,000	13,000	12,000
Raft River	8	63,000	84,000	-21,000
Portneuf River	9	22,600	63,000	-40,400
Medicine Lodge, Deep Creek & Warm Springs Creek	10,13	15,700	39,000	-23,300
Beaver Creek	11	62,000	62,000	0
Camas and Big Bend Creeks	12.14	296,000	266,000	30,000
Henrys Fork	15	19,000	3,000	6,000
Other Reaches	16,17	10,000	166,000	-156,000
Total		859,300	1,305,000	-455,700

[1] from IDWR (1997)
[2] from Garabedian (1992)
[3] Garabedian (1992) specified reaches that may be included in other reaches of IDWR (1997), these do not include tributaries to the south side of the Snake River near Twin Falls.

underflow values for SRPAM1.1 and the USGS model. The largest difference in tributary underflow values is for the Big Lost River valley. The difference may be partially attributed to differences in boundary locations. Additionally, tributary underflow values are very difficult to estimate and are subject to great error.

COMPARISON OF MODELING OF RIVER REACHES FOR SRPAM1.1 VERSUS THE USGS SNAKE RIVER PLAIN MODEL

River reaches are modeled somewhat differently in the two models. As mentioned in the main body of this report, some of the reaches of the Snake River are modeled in SRPAM1.1 as head-dependent river reaches using the MODFLOW River package and other reaches are modeled as specified seepage reaches. All of the head-dependent reaches in the original, non-extended portion of SRPAM1.1 are modeled using an extremely high river conductance and arbitrarily small riverbed bottom elevation. This creates conditions identical to the earlier model version where flow is controlled by hydraulic conductivity of the river cell. In the USGS Snake River Plain Model, all of the cells representing Snake River reaches are modeled as head-dependent reaches using the MODFLOW River package, however, some of the reaches may be perched. Table A2 shows a comparison of river reaches on a reach by reach basis for the two models. River segment gains and losses were compared between the two models. Because the river segments from the Lewisville gage to the At Blackfoot gage are modeled in SRPAM1.1 as specified flux cells, and the same reach is represented as head-dependent river cells in the USGS model, a comparison of river gains and losses in these cells is not valid. Table

Table A2. Comparison of River Cells for SRPAM1.1 versus the USGS Model.

SRPAM							USGS Model				
Row	Colum	Stage (elev)	Conductance	River Bottom	Segment Numbe	Segment Name	Row	Column	River altitude	Conductance	River Bottom
14	6	2855	1.00E+08	1111	1	Hagerman to King Hill	1	3	2600	1.16E+04	2600
							2	3	2650	1.16E+04	2650
							3	3	2725	1.16E+04	2725
							3	4	2800	1.16E+04	2800
							4	5	2900	1.16E+04	2900
							5	5	3050	3.46E+06	3050
9	8	3150	1.00E+08	1111	2	Buhl to Hagerman	6	4	3050	3.46E+06	3050
11	6	3035	1.00E+08	1111			7	4	3000	3.46E+06	3000
12	6	3020	1.00E+08	1111			8	4	3050	3.46E+06	3050
13	6	2940	1.00E+08	1111							
7	13	3502	1.00E+08	1111	3	Kimberly to Buhl	9	5	3100	1.12E+05	3100
7	14	3562	1.00E+08	1111			10	6	3150	1.12E+05	3150
7	15	3644	1.00E+08	1111			11	7	3200	1.12E+05	3200
8	10	3270	1.00E+08	1111			12	7	3300	1.12E+05	3300
8	11	3300	1.00E+08	1111			13	8	3600	1.12E+05	3600
8	12	3422	1.00E+08	1111							
9	9	3225	1.00E+08	1111							
					4	Milner to Kimberly	14	9	3700	5.18E+06	3700
							15	9	3850	5.18E+06	3850
							15	10	3850	5.18E+06	3850
					5	Minidoka to Milner	16	11	4130	1.73E+04	4100
							16	12	4130	1.73E+04	4100
							16	13	4130	1.73E+04	4100
							17	13	4130	1.73E+04	4100
							17	14	4130	1.73E+04	4100
							18	14	4130	1.73E+04	4100
							18	15	4130	1.73E+04	4100
							17	16	4130	1.73E+04	4100
							18	16	4130	1.73E+04	4100
							17	17	4130	1.73E+04	4100
							17	18	4150	1.73E+04	4120
7	32	4195	1.00E+08	1111	6	Neeley to Minidoka	17	19	4190	1.73E+05	4160
7	33	4195	1.00E+08	1111			18	19	4190	1.73E+05	4160
7	34	4195	1.00E+08	1111			18	20	4190	1.73E+05	4160
7	35	4195	1.00E+08	1111			19	19	4190	1.73E+05	4160
7	36	4195	1.00E+08	1111			19	20	4190	1.73E+05	4160
8	29	4135	1.00E+08	1111			20	21	4190	1.73E+05	4160
8	30	4150	1.00E+08	1111			20	22	4190	1.73E+05	4160
8	31	4165	1.00E+08	1111			20	23	4190	1.73E+05	4160
8	37	4205	1.00E+08	1111			20	24	4200	1.73E+05	4170
9	38	4230	1.00E+08	1111			20	25	4240	1.73E+05	4210
10	39	4300	1.00E+08	1111	7	Near Blackfoot to Neeley	19	26	4355	3.85E+03	4325
11	39	4354.3	1.00E+08	1111			19	27	4355	3.85E+03	4325
12	40	4354.3	1.00E+08	1111			18	28	4355	3.85E+03	4355
13	40	4354.3	1.00E+08	1111			19	28	4355	3.85E+03	4355
13	41	4354.3	1.00E+08	1111			18	29	4355	3.85E+03	4355
13	42	4354.3	1.00E+08	1111			17	30	4380	3.85E+03	4380
13	43	4354.3	1.00E+08	1111			18	30	4355	3.85E+03	4355
13	44	4354.3	1.00E+08	1111			17	31	4380	9.50E+05	4380
14	40	4354.3	1.00E+08	1111			18	31	4355	9.50E+05	4355
14	44	4354.3	1.00E+08	1111			19	31	4360	9.50E+05	4360
15	44	4354.3	1.00E+08	1111			20	31	4370	9.50E+05	4370
13	45	4380	1.00E+08	1111			17	32	4380	9.50E+05	4380
16	44	4360	1.00E+08	1111			18	32	4380	9.50E+05	4380

Non-Head Dependent

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17	45	4380	1.00E+08	1111			17	32	4400	9.50E+05	4400

Table A2. Comparison of River Cells for SRPAM1.1 versus the USGS Model.

SRPAM							USGS Model				
Row	Colum	Stage (elev)	Conductance	River Bottom	Segment Numbe	Segment Name	Row	Column	River altitude	Conductance	River Bottom
18	46	4400	1.00E+08	1111	8	t Blackfoot to near Blackfoo	17	34	4440	8.64E+05	4410
							17	35	4475	8.64E+05	4445
					9	Shelley to At Blackfoot	16	36	4500	1.12E+05	4470
							16	37	4530	1.12E+05	4530
							16	38	4560	1.12E+05	4530
							15	39	4600	1.12E+05	4570
		Non-Head Dependent			10	Lewisville to Shelley	15	40	4625	2.16E+05	4595
							14	41	4700	2.16E+05	4670
							11	42	4760	2.16E+05	4730
							12	42	4750	2.16E+05	4720
							13	42	4740	2.16E+05	4710
30	52	4760	5.00E+04	4730	11	Lorenzo to Lewisville	10	43	4770	2.16E+06	4740
31	52	4770	2.16E+06	4740			11	44	4800	2.16E+06	4770
32	53	4785	1.00E+06	4750							
31	54	4800	3.00E+06	4760							
32	55	4810	6.00E+07	4770							
31	55	4820	1.00E+07	4790							
31	56	4850	2.10E+05	4820	12	Heise to Lorenzo	12	45	4860	1.73E+05	4830
30	57	4900	2.10E+05	4870			13	46	4950	1.73E+05	4920
							14	46	4980	1.73E+05	4950
33	55	4810	6.05E+04	4780	13	Ashton to Roberts	10	46	4815	6.05E+04	4785
34	56	4820	3.00E+05	4785			10	45	4810	6.05E+04	4780
35	57	4835	3.00E+05	4800			10	47	4830	6.05E+04	4800
36	58	4870	1.50E+05	4830			10	48	4860	6.05E+04	4830
36	59	4920	1.50E+05	4880							
37	60	5000	3.00E+04	4970			10	49	4910	6.05E+04	4880
38	61	5080	3.00E+04	5050			10	50	5000	6.05E+04	4970
					14	Salmon Falls	8	3	3200	1.16E+05	3200
							9	2	3400	1.16E+05	3400

A3 shows a comparison of the modeled river reach gains and losses for both models as well as the target reach gains and losses for the USGS model.

COMPARISON OF RECHARGE/DISCHARGE FOR SRPAM1.1 VERSUS THE USGS SNAKE RIVER PLAIN MODEL

Head-independent recharge and discharge were compared for the SRPAM1.1 model versus the USGS Snake River Plain Model. The USGS model cells were aggregated into 40 zones, presented by Garabedian (1992), for the purpose of data presentation. The same zones were translated to the SRPAM1.1 model grid. Net recharge within each zone for each model was calculated, with some assumptions:

1. Recharge was not compared in zones where the model boundaries do not coincide (the King Hill, Twin Falls and Oakley Fan areas).
2. The difference in handling of the Snake River between the two models made comparison of zones with modeled river reaches difficult. Some reaches modeled as head-dependent in the USGS model are represented as specified seepage in SRPAM1.1. All zones are included in the comparison, however for zones containing river reaches the comparison may be less valid.
3. Grid orientation and spacing are unequal between the two models—therefore zone boundaries are inexact when translated to the SRPAM1.1 grid and comparisons are only approximate.
4. The USGS model uses both the Recharge and the Well package to input recharge. Recharge from these two packages was summed for the comparison with SRPAM1.1.

Table A3. Comparison of Simulated River Gains and Losses in SRPAM1.1 versus the USGS Model.

River Segment	SRPAM1.1 Simulated River Gain or Loss (-) cfs	USGS Model Simulated River Gain or Loss (-) cfs	Measured River Gain or Loss (-)[1] cfs
Henrys Fork, Ashton To Rexburg	130	30	120
South Fork, Heise to Lorenzo	-130	-180	-150
Snake River, Lorenzo to Lewisville	270	40	290
Snake River, Near Blackfoot to Neeley	2640	2640	2620
Snake River, Neeley to Minidoka	-110	20	180
Snake River, Milner to King Hill	5874	4030	6540

[1] from Garabedian (1992)

Figure A2 shows the USGS model zones overlain on the SRPAM1.1 model grid. Figure A3 shows both the USGS model recharge and the SRPAM1.1 recharge (repeated from Figure 19) mapped to the SRPAM1.1. Figure A3 was generated using the average annual recharge applied in the transient USGS model for the 1976-1980 time period and the 1980-81 calibration data set for the SRPAM1.1 model. Comparison of the two maps in Figure A3 shows that recharge for the two models is almost identically distributed, despite being derived using very different methods.

Figure A4 shows a scatter plot of recharge aggregated by USGS model zone for the two models. The line in Figure A4 is a line of equal recharge. Data points falling on the line represent zones where the USGS model recharge equals the SRPAM1.1 recharge. Data points falling to the right of the line represent zones where the USGS recharge is higher. Data points falling above the line represent zones where the SRPAM1.1 recharge is higher. With the exception of one zone (zone 17), the aggregated recharge for each zone is reasonably well centered around the line of equal recharge. Zone 17 represents the Heise area and includes many river cells, which may explain the difference in recharge between the two models. Table A4 lists the summed recharge by zone for the two models.

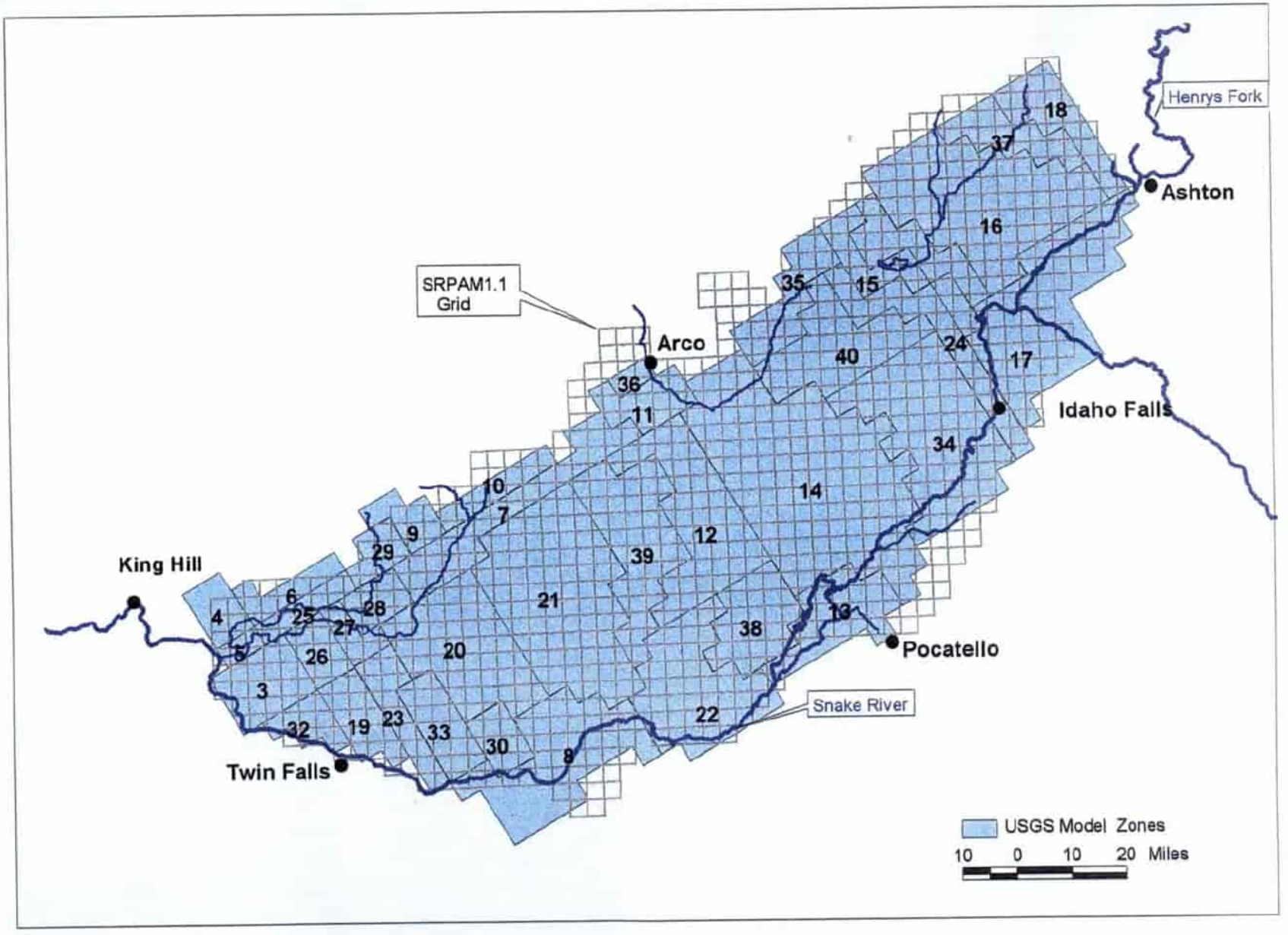

Figure A2. USGS Model Zones Overlain on SRPAM1.1 Model Grid.

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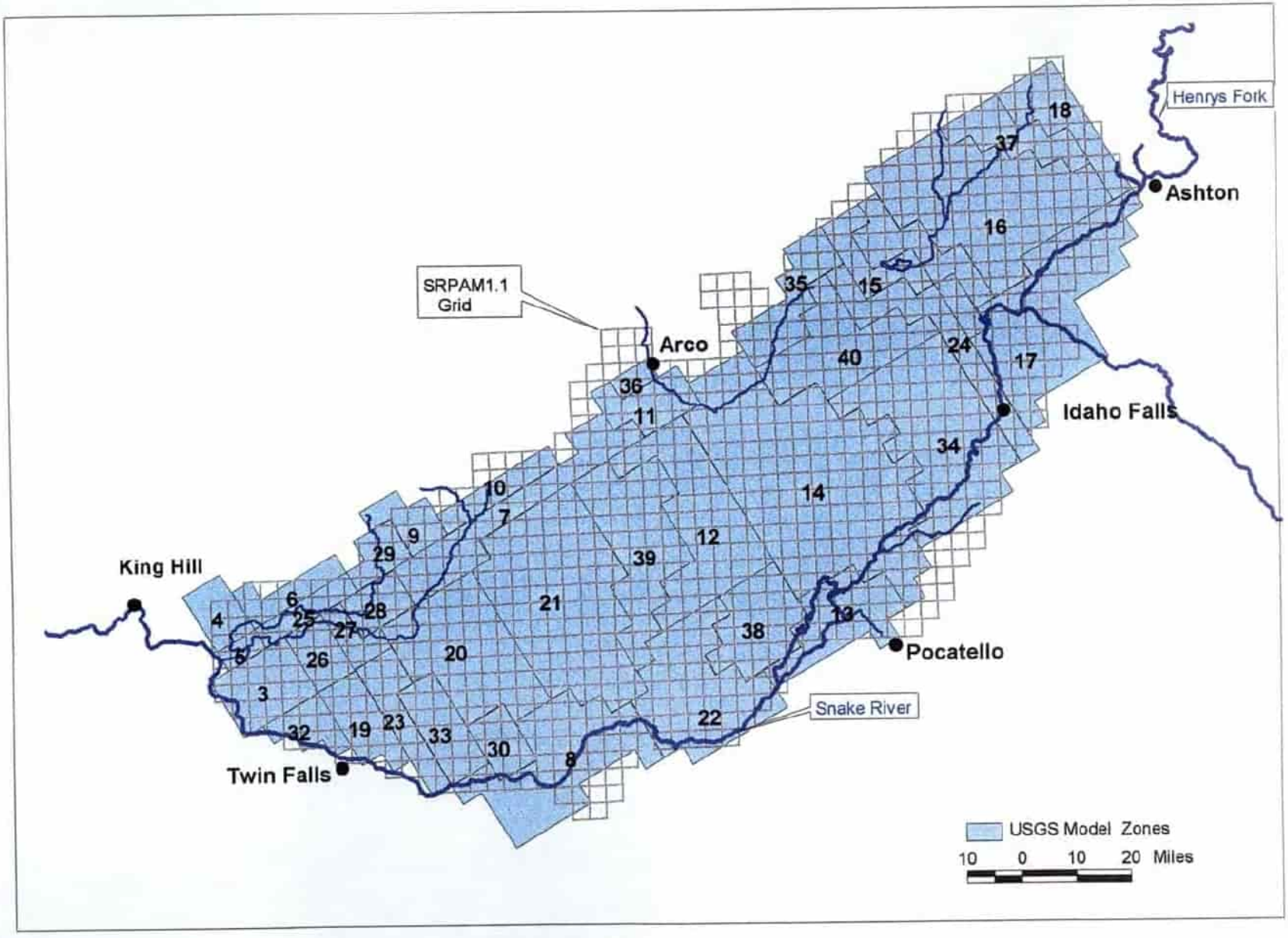

Figure A2. USGS Model Zones Overlain on SRPAM1.1 Model Grid.

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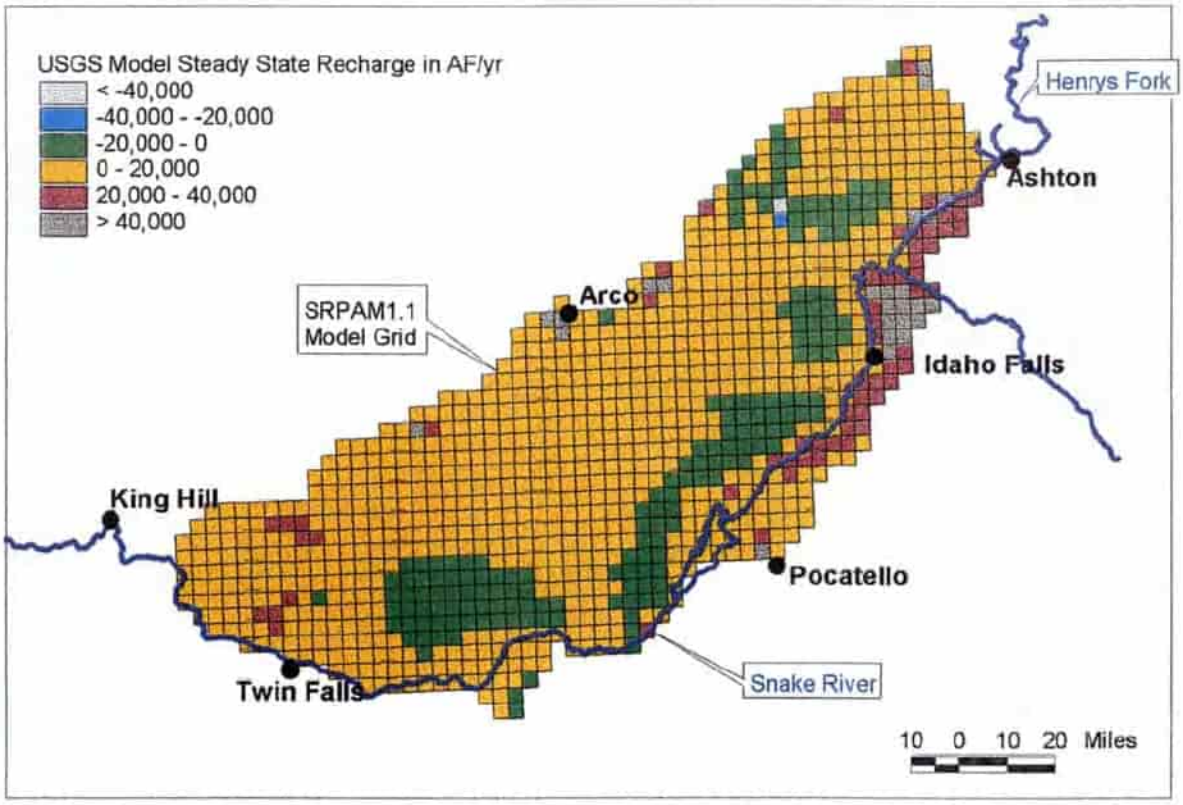
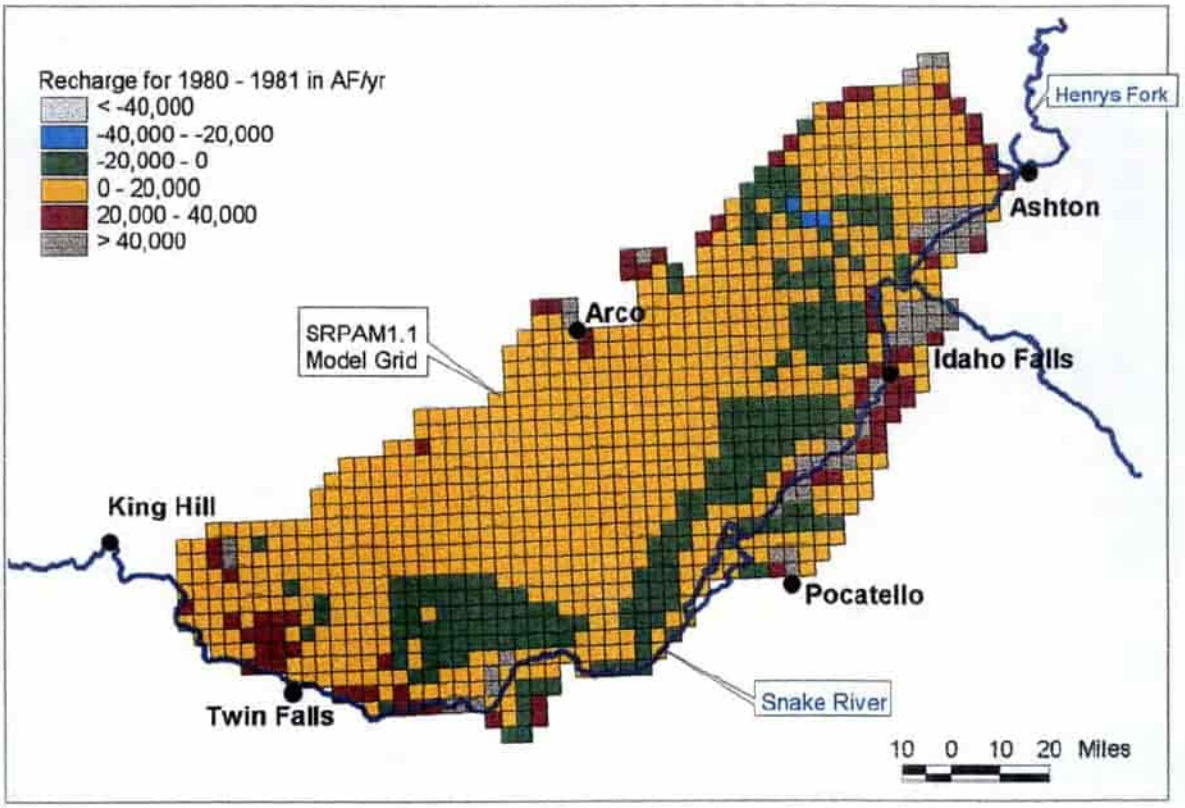


USGS Model Recharge Mapped to SRPAM1.1 Model Grid.



SRPAM1.1 Model Recharge.

Figure A3. Areal Distribution of Head-Independent Recharge for the USGS and the SRPAM1.1 Models (1980 - 1981 Water Year).

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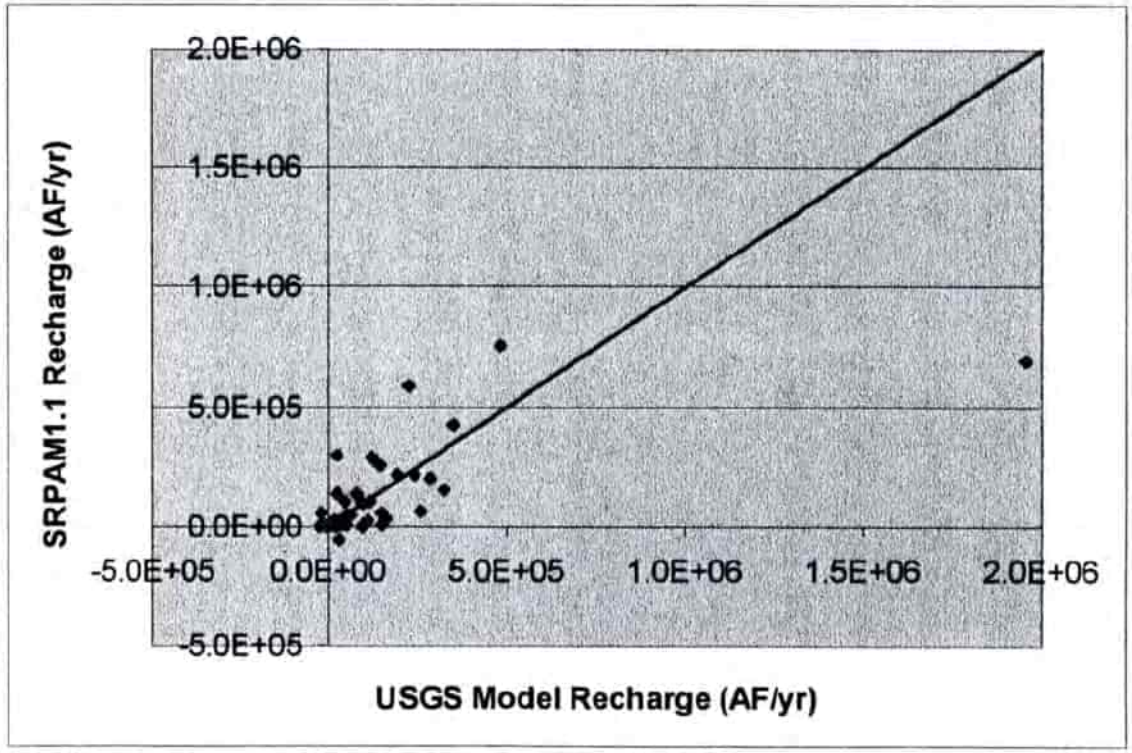

Figure A4. Scatter Plot of SRPAM1.1 Recharge Values versus the USGS Model 1976-1980 Average Annual Recharge.

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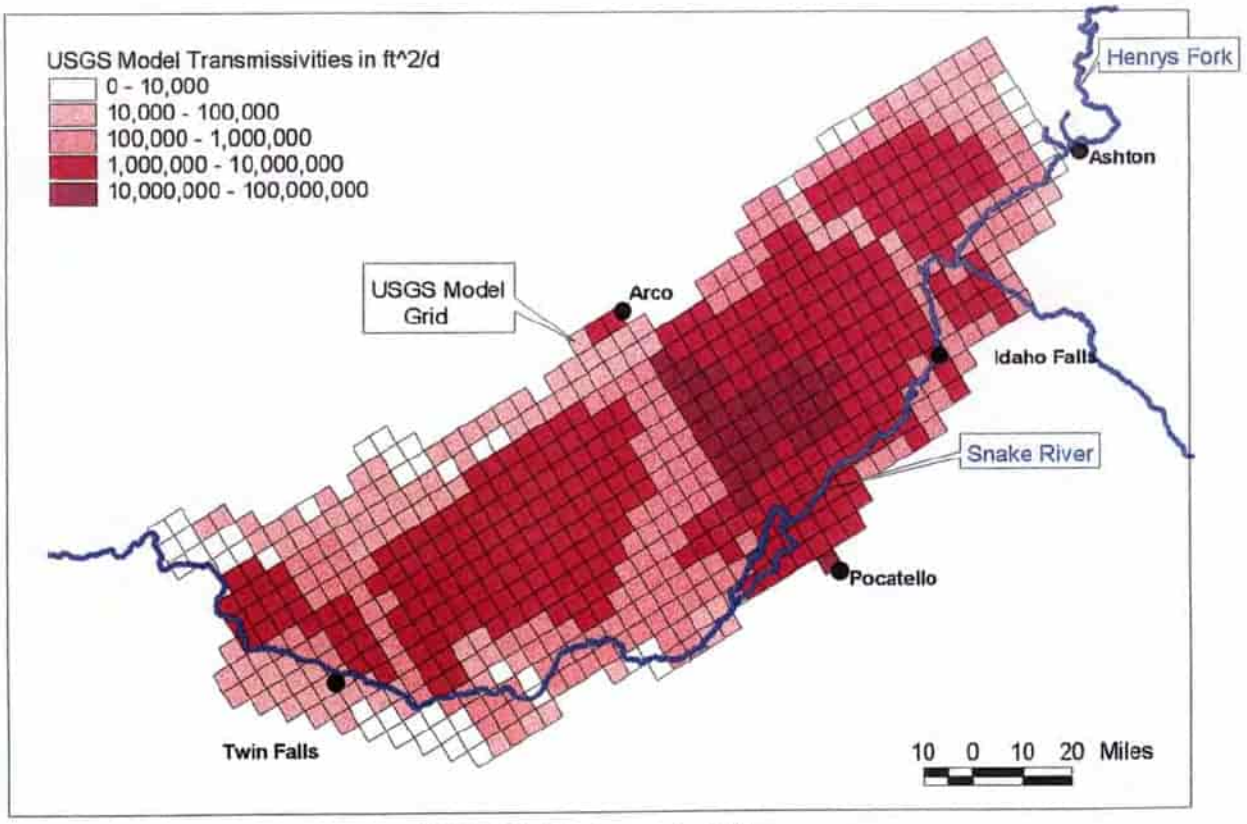
Table A4. Sum of Recharge by Zone for USGS Model versus SRPAM1.1.

Zone	USGS Recharge (AF/yr)	SRPAM1.1 Recharge (AF/yr)
2	284389.7	195663.0
3	119737.4	286837.0
4	37740.6	6378.0
5	23652.1	138834.0
6	48853.5	2516.0
7	90503.6	97204.0
8	348280.4	425651.0
9	9476.9	23146.0
10	155986.7	28994.0
11	44705.2	103690.0
12	20466.7	19546.0
13	241205.0	213265.0
14	222353.1	588931.0
15	25208.8	-57373.0
16	144468.2	4614.0
17	1951808.7	687944.0
19	189491.8	212340.0
20	-5132.8	-5543.0
21	-26214.8	1864.0
22	92935.9	-3111.0
23	78369.8	131882.0
24	20539.1	293858.0
25	110043.5	20135.0
26	44097.0	41746.0
27	55079.6	44430.0
28	145184.9	58168.0
29	7261.4	13774.0
30	17042.2	-4818.0
31	-23724.5	55926.0
32	141398.7	252838.0
33	113902.3	102436.0
34	478450.0	751865.0
35	252723.4	62518.0
36	320306.0	149230.0
38	5299.5	8675.0
39	58054.9	50346.0
40	12474.1	3035.0

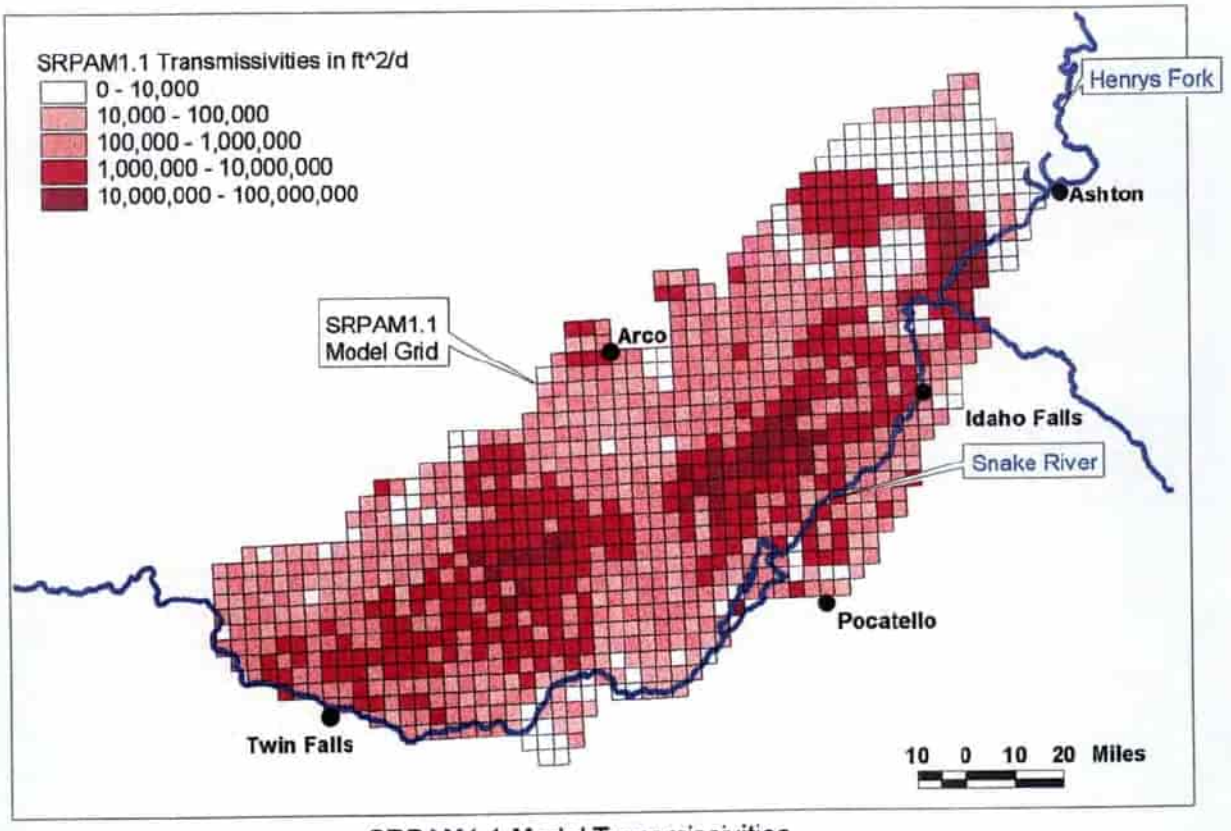
COMPARISON OF AQUIFER PROPERTIES FOR SRPAM1.1 VERSUS THE USGS SNAKE RIVER PLAIN MODEL

Transmissivities and specific yields were compared between SRPAM1.1 and the USGS Snake River Plain Model (Garabedian, 1992). Transmissivities for the unconfined layer in the USGS model were calculated by multiplying hydraulic conductivities by layer thickness. The transmissivities were then summed for the three transient USGS model layers. Figure A5 shows the areal distribution of transmissivities for the USGS model and for SRPAM1.1 (repeated from Figure 20). A comparison of the two maps in Figure A5 shows that transmissivities in the two models are similarly distributed across the Snake River Plain and are of similar magnitude. Both models were calibrated using measured water levels for the 1980-1981 time period, but using different calibration methods, yet the distribution of transmissivities is similar between the two models.

A zone-based comparison of transmissivity also is useful. Transmissivities were calculated and then averaged within the zones shown in Figure A2. Similarly, the hydraulic conductivities for the single, unconfined layer of SRPAM1.1 were multiplied by aquifer thickness to obtain transmissivities and averaged within each zone. Figure A6 shows a log-scale scatter plot of transmissivities for the USGS model versus SRPAM1.1. The diagonal line in Figure A6 represents a line of equal transmissivity (i.e. a data point falling on the line indicates that for that particular zone, the USGS model transmissivity and the SRPAM1.1 transmissivity are the same). The approximately equal distribution of points above and below the line of equal transmissivity indicates that neither model



USGS Model Transmissivities.



SRPAM1.1 Model Transmissivities.

Figure A5. Areal Distribution of Transmissivities for the USGS and SRPAM1.1 Models.

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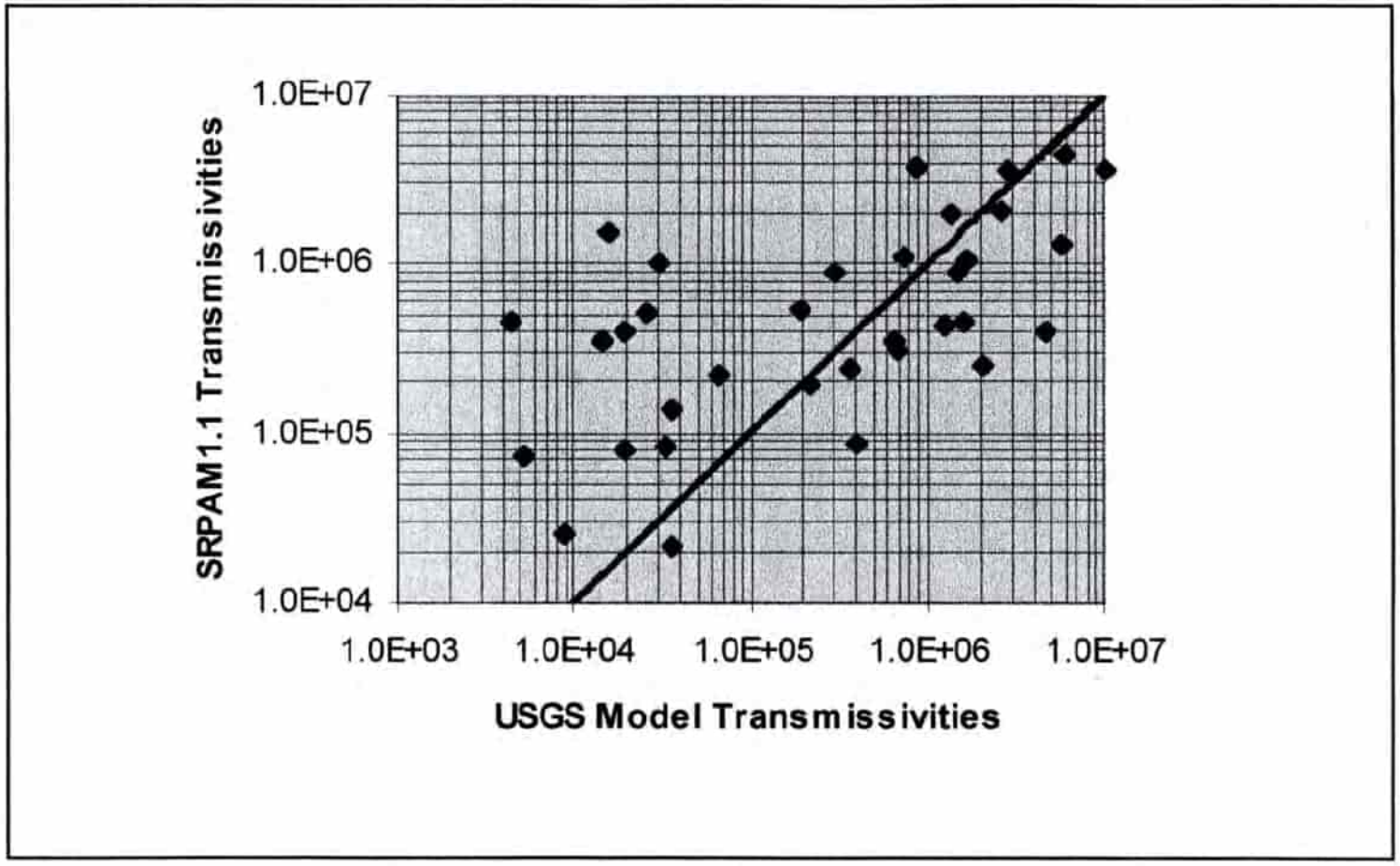

Figure A6. Log Scatter Plot of SRPAM1.1 Transmissivities versus the USGS Model Transmissivities (ft^2/day).

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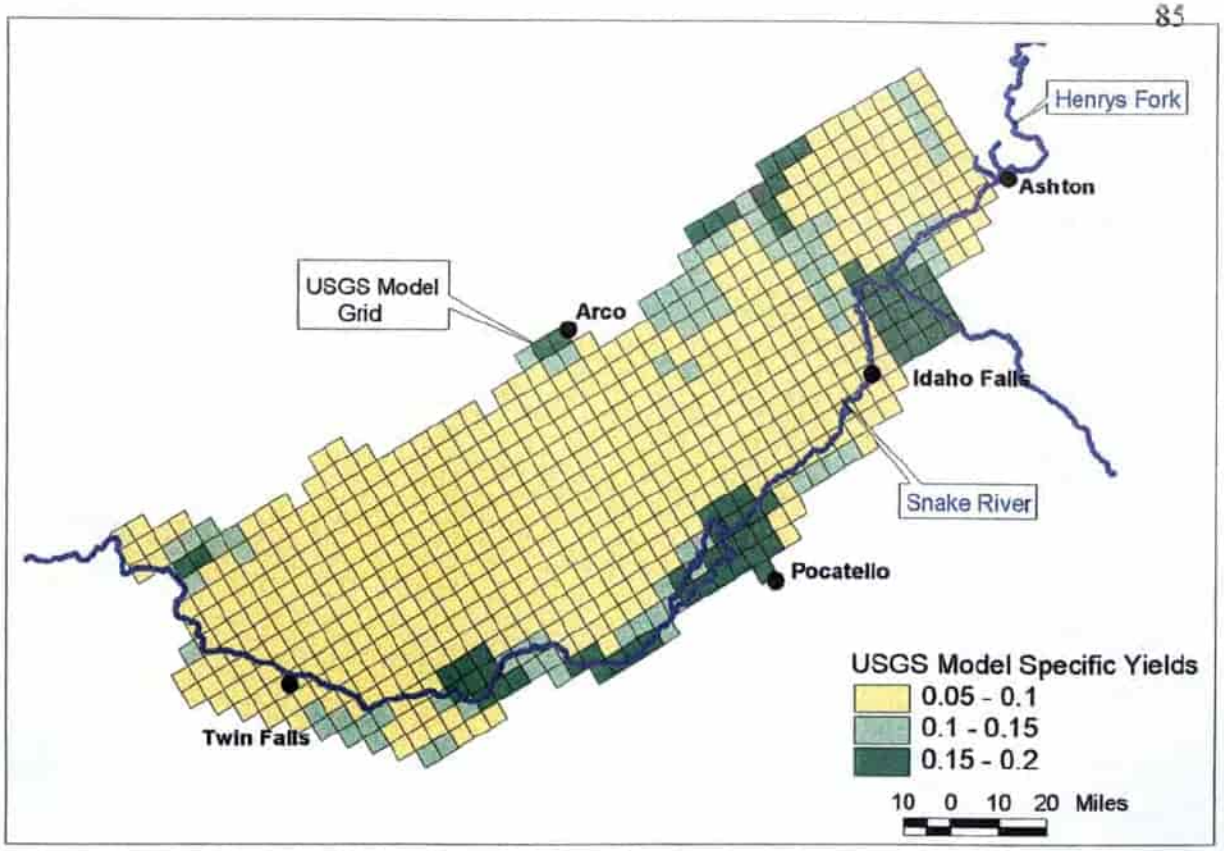
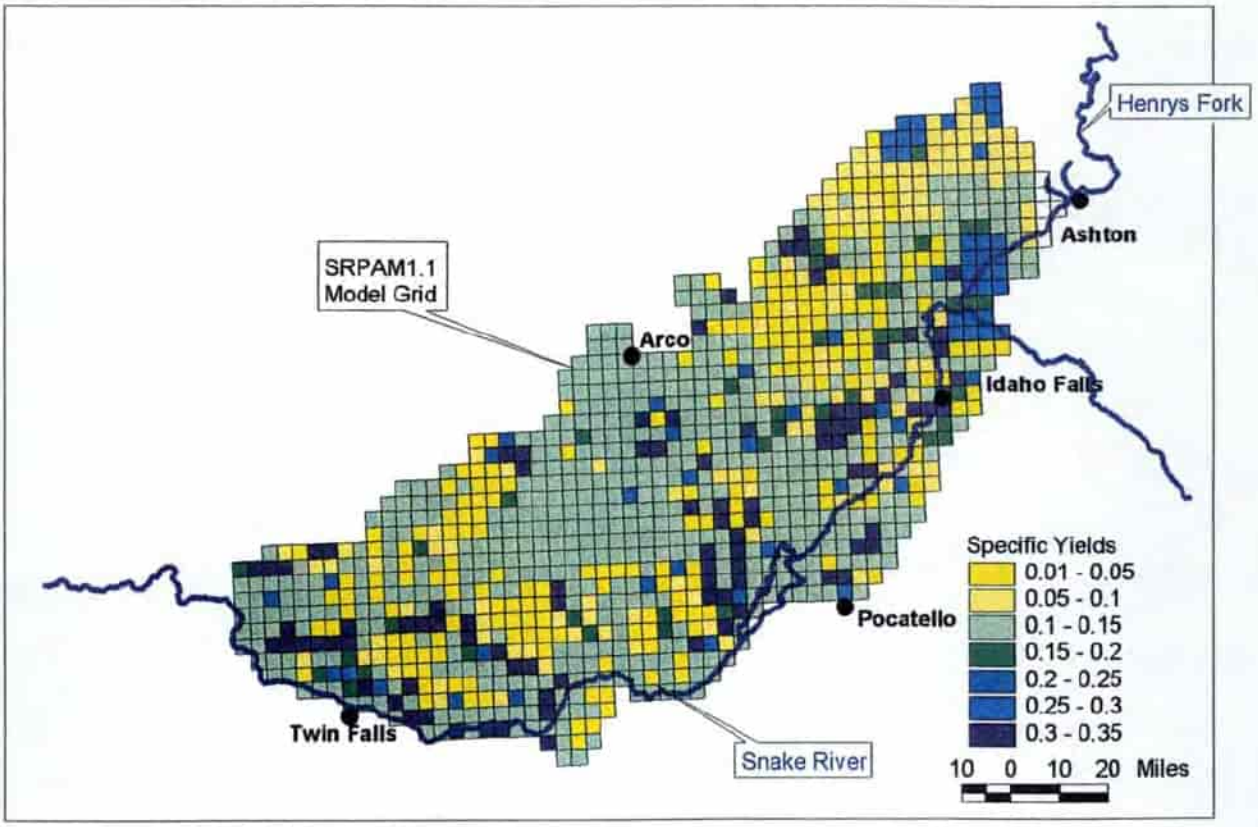
is particularly biased towards low or high transmissivities. Figure A6 does, however, show a great variation in the transmissivity values within each model, an expected condition for a regional model of a heterogeneous system such as the Snake River Plain aquifer.

Similarly, specific yields were compared for the two models. Figure A7 shows the areal distribution of specific yield values for the USGS and the SRPAM1.1 (repeated from Figure 21) models. Specific yields for both models were averaged for the 40 zones previously described. The specific yield for the upper-most, unconfined layer of the USGS model was compared with the specific yield for the SRPAM1.1. Figure A8 shows a scatter plot of the USGS model specific yields versus the SRPAM1.1 specific yields. The diagonal line represents the line of equal specific yield (i.e. any data point falling on the line indicates that for that particular zone, the USGS specific yield equals the SRPAM1.1 specific yield). The number of data points falling above the line indicates a bias towards higher specific yields in the SRPAM1.1 model. On the average, the specific yields in the SRPAM1.1 model are approximately 50% higher than the specific yields in the USGS model. Higher specific yields will cause the SRPAM1.1 model to store or release more water per unit change in aquifer water level. Figure A9 shows a histogram of specific yield values for the USGS Model. This figure is provided for comparison with Figure 22.

Comparison of these two figures also indicates a bias towards higher specific yields in the SRPAM1.1 model. Table A5 shows the average transmissivities and specific yields for the forty zones for both the SRPAM1.1 and the USGS models.



USGS Model Specific Yields.



SRPAM1.1 Specific Yields.

Figure A7. Areal Distribution of Specific Yields for the USGS Model and SRPAM1.1 Model.

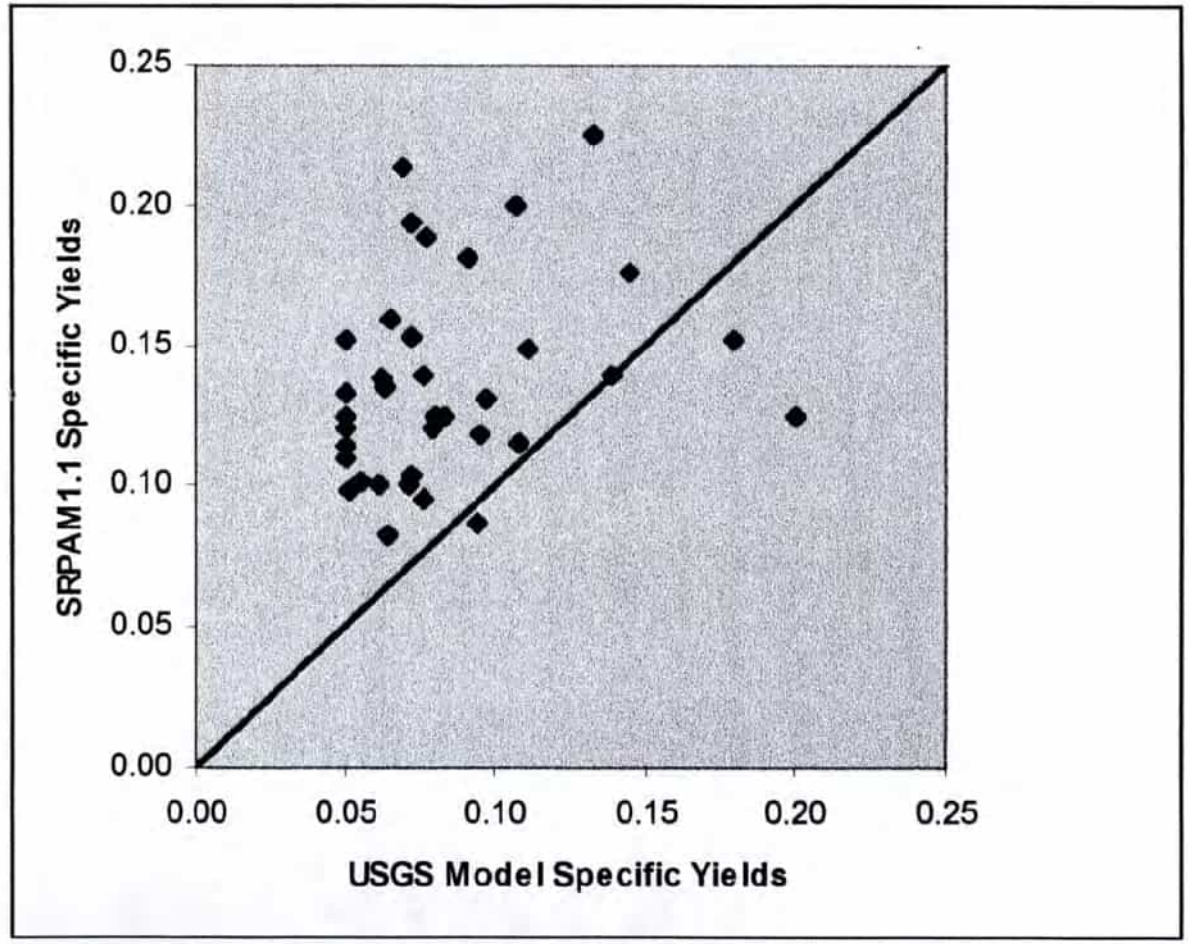


Figure A8. Scatter Plot of SRPAM1.1 Specific Yields versus USGS Model Specific Yields.

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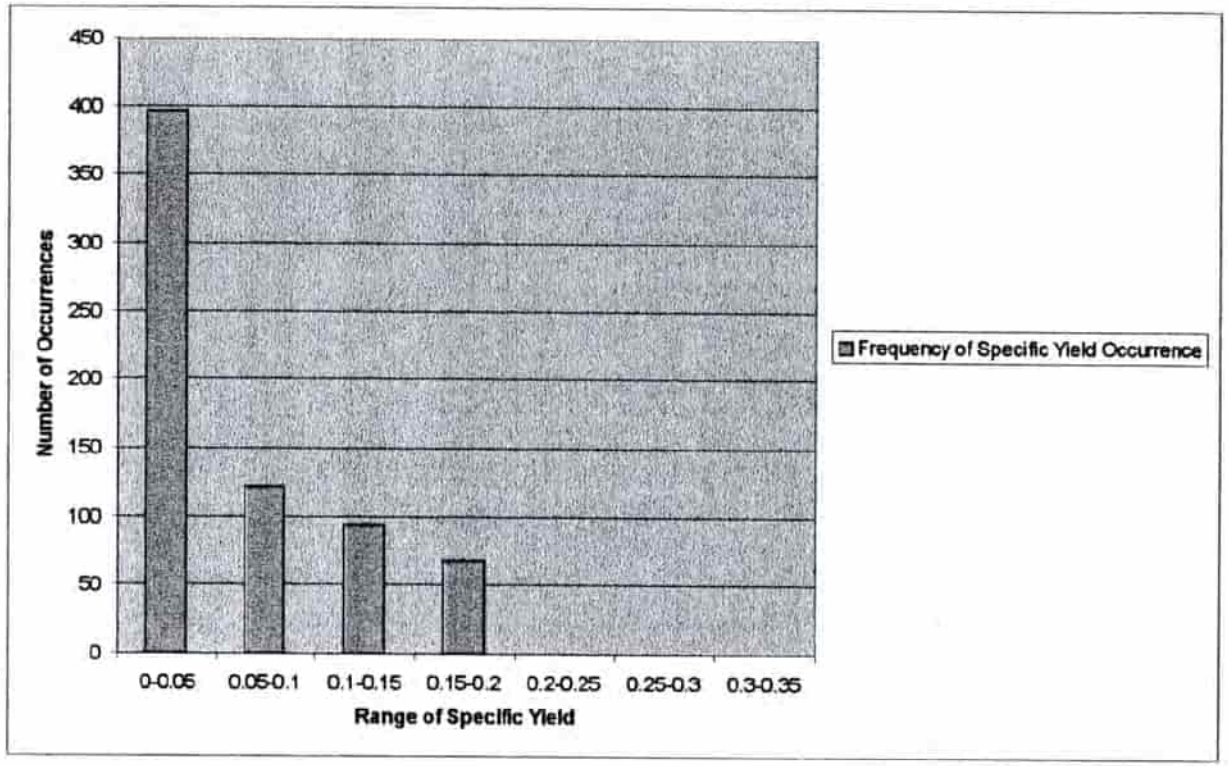

Figure A9. Histogram of Calibrated Specific Yields for USGS Model.

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Table A5. Average Transmissivity and Specific Yield by Zone for USGS Model and SRPAM1.1.

Zone	USGS Model Average T	SRPAM1.1 Average T	USGS Model Average S	SRPAM1.1 Average S
2	15763.2	1517269.3	0.08	0.14
3	1458750.0	877321.7	0.07	0.16
4	8791.7	25593.3	0.13	0.22
5	1605000.0	448286.7	0.11	0.20
6	34519.2	21413.3	0.09	0.09
7	14385.7	353793.3	0.05	0.11
8	186675.4	537473.1	0.11	0.15
9	5071.6	72022.5	0.08	0.10
10	19175.8	78694.0	0.07	0.15
11	29647.4	1012044.0	0.08	0.13
12	290489.0	878928.1	0.05	0.15
13	4513341.1	399727.3	0.18	0.15
14	9842705.8	3672191.1	0.06	0.13
15	66087.9	220718.7	0.11	0.11
16	1215813.6	426152.2	0.07	0.10
17	673866.9	316048.3	0.14	0.18
19	2599473.3	2051280.0	0.07	0.19
20	1354483.8	1959910.2	0.05	0.11
21	5914849.4	4526596.4	0.05	0.12
22	216398.6	193312.1	0.10	0.12
23	718541.3	1087116.3	0.05	0.10
24	2032815.0	245672.5	0.10	0.13
25	35109.6	137976.7	0.08	0.26
26	641125.0	345094.4	0.07	0.10
27	388321.8	86588.3	0.06	0.10
28	32905.3	81870.0	0.06	0.10
29	18705.0	397925.0	0.08	0.13
30	25003.6	521565.0	0.08	0.12
31	4431.5	445472.5	0.09	0.18
32	869583.3	3734762.4	0.08	0.19
33	2759163.6	3687558.9	0.05	0.12
34	1675394.7	1064266.3	0.06	0.14
35	360216.4	237521.4	0.14	0.14
36	5598800.0	1305149.9	0.20	0.13
38	966950.3	488624.1	0.07	0.21
39	1451764.6	2029540.0	0.05	0.13
40	1618044.3	330801.0	0.06	0.08

CONCLUSION

Comparison of the SRPAM1.1 model parameters with the USGS Snake River Plain Model parameters demonstrates some degree of variability in modeling assumptions and calibrated values. However, comparison of the two models shows a high degree of similarity in the distribution of recharge, the calculated river gains and losses and the distribution of transmissivities, three properties which exert great control on modeling results. This high degree of similarity provides confidence that each model reflects a reasonably accurate representation of conditions within the modeled area. Further work should be done to understand what effect the differences exert on predictive results.

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ENHANCED SNAKE PLAIN AQUIFER MODEL FINAL REPORT

July, 2006

By
D. M. Cosgrove, B. A. Contor,
G. S. Johnson
Idaho Water Resources Research Institute,
University of Idaho

for the
Idaho Department of Water Resources

with guidance from the
Eastern Snake Hydrologic Modeling Committee

Idaho Water Resources Research Institute
Technical Report 06-002

Eastern Snake Plain Aquifer Model Enhancement Project
Scenario Document Number DDM-019

Idaho Legislature

IDAHO WATER RESOURCES RESEARCH INSTITUTE

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Abstract

The development of ground-water and surface-water irrigation on the eastern Snake River Plain has necessitated conjunctive management of the ground and surface water resources. To facilitate this management approach, the Idaho Department of Water Resources (IDWR) has placed a strong emphasis on the development, use and refinement of scientific tools which help quantify the impacts of changing water use practices on ground water and surface water supplies on the eastern Snake River Plain. Recognizing the importance of the ground-water model as a water management tool, the IDWR, the State Legislature and the water user community agreed to embark on a model reformulation process.

Model reformulation was funded as a joint effort between the State of Idaho, Idaho Power, the U.S. Bureau of Reclamation and the U.S. Geological Survey. The reformulation was overseen by the Eastern Snake Hydrologic Modeling Committee (ESHMC), a collection of scientists and engineers representing the above-identified agencies and private water user groups. The actual modeling was accomplished by the Idaho Water Resources Research Institute (IWRRI) at the University of Idaho. Major design alternatives were presented to ESHMC members for discussion and guidance. The model development was accomplished in an open environment, with acceptance of design input from all committee members, in an attempt to allay concerns regarding technical bias.

The technical effort was initiated in 1999 and involved data collection for a 22-year calibration period (Spring, 1980 through Spring, 2002), establishing a new model grid and boundary conditions and an exhaustive calibration of the new model. The 22-

year calibration period was broken into 44 6-month stress periods. The calibration was accomplished using version 9.0 of PEST (Doherty, 2005), a non-linear parameter estimation program for data interpretation, model calibration and predictive analysis. The model was calibrated to approximately 11,000 aquifer water level and river gain/loss observations. The resulting model, the Enhanced Snake River Plain Aquifer Model (ESPAM), is a single layer, confined model with 104 rows and 209 columns. Each model grid cell is 1 mile x 1 mile. The model contains 11,451 active cells.

This report documents the enhancement (i.e. design and calibration) of the ESPAM. As design decisions were made during the life of the project, a series of thirty-five reports called Design Documents were written and circulated among ESHMC members for review and comment. The Design Documents contain further details including design alternatives which were considered and the rationale for selecting a specific design option. This report details the accounting of recharge and discharge for the 22-year calibration period, the technical tools used to develop the model, the observations used for model calibration and comparison of the model-predicted aquifer water levels and river gains with observed data. The report cites the various Design Documents for the reader who is interested in more detail.

As with any model of a complex physical system the ESPAM has limitations and uncertainties. The ESPAM is a regional-scale model and is best applied for regional-scale predictions. Additionally, some of the water budget elements and measured observations are known with greater certainty than others. Further discussion about model limitations can be found in the section entitled Model Limitations.

The ESPAM will be used to quantify the impacts of ground-water use on surface water resources. No attempt is made in this report to address the topic of injury to senior water rights.

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Introduction

Background and Study Objectives

Ground water and surface water are highly interconnected on the eastern Snake River Plain. This report documents the design, development and calibration of the Enhanced Snake Plain Aquifer Model (ESPAM). The ESPAM will be used by the Idaho Department of Water Resources to estimate impacts between ground water use and surface water resources to support water management decisions.

This project was initiated as a joint effort overseen by groups of eastern Snake River Plain (ESRP) water interests. The study was funded jointly by the State of Idaho, Idaho Power, the U.S. Bureau of Reclamation, with in-kind services from the U.S. Geological Survey (USGS). Technical oversight and input from representatives of these entities andd water user groups were incorporated in the model development to create the best possible technical tool for management of ground-water resources on the eastern Snake River Plain and to which all involved parties could agree is an unbiased representation of the complex aquifer system. The process, which was established for allowing oversight and technical input from the interested parties, is described in a later section.

The ESPAM project had several other objectives in addition to creating a model which all interested parties could agree to and support. These objectives are: a) to create a numerical ground-water model of the eastern Snake River Plain aquifer which is calibrated to a sufficient time period to represent a wide range of aquifer stresses, b) to improve the model representation of river/aquifer interaction, c) to fully document the

new model including major design decisions and data, and d) to create the model using state of the art model development methods.

Project Scope

The scope of this project was limited to the reformulation and re-calibration of the ground-water model used for water management on the eastern Snake River Plain. This entails the accurate accounting of aquifer recharge and discharge for the modeled period, an accurate assessment of water use on the eastern Snake River Plain, and creation and calibration of a numerical model to represent the Snake River Plain aquifer. The scope of the project was limited to model creation and calibration and did not entail generation of water management scenarios.

The Role of the Eastern Snake Hydrologic Modeling Committee

The ESPAM was created with extensive review and input from the Eastern Snake Hydrologic Modeling Committee (ESHMC) during the period from 1999 through June, 2005. The ESHMC is comprised of professionals working on water issues on the eastern Snake River Plain. Regular members include agency representatives (Idaho Department of Water Resources, U.S. Bureau of Reclamation, U.S. Geological Survey, U.S. Fish and Wildlife Service), industry representatives (Idaho Power), researchers (University of Idaho, Idaho Water Resources Research Institute) and private consultants representing water users on the eastern Snake River Plain. The ESHMC was formed in 1998 and was a follow-on to the previous Idaho Technical Committee on Hydrology (ITCH) which had a similar function. The ESHMC was originally formed to allow researchers and water users a forum for discussing water issues and research on the eastern Snake River Plain and is chaired by the Idaho Department of Water Resources.

Shortly after its formation, the ESHMC was tasked to identify the most critical research needs on the eastern Snake River Plain. The reformulation of the ground-water model was a high priority identified by the ESHMC. Model reformulation was funded jointly by the State of Idaho, Idaho Power and the U.S. Bureau of Reclamation, with in-kind services provided by the U.S. Geological Survey. Model development was contracted by IDWR to IWRRI. Program management for the model reformulation was provided by IDWR. However, realizing the contentious nature of water disputes on the eastern Snake River Plain and, in an effort to temper future disagreement, IDWR elected to have the model design, construction and calibration overseen by the ESHMC. IDWR's goal was to provide insight and input into the model design so that all parties could attest to the facts that a) the model was created with as little bias as possible and b) the model was as accurate a representation of the physical system as possible, given the available data. IDWR further stated the goal that future water disputes on the eastern Snake River Plain should be focused on policy and not on the science. It was understood that not every decision would attain complete agreement from all members of the ESHMC.

IWRRI held approximately quarterly meetings to present project status and proposed design choices to the ESHMC. The design choices were documented in a series of technical reports that are called Design Documents. The Design Documents were distributed to ESHMC members in draft form prior to all design review meetings. During the design reviews, the ESHMC members received presentations of various design options. These options would often be discussed at length. Once either consensus (but not necessarily unanimous agreement) was reached or there was no further

discussion, the final design decision was documented in a final version of the relevant Design Document. Many fundamental design decisions were modified specifically in response to ESHMC guidance. Realizing that the group was being presented with an extraordinary volume of information and detail during the design reviews, the ESHMC members were encouraged to provide written comments on specific Design Documents or on specific design issues as well as oral comments during meetings.

If, in the course of model development or calibration, the technical team determined that a design decision needed to be changed or required more extensive Committee review, either a memorandum or a revised version of the Design Document was distributed to the ESHMC. At every juncture, the ESHMC committee members were kept apprised of model design options and decisions.

Recognizing that multiple (often disparate) viewpoints were represented at ESHMC meetings, it was understood that not all design decisions could be made with unanimous agreement. All major design decisions, however, were discussed at length and consensus on the design approach was reached among the present parties. Throughout this report, major design decisions made by the ESHMC members are noted. The authors recognize that this is an extraordinary approach for ground-water model documentation; however, the authors feel that the method of model development, including and soliciting input from interested parties from the very beginning of model design, was a unique approach aimed at gaining consensus on a potentially contentious model.

ESPAM Version

During the preparation of this final project report, some data entry errors were discovered in the original model calibration, requiring model re-calibration. The data entry errors were centered around the calibration targets used for the river reaches in the upper Snake River. The most significant data entry errors were that the measured irrigation return flow percentages had not been integrated into the model calibration targets and there was a mismatch in reach integration between the model-predicted and observed values for the Shelley to Near Blackfoot and Near Blackfoot to Neeley reaches. These data entry errors were corrected and the model was re-calibrated in May, 2005, resulting in the release of ESPAM Version 1.1, which is described in this report. These data entry errors did not significantly affect results of the model simulation.

Study Area Description

The Snake River Plain extends in an arcuate shape across most of southern Idaho and into eastern Oregon. The plain is divided into eastern and western regions based primarily on ground-water hydrology. The eastern Snake River Plain is the focus of this report and entails an area of about 10,000 square miles extending from Ashton, Idaho in the northeast, southwest to King Hill, Idaho (Figure 1). The boundaries of the plain, shown in Figure 1, were originally defined by the U.S. Geological Survey's Regional Aquifer- System Analysis (RASA) program (Lindholm, 1993) and were modified for this study (see Geographic Boundary Conditions section). The model boundary shown in Figure 1 is the modified boundary used for this study. Elevation of the eastern plain varies from about 2600 feet above sea level in the southwest to over 5000 feet in the northeast.

Population within the plain is generally sparse, with most of the population residing along the eastern and southern margins of the plain in an agriculturally productive band near the Snake River. Much of the remainder of the plain is federal land managed primarily by the U.S. Bureau of Land Management. Extensive portions of the plain are covered by rugged basalt outcroppings that include the Craters of the Moon National Monument.

The Snake River Plain enjoys an arid to semi-arid temperate climate. Precipitation ranges from about 8 to 14 inches per year, falling predominantly in the colder months. Irrigation is required for agricultural production. The crops grown vary with location; the major crops throughout the plain include potatoes, wheat, barley, alfalfa, and sugar beets. Dry edible beans, corn and peas are grown in the southwestern part of the valley.

Irrigation on the eastern Snake River Plain began in the late 1800s using water from the Snake River and its tributaries. Garabedian (1992) describes changes in surface-water and ground-water irrigated areas on the eastern Snake River Plain that are shown graphically in Figure 2. Acreage irrigated by surface water has been declining since the mid-1940s. Since the onset of ground-water irrigation in the 1950s, the number of acres irrigated by ground water increased steadily until the early 1990s.

Irrigation practices are continually changing in response to technology and economic factors. Furrow, flood, and sub-irrigation were the dominant methods of water application into the second half of the twentieth century. In the 1980s and 1990s sprinkler systems have commonly replaced surface application methods, with a resulting decrease in the amount of water diverted per acre of agricultural land.

Significant legal developments in the 1990s have dramatically affected water use on the Snake River Plain. A basin-wide adjudication of water rights was initiated in 1987 (Idaho Water Resources Board, 1996). The Idaho State legislature enacted legislation affecting the adjudication, including recognition of enlargements in irrigated acreage that occurred before 1987. A moratorium on expansion of irrigated acreage has been in effect for the Snake River Basin since 1992. The moratorium includes both surface and ground water irrigated lands within the basin (Idaho Water Resource Board, 1996). Conjunctive management rules were adopted by the Idaho Department of Water Resources (IDWR) in 1994, essentially linking administration of ground- and surface-water rights. Water measurement districts were established in 1996 to provide records of ground-water pumpage for irrigation. Managed recharge of the Snake River Plain aquifer has also been supported by the Idaho legislature. Estimates for managed recharge, which has occurred at various locations through existing irrigation facilities, are listed in Table 1.

The onset of drought conditions in 2000 caused multiple legal actions to be initiated accelerating the conjunctive administration of surface- and ground-water resources. It was widely agreed that the old numerical model of the eastern Snake River Plain was not sufficiently documented to support conjunctive management decisions.

Model History

Numerical ground-water flow models of the Snake River Plain aquifer have been developed and applied by state and federal agencies, universities, and private interests. The models vary in purpose, extent, and the computer code employed. The first numerical model of the aquifer was developed by the University of Idaho for IDWR and

the U.S. Bureau of Reclamation (deSonneville, 1974). The original IDWR/UI model has undergone multiple revisions and improvements, described below.

The finite-difference model code developed by the University of Idaho and evolved by the University and the IDWR will be referred to as the IDWR/UI Ground Water Flow Model Code. The application of this code to the Snake River Plain aquifer will be referred to as the IDWR/UI Ground Water Flow Model, following the convention established by the IDWR (IDWR, 1997a). The IDWR has applied various versions of this model as a planning and management tool for over two decades.

In the early 1980s, the IDWR/UI Ground Water Flow Model was re-calibrated to 1980-1981 conditions. This re-calibration was able to capitalize on the extensive data collection effort which the USGS did in support of the Regional Aquifer-System Analysis (RASA) study of the Snake River plain during that period. In the early 1980s, the USGS also created a model of the eastern Snake River Plain aquifer for scientific investigations (Garabedian, 1992).

In 1999, the IDWR/UI Ground Water Flow Model was converted to use one of the most widely used and accepted ground-water modeling codes, MODFLOW (McDonald and Harbaugh, 1988). The conversion to MODFLOW was not intended to create a new model, but to develop an equivalent model using a different code. Model representation of physical properties such as aquifer transmissivity, storage and streambed conductance were preserved in this conversion of the IDWR/UI Ground Water Flow Model to the MODFLOW code. The 1999 MODFLOW application to the Snake River Plain aquifer will be referred to as the Snake River Plain Aquifer Model (SRPAM), with the most recent version being SRPAM1.1. There were several benefits gained from

conversion to the MODFLOW code including: a) the MODFLOW code is accepted as an industry standard, b) MODFLOW includes algorithms that simulate physical processes and have been verified against analytical solutions, c) MODFLOW is more familiar to a wider group of scientists and engineers, d) numerous user interfaces have been developed for MODFLOW, e) MODFLOW capabilities are continuously increasing, f) MODFLOW has a significant capability for treating more advanced features such as three-dimensional flow and variable grid spacing, and g) the MODFLOW code is well documented.

In addition to conversion of the IDWR/UI Ground Water Flow Model to the MODFLOW code, the model was modified to improve model representation of the physical system. This was achieved primarily by expansion of the model domain to include segments of the Snake River and tributaries in the northeast portion of the plain that were not previously simulated. Additionally, model documentation was significantly enhanced (Cosgrove and others, 1999; Johnson and others, 1999).

With the potential for rising conflict between surface water and ground water users on the eastern Snake River Plain, in 2000, IDWR embarked upon a full reformulation and re-calibration of the ground water model. This effort resulted in the model which is documented in this report. The resulting model is called the Enhanced Snake Plain Aquifer Model (ESPAM).

Hydrogeology

Geologic Framework

The surface of the Snake River Plain consists primarily of volcanic rocks, which, in most areas, are covered by a veneer of windblown or fluvial sediments. Sediment deposits overlying the basalt vary in thickness from zero to tens of feet. Exposed

volcanic rocks are predominantly basalt, which in places such as the Craters of the Moon National Monument, cover expansive areas.

The eastern Snake River Plain is composed of a series of relatively thin basalt flows and interbedded sediments. Flows range in thickness from a few feet to tens of feet. Welhan and Funderberg (1997) report median flow thickness near the Idaho National Laboratory ranging from about 7 to 25 feet. Individual flows typically have a rubble or clinker zone at the top and bottom with a more massive interior containing fewer vesicles. Vertical fractures in the flow interiors form columnar basalt in some locations (Garabedian, 1992). Individual basalt flows generally are not extensive (Welhan and Funderberg, 1997). The collective thickness of basalt flows of the eastern Snake River Plain is estimated to exceed several thousand feet in places (Whitehead, 1986). More detailed descriptions of the geology of the eastern Snake River Plain are provided by Anderson (1991), Whitehead (1986), and Kuntz and others (1992).

The eastern plain is bounded structurally by faulting on the northwest and downwarping and faulting on the southeast (Whitehead, 1986). The plain is bounded by Yellowstone Group rhyolite in the northeast and Idavada volcanics in the southwest. Granitic rocks of the Idaho batholith, along with pre-Cretaceous sedimentary and metamorphic rocks, border the plain to the northwest (Garabedian, 1992).

Surface-Water Hydrology

The Snake River passes along the southern margin of the eastern Snake River Plain and is the exclusive surface water discharge mechanism for the eastern plain. Ground water underflow from the eastern plain into the western plain is assumed to be minimal, due to the more extensive low hydraulic conductivity sedimentary deposits of

the western plain. Consequently, flow of the Snake River at King Hill is widely considered to be the equivalent of basin discharge, excluding evaporation. Annual discharge of the Snake River at King Hill is shown in Figure 3. The cumulative discharge line in Figure 3 shows little long-term change in slope. This indicates that despite significant changes in water use during the last several decades, there has been little change in basin outflow. A possible reason for the stability of the slope of the cumulative graph in Figure 3 is that human activities have apparently had a greater temporary impact on aquifer storage than on basin outflow.

The Snake River is intensively managed for irrigation and hydropower generation. The average annual flow, major inflows and diversions at different points within the system are illustrated by river width in Figure 4. The flow in the Snake River is noticeably depleted at Milner Dam where substantial diversions are made for irrigation. A gradual increase in river flow below Milner Dam is due largely to aquifer discharge in the form of springs emitting from the wall of the Snake River canyon. North of Idaho Falls, in the eastern part of the plain, the Henrys Fork (locally referred to as the North Fork) joins the Snake River, locally referred to as the South Fork, shortly downstream from Lorenzo, Idaho. The origin of the Henrys Fork is in the Island Park area to the northeast of the Snake River Plain. Headwaters of the Snake River (South Fork) are in Yellowstone Park in Wyoming. On average, flow of the Snake River at Lorenzo is about triple the flow of the Henrys Fork near Rexburg.

Several reservoirs have been constructed on the Snake River and its tributaries for the purposes of irrigation, flood control, hydropower generation, and recreation. In some years, spring snowmelt exceeds system storage capacity and irrigation demands and

water is spilled past Milner Dam. On average, about two million AF of water are discharged annually past Milner Dam (Figure 5).

Direct tributaries to the Snake River occur primarily from the east and south sides of the basin. Several streams along the northern margin disappear through seepage before flows can reach the Snake River (Figure 4). Only flows of the Big and Little Wood Rivers, Silver Creek (not shown in Figure 4, but tributary to the Big Wood River), and Camas Creek may eventually reach the Snake River from the northern margin of the plain. Other streams on the northern margin of the plain, such as the Big and Little Lost Rivers, contribute recharge to the Snake River Plain aquifer, but do not directly discharge to the Snake River.

An extensive network of irrigation canals provides water for approximately 1.0 million acres of surface-water irrigated land on the eastern Snake River Plain. Technical reports provide different estimates of surface water irrigated land due to: 1) differences in the area being evaluated, 2) difficulties discriminating between ground-water and surface-water irrigated land in some locations, and 3) the application of adjustments for non-productive lands (e.g. homesteads, roads, ditches) within an area that appears irrigated in satellite images. In 1980, the U.S. Geological Survey reported 2.1 million acres of irrigated land (both surface- and ground-water) on the eastern Snake River Plain (Garabedian, 1992) within the RASA aquifer boundary. For the current study, it was estimated that there are 1.0 million acres irrigated by surface water and 1.1 million acres irrigated by ground water, for a total of 2.1 million irrigated acres.

Irrigation diversions consume a large proportion of the flow of the Snake River during irrigation season. Diversions of surface water for irrigation in the eastern Snake

River Plain (including all tributaries) have diminished by about 20 percent from the nearly eight million AF/yr diverted in the early 1970s (IDWR, 1997a). Irrigation diversions both deplete and affect the timing of flows in the river, with some of the diverted water returning to the river as either surface or ground water return flows. In addition, surface water diverted for irrigation also has a major effect on recharge of the Snake River Plain aquifer as will be discussed in the following section.

Extensive ground water irrigation across the plain also impacts the surface water resources. Due to the interconnection between the aquifer and the river, water withdrawn from the aquifer to supply the approximately 1.1 million acres of ground-water irrigated land either diminishes aquifer discharge to the river or increases river losses to the aquifer.

Ground-Water Hydrology

The Snake River Plain aquifer underlies the eastern Snake River Plain. This highly productive aquifer is hosted in fractured basalts and interbedded sediments. The primary conduit for ground-water flow appears to be the highly permeable rubble zones that formed at the tops of the numerous basalt flows which comprise the Snake River Plain. Garabedian (1992) reports median specific capacity on a county basis for 176 wells across the eastern plain. The median values ranged from 4 to 950 gallons per minute per foot of drawdown, with the largest values occurring in counties near the center of the plain where Quaternary basalts are thickest. The lower values were found near the margins of the plain where Tertiary basalts and sediments predominate.

Although the collective thickness of the basalt flows may be in excess of several thousand feet in places, the active portion of the aquifer often is thought to be limited to

the upper several hundred feet of saturated thickness. Robertson (1974) states that "Although the real aquifer system is probably more than 1,000 feet thick, a thickness of 250 feet is used in this study based on the apparent layering effects of the aquifer." Based on the presence of low permeability sedimentary layers encountered in a well drilled on the Idaho National Laboratory, Mann (1986) suggests that the aquifer is 450-800 feet thick. Model studies by the U.S. Geological Survey (Garabedian, 1992) represent the aquifer as four layers with a collective thickness ranging from 500 to over 3,000 feet. Modeling by the IDWR and the University of Idaho (deSonneville, 1974; Newton, 1978; IDWR, 1997a; Cosgrove and others, 1999) represents the aquifer as a single layer ranging from 200 to 1,700 feet thick.

The Snake River Plain aquifer generally is considered unconfined; however, in some locations and under certain conditions the aquifer responds as a confined system. In some areas, low permeability lakebed sediments create local confining layers (Spinazola, 1994). The layered basalts and interbedded sediments also may produce conditions that appear locally confined, at least when subjected to short duration stress (Frederick and Johnson, 1996).

The Snake River Plain aquifer is recharged by irrigation percolation; canal, stream, and river losses; subsurface flow from tributary valleys; and precipitation directly on the plain. The aquifer discharges to the Snake River, springs along the Snake River and to ground-water pumping, primarily for irrigation. Figure 6 shows a conceptual model of recharge and discharge to the Snake River Plain aquifer. The relative magnitudes of the recharge and discharge components were evaluated by the USGS (Garabedian, 1992) and, more recently, for this study. Estimates from the USGS

represent conditions in 1980 for the entire Snake River Plain (Figure 7). Estimates from the current study represent an average of 1980 through 2001 conditions (Figure 8). The USGS estimates of water budget components include portions of the plain not included in the current estimate due to differences in model boundaries (model extent is discussed in a later section).

Incidental aquifer recharge from irrigation is a significant component of the water budget and has varied as irrigation practices have evolved. The 1980 water budget of the USGS (Garabedian, 1992), shown in Figure 7, shows that surface water irrigation contributes more than 50 percent of the total recharge to the aquifer. Historically, recharge from surface water irrigation increased as more land was brought into production up to the 1970s. Since the 1970s, a gradual conversion to sprinkler irrigation methods reduced the amount of incidental recharge from irrigation.

Natural discharge from the Snake River Plain aquifer is primarily to the Snake River along two reaches: Kimberly to King Hill, and Near Blackfoot to Neeley. These reaches are defined by gaging stations shown in Figure 1. Spring discharge has varied in response to changes in precipitation, irrigated acreage, and irrigation practices. Overall, discharge in the Kimberly to King Hill reach appears to have been impacted more than in the Near Blackfoot to Neeley reach (Figure 9), although the Near Blackfoot to Neeley reach shows more seasonal variation since approximately 1970. The effects of weather variation and irrigation recharge are apparent from the short-term variation of spring discharge. Maximum discharge occurs around October, near the end of the irrigation season. The seasonal variation in the Blackfoot to Neeley and Milner to King Hill

reaches is about 15 and 20 percent of the respective maximum reach gains (from interpretation of Kjelstrom, 1995a).

Historically, aquifer water levels and corresponding discharges to the Snake River rose significantly at the onset of surface water irrigation. This is particularly apparent in the historic discharge in the Milner to King Hill reach shown in Figure 9. Aquifer water levels peaked around 1950 and have been declining since that time. The declines are attributed to the onset of ground-water irrigation, more efficient surface water irrigation practices such as conversion to sprinkler irrigation and canal lining, and the recent seven years of drought. Historic discharge in the Near Blackfoot to Neeley reach shows a less dramatic response to historic changes in irrigation practices, however the reach does exhibit more dramatic seasonal variation since the 1950s.

Other reaches of the Snake River also are hydraulically connected to the aquifer. In these segments, the river may gain or lose water, depending on river stage and the water level in the aquifer. The Neeley to Minidoka reach both gains and loses water, with gains generally exceeding losses. Further upstream, between Heise and Lorenzo, the South Fork of the Snake River is a seasonally losing stream (Kjelstrom, 1995a). Average annual loss of this reach was 150 ft^3/sec in the 1980 water year. During that same period, the Lorenzo to Lewisville reach of the main stem of the Snake River and the lower Henrys Fork reach were estimated to have gained 290 and 120 ft^3/sec, respectively (Garabedian, 1992).

Contours of the potentiometric surface indicate that ground-water flow direction generally is parallel to the axis of the plain (Figure 10). Steep hydraulic gradients are apparent near the margins of the plain due to tributary valley inflow and lower

transmissivity relative to the center of the plain. Steep gradients also are apparent near the Kimberly to King Hill discharge area due to convergence of flow lines and probable aquifer thinning. Near the center of the plain and near Mud Lake, steeper gradients presumably result from decreased transmissivity due to the volcanic rift zone and thick sediment deposits, respectively. Garabedian (1992) used transmissivities ranging from $4x10^3$ to $1x10^7$ ft^2/day. The SRPAM model had transmissivities which ranged from $2x10^4$ to $5x10^6$ ft^2/day. These ranges of values are consistent with published values for fractured basalt.

Aquifer storage in the eastern Snake River Plain aquifer is reasonably high due to the highly fractured nature of the system. Garabedian (1992) used specific yield values ranging from .05 to .2 (unitless ratio). Specific yield values used in the SRPAM model were higher, ranging from .08 to .26. The specific yield values used by Garabedian and the SRPAM model are consistent with published specific yield values for fractured basalts in unconfined systems, although many of the SRPAM values are at the upper limits of published values.

Aquifer water levels have changed significantly over the past several decades in response to changes in irrigation and variations in weather. Figure 11 shows the water level changes on the eastern Snake River Plain for the period from spring, 1980 to spring, 2002. This change in water level corresponds approximately to the change in aquifer storage shown in Figure 8 (Figure 8 shows the change in storage up through 2001). During that period, water levels across the plain generally declined between 5 and 15 feet, with some areas experiencing declines as great as 20-25 feet. The greatest changes in water level appear in a band traversing the south-central portion of the plain. Figure

12 shows water level declines between spring, 2001 and spring, 2002, the last year of the period shown in Figure 11. The reader will note that water level declines shown in Figure 12 are almost half of the total decline in the 1980-2002 period, reflecting a rapid aquifer response to the drought conditions of the year 2001-2002. This suggests that under long-term, average conditions (1980-2001), water use on the eastern Snake River Plain was reasonably in balance with use slightly exceeding supply. The rapid decline in the 2001-2002 year indicates that water level declines occur rapidly under drought conditions. This general decline in water level is consistent with observed declines in aquifer discharge to the Snake River.

Model Description

Governing Equations and Model Code

The mathematical equations governing unconfined flow are non-linear due to the fact that saturated thickness and, therefore, transmissivity, change with time. In confined systems, saturated thickness is constant, therefore the mathematical representation is linear.

The ESPAM is a confined representation of the eastern Snake River Plain aquifer. This decision was made by the ESHM Committee and was consistent with field observations of the propagation of pumping impacts through the aquifer (Frederick and Johnson, 1996). Additionally, the deep saturated thickness (Whitehead, 1986) supports the representation of a generally unconfined aquifer as confined since drawdowns in the highly transmissive aquifer will be less than 10% of total saturated thickness in most management applications (Anderson and Woessner, 1992). The confined representation of the eastern Snake River Plain aquifer allows a more stable numerical simulation of the

aquifer during automated model calibration. ESPAM Design Document DDM-019 discusses the confined representation of the ESPAM. The thickness of the aquifer is discussed further in the section on Geographic Boundary Conditions.

The general equation governing confined, steady state, anisotripic, heterogeneous flow in two dimensions is:

$$\frac{\partial}{\partial \mathrm{x}}\left(K_{xx}\frac{\partial h}{\partial x}\right)+\frac{\partial}{\partial \mathrm{y}}\left(K_{yy}\frac{\partial h}{\partial y}\right)=0 \qquad \text{(Eq. 1)}$$

where:

K_{xx} is hydraulic conductivity in the x-dimension (ft/d)

K_{yy} is hydraulic conductivity in the y-dimension (ft/d)

h is aquifer head (ft)

The general equation governing confined, transient, anisotropic, heterogeneous flow in two dimensions is:

$$\frac{\partial}{\partial \mathrm{x}}\left(K_{xx}\frac{\partial h}{\partial x}\right)+\frac{\partial}{\partial \mathrm{y}}\left(K_{yy}\frac{\partial h}{\partial y}\right)-W=S_s\frac{\partial h}{\partial t} \quad \text{(Eq. 2)}$$

where:

K_{xx} is hydraulic conductivity in the x-dimension (ft/day)

K_{yy} is hydraulic conductivity in the y-dimension (ft/day)

h is aquifer head (ft)

W is the rate of aquifer recharge (1/day)

S_s is specific storage (1/ft)

t is time (days)

The ESPAM comprises both a steady state and transient, two-dimensional, isotropic representation of the eastern Snake River Plain aquifer. The isotropic

representation means that $K_{xx} = K_{yy}$. In a numerical model, individual model cells are homogeneous. Heterogeneity is represented by the spatial variation of properties such as transmissivity, on a cell by cell basis. Therefore, the governing equations for a numerical model are the same as for a homogeneous system. Multiplying Equations 1 and 2 by b/T, where b is saturated thickness (ft) and T is aquifer transmissivity (ft^2/day), yields the following:

$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} - W\frac{b}{T} = 0 \quad \text{(Eq. 3)}$$

and

$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} - W\frac{b}{T} = \frac{S}{T}\frac{\partial h}{\partial t} \quad \text{(Eq. 4)}$$

where:

T is aquifer transmissivity (ft^2/day)

h is aquifer head (ft)

W is the rate of aquifer recharge (1/day)

S is storativity (dimensionless)

t is time (days)

b is aquifer thickness (ft)

Equations 3 and 4 represent the governing equations used for representing groundwater flow in the ESPAM steady state and transient models, respectively.

Flow between the aquifer and river or drain cells is governed by equations which are based on Darcy's law. Darcy's law is:

$$Q = -KA\frac{dh}{dl} \quad \text{(Eq. 5)}$$

where:

Q = discharge (ft^3/day)

A = cross-sectional area (ft^2)

K = hydraulic conductivity (ft/day)

dh/dl = hydraulic gradient (dimensionless)

In a numerical model, for both river and drain cells, the hydraulic conductivity term represents the conductivity of the river-bed or drain sediments which controls the flow between the river/drain and the aquifer. The gradient (dh/dl) represents the head differential between river stage (or drain elevation) and aquifer level.

In a finite-difference model, the ground-water flow equation is solved for each individual model cell and river or drain cell, preserving the mass balance of water. Each model cell can have individual properties representing aquifer transmissivity and storage. Similarly, all river and drain cells can have individual properties representing river/drain elevation and conductance. At every time step of the model, the equations are solved simultaneously using a numerical solver.

The ESPAM was constructed using MODFLOW2000, a finite-difference code widely used for ground-water modeling which was created by the U.S. Geological Survey (McDonald and Harbaugh, 1988, Harbaugh and others, 2000). The ESPAM was constructed using the Link-Module Gradient (LMG) solver (Mehl and Hill, 2000), however, the model can also be run using the Pre-Conjugate Gradient solver (Hill, 1990). With the LMG solver, the water budget closure criterion is .00001 and the dampening parameter is 1.0. The parameter estimation code, PEST version 8.3 (Doherty, 2004) was used to assist with model calibration.

MODFLOW2000 was selected because it is considered an industry standard for finite difference ground-water models. PEST was selected because of adaptability to the complexity of the model calibration where model results were compared with thousands of aquifer measurements during the calibration process.

Discretization

Finite difference modeling consists of breaking a large physical area into small volumes, which are called model cells, and simultaneously solving the numerical problem (Equations 3, 4 and 5) for each model cell. Additionally, if the model is transient, the total simulation time is also broken down into smaller time periods and the problem is solved at the end of each time period. In the case of ground-water modeling, the problem is being solved to determine aquifer head at each of the model cells and flux to drains and to/from rivers. This process of breaking the larger pieces down into smaller pieces is referred to as discretization.

For a uniform grid, the estimated aquifer head for each model cell represents the head at the center of the cell. If the cells are very large and the gradient is steep, interpolating head at locations other than at the center of the cell can introduce significant error.

Spatial Discretization

The spatial discretization of the model study area is the representation of the eastern Snake River Plain aquifer system in small volumes. The study area was overlain by a uniform 1 mile x 1 mile grid. The grid was intersected with the model boundary. Any cell within the model boundary is considered an active cell, or a cell for which aquifer head would be computed using the model. Any cell outside of the model

boundary is considered an inactive model cell and not part of the calculation of aquifer head.

Model Grid

The ESPAM grid consists of 104 rows and 209 columns. The grid rows are numbered with row 1 at the top of the grid. The grid columns are numbered from west to east, with column 1 being the west-most column. The grid origin is at the outside corner of model cell (1,1), the most northwest point of the model grid, and is at Idaho Transverse Mercator (IDTM) coordinates x=378,416.2 m and y=233,007.2 m (in feet: x=1,241,523 and y=764,459.2, latitude = 43.118806°, longitude=-115.49619 °). The reader should note that these IDTM coordinates are in the original IDTM system (IDTM 27) and not the IDTM83 system which was adopted in 2004. For more information on IDTM coordinates, the reader is encouraged to contact IDWR.

The model grid is rotated 31.4° counter-clockwise relative to an east-weat orientation. The rotation is selected to minimize the number of inactive model cells. Figure 13 shows the model grid, the origin and the orientation. The grid is comprised of model cells which are 1 mile x 1 mile square cells (5,280 ft x 5,280 ft). There are 11,451 active model cells. Selection of the 1 mile x 1 mile grid size was consistent with the density of data available for the study area and the steepness of gradients in the Snake River Plain aquifer. Figure 14 shows a close-up of the model grid in the Thousand Springs area (between the Kimberly and King Hill gages) and the density of observation wells in that area. This gives the reader a sense of the density of available data relative to the model grid size. Details of the model grid design are available in ESPAM Design Document DDM-015.

Model Layers

The ESPAM of the eastern Snake River Plain aquifer is a single-layer model. Previous models of the aquifer have contained both single (Cosgrove and others, 1999) and multiple (Garabedian, 1992) layers. It is generally agreed that the regional eastern Snake River Plain aquifer resides in a single large stratigraphic unit, consistent with a single layer model (Whitehead, 1986).

There are localized lenses of sediments in some locations on the plain (the Rigby Fan and the Burley-Rupert area), which may contain locally elevated water levels. When the ESPAM was being designed, it was agreed among the ESHMC that the option of adding a top layer to represent the sedimentary units would be explored only if time permitted and data were available. Investigation showed that there are little data available to support calibration of separate layers representing these locally elevated zones and ESHM Committee members agreed that a single layer model was sufficient. More information on the choice of using a single layer representation is available in ESPAM Design Document DDM-003.

Temporal Discretization

The ESPAM includes both a steady state and a transient model. Steady state simulation does not involve a time factor (Eq. 3). For a transient model, it is necessary to select a) the total time span for the model calibration period, b) the model stress period interval and c) the number of time steps in each stress period for which aquifer head and river gains will be calculated. Decisions on model calibration time span and temporal discretization were made by the ESHM Committee.

The criteria used to select the model calibration period included a) the period should represent a wide range of recharge and discharge, b) reliable data should be

available for the period, c) the period should be long enough to allow the ground-water model to adequately predict long-term aquifer trends and d) the period should reflect current land use and irrigation practices. The ESHM Committee selected a model calibration period of 22 years, from May, 1980 through April, 2002. The starting date was selected to coincide with the extensive data collection effort on the eastern Snake River Plain which was done by the USGS as part of the RASA project. The end date was originally set one year earlier (April, 2001); however, since the 2001-2002 water year was an extreme drought year, the choice was made to extend the model end period by one year to include the 2001-2002 water year. This decision had the added benefit of allowing the modelers to use field measurements from the 2001-2002 water year. The period of May, 1980 through April, 2002 includes the wettest year on record (1997), early drought years (1987-1990) and the starting years of the current drought period (2000-2002). A calibration period with a wide variation of recharge and discharge results in calibration targets (river gains, spring discharges and aquifer water levels) which provide a better constraint on the calibrated model parameters (aquifer transmissivity and aquifer storage and riverbed conductance).

In a MODFLOW model, a stress period is the length of time during which aquifer recharge and discharge (aquifer stresses) are held constant. In the ESPAM, because the hydrology is dominated by irrigated agriculture, 6-month stress periods (182 days during the irrigation season and 183 days during the non-irrigation season) were selected. The irrigation season stress period starts on May 1 and ends on October 31 and the non-irrigation season starts on November 1 and ends on April 30. The ESHM Committee agreed that, if calibration were successful with the 44 6-month stress periods, an attempt

would be made to calibrate with 6-month stress periods representing the first 21 years and twelve 1-month stress periods representing the last year. This was attempted during model calibration; however, there was insufficient resolution in many components of the recharge and discharge data to support the 1-month stress periods. Hence, the final calibrated ESPAM transient model has 44 6-month stress periods. Table 2 lists the dates represented by each of the 44 transient stress periods.

In ground-water modeling using MODFLOW the stress period is subdivided into time steps. The ground-water flow equations are solved at every time step. Even though the same aquifer stress is being applied during the whole stress period, aquifer water levels and river gains are changing throughout the stress period (the aquifer water levels and river gains are responding to the applied stress). By further discretizing time using time steps, the model predicts these intermediate aquifer water levels and river gains, allowing comparison of predicted water levels and river gains with measured values and reducing uncertainty in model predictions. For ESPAM calibration, 10 time steps of equal length (18.2 days during the irrigation season and 18.3 days during the non-irrigation season) are used for each model stress period. Since each time step is 18.2 or 18.3 days in length, the net result is that aquifer water levels and river gains are estimated by the model every 18.2 or 18.3 days during the 22-year calibration period.

Model Boundary Conditions

In a numerical ground-water model, the boundary conditions can exert a great amount of control on the model solutions, particularly for steady state solutions. The selection of boundary conditions is a critical element of the conceptual design of any ground-water model.

The ESPAM employs several types of numerical model boundary conditions. No-flow boundaries are used around most of the perimeter of the model, simulating the physical contact between the aquifer and impermeable geologic formations. Specified flux boundaries are used to represent tributary underflow, non-Snake River reaches, wells where water is not locally applied for irrigation, recharge from precipitation on non-irrigated lands, irrigation conveyance loss and net recharge/discharge from surface- and ground-water irrigation. Head-dependent boundaries, where the rate of discharge to or from the aquifer is driven by a head differential between the aquifer and a hydraulically connected water body (such as a river reach or spring), are employed to represent some reaches of the Snake River and springs immediately tributary to the Snake River.

Geographic Boundary Conditions

The ESPAM boundary is based on the SRPAM and RASA aquifer boundaries, with some modifications. Figure 15 shows the ESPAM boundary, the RASA boundary, the SRPAM model boundary and irrigated areas. Because the ESPAM is intended for the conjunctive management of ground- and surface-water resources, the SRPAM and RASA boundaries were evaluated based on inclusion of irrigated areas. Modifications were made to expand the original aquifer boundaries to include irrigated acreage in the Kilgore, Rexburg Bench, American Falls and Oakley Fan areas (Figure 15). The Twin Falls tract, which is within the RASA boundary but not the SRPAM boundary, was excluded since the Snake River is deeply incised between Kimberly and King Hill, so there is no communication between the aquifers on the north and south sides of the Snake River.

In the King Hill area, the RASA boundary extends several miles further to the west than the SRPAM boundary. The decision was made to include that area in the ESPAM boundary, allowing inclusion of the King Hill gage on the Snake River. The model boundary was extended up the Big Lost River drainage to Mackay Dam in order to simplify the estimate of tributary underflow in that drainage. A result of the expansion of the model grid (beyond SRPAM) was the inclusion of approximately 294,000 acres of irrigated lands, which had a significant impact on the model water budget (addressed in a later section). The ESHM Committee felt, however, that this was necessary to support the need for model use for conjunctive management of surface- and ground-water resources.

In addition to the areal extent of the study area, an analysis was done of the bottom of the aquifer. In hydrogeology, the aquifer transmissivity (T) is equal to the saturated thickness (b) multiplied by the aquifer hydraulic conductivity (K). Since the bottom of the aquifer is unknowable in many locations, the imperfect understanding of the saturated thickness is compensated for by adjustments to K during model calibration. Stating this another way, it is the combined parameter, transmissivity (T=K*b) which is critical to understanding the movement of water in the aquifer. Neither the hydraulic conductivity nor the saturated thickness must be individually well understood. Although not overtly necessary to calibration of a model, knowledge of the bottom of the aquifer is of interest when interpreting modeling results. An estimate of the bottom of the aquifer allows the modelers to determine an estimate of hydraulic conductivity based on T and b. Additionally, when analyzing the potential non-linearities in an aquifer system, an

understanding of the magnitude of saturated thickness relative to aquifer drawdown is critical.

Whitehead (1986) published basalt thickness maps for the eastern Snake River Plain. The maps were based on borehole logs and geophysics at a limited number of locations. The ESHM Committee agreed that a delineation of the bottom of the eastern Snake River Plain aquifer which was based on Whitehead's work with an assumption of a minimum aquifer thickness at the aquifer margins of 200 ft was a reasonable approach. Figure 16 shows the kriged surface of the bottom of the aquifer assumed for the current study. Because there are very few data points available for delineation of the bottom of the aquifer, Whitehead used some presumed data points to delineate the bottom of the aquifer. For this model, some of Whitehead's presumed data points were used, some were modified and several points were established in the Thousand Springs region to establish the minimum aquifer thickness of 200ft. The locations of these data points are all shown in Figure 16. Figure 17 shows the locations at the aquifer margin where the aquifer thickness was set to 200 ft. More details about the determination of the bottom of the aquifer can be obtained in ESPAM Design Document DDM-012.

Hydrologic Boundary Conditions

Hydrologic boundary conditions are used to represent the interaction of the aquifer with rivers, streams, lakes and springs. Strictly speaking, the representation of aquifer recharge and discharge is also a hydrologic boundary condition. The following sections discuss how rivers, streams and springs are represented in the ESPAM. As previously mentioned, some reaches of the Snake River and some springs discharging to the Snake River are represented as head-dependent flux boundaries. Tributary

underflow, non-Snake River streams and rivers, and irrigation conveyance loss are represented as specified flux boundaries. All other components of aquifer recharge and discharge (e.g. wells and net recharge/discharge from surface- and ground-water irrigation) are represented as a specified flux in each model cell. Estimation of aquifer recharge and discharge is discussed in the section on Model Water Budget.

MODFLOW Representation of Head-Dependent Boundaries

Head-dependent boundaries are boundaries where the rate of flux between the surface water body and the aquifer is dependent upon the head gradient between the surface water body and the aquifer. Head-dependent boundaries are used to represent surface water bodies which are hydraulically connected to the aquifer. These surface water bodies can be either gaining water from or losing water to the aquifer. In the case of springs, the model representation is strictly a discharge out of the aquifer through the spring.

The flow between the aquifer and a hydraulically connected surface water body is governed by Equation 5. In the MODFLOW River Package, Equation 5 is implemented in terms of a) stage of the surface water body, b) aquifer water level and c) a conductance term describing the hydraulic conductivity of the riverbed (or spring) sediments and the wetted areas of the riverbed. The user specifies river stage, elevation of the bottom of the river sediments and conductance of the riverbed sediments. As long as the water level in the aquifer is above the elevation of the bottom of the river sediments, the discharge to (or from) the river is calculated as:

$$Q_{riv} = C_{riv}(h_{riv} - h_{aq}) \quad \text{(Eq. 6)}$$

where:

Q_{riv} is the discharge to or from the river (ft^3/day)

C_{riv} is the riverbed conductance (ft^2/day)

h_{riv} is the head in the river (ft)

h_{aq} is the head in the aquifer (ft)

Figure 18 shows conceptually how river leakage is calculated in MODFLOW. As long as the aquifer head is above river bottom, the discharge to or from the river is calculated based on the head differential. When the aquifer water level drops below the bottom of the riverbed sediments, the river becomes perched and leaks at a constant rate.

Springs in the ESPAM are represented using the MODFLOW Drain Package. The Drain Package is identical to the River Package with one important distinction: the drain package only allows water to exit the aquifer. When the aquifer water level drops below the drain (spring) elevation, the drain or spring shuts off until the aquifer water level recovers. The equation governing aquifer discharge to drains in MODFLOW is:

$$Q_{drn} = C_{drn}(h_{aq} - el_{drn}) \quad \text{(Eq. 7)}$$

where:

Q_{drn} is the discharge to the drain (ft^3/day)

C_{drn} is the drain conductance (ft^2/day)

h_{aq} is the head in the aquifer (ft)

el_{drn} is the drain elevation (ft)

ESPAM Head-Dependent River Boundaries

Head-dependent river boundaries are used in the ESPAM to represent most of the Snake River above Milner Dam. Two hundred and thirty river cells were established to represent the Snake River above Milner Dam. Since riverbed conductance is a lumped

parameter (ie. it represents multiple physical attributes) and impossible to measure, it is commonly estimated during model calibration. Figure 19 shows the ESPAM head-dependent river cells and the aggregation into reaches. Water balance calculations (accomplished using the IDWR Reach Gain and Loss program) indicate that there is virtually no leakage in the reach between Minidoka and Milner, so the reach is not represented in the model. Table 3 lists the model cells used in the MODFLOW River Package and the assigned reach.

The MODFLOW River package requires river stage, elevation of the river bottom and riverbed conductance for each river cell. Determination of river stage and river bottom elevation will be discussed in this section. The estimation of riverbed conductance will be discussed in the section on model calibration. River stage (or elevation of the river surface) was determined by projecting a GIS coverage of the Snake River onto the 10 meter digital elevation models (DEMs) available from the USGS. Once this projection was accomplished, the river elevation was digitized from the DEMs. The 95% confidence interval on deriving elevations using 10 m DEMs is estimated at 1.21 ft +/- 1.17 ft (ESPAM Design Document DDM-010).

Elevation of the river bottom is important, particularly in reaches which may transition between hydraulically connected and perched. Estimation of the river bottom elevation carries a high degree of uncertainty, as it is difficult to measure and may vary greatly at different locations. Elevation of the river bottom is typically only known at gaging stations. The ESHM Committee decided that the best approach for estimating the elevation of the river bottom was to interpolate river bottom depth between the known points at gaging stations. Using this method, the differential between river stage and the

bottom of the riverbed ranged between 33 feet and 63 feet. For more information on estimation of river stage or the elevation of the bottom of the riverbed, the reader is referred to ESPAM Design Document DDM-010.

Head-Dependent Spring Representation

In the ESPAM, springs discharging to the Snake River in the Thousand Springs region (between the gaging stations at Kimberly and King Hill) are represented using the MODFLOW Drain Package. As previously discussed, the Drain Package is very similar to the River Package in that discharge from the aquifer through the drain is calculated based on the head differential between the aquifer water level and the drain elevation. If the aquifer water levels drop below the drain elevation, discharge from the drain ceases until the aquifer water levels recover. In the Thousand Springs region, the Snake River flows through a deeply incised canyon, allowing little opportunity for water to discharge from the river to the aquifer. Therefore, selection of the Drain Package is consistent with the physical system.

Forty-five drain cells were used to represent spring discharge in the Thousand Springs area. Unlike the river cells which represent the upper reaches of the Snake River, the drain cells are not contiguous along the Thousand Springs area. The drain cells were sited by mapping springs with significant discharge from the Covington and Weaver (1990) maps published by the USGS. The Covington and Weaver maps were also used to establish initial drain elevations; however, drain elevations were modified during calibration (see the section on model calibration). Table 4 lists the model cells represented with the MODFLOW Drain Package.

Discharge of individual springs or individual drain cells is difficult to represent with a regional scale model. Consequently, the ESHMC agreed that drain cells should be aggregated into reaches that were more consistent with the scale of the model. Aggregation of the drain cells into reaches was accomplished based on an analysis of a) discharge of individual groups of springs and b) cumulative discharge of springs along the entire Thousand Springs reach. Figure 20 shows the cumulative spring discharge along the Thousand Springs reach starting at Devils Washbowl (near Milner dam). Inspection of Figure 20 shows that there are some natural changes in the slope of cumulative discharge which supported aggregation of groups of springs into reaches. In Figure 20, it can be seen that cumulative discharge progresses at a fairly constant slope between Devils Washbowl and Buhl. At approximately the Buhl gage, the slope of the cumulative discharge curve increases until the springs at the Thousand Springs power plant. The springs at the power plant have extremely high discharge, causing a dramatic rise in cumulative discharge. The slope of the cumulative discharge is lower between Thousand Springs and Malad, where the cumulative discharge curve has a second dramatic rise. Between Malad and Bancroft, the cumulative discharge curve again has a lower slope. Analysis of Figure 20 resulted in the springs being aggregated into the following six reaches, shown in Figure 21: Devils Washbowl to Buhl, Buhl to Thousand Springs, Thousand Springs, Thousand Springs to Malad, Malad, and Malad to Bancroft. The color-coded squares in Figure 21 represent individual model cells where MODFLOW drains are used to represent spring reaches.

Initial values of drain conductance for the drain cells along a spring reach were estimated based on the discharge for the group of springs and the estimated head

differential between the aquifer and the spring elevation. Drain conductances were calibrated during model parameterization. This will be discussed further in the model calibration section. More details on the location of drain cells, aggregation of the spring reaches and estimation of initial drain conductance can be found in ESPAM Design Document DDM-018.

Specified Flux Boundaries

Specified flux boundaries are used to represent flow to or from the aquifer which occurs at an estimated rate and is not driven by a head differential. Specified flux boundaries are typically used to represent the interface between the aquifer and a water supply which is not hydraulically connected. In the ESPAM, tributary basin underflow, percolation from irrigation and precipitation on non-irrigated lands, seepage from perched rivers and irrigation conveyance losses are represented using specified flux boundaries. This section describes the specified flux boundaries. The rate of specified flux used in the ESPAM, including pumping, will be discussed in the Water Budget section.

Underflow from Tributary Basins

Tributary underflow represents the subsurface discharge of water from a tributary basin into the eastern Snake River Plain aquifer. Because tributary underflow is subsurface flow, it is difficult to estimate. Underflow from 22 tributaries is represented in the ESPAM. Table 5 lists the tributary basins, for which underflow is represented in the ESPAM. Figure 22 shows the location of each of the tributary basins on the Snake Plain. In Figure 22, the individual model cells which are used to enter the specified flux are highlighted. Appendix A contains a table listing the model cells associated with each

tributary (Table A-1). The estimated flux for each tributary is evenly distributed across the model cells assigned to that tributary in each stress period. Estimation of the rate of tributary underflow discharge is discussed in the water budget section.

Perched River Seepage

The ESPAM has 12 locations at which perched river seepage is represented. These reaches represent surface water bodies other than the Snake River. Perched reaches of the Snake River (other than the previously mentioned reach between Minidoka and Milner) are represented using the MODFLOW River Package. Table 6 lists the non-Snake River perched reaches. Strictly speaking, not all of the perched reaches are river reaches. Several flood control sites are represented in the same manner as perched river reaches. Figure 23 shows the location of each perched reach. The model cells in which perched seepage is represented are highlighted in Figure 23. Appendix A contains a table listing the model cells associated with each perched reach (Table A-2). The estimated flux for each perched reach is evenly distributed across the model cells assigned to that perched reach in each stress period. Estimation of the rate of perched seepage is discussed in the water budget section.

Irrigation Conveyance Loss

As irrigation water is delivered to fields, there is leakage from the canals and laterals. This is referred to as irrigation conveyance loss or canal leakage. The eastern Snake River Plain has approximately 1,000,000 acres of land irrigated by surface water which is delivered by canals and laterals. It would be impossible to characterize leakage from all of the canals and laterals, so leakage is only explicitly represented from the largest of the canals and canals where the seepage was determined to affect simulation of

spring discharges. Other canal leakage is assumed to have approximately the same spatial distribution as incidental recharge from irrigation and is implicitly included in the irrigation recharge calculation. Canal leakage rates are estimated as a percentage of surface water diversions and are discussed in the water budget section.

Leakage from the larger canals is represented in the ESPAM as specified flux boundaries. The ESPAM has 5 locations at which irrigation conveyance loss is represented. Table 7 lists the represented canals. Figure 24 shows the location of each leaky canal and the model cells in which canal seepage is represented. Appendix A contains a table listing the model cells associated with each canal (Table A-3). The estimated flux for each canal is evenly distributed across the model cells assigned to that canal in each stress period.

Model Initial Conditions

Estimates of aquifer head for each model cell at the beginning of a simulation form the initial model conditions. Of primary concern are initial aquifer water levels or starting heads for the transient simulation. For the steady state ESPAM, the starting heads are set at an arbitrary initial value of 7000 ft. Because a steady state simulation is run until there are no further changes in aquifer water levels, the starting heads are not important. The simulation will continue running and balancing the water flow between each model cell until the system reaches equilibrium and there are no further changes in water levels.

For the transient ESPAM, the starting water levels are the ending heads from the steady state model. In the physical system, water levels fluctuate with location and with season, largely in response to irrigation practices. It is very difficult to accurately

estimate the water levels throughout the aquifer at an instantaneous point in time, so the ESHM Committee agreed that using the ending heads from the steady state simulation was a reasonable point for starting heads for the transient simulation. The ending steady state heads will represent an average water level condition—high in some locations and low in others. As the transient model progresses in time, the water levels will be driven by the recharge and discharge and the physical aquifer properties (transmissivity, aquifer storage and riverbed conductance). This means that changes in aquifer water levels during the first few years of transient simulation are less meaningful than the later years, after the initial head conditions have been overcome.

Model Water Budget

The model water budget is one of the most important elements of a ground-water model. The water budget comprises the accounting of all recharge and discharge to the aquifer both for the steady state period and for each model stress period. By definition, steady state means that there are no changes in aquifer water levels (which equates to no change in aquifer storage). Therefore, for steady state, the inflows must balance with the outflows (Eq. 3). For each transient stress period, the inflows minus the outflows must balance with the change in aquifer storage (Eq. 4).

Water use, and therefore the hydrology, on the eastern Snake River Plain is dominated by irrigated agriculture. The major sources of recharge to the aquifer are incidental recharge from surface water irrigation, tributary underflow, leakage from canals and rivers and recharge from precipitation on non-irrigated lands. The major sources of discharge from the aquifer are evapotranspiration and spring discharges to the Snake River (Figure 8). There is a lot of natural variation in water supply from year to

year. Several large reservoirs on the Snake River help to buffer the water supply available for irrigation, but supply is still limited in some years.

Estimation of the water budget for the ESPAM required estimation of all of the above-mentioned components. Estimation of some of these components entailed multiple steps. In addition to the major components of the water budget, there are several smaller components which were also estimated and are discussed below.

Land Use

One of the first steps in evaluating water use for a study area is an evaluation of land use. Recharge to the aquifer can vary greatly among different land uses. For example, on land irrigated with surface water, the amount of irrigation water applied generally exceeds the consumptive use, so there is a net recharge to the aquifer. On the other hand, on lands irrigated with groundwater and on wetlands, there is a net extraction from the aquifer to meet consumptive use. Identifying land use is an important part of estimating the water budget, particularly in an area where the water use is dominated by irrigated agriculture, such as in the eastern Snake River Plain.

To evaluate irrigated areas for the ESPAM, multiple sources of data were evaluated. One of the problems with using land use analyses from different sources is that it is difficult to discern whether changes in land use reflect actual changes over time or different analysis techniques. The modeling team did an exhaustive job of comparing data from multiple sources and ground-truthing the land use analyses, as documented in ESPAM Design Document DDW-015. Initially, the ESHM Committee decided to employ land use analyses based on imagery from 1980, 1992 and 2000. The 1980 (RASA80LC, IDWR, 1980) analysis is a land classification of LANDSAT data

performed by the Idaho Image Analysis Facility of IDWR (IDWR, 1982), using the "thematic mapper" LANDSAT sensor and Vicker's classification algorithms, which are not directly comparable with later LANDSAT data and methods (Morse, 2001). The 1992 (SNAKLC92, IDWR, 1997b) analysis is based on 1987 aerial photography and extensive field work. The 2000 (ESPAC2000, IDWR, 2002a) classification was performed by IDWR specifically for this project, using classification of multiple LANDSAT images, with a two-week to one-month image frequency. These three land use analyses were initially selected to represent the changes in irrigated area between 1980 and 2002.

During model calibration, comparison of the water budget with the aquifer water levels and spring discharges indicated that the slight trend of decreasing irrigated acreage over time, as evidenced by the land use analyses of these three sets of imagery, was inconsistent with trends in measured modeling targets. Inspection suggested that the differences in spatial distribution between the three land-cover data sets were minor and the differences were distant from river or spring reaches of concern. The decision was made by the ESHM Committee that the final model calibration would use the irrigated lands analysis which was based on the SNAKLC92 data set for the entire calibration period. The extensive ground-truthing which was done for the SNAKLC92 data set provided the highest confidence in the land use analysis.

The location of wetlands was derived from a 1991 analysis of LANDSAT imagery done by IDWR (SRBAS91LU, IDWR, 1994). Some of the available land use analyses did not identify wetlands. For the land use analyses which did identify

wetlands, known wetland locations were ground-truthed. The SRBAS91LU coverage had the most reliable identification of wetlands.

Identification of cities was compared among the available land use analyses. 2000 LANDSAT images of the City of Idaho Falls were compared with the analyses which did identify cities. The ESHM Committee agreed that the SRBAS91LU (IDWR, 1994) analysis provided the most accurate delineation of cities. For further details on the delineation of wetlands and cities, the reader is referred to ESPAM Design Document DDW-015.

Figure 25 shows a composite coverage of irrigated lands, wetlands, cities and soil types on non-irrigated lands (to be discussed in a later section). Figure 25 reflects the land use which was used in compiling the ESPAM recharge and discharge.

Estimation of Recharge/Discharge

Estimation of aquifer recharge and discharge includes estimation of many intermediate variables which are used to calculate the net recharge to the aquifer. For example, even though precipitation contributes to aquifer recharge, it is actually used as an intermediate variable for estimating recharge on surface-water irrigated lands, discharge from ground-water irrigated lands and recharge on non-irrigated lands. The reason it is treated as an intermediate variable is that some estimate must be made of the amount of precipitation which evaporates versus the amount which is available to recharge the aquifer. Similarly, evapotranspiration on irrigated lands, canal seepage, irrigation return flows (irrigation water returning to the surface water system which includes end of canal spills and surface run-off), off-site pumping and crop mix are used as intermediate variables in the estimation of aquifer recharge and discharge associated

with irrigation. The next sections will discuss how these variables are used in the estimation of net aquifer recharge as well as how these variables are estimated.

Other components of aquifer recharge and discharge are estimated directly. These include tributary basin underflow, perched river seepage, pumping for surface water replacement and recharge on non-irrigated lands.

The following sections describe a) the estimation of all of the components of the water budget including both intermediate variables and directly estimated components and b) how the various components are used in the water budget estimation.

Recharge on Irrigated Lands

Irrigated agriculture can result in a net recharge to the aquifer (surface-water irrigation) or a net discharge from the aquifer (ground-water irrigation). The land use analysis described above identified irrigated agriculture, but a separate analysis was required to delineate surface-water irrigated lands from ground-water irrigated lands.

Estimation of net recharge to the aquifer from surface-water irrigated lands requires surface water diversion, irrigation return flow, canal leakage, precipitation and evapotranspiration data. The calculation is as follows:

$$\text{Field Delivery} = \text{Diversions} - \text{Canal Leakage} - \text{Return Flows} \quad \text{(Eq. 8)}$$

$$\text{Net Recharge (surface)} = (\text{Field Delivery} + \text{Precipitation}) - (\text{ET} \times \text{Adjustment Factor}) \quad \text{(Eq. 9)}$$

Ground-water pumping rates have only been measured since the mid-1990s on the ESRP. The measurement methods are not consistent throughout the plain, so measurement data is not yet reliable. Additionally, the data that do exist record gross pumpage and not net extraction. The lack of historical ground-water pumping

measurement data and the lack of consistency in the measured data required an alternative method of estimating net discharge from ground-water irrigation. Net discharge from the aquifer from ground-water irrigated lands is estimated using evapotranspiration, offset by available precipitation. The rationale behind this method of estimation is that any ground water which is pumped in excess of crop demand (ET) will infiltrate back into the aquifer. The calculation is as follows:

Discharge from aquifer = Precipitation - (ET x Adjustment Factor) (Eq. 10)

By agreement, the ESHM Committee and modeling team decided that surface runoff was negligibly small and could be disregarded for this calculation. Similarly, because precipitation and ET were estimated for the full year, it was agreed that soil moisture content could also be neglected.

When the precipitation exceeds the demand, there will be a net recharge to the aquifer on ground-water irrigated lands. When demand exceeds precipitation, there will be a net discharge.

Precipitation

Precipitation for the study period was estimated using PRISM (Parameter-elevation Regressions on Independent Slopes Model) maps produced by the Oregon Climate Service and the Spatial Climate Analysis Service (Daly and Taylor, 1998). PRISM uses point data, a digital elevation model, and other spatial data sets to generate gridded estimates of several spatial and temporal climatic parameters, including precipitation. A summary of the steps taken to estimate precipitation is provided below. For more detailed information on the estimation of precipitation for the ESPAM, the reader is referred to ESPAM Design Document DDW-011.

PRISM distributes point measurements of monthly, seasonal, and annual precipitation to a geographic grid of four kilometers by four kilometers. By use of a resampling algorithm, two-kilometer by two-kilometer resolution grids can be estimated. These grids are produced in a GIS-compatible latitude-longitude grid or a gridded map projection.

Monthly PRISM maps for the study area for 1980 through 1997 were obtained from the Spatial Climate Analysis Service. As of the estimation of the ESPAM water budget, maps were not available for 1998 through 2002. For consistency in precipitation data estimation, a method was devised, with the concurrence of the ESHM Committee, to interpolate precipitation data between weather stations for the years 1998-2002. The method is described below.

Precipitation data for the years 1998 to 2002 were purchased from NOAA (http://lwf.ncdc.noaa.gov/oa/ncdc.html) for all NOAA stations on the eastern Snake River Plain. These data series include precipitation values, in inches, and the departure from normal values, in inches.

In order to maintain precipitation data consistency over the entire 22-year study period, 1998 to 2002 NOAA data were processed with 30-year average PRISM data to achieve consistent data formatting with the PRISM two-kilometer by two-kilometer grids for each monthly precipitation map. This 1998 to 2002 NOAA processed dataset was then used to supplement the 1980 to 1997 PRISM dataset. A detailed description of the NOAA data processing follows.

Using the NOAA departures from normal values and the NOAA monthly actual precipitation values, a normal for each NOAA station was calculated. Then, actual

precipitation as a fraction of the normal was calculated for each NOAA station. This resulted in a multiplier which, when multiplied by the normal value, gave the actual NOAA precipitation value. A set of multipliers was calculated for each month for the period of January 1998 to April 2002. Using ArcView3.2, the point-value multipliers were interpolated to a raster surface of NOAA multipliers. The NOAA multipliers were applied to the PRISM 30-year average monthly precipitation data using ArcView 3.2. The multiplier datasets were applied to the 30-year average PRISM rasters to produce monthly precipitation rasters for the 1998-2002 period.

Once monthly precipitation maps were generated for the full model period, the monthly rasters were summed into the same time periods as the ESPAM stress periods. Figure 26 shows example PRISM precipitation maps for average precipitation for the 22-year model period, for both the irrigation season and the non-irrigation season. Inspection of Figure 26 shows the great difference between irrigation season and non-irrigation season precipitation on the ESRP. Figure 27 shows the annual total precipitation for each year of the study period. Inspection of Figure 27 shows that there is a great degree of annual variation in precipitation.

Crop Mix

Knowledge of the mix of grown crops is necessary for the estimation of evapotranspiration. Differences in crop mix can change average ET by as much as ten percent, which translates into 1.7×10^{10} ft^3 (400,000 AF), or approximately seven percent of the aquifer water budget, assuming two feet of ET on 2,000,000 irrigated acres and a 6,000,000 acre-foot aquifer budget. The final crop mix used for the ESPAM was calculated based on data from several sources of crop statistics data, as discussed below.

The primary data source is the National Agricultural Statistics Service (NASS) crop report data, which are based on county-wide surveys of farm operators. These data are available in three formats for the study area. These are the Published Estimates Data Base On Line (USDA, 2000), the US Agricultural Census (USDA, 1992, 1997) and the Idaho Agricultural Statistics (Idaho Department of Agriculture, 1981 - 2002) reports. The Published Estimates Data Base On Line (PEDB) version provides county-wide acres planted and harvested, by crop. These reports do not include alfalfa hay for the earlier years of the study, so 1982 and 1987 values from the US Agricultural Census (Ag Census) version of the NASS data for alfalfa were used. The Idaho Agricultural Statistics (IAS) report was used to fill in gaps in the PEDB potato data. The Agricultural Census reports provide more detailed results, including details of irrigated and non-irrigated acreage by county, for the years 1982, 1987, 1992, and 1997. The IAS report is compiled from NASS data and includes yearly values for irrigated and non-irrigated acreage, by county, for major crops. As of the time of this study, the IAS data were available for years 1980 through 2001. Many of the county agents interviewed recommended the NASS/IAS data.

About half of the counties in the study area have farmed land both inside and outside the study area (Figure 28). It is possible that the crop mix outside the study area is different than the mix inside. The potential errors associated with these crop differences were first assessed by estimating a “reasonable” and “extreme” crop mix for lands inside the study area, and calculating volume of ET for each. The analysis was performed for Bonneville and Cassia Counties. The result of the analysis was that “irrigated only” crop report data provided a better representation of the study area than

did county-wide data. Therefore, whenever possible, “irrigated only” (agricultural census or IAS) data were used.

The final data compilation uses the published Idaho Agricultural Statistics (Idaho Department of Agriculture 1981 - 2002) data with some refinements, as detailed in ESPAM Design Document DDW-001. Final crop mix fractions by year and county are listed in Table A-4 in Appendix A. The crop evapotranspiration estimates compiled from crop mix data and reference evapotranspiration data indicated that year-to-year variation in total crop consumptive use is very small. A more detailed description of the evaluation of crop mix for the ESPAM can also be found in ESPAM Design Document DDW-001.

Evapotranspiration

One of the largest components of discharge on the ESRP is evapotranspiration, a combined variable encompassing evaporation and plant transpiration. Evapotranspiration is controlled by climate as well as crop and soil characteristics. Climate affects the evaporative power of the atmosphere, reflecting the energy available to drive evapotranspiration and the capacity of air to accept evapotranspired water. Soil and plant characteristics control the crop’s ability to extract water from the soil, and biological characteristics of the crop control the transpiration response to evaporative power. Soil texture, surface wetness and condition and shading by plants control the soil’s response to evaporative power. Although far more water evapotranspires during the growing season, there is still measurable evapotranspiration during the non-growing season. For the ESPAM, growing season ET was estimated separately from non-growing season ET.

Growing season evapotranspiration was estimated primarily using an alfalfa reference ET scaled by crop coefficients. The alfalfa reference ET is available for each

NOAA weather station within the ESRP. Allen (2002) evaluated five different ET calculation methods. The Kimberly-Penman Alfalfa Reference method was chosen as most suitable for the modeling application (Allen, 2003). This method was developed with Idaho empirical data and of the five methods is the most directly comparable to the reference ET reported in Estimating Consumptive Irrigation Requirements for Crops in Idaho (Allen and Brockway, 1983) data and to Agrimet (U.S. Bureau of Reclamation, 2003) estimates.

The selected data series provides only reference ET, but calculation of crop ET also requires crop coefficients (Kc values). Coefficients for individual crops were extracted from the original Allen and Brockway (1983) data by dividing individual crop ET by reference ET, for each weather station each month. The original data only include typically grown crops for each location. To avoid calculating zero ET if an atypical crop is grown, Kc values for all crops were assigned to all weather stations. Missing values were supplied from nearby stations. The variation of Kc between weather stations for any given crop is low (Allen, 2003). Because the data for each county include values for all typically grown crops, missing values represent rarely-grown crops. Therefore, this substitution will affect only a few acres within any stress period and has a very low potential of introducing error. An average Kc value was determined for each county which was an average, weighted according to the proportion of crops, from the nearest NOAA station data. This was performed for each model stress period.

ET estimation for this project included a remote sensing analysis of ET using the METRIC algorithm (Allen and others, 2002; Allen and others, 2005; Morse and others, 2000) for the 2001 growing season. METRIC results were used to calculate ET

adjustment factors. ET adjustment factors allow adjustment of ET to account for deviations from a perfectly managed crop such as a) water shortage, b) crop disease or c) post-harvest watering. ET adjustment factors may also reflect differences in ET due to source of irrigation water or method of application. Unique ET adjustment factors were evaluated for a) sprinkler or furrow application, b) ground water or surface water source and c) irrigation entity. The METRIC analysis indicated that the Kimberly-Penman estimates of ET are consistent with crops which are furrow-irrigated, but that crops irrigated with sprinklers have approximately 5% higher ET. For the ESPAM calibration, ET adjustment factors were set at 1.0 for all furrow application and at 1.05 for all sprinkler application. For more information regarding ET adjustment factors, the reader is referred to ESPAM Design Document DDW-021.

Though crops do not actively transpire in the winter time, evaporation and sublimation continue. For the ESPAM, winter-time ET is based on experiment data collected over several years at Kimberly, Idaho (Wright, 1993). The average winter ET from the Wright study is reported in Table 8.

Except for February, these values should generally be representative of the entire study area. The February value is representative of the lower-elevation portions of the study area, but February ET for higher elevation areas that are still snow covered in February is probably closer to the January average from Kimberly (personal communication, Wright, 2003). Snow increases the reflection of solar radiation back into the atmosphere, reducing the energy available to drive evaporation or sublimation. To adjust for differences in snow cover, February ET was scaled by elevation. February ET at Twin Falls (elev. 3770 feet) was set to 1.0 mm/day, and at Rexburg (4920 feet) to 0.6

mm/day. ET at other locations was adjusted using linear interpolation between the elevations at Rexburg and Twin Falls according to the equation:

ET (mm/day) = -0.0003478 x Elevation (feet) + 2.3112 (Eq. 11)

For stations higher in elevation than Rexburg, December and January ET were adjusted to be no higher than the elevation-adjusted February value. November ET was adjusted to be no higher than 120% of the adjusted February value. Table 9 lists the resulting winter-time ET values for all stations, converted to feet per month.

Figure 27 shows the annual total evapotranspiration for each year of the study period. Inspection of Figure 27 shows that there is some degree of annual variation in evapotranspiration, however, ET is relatively constant.

Source of Irrigation Water

Net recharge from surface-water irrigation is the largest component of the water budget. The second-largest component of the water budget is net withdrawal (calculated as consumptive use, or evapotranspiration) due to ground-water irrigation. The source of water for individual parcels must be identified so that diverted volumes of surface water are applied to the appropriate spatial locations. In the ESRP, aquifer water levels respond to surface-water irrigation by rising during the irrigation season and declining during the non-irrigation season. Aquifer response to ground-water irrigation is exactly opposite.

The source of irrigation water also affects the calculation of consumptive use, which depends in part on evapotranspiration (ET) adjustment factors, application method (sprinkler or gravity), and the reduction factor for non-irrigated inclusions within irrigated lands. For an individual parcel, the ET adjustment factor and sprinkler percentage from the local surface-water irrigation entity or the local ground-water

irrigation polygon are applied, depending on the water source identified for the parcel. The source of irrigation water by parcel is also required for model scenarios; for example, a hypothetical scenario might represent curtailment of a specific source of irrigation.

Water rights data provide the best information regarding source of irrigation water for each parcel of land. Many irrigated lands are either 100% surface-water irrigated or 100% ground-water irrigated. However, some irrigated lands have mixed ground water and surface water sources. This has typically occurred where surface water sources were inadequate, and supplemental ground water sources have been developed. The following sections describe the method used to determine the source of irrigation water and the method used to calculate recharge on mixed-source lands. A more detailed description of the assignment of irrigation source may be found in ESPAM Design Document DDW-017.

Geographic Information Systems (GIS) technology and Water Measurement District and Ground Water District records of actual well diversion volumes have recently become available. These sources were used for determining the source of irrigation water, in conjunction with Snake River Basin Adjudication data base records, which reflect varying degrees of resolution in the adjudication process. The adjudication data reflect accomplished changes not shown in water rights data. The adjudication data also represent legitimate “beneficial use” rights perfected before the statutory requirement to obtain a state permit for a water right. Adjudication claims are the users’ representations of water use, and exist for the entire plain. Recommendations are Idaho Department of Water Resources’ findings from investigation of claims. As of the time of this study, recommendations existed for about 2/3 of the study area. The court’s

determination of the adjudicated water right is called a partial decree. At the time of this study, partial decrees existed for a much smaller portion of the study area. Not all the partial decree data were available for automated electronic querying.

The map identifying water source by 40-acre quarter-quarter section is compiled from IDWR adjudication data with manual adjustments. Using GIS, the map identifying water source is combined with the map of irrigated lands (Figure 25) to identify irrigation water source for all irrigated lands. Figure 29 shows the GIS map of water source used in model calibration.

There are some limitations to the available water rights data. The ground-water diversion volume data only cover the years 1997 through 2002, and may have missing values, especially for the earlier years. These data were used to verify irrigation water source assignment which was based on adjudication data. The adjudication claims are uninvestigated representations of water users. Recommendations and partial decrees reflect the legal authorization to use water, not necessarily the actual practice. Because of the common occurrence of overlapping water rights, the ratio of ground-water to surface-water rights in a quarter-quarter section is not useful for determining the mix ratio on mixed-source lands.

Potential errors in the mix ratio apply only to the 13% of the quarter-quarter sections identified as mixed-source in the adjudication data. The modeling team, in conjunction with the ESHM Committee, developed a method for apportioning the mixed-source lands to either ground-water or surface-water irrigation. Consumptive use for mixed-source irrigated lands was evaluated for each irrigation entity. Assuming a requirement of 4 feet of delivered water (to meet consumptive use, conveyance loss and

irrigation inefficiencies), the team estimated how many acres could be satisfied by the recorded diversions. The balance of the irrigated acres was assigned to ground-water source. It was acknowledged that the actual split may change from irrigation season to irrigation season depending upon the surface water supply and that no record is kept of supplemental ground water use. This analysis resulted in approximately 63% of mixed-source lands within the study area being assigned to a ground-water source (ESPAM Design Document DDW-017).

The operation of the Fortran recharge tool implicitly adjusts for changes in ground-water use on mixed-source lands, by the process used to calculate net recharge. Within the tool, full irrigation requirement (consumptive use minus precipitation) is applied to all irrigated lands as an aquifer extraction. On lands with surface-water supplies, net surface-water application is applied as aquifer recharge, offsetting the required irrigation extraction. For each stress period and each surface-water irrigation entity, the net depth of surface-water application is calculated based on the diversion and return data for that stress period. The application depth is based on the full acreage of surface-water only parcels and a portion of the acreage (based on the source fraction described above) of mixed-source parcels. Then, within each model cell, the stress-period-specific application depth is applied as an aquifer recharge. The applied water is pro-rated to mixed-source and surface-water-only parcels based on the source fraction. Where application exceeds irrigation requirement (surface-water-only parcels) a net recharge is inferred. Where irrigation requirement exceeds application (mixed-source parcels) a net withdrawal is inferred. On mixed-source parcels, in years with high surface-water supplies, the difference between irrigation requirement and surface-water

supply is small and small amounts of net ground-water pumping on these mixed lands are represented in the model water budget. When surface-water supplies are low, the difference is large and large amounts of ground-water pumping are represented.

Reduction for Non-Irrigated Inclusions

The irrigated lands shown in Figure 25 represent the spatial extent of irrigated areas. However, some portion of these areas is actually non-irrigated areas such as roads, homes, rock piles and canal banks. During the estimation of recharge and discharge, the actual square footage of irrigated area in each model cell is reduced by a factor which accounts for these non-irrigated inclusions. For the ESPAM calibration period, irrigated areas were reduced by 12%. The reduction factor was determined using a GIS analysis of individual parcels mapped by IDWR as part of the Snake River Basin Adjudication (Norquest, 2002). ESHM Committee members agreed that 12% was a reasonable estimate for reduction in irrigated area.

In the GIS/Fortran Recharge Tool (described in Appendix B), the capability exists to specify a reduction factor for each model stress period by application method. This enables the user to reflect a potential different reduction factor for sprinkler versus gravity irrigation for each time period. For the ESPAM calibration, the consensus of the ESHM Committee members was that the estimate of non-irrigated inclusions derived from IDWR GIS data, which showed no statistically-significant difference between sprinkler and gravity application, represented the best available estimate for the irrigated lands reduction factor.

Aggregation of Canal Companies into Surface Water Entities

There are more than 100 surface water irrigation companies and numerous private surface water irrigators within the ESPAM boundary. Many of these irrigation companies share common acreage. In order to treat all surface water irrigated areas in a consistent manner, these surface water irrigation companies are aggregated into a smaller number of 'irrigation entities.' The aggregated irrigation entities more accurately reflect the delivery of surface water to the irrigated areas by maintaining a level of resolution consistent with available diversion and return flow data.

A similar surface water irrigation company aggregation was performed for the original UI/IDWR SRPAM model. Because GIS software was not available at that time, the irrigation company aggregation was a more difficult process and took much longer to complete. The earlier aggregation resulted in approximately 172,000 acres throughout the plain being assigned to an un-named surface-water entity.

For the current study, the process of aggregating surface water irrigation companies entailed evaluating each irrigation company to identify the point of diversion from the river and the likely corresponding irrigation return flow location. Adjacent irrigation companies were then examined for similar characteristics, including irrigation practice, points of diversion, common conveyance, location of irrigation return flow, soil type, water right priorities, common drainage area, and previous aggregation in the earlier UI/IDWR SRPAM model. If adjacent irrigation companies did not have any significant differences from one another, they were aggregated into the same irrigation entity to maintain a level of irrigation company resolution consistent with the resolution of the diversion and return flow data.

Most private water rights within the model boundary were aggregated with the organized irrigation companies. The private rights that were not aggregated with adjoining entities are: Camas and Beaver Creek (Basin 31), Birch Creek and Medicine Lodge Creek (Basin 32), and Little Lost River (Basin 33). The private rights in these three basins were aggregated separately from each other and from the irrigation companies because of different practices and water supply than the organized companies. Source of irrigation water was determined from IDWR adjudication data (see ESPAM Design Document DDW-017).

Three irrigation companies in the Mud Lake area, including Jefferson Irrigation Company, Monteview Canal Company Incorporated, and Producers Irrigation Company, do not use surface water for irrigation. These companies use off-site ground water pumping and were aggregated as a surface water irrigation entity for model purposes. With ordinary ground water irrigation, it is assumed for modeling that the pumping and the recharge occur within the same model cell. This is not the case for the aforementioned canal companies. The wells used to obtain water are miles from the place of use and conveyed by a canal. Therefore, in the model, the pumping and recharge would occur in different model cells. Because many irrigation companies that use off-site ground water pumping co-mingle the pumped ground water with the surface water in the canals, the ground water withdrawal was treated as a point extraction assigned to the model cell. This withdrawal, or volume extracted, was added to the surface water diversions for the respective irrigation entity. When water master records were not available to determine the amount of ground water pumped, estimates were made. For

the three companies mentioned, the surface-water component is set to zero, since there is no surface-water supply.

The aggregation process resulted in 43 irrigation entities (Table 10). These 43 entities were assigned an identification number (for use by the GIS/Fortran Recharge Tool) and a descriptive name. Descriptive names were created by choosing the largest (by area) organized irrigation company in the entity, and adding on to that name the number of organized companies aggregated to create that entity. For example, aggregated entity IESW16, named "Egin 2", consists of two organized companies, Egin Bench Canals Inc. and St. Anthony Union Canal Company, of which Egin Bench Canals Inc. is the larger (by area), of the two companies. (Note that a mid-project recombination of some of the entities to correspond to new return-flow data resulted in some entities whose names may violate the "biggest company" naming convention.) Figure 30 shows the final set of irrigation entities. For a more detailed description of the aggregation of canal companies into irrigation entities, the reader is referred to ESPAM Design Document DDW-008.

Delineation of Ground Water Irrigation Polygons

This section describes the designation of portions of the study area into "Ground Water Irrigation Polygons" for the purpose of recharge calculation. The withdrawals associated with irrigation from ground water are a negative recharge and are calculated based on adjusted ET and precipitation. The ET adjustment factor is applied according to the geographic location of the irrigated land being calculated and the method used to apply irrigation water. ET adjustment factor and application method parameters for

irrigation from ground water are carried as attributes of the ground water irrigation polygon map.

The goals in constructing the ground water irrigation polygon map were to adequately represent known differences between geographical areas and management practice and to minimize the number of unique ground water polygons (to reduce data management concerns and recharge tool run times). Because these ground water irrigation polygons are only used for assigning ET adjustment and application method parameters for recharge calculation, no requirement was made that polygons be contiguous areas. Similarly, the ground water irrigation polygons assigned for recharge calculation are not based on current ground water management areas or measurement districts, nor is it contemplated that these polygons would form the basis for any administrative boundaries or decisions.

Because both ET adjustment factor and percent sprinkler application are driven largely by cost of water, and because the primary cost of ground water is the energy cost for lifting water out of the ground, depth-to-water was used as the basis for delineation of the polygons. Relative to the range of depths on the plain, water level changes since 1980 are minor, so a single water table map was deemed adequate for the delineation. Figure 31 shows the depth-to-water map used for the analysis, digitized from a paper map created by Lindholm and others (1988).

Pumping lift was hypothesized to influence the cost of water and crop production and consequently the intensity of management. Regional variations in cropping patterns and climate throughout the Snake Plain were also considered to be factors in management intensity. Intensively managed crops are expected to approach the ideal values of crop

coefficients. Poorly managed crops are expected to exhibit less evapotranspiration. Depth to water (pumping lift) provided a basis for dividing the Snake River Plain into GIS polygons. These polygons were then subdivided based on location within the plain. That is, if a single polygon represented a depth to water of 100 to 200 feet, this polygon would be divided into two units if this depth range existed in both the southwest and northeast portions of the plain. The final GIS polygons are presented in Figure 32. The central portion of the plain is absent of irrigation which is identified as polygon IEGW600 in Figure 32.

The Mud Lake area and the U.S. Bureau of Reclamation project known as the "A & B Irrigation District" were the first large-scale applications of ground water on the plain (Goodell, 1988). These developments pre-dated the widespread use of sprinklers, while most other ground water development post-dated the use of sprinklers. Field observations show that the Mud Lake area still has a different mix of application method relative to other ground-water areas. The same is true of the A & B Irrigation District (Temple, 2002). For this reason, these two areas were partitioned into their own, unique ground water irrigation polygons.

Method of Irrigation Application

An analysis was done to identify what percentage of irrigated areas has been irrigated by sprinkler versus furrow irrigation throughout the simulation period. Because actual evapotranspiration may be affected by the type of application system used (as well as other factors), and because changes in application system type (e.g. conversion from gravity to sprinkler) have occurred during the period of the study, a method for identifying application method and describing changes was required. Identification of the

method of irrigation application on each parcel of land allows application of ET adjustment factors for deviations from predicted ET which are associated with sprinkler or furrow irrigation.

Previous modeling efforts have not included an ET adjustment factor, so there has not been a need to identify application method. Neither Garabedian (1992) nor IDWR (1997a) explicitly referred to consideration of application method in irrigation calculations. Goodell (1988) used application method to derive discharge pressure parameters for pumpage calculations, but not for recharge or ET calculations. IDWR (1997a) adjusted for non-irrigated inclusions based on a distinction between ground water and surface water, but examination of maps indicates that it is likely the difference is actually driven by application method, and water source was used as a surrogate.

Available data included Geographic Information Systems (GIS) electronic maps that delineate the irrigated lands in the study area in 1982 and 1992 as sprinkler or gravity irrigated (IDWR 1982, 1992). The Natural Resource Conservation Service National Resource Inventory (NRI) includes a report of a statistical sample indicating percent of irrigated acres using pressurized (sprinkler) systems by 8-digit Hydrologic Unit Code area or by Major Land Resource Area (MLRA) (NRCS, 1997). NRCS also classifies drip irrigation as a pressurized system but this is such a minor practice within the current calibration period that it is neglected here.

Since the 1982 and 1992 GIS maps represent the most certain data, and the data with the best spatial resolution, these maps were used as the primary data source. The NRI data are statistically-based, and quantify percentages, so they were used to establish overall percentages for 1987 and 1997.

Initial tables of sprinkler percentage for each irrigation entity or polygon were constructed for 1982 and 1992, using GIS and the 1982 and 1992 maps. From the irrigation entity and water source maps (Figures 29, 30 and 32), all ground-water-irrigated and mixed-source lands in each ground water polygon, and all surface-water-irrigated and mixed-source lands in each surface-water entity were identified using GIS software. These maps were intersected with the application method maps to produce maps of irrigated lands with appropriate water source, by application method, by ground water polygon or irrigation entity. The total area of each method, within each entity, was used to calculate a sprinkler percentage for each entity or polygon. This process was done for both 1982 and 1992. The result was a table of values, having a unique sprinkler percentage for each irrigation entity or polygon, for the break-point years 1982 and 1992.

The NRI data were used as a secondary source, to determine sprinkler percentages for 1980, 1987, 1997 and 2000. Sprinkler percentages for other years were linearly interpolated between these values. Table 11 lists the ratio of area under sprinkler application for each ground-water and surface-water entity for each of the years for which data were available.

The complete table used in model calibration includes values for each stress period and is presented in Appendix A, Table A-5. Figures 33 and 34 show the spatial distribution of the sprinkler fractions for the years 1980 and 2000 by surface water irrigation entity and by ground water polygon, respectively.

Surface Water Irrigation

Net recharge incidental to surface irrigation occurs when more irrigation water is applied and remains on the field than the crop demands. As noted in Equation 8, field

delivery is the volume of water diverted minus canal leakage and irrigation return flows. Net recharge to the aquifer is estimated as the field delivery plus precipitation, less adjusted ET (Eq. 9). Precipitation and adjusted ET have been discussed in previous sections. The following sections discuss estimation of irrigation diversions, return flows conveyance loss and the estimation of net recharge due to surface water irrigation.

Irrigation Diversions

In order to effectively and accurately estimate percolation to the aquifer due to surface water irrigation, irrigation diversions from the river must be estimated with the highest possible degree of accuracy. Irrigation return flows to the river and evapotranspiration are also components of calculating percolation from surface water irrigation.

For Snake River diversions, two sources of data were considered for use in estimating surface water irrigation diversions. The first source is irrigation diversion and return flow 'raw' daily data from the water districts, and the second source is 'processed' monthly data that is used in the IDWR Reach Gain/Loss Program. For consistency with the IDWR Reach Gain/Loss Program estimates of reach gains that were used for model calibration, the 'processed' monthly data were used to estimate irrigation diversions.

The diversion data which are used as input to the IDWR Reach Gain/Loss Program were assigned to appropriate canal companies. The diversion data for each canal company were aggregated into the appropriate surface irrigation entity by use of a Microsoft Excel spreadsheet, described below. More information about the estimation of Snake River surface irrigation diversions is available in ESPAM Design Document DDW-012.

Data for surface water diversions from sources other than the Snake River were primarily available from watermaster records. The actual data were obtained from various sources, including electronic files from Idaho Department of Water Resources (2001), paper and microfiche watermaster records (IDWR, 2002b), and other sources. In the case of watermaster reports, data were generally available as annual summaries. Monthly fractions were determined by hand calculation from a sample of microfiche or paper copies of daily watermaster records, and applied to annual data. The irrigation entities which use some non-Snake River diversions are IESW005, IESW007, IESW008, IESW025, IESW029, IESW037, IESW051, IESW052 and IESW054 (see Table 10). A complete description of the non-Snake River diversion data is available in ESPAM Design Document DDW-024.

Using both the Snake River and non-Snake River diversions and the aggregated surface water irrigation entities, a spreadsheet was created in Microsoft Excel to estimate surface water irrigation diversions for each surface water irrigation entity. This spreadsheet was also used to perform the calculations to estimate irrigation return flows to the Snake River, using monthly diversion data and return flow percentages (see section on Irrigation Return Flows).

The spreadsheet contains separate worksheets for each irrigation entity. Each worksheet contains the diversion data and return flow factors for all of the irrigation companies and private irrigators which comprise the associated irrigation entity.

Irrigation return flow factors (discussed in the following section) are applied to the respective diversion data on each worksheet of the spreadsheet file. The monthly diversions and returns for each canal company and private irrigator are summed to yield

the monthly diversions and returns for the irrigation entity. Table A-6 lists the diversion volume for each irrigation entity for each stress period.

Irrigation Return Flows

Forty-six irrigation returns were measured as part of this study. The sites were selected and measured in a joint effort between Idaho Power and the U.S. Geological Survey, with oversight from the ESHM Committee. Irrigation return flow locations on the Snake River below American Falls Reservoir were suggested by IDWR to match the sites used in a study conducted in 1985-86. For the upper Snake River, candidate sites were identified from a video taken during a helicopter flight over the Snake River above American Falls and the Henrys Fork.

The site selection was verified through field work. Each selected site was assigned a standard eight digit USGS gage identification number. Pressure transducers with data loggers were installed at each site and irrigation return flow data were collected for the 2002 and 2003 irrigation seasons. The reader should note that both 2002 and 2003 were extraordinarily dry years, so the measured return flows from these two seasons may not be representative of other years. However, very little measured return flow data exist for the ESRP. Table 12 lists the site name, location (lat/long) and USGS identification number for each measured site. Maps of site locations above and below American Falls are included in Figures 35 and 36, respectively.

Each return flow was assigned to an appropriate irrigation entity as defined in ESPAM Design Document DDW-008. The assignment was accomplished using the maps of irrigation entities (Figure 30) and return flow locations (Figures 35 and 36). The assignment was made based on location, land elevations and canal locations. Some of the

returns on the Henrys Fork serviced more than one irrigation entity. The number of return sites per entity ranged from as many as ten for IESW032 (Twin Falls Southside) to one site shared by three irrigation entities on the Henrys Fork of the Snake River. Several entities were grouped together for the purpose of return flow calculation rather than try to parse the amount diverted from a single diversion between two or more entities. This procedure resulted in aggregating the returns and diversions into ten unique groups that were used to calculate the return flow lag factors. Table 13 lists the grouping of irrigation entities used to estimate return flow percentages. Diversions were summed for each of the return flow groups. Using measured return flows and an estimate of the volume of un-measured return flows for each group, a total percentage of irrigation return flow was estimated. This percentage was used to reduce the total diversion by the fraction of return flow to estimate how much water to apply to lands irrigated with surface water. Figure 37 shows the net irrigation diversions (minus return flows) and return flows for each year.

It should be noted that the Milner-Gooding Canal is used to deliver Snake River water directly to irrigation and also to deliver Snake River water into the Big Wood River, for downstream re-diversion by other canals. The data in their native format include this water as a Snake River diversion to the Milner-Gooding Canal and also as a Big Wood River diversion to other canals. To prevent this from causing double-counting of surface water applied to land surface, deliveries from the Milner-Gooding Canal directly into the Big Wood River were treated as return flows in the net-diversion calculations for entity IESW007. Due to this adjustment, the variability of the return-

flow values shown in Figure 37 is somewhat dampened and the magnitude is somewhat amplified.

Irrigation diversions and return flows are also used for the estimation of river gains and losses, which are discussed in a later section. In addition to the return percentage, the measured return flow data were also used to calculate the lag time of return flows in support of the estimation of river gains and losses. Examination of typical hydrographs of surface water returns versus diversion records indicates that there is a time lag between the timing of the diversions and the timing of the returns. A typical return flow hydrograph shows an increase as the irrigation season progresses. The diversions will remain constant or actually decrease during this same time period. The increase is likely due to increased returns as the fields and canals become saturated.

This phenomenon was dealt with by applying the concept of lag factors. Lag factors are the portion of the diverted water which returns to the river in each month following diversion. The lag factors are a time series of ratios. For example, a typical lag factor series might be (.01, .03, .07, .02, .01). Applied to a single month's diversion, this would mean that 1% of the diverted water returns in the first month, 3% in the second month, 7% in the third month, etc. By applying the lag factor series to the monthly diversions, the net diversion and return flow for each model stress period can be calculated. The sum of the lagged factors equals the total return percentage used in calculating net diversions.

Up to twelve lag factors could be used but more than five were never needed to obtain a "best fit" to the measured return flow data. The lags were estimated using an Excel spreadsheet. Measured return flow hydrographs were compared with predicted

return flow hydrographs. The return flow lag factors used to generate the predicted return flow hydrographs were adjusted until a reasonable match was obtained between predicted and measured hydrographs. This process was repeated for each of the ten groups of irrigation entities. Table 14 shows the final return flow lag factors for each of the ten groups of irrigation entities. ESPAM Design Document DDW-005 describes the estimation of return flow lag factors in detail. ESPAM Design Document DDF-007-2002 summarizes the measured return flow data for the 2002 season.

Irrigation entities for which there were no measured return flows were correlated with one of the ten groups of entities based on a) magnitude of diversions, b) method of irrigation application, c) regional similarity and d) similar crop mix. The return flow lag factors for the correlated entity were applied to the entity for which there were no measured return flows. These lag factors were entered into the input data sets for the IDWR Reach Gain/Loss Program which is used to estimate monthly Snake River gains and losses.

During model calibration, comparison of net model recharge with measured hydrographs indicated that there was too much water being applied to the model in the latter ten years of the calibration period. Inspection of the data indicated that the first ten years of simulation showed generally high water levels, corresponding to wet hydrologic conditions and high rates of recharge. This was followed by a decline in simulated water levels and then by a return to the high levels simulated for the first wet period. Observed water levels showed this same general trend, but in the second ten-year period, water levels did not quite return to the levels observed during the first ten-year period. The discrepancy between these two temporal patterns suggested that estimated net recharge

was too high during the latter part of the calibration period. After much discussion, the ESHM Committee agreed that applying an increase in irrigation returns would serve the purpose of reducing the net recharge. This adjustment was made to help balance the water budget and did not imply any knowledge of the trends of irrigation return flows over time. Irrigation return flows have largely been un-measured on the ESRP despite the fact that return flows are such an important element of the water budget. The current study was limited to using measurements from the 2001 irrigation season and some limited measurements which were made in the 1985-1986 seasons. Efforts to measure return flows on the ESRP should be continued into the future so that the return flows can be better characterized and the new information can be incorporated in future modeling and calibration efforts. Table A-7 lists the return flow volume for each irrigation entity for each model stress period.

Conveyance Loss

Some of the water lost from irrigation is seepage from canals and ditches. This water is not available for irrigation and therefore neither available for crop evapotranspiration (ET) nor for recharge associated with irrigated agricultural fields. However, the leakage is still a component of recharge associated with irrigation activity. Seepage from canals can be an important source of aquifer recharge. Long canals in porous soils can lose 40% or more of the water diverted from the source (Chavez-Morales, 1985). In Idaho's climate, virtually all of this loss is associated with leakage to the aquifer (Dreher and Tuthill, 1999). Canal leakage can be represented by explicitly identifying leakage rates and locations. Or, a simplified approach can be taken by

assuming that canal leakage is spatially distributed across the irrigated lands served by the canal.

Most canal systems have a large main canal or canals, supplying secondary laterals. These in turn supply individual farm ditches. Because size, construction, and maintenance of laterals and farm ditches are highly variable, estimating leakage on these secondary conveyances is difficult. Alternate wetting and drying can damage the "skin of sediment and biological slime" that helps seal canals. Smaller channels have more frequent drying cycles, and have more wetted perimeter relative to total flow capacity, so losses in these ditches are often higher than in main canals (Hubble, 1991). These laterals and farm ditches are widely distributed across irrigated areas. For these reasons, the simplified approach often closely reflects reality.

In prior Eastern Snake Plain models, a mixed approach has been taken. Garabedian (1992) treated three canals - Aberdeen-Springfield (95,000 AF/year), Milner-Gooding (97,000 AF/year), and Reservation (11,000 AF/year) - as leaky. IDWR (1997a) treated only the Milner-Gooding Canal as leaky and attributed 146,000 AF of annual leakage to that canal. In both models, all other canal leakage was assumed to have spatial distribution similar to the spatial distribution of irrigated lands.

In the ESPAM, Northside, Milner-Gooding and Aberdeen-Springfield canals are represented as leaky. These are high-volume canals with significant leakage along reaches that do not correspond with the irrigated places of use. Figure 24 shows a map of the canals which are represented as leaky in the ESPAM. Some of the canal reaches shown in Figure 24 are sub-reaches of the three canals mentioned above.

Seepage is a function of the hydraulic conductivity of the bed material, the wetted perimeter, and the head (depth of water) in the canal. Because wetted perimeter and head can vary with flow, there is conceptual justification for using a percentage of flow to describe leakage. This is sometimes done in irrigation system assessment (Hubble, 1991) and has been used in aquifer modeling (Booker and others, 1990). Canal leakage can also be represented as a specified rate (volume per time), which has also been used in ground-water modeling efforts (Garabedian, 1992).

Because both specified-rate and percentage-based leakage rates are supported in the literature and can be justified conceptually, either was a candidate for use in the ESPAM. Since a diversion rate partially controls seepage (apparent from the Chavez-Morales (1985) data), and since a percentage calculation guarantees that there will never be leakage calculated in a period without diversions, a percentage-based method was selected for the ESPAM. Canal leakage was applied to linear GIS features representing leaky sections of canal. The GIS/Fortran Recharge Tool accommodates multiple leaky canal sections per irrigation entity, each with a unique leakage rate. The leakage rate can also be varied with time. Locations and leakage rates were assigned based on interviews with canal company personnel and results of previous studies. Some laterals of the Northside Canal were added in response to comparisons between model-predicted hydrographs and observed hydrographs at some wells, during early stages of calibration. For the Northside and Milner-Gooding canals, a constant leakage rate was used throughout the study period. For the Aberdeen-Springfield canal, unique values were assigned to each stress period based on canal-company data (Howser, 2002).

Varying canal seepage within a season may allow a better fit to measured heads in wells. While it is acknowledged that intra-season variation in canal leakage may occur, and that these differences may propagate into aquifer heads, data were not available to adequately represent these conditions for the calibration period. Leakage rates were based on interviews with canal personnel and checked against values published by Garabedian (1992) and IDWR (1997a). Because imprecision in calculating canal leakage affects only the spatial distribution and not the total amount of recharge, and because of the danger of introducing error by synthesizing data, canal leakage for the model calibration period was estimated as a constant percentage of diversion volume within each irrigation season. To allow for future testing of various scenarios, the GIS and Fortran components of the recharge tool allow unique canal leakage percentages to be applied to each stress period. The data available from the Aberdeen-Springfield Canal Company are annual volume totals, so the fractions calculated were based upon annual volumes. Table A-8 lists the canals, the assigned irrigation entities and the seepage percentages used during the simulation for each of the canals.

Net Recharge from Surface Irrigation

Net recharge due to surface irrigation is calculated in the GIS/Fortran Recharge Tool (Appendix B). The GIS component of the tool prepares text data files containing a) a mapping of surface water entities to model cells within each entity's service area, b) reduction factors for non-irrigated inclusions, c) ET and precipitation for each model cell for each stress period, d) ET adjustment factors, e) diversion data, return flow percentages, canal leakage percentages and sprinkler proportion for each model stress

period for each surface water irrigation entity and f) off-site pumping volume delivered for irrigation.

For each model cell, for each stress period, the GIS/Fortran Recharge Tool calculates the net recharge due to surface water irrigation according to Equations 8 and 9. The net recharge from surface water irrigation is added to other estimated recharge and discharge (for example, ground-water withdrawals in the same model cell). Figure 37 shows the net recharge due to surface water irrigation for every year of the calibration period. Inspection of Figure 37 shows that there is approximately a 2 million-acre-ft variation in net recharge due to surface water irrigation between the highest and lowest years of the 22-year calibration period. This reflects the great variation in natural water supply. This also reflects the important role that incidental recharge to the aquifer from surface water irrigation plays in aquifer recharge.

Ground Water Irrigation

Net discharge from ground-water irrigation is estimated as consumptive use (ET) offset by available precipitation (Eq. 10). ET adjustment factors are applied to the estimated evapotranspiration based on source of irrigation water and method of application. No difference was found between ET for ground-water or surface-water irrigation. Sprinkler irrigation was determined to consume approximately 5% more water than furrow irrigation (see ESPAM Design Document DDW-021). Figure 37 shows the net extraction due to ground-water irrigation. As can be seen in Figure 37, a relatively constant 2 million AF annually is applied to approximately 1.1 million acres of ground-water irrigated land. This reflects the relatively constant rate of ET (see Figure 27). Much of the variation in net extraction due to ground-water irrigation (a variation of

approximately 900,000 AF) is arguably driven by variation in precipitation (approximately 1,200,000 AF variation). Figure 38 shows the spatial distribution of the net extraction due to ground-water irrigation averaged for the 22-year model calibration period.

Tributary Underflow

Groundwater contributions from tributary basins, or tributary underflows, were estimated for the new model based on tributary underflow estimates published in Garabedian (1992). The Garabedian estimates were adjusted in tributary basins where the ESPAM aquifer boundary differed from the Garabedian aquifer boundary. As part of the water budget balancing process, all of the tributary underflow estimates were scaled by a factor of .97 (a net 3% reduction). Table 5 lists the average annual tributary underflow values used for ESPAM.

Recognizing that tributary underflow varies seasonally and from year to year, the average annual ESPAM tributary underflow values were scaled using normalized annual values based on measured discharges at Silver Creek. Silver Creek was selected because a) it is almost entirely spring-fed and sits on bedrock, b) there is a long-term gage on Silver Creek and c) the flows in Silver Creek reflect spring discharge from a basin which is similar to many of the Snake Plain aquifer tributary basins from the standpoint of land use, precipitation, and elevation. It is believed that flow of Silver Creek is more seasonally variable than underflow in the tributary valley. Therefore, the variation of Silver Creek discharge was dampened by 2/3 to decrease the amplitude of variation. Table 15 lists the non-dampened and dampened normalized flows for Silver Creek for each year of the ESPAM calibration period. The average annual tributary underflow

discharge for each tributary basin was multiplied by the dampened Silver Creek normalized flow for each time period, yielding the contribution from each tributary to the ground water model for each stress period. While it is acknowledged that there will be intra-year variations in flow, lack of knowledge about the basin-to-basin differences in the timing of peak flow dictated shaping underflow on a year-by-year basis (Table 5). ESPAM Design Document DDW-004 describes the estimation of tributary underflow for the ESPAM in more detail.

Recharge on Non-Irrigated Lands

This section discusses calculation of two spatially-distributed components of the aquifer water budget; recharge from precipitation on non-developed lands and spatially-distributed recharge and discharge from land uses that comprise a small fraction of the study area. These minor-use areas are dry farms, cities, and wetlands.

Precipitation on the plain is approximately 6.7 million AF per year, with 80% of this falling on non-developed lands. Garabedian (1992) estimates that precipitation on non-developed lands produces 700,000 AF of recharge per year, which equals approximately 15% of the magnitude of irrigation recharge. It is the component of recharge to which Garabedian assigns the most uncertainty. The other land uses, dry farms, cities, and wetlands, represent minor components of the water budget, with a combined net effect of about 160,000 AF per year (calculated from data reported by Goodell, 1988).

Recharge on Non-Developed Lands. A method was developed for estimating recharge from precipitation using GIS grid maps of monthly precipitation (Daly and others, 1998) and thickness and texture of soil coverage (Figure 25). The developed

method is suggested by Rich (1951). Rich studied basins which, unlike the Eastern Snake Plain, had a component of surface discharge. His relationship actually described total basin yield, but it is simplified here to represent recharge, since runoff that does occur on the plain collects in depressions where it also recharges the aquifer. The equation is:

$$\text{Recharge} = K * (\text{Precipitation})^{N} \qquad \text{(Eq. 12)}$$

where K is an empirical slope parameter and N is an empirical exponent that introduces curvature into the relationship.

Rich applied this formula to annual precipitation. The formula presumes that with less precipitation, most of the precipitation is intercepted by various mechanisms (leaf interception, depression storage, soil moisture storage, evaporation, etc.) and that with increasing precipitation, more of the precipitation is available for infiltration. Parameters K and N can be adjusted to shape the calculated recharge curves. However, knowing the actual recharge from precipitation on non-irrigated arid lands is very difficult (Gee, 1988). Attempts to use a water balance to determine the non-irrigated recharge are frustrated by the fact that another large component of recharge, tributary basin underflow, is also poorly defined. Consequently, parameters K and N were initially calibrated to match previous results. ESPAM Design Document DDW-003 contains a detailed explanation of the estimation of recharge on non-irrigated lands.

Estimates of recharge depth from Equation 12 were performed for three soil classifications based largely on soil thickness. These calculations employed monthly estimates of precipitation. Precipitation during November through February was summed into the February value to represent snowmelt. These calculations were performed

external to the GIS component of the recharge program but were input to the Fortran component of the recharge program as monthly recharge depths. A fourth soil classification was used to represent the minor land uses (cities, wetlands and dry farms).

Within the Fortran component of the recharge program, the recharge depths from non-developed land were multiplied by the non-irrigated land in each cell. Non-irrigated land was determined as the difference between the area of a cell and the irrigated area within the cell. Monthly non-irrigated recharge values were summed to estimate recharge in each stress period. Figure 39 illustrates the areal distribution of non-irrigated recharge averaged for the 22-year calibration period.

Recharge on Minor Land Use Types. Several minor land use types were identified and recharge on these areas was handled separately. The categories of minor land uses which were identified were: dry farm, water and wetlands and cities and industrial areas. Table 16 lists the minor land use types, the acres represented by these types and the recharge rate. On dry farms, the recharge rate was presumed to be zero. Discharge on wetlands was presumed to be three feet, less precipitation. Discharge for cities and industrial areas, which is attributable to parks and lawn watering, was presumed to be 1.2 feet/year. The discharge from wetlands and cities is represented in Figure 39 as negative recharge. These minor land uses are discussed further in Contor (2002).

Fixed Point Pumping

Fixed point pumping (or recharge) represents an impact that occurs at a single point and does not enter into any other recharge calculation. Negative values are applied directly as an extraction from the model cell that contains the point, and positive values

are applied as a direct injection. Fixed point pumping was used to represent the following practices: a) pumping where the pumped water is added to a natural water body to augment the surface water supply and the same water is counted as a diversion from that surface water body, b) recharge corrections for deficit irrigation on the Richfield tract and c) recharge correction for wetlands. Table A-9 lists the model cells where fixed pumping is represented.

Irrigation Wells. In the ESPAM, certain irrigation wells are treated as fixed-point pumping because the pumped water is delivered to a natural water body and is included in the water master reported diversion volume of water diverted for irrigation from the water body. One group includes wells known as "exchange wells," which pump water into the Teton River or the Snake River. Their volumes are included as diversions within the diversion data files from the IDWR planning model (see ESPAM Design Document DDW-012). The other group of fixed-point wells includes the wells that deliver water into Mud Lake or Camas Creek in Jefferson County, for diversion to irrigation entity IESW029. The volume of water pumped from these wells is included within the diversion volumes reported by Water District 31 (see ESPAM Design Document DDW-025).

The spatial location of the "exchange wells" class of fixed points was obtained from GPS data or public land survey legal descriptions supplied by Water District 01 (Madsen, 2000; Olenichak, 2003). Figure 40 shows the location of these exchange wells.

The GIS points for the Mud Lake fixed points and the offsite ground-water pumping wells were placed to represent groups of physical wells within small local areas. The actual locations of the physical wells were obtained from IDWR GPS data (IDWR,

1999) and aerial photography. Figure 41 shows the fixed points in the Mud Lake area, relative to the model grid, observation wells, and physical pumping wells.

Pumping volume for the "exchange wells" fixed points was obtained from Water District 01 annual reports (Water Distrtict 01, 2003). These data are complete for the entire calibration period. The annual reports include monthly pumpage volume for each well that is active in a given year. The gross pumping volume for the "Mud Lake" fixed points was obtained from Water District 31 data, as described in ESPAM Design Document DDW-025. To apportion the Mud Lake volume to individual points, the number of wells per model cell was adjusted to better reflect field observations of relative production of individual well groups. The fraction of the total volume assigned to each point was apportioned to the adjusted number of wells, as shown in Table 17. Any uncertainty in apportionment represents imprecision in the spatial distribution of discharge, but not an uncertainty in the water budget.

Richfield Tract Recharge Adjustment. An adjustment was made on the Richfield tract to account for deficit irrigation conditions. Because most irrigated areas with limited surface-water supplies have supplemental wells, the GIS/Fortran Recharge Tool automatically presumes supplemental ground-water pumping whenever surface-water supplies are inadequate to meet consumptive use demand. For some stress periods this is an inappropriate calculation for irrigation entity IESW007 (in the Richfield area), since deficit irrigation occurs without the opportunity for supplemental ground-water pumping. This is corrected by applying an offsetting volume to a deficit-irrigation class of fixed points, in those cells where deficit irrigation occurs without supplemental ground water. This correction is explained in further detail in ESPAM Design Document DDW-003.

Deficit irrigation correction volumes were determined by identifying cells without groundwater where net irrigation from surface-water irrigation was zero or negative. Using a spreadsheet, a correction volume was calculated to offset the indicated negative recharge.

Wetlands Correction. During model calibration, the need for a correction for wetlands became apparent. As described in ESPAM Design Document DDW-003, Recharge on Non-irrigated Lands, a correction was required for model cells that contained both wetlands and irrigated lands. The GIS/Fortran Recharge Tool applies the cell-average non-irrigated recharge rate to the non-irrigated lands within each model cell. When part of the cell is irrigated and part is wetlands, the cell-average rate is biased by the non-irrigated-recharge rate associated with the soil type on the irrigated lands. This bias was corrected by applying an offsetting volume to a wetlands class of fixed point pumping in those cells containing both irrigation and wetlands. Wetlands correction point volumes were determined by calculating the correct non-irrigated recharge in individual cells with both wetlands and irrigation, and comparing the volumes to the volumes calculated by the GIS/Fortran Recharge Tool.

Figure 42 illustrates fixed points used to represent the wetlands and deficit-irrigation correction points. Table 18 lists the total adjustment to recharge for each stress period for each category of fixed point well.

Off-Site Ground Water Pumping

Offsite ground water pumping refers to irrigation pumping that is conveyed to a distant location for application to irrigated lands. It must be accounted as a withdrawal from the model cell that contains the well and as applied irrigation water to the model

cells that contain the irrigated lands. While physically this is the same process that is represented by fixed-point pumping for the exchange wells and Mud Lake wells described above, the accounting difference is that offsite-pumping volumes have not been included in a water-master reported diversion volume. They must be added to diversions within the recharge calculations. In this modeling effort, wells in Jefferson County that supply water to irrigation entity IESW044 are represented as offsite ground water pumping. While irrigation entities IESW001 (A & B Irrigation District) and IESW018 (Falls Irrigation District) also pump ground water into canals for conveyance to places of use, their wells are distributed approximately uniformly across the irrigated service area, similar to other ground-water irrigated areas within the study area. There is not a need to spatially separate the extraction and recharge associated with irrigation.

In the Fortran component of the recharge tool, the pumped volume from the offsite ground water pumping wells is removed from the cells in which the wells are located, and added to diversions for IESW044. The entire pumped volume is included in the irrigated-lands recharge calculation as a contribution towards recharge. Volume-for-volume, any over-estimate in pumping becomes an over-estimate in irrigated-lands recharge, and any under-estimate in pumping becomes an under-estimate in recharge. The inaccuracies balance, so that the only consequence of an inaccuracy in estimating pumping volume is an inaccuracy in spatial distribution of discharge and recharge. The region in which this practice occurs is distant from the Snake River so these potential inaccuracies have a low impact to predictions near the river.

An initial pumping estimate of 4 AF/ac/yr comes from experience of the North Water Measurement District for water years 1997 through 1999. This appears reasonable considering ET, precipitation rates and irrigation and conveyance efficiency.

The lands in IESW044 are aggregated from three irrigation companies; Jefferson Irrigation, Monteview, and Producers Canal Companies. Three of the offsite points are associated with the Jefferson lands, three with the Monteview lands, and two with the Producers lands. Figure 43 shows the location of the off-site wells. Based on the original GIS shapefiles (see ESPAM Design Document DDW-008), the 2000 irrigated lands map was clipped to show irrigated lands in each of the three companies. The acreage of these lands was multiplied by four feet to determine a gross pumpage volume for each company, then divided by the number of represented off-site wells to obtain an annual volume per well. The annual volume was distributed among the months according to a crop-weighted average monthly ET from U.S. Bureau of Reclamation (2003) Agrimet data for 2000.

To scale pumpage to reflect year-to-year differences in ET, an index was constructed for each year 1980 through 2000 using revised ET values (Allen, 2002) for Hamer, Idaho (the nearest weather station with a full record). The ET index is a factor that relates ET for each given year to the long-term average ET. It is multiplied by the derived average monthly pumpage to give a monthly pumpage adjusted for the individual year's climatic regime.

Because the Monteview AGRIMET station did not start operation until 1997, the Hamer NOAA station was used to calculate the index for years up through 2000. For each of those years, the index was estimated as the ETr for the specific year divided by

the average ETr. Because the revised ETr for the Hamer NOAA station did not include a value for 2001, the 2001 index was derived from Monteview AGRIMET data. The results are summarized in Table 19. ESPAM Design Document DDW-026 contains more details regarding the estimation of off-site ground-water pumping. Table 20 lists the represented pumping in each model stress period for the off-site wells.

Perched River Seepage

Perched seepage, or bed loss, represents seepage from a creek or river which is above the water table. The seepage rate is independent of the nearby aquifer water levels; that is, the reach is not hydraulically connected to the aquifer. All perched seepage is entered into the model as a line source. The estimated seepage is distributed among the model cells associated with each perched reach. This information is prepared as input to the Fortran component of the recharge tool, which applies the perched seepage in the estimation of net recharge.

Perched river seepage for rivers and creeks other than the Snake River was estimated from a water balance using gage and diversion data. The same data were often used for both diversion (see section on surface water diversions) and seepage calculations. Figure 23 shows the primary perched reaches. Some of the less significant represented perched reaches (for example, the Birch Creek hydropower discharge) were represented in the model but are not shown on Figure 23. Table 6 contains a complete listing of the represented perched reaches. Table A-2 lists the model cells associated with each of the perched reaches.

Data were not always available for every gage for every year. The following section summarizes how the seepage from each perched reach was estimated. For a complete description, the reader is referred to ESPAM Design Document DDW-024.

Camas Creek and Lone Tree. Flood-control diversion volumes (USGS, 2002) were applied as a line source at the Lone Tree spreading location. Camas Creek perched-river seepage (bed loss) was based on the difference in flow between two gaging stations at Camas Creek. The upper gaging station is Camas Creek at Red Road near Kilgore and the lower is Camas Creek near Camas. Corrections were made for diversions at Lone Tree and irrigation diversions between the two gages (Shenton, 2002).

The Red Road gage data series (the north end of the losing reach) was incomplete. Thus, the final perched seepage values used in model calibration were based on gage data for all periods where data were available and estimated seepage where Red Road gage data were not available.

Medicine Lodge Creek. Medicine Lodge Creek lies partially inside and partially outside the model study area. GIS analysis shows that 45% of District 32-c irrigated lands are within the study area. Medicine Lodge Creek sinks into the Snake River Plain south of the irrigated lands. Bed loss was calculated by subtracting the inside-study-area diversions from the gaged flow of Medicine Lodge near Small, Idaho. The gaging station for Medicine Lodge began to function during the summer of 1985; records were not kept prior to that date. For years after 1985, the “Big Lost River Below Mackay Reservoir” gaging station was compared with Medicine Lodge creek gage records using linear regression. This produced a reasonable relationship, which was applied to the years before 1985. For all years before 1985, the predicted Medicine Lodge gage record was

used with actual diversions in calculating bed loss. Actual data were used to calculate bed loss for all years after 1985.

Birch Creek and Birch Creek Hydropower Plant. The bed loss and diversion calculations for Birch Creek are divided into two different time periods. Before 1987, water was delivered to Reno Ranch through a ditch with an estimated 50% bed loss. After 1987, water was diverted into a lined canal and pipeline and delivered to the Birch Creek hydroelectric plant before being used by the Reno Ranch (Sorenson Engineering, 2002).

Prior to 1987, Birch Creek was measured at the USGS gage station "Birch Creek at Eight-mile Canyon Road Near Reno Idaho." Water measured by this gage station was then diverted into the old Reno Ranch ditch during summer months. Excess water (and all water during winter months) was allowed to continue downstream and flow out onto the desert.

For months when the Eight-mile gage station was not active, gage records were predicted using regression based on Birch Creek diversions. Prior to 1987, half of the reported diversions were applied as diversions to irrigation entity IESW037. The Eight-mile gage record, minus diversions applied to IESW037, was applied as perched river seepage (bed loss) in the natural channel of Birch Creek within the study area. This actually applied the 50% ditch loss from the old ditch to the natural channel of Birch Creek, but since the old ditch is outside the model study area, seepage from the ditch actually enters the model domain as sub-surface flow in the model cells near the creek channel.

During the summer of 1987, the Birch Creek hydroelectric plant began to operate and the Eight-mile gage was discontinued. The entire flow of Birch Creek is delivered to the plant through a lined canal and pipe system. Outflow from the plant is applied to irrigation of the Reno Ranch or delivered to a channel where it infiltrates into the subsurface. Discharge records were obtained from the Birch Creek hydroelectric plant for use in calculating bed loss (Sorenson Engineering, 2002), in combination with watermaster diversion records.

Camas National Wildlife Refuge and Mud Lake. For the wildlife refuge, surface-water delivery volumes are recorded by the watermaster. These volumes are applied to a GIS line feature along the axis of the wetland.

Camas Creek inflows to Mud Lake. In some years, particularly during the winter, Camas Creek supplies water to Mud Lake. In the perched river seepage data set, Camas Creek inflows are applied as perched river seepage (recharge to the aquifer) to a GIS line feature that occupies the same model cells as the lake. Summertime values are obtained from watermaster records (Shenton, 2002). Wintertime inflows are not recorded directly, but are computed from a mass-balance calculation of October and May lake contents, winter-time pumping to the lake, and estimates of winter-time ET and precipitation, using watermaster-supplied data.

Mud Lake Flood Control. In high water years, water is pumped from Mud Lake to the desert south of the farm lands as a flood control measure. Data are obtained from watermaster records. No irrigation diversions are associated with this perched river seepage site.

Little Lost River and Little Lost River Flood Control. Because the Little Lost River infiltrates to the aquifer a short distance beyond the irrigated lands, perched river seepage is calculated as the difference between flow at the Little Lost River gage (very near the model boundary) and diversion volume.

When annual diversion volumes were interpolated to monthly values based on percentages from 2001 daily records, many negative bed loss values were generated. To correct this condition, annual diversion volumes were distributed temporally according to summer gaging station temporal patterns. This gave a more reasonable distribution without causing negative bed loss values.

The gaging station at "Little Lost near Howe" was decommissioned in 1991. A number of prediction options were explored to estimate gaging records for the last years of the model calibration period. A linear regression based on precipitation at the Howe gage was the selected method.

Using the predicted yearly gage station record for years after 1991, yearly diversions were subtracted to give a total bed loss for each year. Annual values were interpolated to monthly results using percentages from the pre-1991 data. To smooth the time series, months were grouped together and averaged. The groups were April-Oct, Nov-Feb, and March.

In 1985, a flood-control spreading area was developed up-river of Little Lost River diversions. During winter months water is diverted to the spreading area to prevent icing and local flooding. Another line source was developed to show this location as a point of recharge during winter months. Prior to 1985, wintertime bed loss is applied to

the channel of the Little Lost River below the gage. For 1985 and later years, it is applied to the spreading area. Summertime bed loss is always applied to the river channel.

Big Lost River. The entire irrigated area of the Big Lost Valley that is included within the model area is bounded between two gages on the Big Lost River. The river flows through irrigated lands throughout this area, and there is a fairly dense network of diversion canals and laterals throughout the irrigated area. The gage data were complete for the entire calibration period. Therefore, the recharge associated with surface water irrigation, canal leakage and perched river seepage was all lumped into the surface-water irrigation calculation. For summer months, the entire difference between the upstream gage (Mackay Dam) and the downstream gage (Near Arco) was applied as a diversion to irrigation entity IESW005. In the winter months, the entire difference was applied as bed loss (perched river seepage) to the line feature representing the riverbed, illustrated in Figure 23. This resulted in some wintertime negative values, which could be consistent with the processes of periodically gaining reaches and of lagged return flows. These are both physical possibilities, so the negative values were retained in the data. Three gages below Arco and records of diversions to a flood-control spreading ground at the Idaho National Laboratory were used to spatially distribute any water discharging past the Near Arco gage to the spreading ground and lower reaches of the river.

Big Wood River and Little Wood River. Most of the Big Wood River was represented with no perched seepage because the bed loss calculated from gage data oscillated about zero, with a very small magnitude relative to stream discharge. Upstream and downstream gage data (adjusting for diversions and returns) were used to calculate bed loss in the Little Wood River, the lower reach of the Big Wood River, and

the reach of the Big Wood River identified in Table 6 as the "Below Magic Reservoir" reach, just below the reservoir.

Twin Falls Canal and Lake Murtaugh. Because nearly all of the Twin Falls Canal Company lands lie outside the study area, the diversions applied to irrigation entity IESW041 were discounted substantially. However, the leaky portion of the canal within the study area and a part of Lake Murtaugh within the study area contribute recharge to the aquifer based on total diversions. Because of the large volume of recharge relative to the small fraction of diversions applied to the model, these leaky features were not treated with the leaky canal function of the GIS/Fortran Recharge Tool. Instead, recharge for these locations was calculated in a spreadsheet using the full diversion volume, and applied in recharge calculations as perched river seepage to the location illustrated in Figure 23. Leakage calculations relied upon data from Twin Falls Canal Company (circa 1955).

Table 6 lists the average perched seepage for each reach. Both average stress period seepage and average annual seepage are listed in Table 6.

Steady-State Model Water Budget

During compilation of water level data, it became apparent that there was an 18.5-year period (May 1, 1982 to October 31, 2000) during the 22-year model calibration period where aquifer water levels across the eastern Snake River Plain started and ended at approximately the same levels. This suggests that during that period, there was no net change in aquifer storage or, stated otherwise, that on the average during that period the inflows were equal to the outflows. This period was selected as the steady state period for the ESPAM. To generate the recharge for the steady state model, each component of

recharge was averaged for that period. Figure 44 shows a bar graph of the elements of the steady state recharge. River gains in Figure 44 represent the net of Snake River and Henrys Fork gains and losses above Minidoka and spring discharges in the Milner to King Hill reach. Figure 45 shows a map of the areal distribution of steady state recharge.

Transient Model Water Budget

All of the components of recharge described above were estimated for each of the 44 transient model stress periods and were processed through the GIS/Fortran Recharge Tool. The output of the Fortran component of the recharge tool is the MODFLOW-formatted well file or recharge array which contains the net recharge or discharge for every model cell for every stress period. Figure 46 shows a graph of the annual net recharge for the 22-year period, graphed along with precipitation for the same period. There are several striking features to note in Figure 46. The amount of net aquifer recharge is highly correlated to the amount of precipitation. Precipitation contributes to net aquifer recharge in three ways: precipitation is the basis for the water supply for surface water irrigation, high summer precipitation reduces the requirement for ground-water pumping and precipitation contributes directly to aquifer recharge via recharge on non-irrigated lands. Additionally, in a high precipitation year, carryover water will be left in the reservoirs for use in the following season, helping to sustain the supply of water available for aquifer recharge in the following year. Another striking feature from Figure 46 is that there is a 4.7 million acre-foot variation in estimated annual recharge to the aquifer, ranging from a high in 1984 of approximately 7.5 million AF to a low in 1989 of approximately 2.8 million AF. These dramatic variations in net aquifer recharge will cause dramatic variations in aquifer water levels.

Figures 47 and 48 show the spatial distribution of transient recharge for the irrigation season and the non-irrigation season, respectively, for 1980-1981. Comparison of Figures 47 and 48 shows that irrigated agriculture plays a significant role in net aquifer recharge.

Model Calibration

The ESPAM was calibrated using automated parameter estimation tools. The goal of model calibration was to adjust model parameters (transmissivity, aquifer storage, riverbed conductance and drain conductance and elevation) until model-predicted values of aquifer water levels and discharges to the river matched observed values. The calibration was done in two steps. An initial steady state calibration was done to establish initial aquifer transmissivity and riverbed and drain conductance. After the initial steady state calibration, a coupled steady state and transient calibration was done. During the coupled steady state and transient calibration, the parameter estimation software would adjust aquifer storage and drain elevation during the transient portion, followed by a check of the steady state model fit. This forced the transient calibration to not only provide a 'best fit' to the transient data but to also honor the steady state observations. Changes to the transmissivity field and riverbed and drain conductance were allowed during the coupled steady state/transient calibration.

The following sections describe the parameter estimation tools used for ESPAM calibration, the collection of aquifer observation data used during model calibration and the initial steady state and final coupled steady state/transient calibrations. Final model parameters and a comparison between model-predicted values and observed values are presented in the section describing the coupled steady state/transient calibration.

Parameter Estimation Tools

PEST, a nonlinear, least-squares inverse modeling program developed by Doherty (2004) was used to calibrate the model. (PEST is available for download on the web at *www.sspa.com/pest*.) During calibration, PEST runs the MODFLOW model thousands of times, comparing model-predicted results with observations. After each model run, the objective function is analyzed to determine whether the model run was an improvement over the previous run. After each model run, PEST evaluates each adjusted parameter to determine the next best adjustment to that parameter. PEST then prepares the input data set for the next model run with the adjusted parameters, runs the model and re-evaluates the output. The goal is a weighted, least-squares optimization of the fit between the model-predicted values and the observations.

A key to success at using parameter estimation tools is to have a greater number of observations than parameters being estimated. With previous parameter estimation packages (including previous versions of PEST), this was accomplished by establishing zones of transmissivity and aquifer storage. The parameter estimation software would be tasked to calibrate a single parameter value for each zone, thus greatly reducing the number of parameters being estimated for the entire model. The delineation of the zones was subjective and the calibrated model had abrupt changes in parameter values at zone boundaries.

PEST allows an option of using “pilot points” where parameter values are estimated at user-specified points. PEST interpolates model parameter values between the pilot points using kriging or some other spatial interpolation scheme. For example, during ESPAM calibration using PEST, transmissivity was estimated at 169 pilot points. The transmissivity at these 169 points was interpolated to the entire grid of 11,000 active

model cells. Similarly, aquifer storage, which has a much lower degree of variation than transmissivity, was estimated at 28 pilot points and interpolated to the whole grid. Doherty (2003) provides a more rigorous description of pilot points and how the process works. Additionally, PEST was instructed to calibrate riverbed conductance at the five reaches of the upper Snake River and drain conductance and elevation at the six spring reaches in the lower Snake River. At each calibration run, PEST minimized the difference between observed and model-predicted aquifer water levels and river gains.

River Gain/Loss Calibration Targets

For the upper Snake River, the river gain/loss calibration targets were estimated using the IDWR Reach Gain/Loss Program. The Reach Gain/Loss Program uses gaged reach inflows and outflows, measured diversions and estimated irrigation returns and reservoir storage and evaporation to calculate a water balance for the reach. The residual of the water balance is the estimated river reach gain from or loss to the aquifer. More information on the IDWR Reach Gain/Loss Program can be obtained directly from IDWR. Inputs to the Reach Gain/Loss Program include measured diversions, gaged river flows, reservoir stage and irrigation return flow lag factors (described above). For the purposes of the ESPAM modeling, the newly calculated return flow lag factors were entered into the Reach Gain/Loss Program input files.

Figures 49 through 53 show the estimated monthly reach gain for the five reaches of the upper Snake River (Ashton to Rexburg, Heise to Shelley, Shelley to Near Blackfoot, Near Blackfoot to Neeley and Neeley to Minidoka). As can be seen in Figures 49-53, there is a lot of noise in the monthly data. Prior to use as calibration targets, the

monthly reach gains/losses were filtered to eliminate some of the noise (see transient calibration section).

The streamflow gages on the Snake River are maintained by the USGS and are assigned a rating of “excellent,” ”good” or ”fair,” with associated uncertainty bands of ± 5%, ± 10% and ± 15%, respectively. Each of the upstream gages for the five reaches of interest is rated “good.” Given the “good” rating, the uncertainty on the inflows for each reach is approximately ± 10%. In general, assuming that there is no systematic error introduced at a gage, the ± 10% uncertainty is for an instantaneous measurement. Assuming no systematic error, the uncertainty in the river discharge should be reduced as single day measurements are aggregated into weekly or monthly measurements.

The uncertainty in the estimated river gain or loss is driven by a) uncertainty in both the upstream and downstream gages, b) uncertainty in measured diversions, c) uncertainty in estimated irrigation return flows and d) uncertainty in reservoir storage and evaporative losses. The estimated reach gain or loss cannot be more accurate than the least accurate component. In order to provide a sense of the magnitude of the estimated river gain or loss relative to gage uncertainty, Figures 49 through 53 also show an uncertainty band of ± 5% of the upstream gage. This is not a statement of the true uncertainty of the estimated reach gain or loss but is provided as a guideline for the magnitude of the gain or loss relative to a conservative uncertainty band on the gaged inflow.

If the estimated reach gain or loss is approximately the same magnitude as the ± 5% band, then there is low confidence that the reach is gaining or losing. Figure 53 shows that the magnitude of the Neeley to Minidoka estimated reach gain is almost

always within this ± 5% band; hence, there is significant uncertainty that this reach is gaining or losing. In contrast, Figure 52 shows that the magnitude of the Near Blackfoot to Neeley estimated reach gain is significantly greater than the ± 5% band; hence there is more confidence that this reach is gaining. The estimation of river gain and loss calibration targets is further discussed in ESPAM Design Document DDM-017.

Spring Discharge Calibration Targets

Spring discharge calibration targets proved to be something of a challenge for the ESPAM project. Very few of the springs in the Thousand Springs region are measured with any regularity or accuracy. For many of the springs in the region, it is difficult to discern the discharge point of the spring. Many of the springs have complex plumbing which routes the collected water to various users, making measurement difficult.

The USGS estimates the total annual spring discharge from the regional eastern Snake River Plain aquifer (excluding spring discharge from the Twin Falls area on the south side of the river) based on a regression equation developed by Kjelstrom (1995b). The regression equation uses measured flow at several index springs. However, the Kjelstrom method addresses neither seasonal nor spatial variation in spring discharge. Table 21 lists the annual estimated reach gain from the north side in the Milner to King Hill reach for the calibration period.

In order to compensate for this lack of data, the ESPAM modeling team and the ESHM Committee agreed to try to spatially distribute the total reach gains as predicted by the Kjelstrom method according the magnitude of the springs recorded by Covington and Weaver (1990). For each of the spring sub-reaches shown in Figure 21, the relative magnitude of spring discharge in the sub-reach to spring discharge in the whole reach

was estimated. These estimates were based on the Covington and Weaver (1990) estimates. Table 22 lists the relative magnitude of the six spring sub-reaches from Milner to King Hill and the percent of the total reach gain that each represents. Temporal discretization was done using the seasonal variation in measured springs such as Blue Lakes, Crystal and Box Canyon, which were deemed representative of the springs in the whole reach. This was the method initially used to generate spring calibration targets in the Thousand Springs reach. This method was successful for generating average spring reach calibration targets for steady state calibration. During transient model calibration, however, it became apparent that springs varied markedly in their temporal discharge patterns. Thus the initial method of generating spring targets was unsuccessful for use in the transient calibration.

The second approach, which ultimately was successful for transient calibration, was to use actual spring measurements for the springs for which measurements exist. Initially, the springs for which long-term measurements existed were: Devils Washbowl, Devils Corral, Blue Lakes, Crystal Springs, Clear Lakes, Briggs Springs and Box Canyon Springs. The two springs with the greatest magnitude of discharge, Thousand Springs Power Plant and Malad Gorge Power Plant, did not have discharge measurement records.

At the request of the modeling team, Idaho Power used power generation records at the two plants to estimate spring discharge for Malad and Thousand Springs. Although not obtained through direct measurement, these turned out to be reasonable proxies for measurements of the springs at Malad and Thousand Springs. Once those hydrographs were obtained, transient model calibration was successful. Figure 54 shows the location of the individual springs used as calibration targets. Hydrographs of the measured (and

estimated) springs will be presented in figures in the discussion of transient model calibration. Table 23 lists the model cells representing the springs used as transient calibration targets. Table 24 lists the number of observations and the date range of the observations for each of the calibration target springs. In addition to using monthly spring measurements, the mean discharge and standard deviation of each spring were also used as calibration targets. The annual Kjelstrom estimate of total spring discharge for the entire Milner to King Hill reach as well as the estimated sub-reaches were used to help evaluate the model fit. The estimation of spring discharge calibration targets is further discussed in ESPAM Design Documents DDM-018 and DDM-008.

Aquifer Water Level Calibration Targets

Aquifer water level calibration targets were obtained from the IDWR data base of Idaho aquifer water level measurements using the program WellLog. The WellLog data base includes measurements from the USGS, IDWR, Idaho Power and private consulting firms contracted by the agencies to conduct water level measurements. More information about WellLog can be obtained in the WellLog user's manual (IDWR, 1997c).

Several synoptic measurements (mass measurements) of aquifer water levels were done in 1980-1981 as part of the USGS Regional Aquifer-Systems Analysis effort on the eastern Snake River Plain. This entails measuring as many wells as possible throughout the study area in a short period of time in order to estimate a regional potentiometric surface. As part of the current study, three additional synoptic measurements were done; in Spring, 2001, Fall, 2001 and Spring, 2002. This provided mass measurements at the beginning and ending of the model calibration period.

WellLog was queried for all depth to water measurements within the study area within the calibration period. Depth to water measurements which were documented to be in aquifers other than the regional aquifer, such as locally perched zones, were excluded. Similarly, depth to water measurements which appeared flawed (perhaps an error in recording or a measurement taken shortly after a well was pumped) were discarded. If neighboring water level measurements corroborated a seemingly spurious measurement, the measurement was retained.

Wellhead elevations were estimated using USGS 10 meter digital elevation maps (DEMs) intersected with the IDTM position of each well. This was done using GIS software. An analysis of the accuracy of this technique was done by comparing the elevation determined using 10 meter DEMs versus surveyed elevations where they existed. It was found that, on the average, the elevation determined from the DEMs was within 1.21 ft of the surveyed elevation. This was considered acceptable accuracy by the ESHM Committee. More detail on the use of DEMs for estimating wellhead elevation can be found in ESPAM Design Document DDM-011.

Using the estimated wellhead elevations and the measured depth to water, water table elevations were calculated for each measurement. Figure 10 illustrates water table contours from the Fall 2001 mass measurement. More detail on the collection of aquifer water level data can be found in ESPAM Design Document DDW-014.

Initial Steady State Calibration

Steady-State Calibration Data

Although true steady state conditions rarely exist in natural aquifers, most ground water modeling efforts include a steady state analysis because the transmissivity

distribution tends to be more sensitive to steady state water levels than transient water levels. As previously stated, the net change in aquifer storage, as indicated by water levels between May 1, 1982 and October 31, 2000 was small, so the period was selected as the steady state period. At steady state, the recharge and discharge for an aquifer system are balanced and no water is entering or leaving aquifer storage.

Steady state calibration water level targets were generated by averaging water level measurements for this period. Wells with only one observation during this time period were not used as targets. A total of 1009 steady state aquifer water level observations were used. Figure 55 shows the locations of the wells used as observations for steady state calibration. Figure 55 also shows the location of the river and spring reaches. The reader will note in Figure 55 that many of the wells used for steady state calibration targets are located reasonably close to the river and spring reaches. This helps to control the certainty of the calibrated parameters in these areas of high interest. In areas with few observation wells, the calibration parameters are less certain.

Steady state river gain targets were estimated by averaging the transient river gains for each of the five sub-reaches for the steady state period. Similarly, steady state spring calibration targets were estimated by averaging the transient spring reach targets for the steady state period. Table 25 lists the steady state river and spring calibration targets.

Steady-State Calibration Procedure

During steady state calibration, the model parameters of aquifer transmissivity and riverbed and drain conductance were estimated. The steady state calibration was accomplished using 1020 observations and 180 adjustable parameters. The observations

include 1009 aquifer water level observations, five river reach gain/loss observations, and six spring reach observations. The adjustable parameters include 169 pilot points used to adjust the transmissivity distribution, five river parameters to adjust riverbed conductance for the five river reaches, and six drain parameters to adjust drain conductance for the six spring reaches. Figure 56 shows the location of the pilot points used for calibration of aquifer transmissivity.

The steady state calibration was accomplished by minimizing the difference between model-predicted steady state aquifer water levels and Snake River gains and losses and the averaged observed water levels and averaged estimated Snake River gains and losses and spring discharges. The steady state calibration was done using PEST parameter estimation tools. During the steady state calibration, model-predicted aquifer water levels, which are generated for the center of each model cell, were interpolated to the actual location of each observation well prior to comparison.

The same steady state calibration targets and calibration procedure were used during the initial steady state calibration and during the coupled steady state/transient calibration. The product of the initial steady state calibration is an intermediate product. The ending steady state heads and aquifer transmissivity and riverbed conductance became the starting values for the coupled steady state/transient calibration. The coupled steady state/transient calibration yielded both calibrated steady state and transient versions of the ESPAM.

Coupled Steady State/Transient Calibration

Transient Calibration Data

The transient calibration data include aquifer water level observations, monthly Snake River gains and losses, and spring discharge observations. Transient calibrations are undertaken primarily to determine specific yield. Changes in aquifer water level are a function of aquifer storage or specific yield; hence transient model water level targets are changes in water levels, not the absolute measured water levels. Modeled aquifer water levels were also converted to changes in water levels for comparison with the targets. For the ESPAM calibration, three different types of transient aquifer water level data were used as calibration targets: 1) seasonal wells - wells with long time series consisting of frequent observations (9548 total observations in 39 wells over a maximum of 17 years), 2) mass measurement wells - water level observations collected between spring 2001 and spring 2002 as part of this project (1766 total observations in 601 wells), and 3) trend wells - wells with regular spring-time observations (1403 observations in 173 wells). Figure 57 shows the locations of the transient aquifer water level observation wells.

As during the steady state calibration, model-predicted aquifer water levels are interpolated from the center of the model cell to the actual location of the observation wells. For the transient part of the calibration, a similar interpolation was also done in time. The model-predicted water levels are generated at every model time step (in the case of the ESPAM calibration, every 18.2 or 18.3 days). During calibration, the PEST software interpolated model-predicted water levels to times which match the actual dates of aquifer water level observations.

The monthly gains and losses for the five river reaches above Milner Dam which were computed using the IDWR Reach Gain/Loss Program proved to contain significant measurement noise, so the data were filtered in a computer program called TSPROC (Doherty and Johnston, 2003) prior to their use as calibration targets. TSPROC uses a 1-stage, low passButterworth filter to remove excessive noise in time series data sets. For the ESPAM application, the cutoff frequency was 5.48e-4. Model-predicted river gains were filtered using TSPROC and matched with the filtered observations.

Measured discharge data from Devils Washbowl, Devils Coral, Blue Lakes, Crystal Springs, Clear Lakes, Briggs Springs and Box Canyon Springs were used as calibration targets, as were the spring discharge estimates for Thousand Springs and Malad which were estimated from power records. In general, these spring discharge data were not as noisy as the river gain and loss estimates from upstream reaches and therefore were not filtered. Model-predicted spring discharge at the model cells noted in Table 23 were interpolated in time and then compared with the measured spring discharges. Despite the fact that these individual springs were explicitly modeled, the ESPAM is a regional model and is not intended for predictions of impacts to individual springs. A regional model is limited to replicating broad-scale heterogeneity in the physical system and cannot replicate localized heterogeneities.

Coupled Steady State/Transient Calibration Procedure

The coupled steady state/transient calibration was done using PEST parameter estimation software. During the transient part of the calibration, aquifer specific yield was calibrated at 28 pilot points (see Figure 56), spring (drain) elevation was estimated at the model cells representing the springs used as calibration targets and spring (drain)

conductance was estimated at the six spring reaches and the nine drains used as calibration targets. The steady state portion of the calibration was as described above. The ending heads from steady state were used as starting heads for the transient calibration. During the coupled steady state/transient component of each calibration model run, PEST was allowed to modify aquifer transmissivity and river and drain conductance as well as establish aquifer specific yield and spring elevations. After each pair of steady state and transient model runs, the model-predicted aquifer water levels and river and spring discharges were compared with the thousands of calibration target values. The coupling of the steady state and transient models during transient model calibration forced the calibrated transient model to match both the steady state and transient calibration targets, ensuring that there was minimal degradation in the match to the steady state data caused by the transient calibration.

The objective of the transient part of the model calibration was to minimize the difference between observed river gains and losses, spring discharges and water level changes between May 1, 1985 and April 30, 2002. The transient model required a warm-up period of about five years because observations during the initial 1980-1985 period are partly dependent on events that occurred years prior to 1980. By using the ending steady state heads as the transient starting heads, the impacts of recharge and discharge in the years prior to 1980 were approximated. When the model was allowed to run with estimated recharge and discharge data from 1980 to 1984, by 1985 the model was responding appropriately based on comparison with measured values (river gains and losses and aquifer water levels).

The coupled steady state/transient calibration utilizes about 16,600 observations and 225 adjustable parameters. The observations include 12,700 aquifer water level change observations, 1300 Snake River gain/loss observations, 1500 spring discharge observations and the previously mentioned steady state observations. The adjustable parameters include 169 pilot points to adjust the transmissivity distribution, 28 pilot points to adjust the specific yield distribution, 5 river parameters to adjust riverbed conductance for the five river reaches, and 9 drain conductance parameters and 9 drain elevation parameters at model cells with spring records.

When data entry errors in the calibration targets were discovered in ESPAM Version 1.0, the coupled steady state/transient calibration was re-run using the corrected reach aggregations and upper Snake River calibration targets. Keeping all initial estimates of calibration parameters and the overall calibration methodology the same as were used for Version 1.0, making only the changes required for correcting the data entry errors in the previous calibration, the PEST calibration was re-run to generate ESPAM Version 1.1. The statistics and parameters discussed below are for ESPAM Version 1.1. These data entry errors, however, did not significantly affect results of the model simulation.

Steady State Calibration Model Fit

Model residuals (the difference between model-predicted and observed values) are generated by the PEST software, providing an indication of how well the model-predicted values match the observed values. Model statistics for the steady state calibration indicate an overall R^2 between measured and modeled aquifer water level observations of 0.9943. The standard error for the aquifer water level estimates is 17.84

ft indicating that about 95 percent of the modeled aquifer water levels are within about 35.6 ft of observed values, which represents less than 2% of the head change in the aquifer between St. Anthony and King Hill, Idaho. Figure 58 shows a scatter plot of model-predicted versus observed aquifer water levels. Figure 58 shows an excellent match between the predicted and observed aquifer water levels. A regression line for the data indicates a slope of .9936 and an intercept of 28.618. With a perfect match, each point in Figure 58 would fall on a line with a slope of 1 and an intercept of 0. Relative to the range of values on either axis, 28.618 is very nearly zero. Figure 59 shows a map with water level contours for both the model-predicted and observed aquifer potentiometric surface. Figure 59 also shows an excellent fit between the model and the steady state observations.

Steady state model-predicted versus observed discharge to river and springs is shown in a scatter plot in Figure 60. Figure 60 shows an excellent fit between model-predicted and observed discharges to the river, with an R^2 value of .9878. The regression line which fits the data in Figure 60 has a slope of 1.0107 and a y-intercept of 679,326. Table 25 lists the model-predicted and observed steady state river and spring discharges.

Transient Calibration Model Fit

Comparison of Simulated and Observed Transient Heads

One of the measures of a transient calibration is how well the model simulates measured aquifer water levels over time. Figures 61 through 65 show transient model-predicted versus observed water levels. On Figures 61 through 65, the transient comparisons are sited on maps of the study area with pointers to the location of each hydrograph. In each of these figures, the pink line represents the model-predicted values.

Wells with multiple measurements each year for a long period were selected to calibrate the ESPAM's model ability to replicate the seasonal changes in aquifer water level. Figures 61 and 62 show eight selected wells with seasonal fits. The ability of the model to replicate seasonal aquifer water level changes is a function of aquifer storage and transmissivity as well as the model recharge and discharge. Figures 61 and 62 show that the ESPAM does a very good job of matching seasonal aquifer water level data. The standard error for the seasonal aquifer water level ovservations is 1.84 ft.

Wells with a spring observation for each of many years were selected to test the ESPAM's ability to replicate the long-term trend of aquifer water levels for the calibration period. Figures 63 and 64 show model-predicted versus observed aquifer water level trend data. Similar to the seasonal data, a model's ability to match trend data is a function of aquifer storage, transmissivity and model recharge and discharge. Figures 63 and 64 show that the fit to trend data was very good. The standard error for the trend data is 5.83 ft.

Figure 65 shows the model's fit to the mass measurement data which was collected for three periods at the end of the calibration period. Figure 65 also shows a reasonable fit to the mass measurement data. The standard error for the mass measurement data is 5.17 ft.

Comparison of Simulated and Observed River Reach Gains

Figures 66 through 70 show the filtered modeled gains in the upper Snake River versus the filtered observed gains. Figures 71 through 75 show the same data, without the filtering. Figures 66 through 70 and 71 through 75 represent reach gains in the Ashton to Rexburg, Heise to Shelley, Shelley to Near Blackfoot, Near Blackfoot to

Neeley and Neeley to Minidoka reaches, respectively. The pink line in Figures 66 through 70 represents the model-predicted values. The observation data shown in Figures 66 through 70 is the filtered data shown in Figures 49 through 53, as previously discussed. In each river reach, no attempt was made to match the first five years of data due to the transient model warm-up period. As can be seen in Figures 66 through 70, the model does a reasonable job of predicting reach gains in each reach of the upper Snake River. For the Neeley to Minidoka reach, the measured data shows that the reach gain is somewhat erratic, year to year, but is a slight gain on the average. The model predicts an almost constant modest gain for Neeley to Minidoka. Inspection of Figure 53, the raw monthly reach gain observation data versus gage uncertainty for the Neeley to Minidoka reach, shows that this reach effectively, on the average, has a slight gain. Hence, the model-predicted value was considered reasonable.

Figures 71 through 75, the comparison of unfiltered model-predicted versus measured river gains, show the seasonal variation of both the measured and predicted river gains. The model generally under-predicts the month to month variation of the measured data; however, inspection of the unfiltered measured reach gains shows a significant amount of noise in the data, reflecting uncertainty in instantaneous river gage measurements.

Comparison of Simulated and Observed Spring Discharges

Figures 76 through 84 show the model-predicted versus observed spring discharges for the following springs: Devils Washbowl, Devils Corral, Blue Lakes, Crystal, Clear Lakes, Briggs, Box Canyon, Thousand Springs and Malad. As with previous transient hydrographs, the pink line represents the model-predicted values in

Figures 76 through 84. As can be seen in Figures 76 through 84, the model does an excellent job of predicting the magnitude of the spring discharge for each spring. The model underestimates the seasonal amplitude of spring discharge for Crystal, Briggs, Box Canyon, Thousand Springs and Malad. The measured seasonal amplitude for these springs is approximately 20% and the model-predicted seasonal amplitude is approximately 9%.

Calibrated Model Parameters

Aquifer Transmissivity

Simulation results indicate a wide range in transmissivity from about 125 to 4.9 x 10^7 ft^2/day (Figure 85). Riverbed and drain conductance ranges from 10.3 to 1.57x 10^7 ft/day/ft. Final values for riverbed and drain conductance can be found in Tables 3 and 4, respectively. Figure 86 shows the ratio of the final ESPAM transmissivity to the preliminary steady state transmissivity. As can be seen in Figure 86, the preliminary steady state transmissivities were scaled by as much as an order of magnitude during the coupled steady state/transient calibration. This represents the amount of change required in the initial steady state transmissivity field in order to accommodate the transient data.

The map of the calibrated model transmissivity (Figure 85) shows that estimated transmissivity values tend to be lower along the margins of the plain and higher towards the center. Two major exceptions to this generalization include the Mud Lake barrier and the Great Rift. The Mud Lake barrier extends east to west across the aquifer from the Bitterroot Mountains to just south of the confluence of the Henrys Fork and the South Fork of the Snake River. The Great Rift extends north to south across the plain from the Big Lost River Valley to just west of American Falls Reservoir. The transmissivity of

both of these features is lower and impedes ground water flow as evidenced by the more tightly spaced equipotential lines in these areas. These features in the calibrated transmissivity distribution match our current understanding of the aquifer.

Aquifer Storage

The transient component of a model calibration is primarily used to calibrate aquifer storage (storativity or specific yield). In the case of the ESPAM, the confined representation of the physically unconfined system uses aquifer storativity (rather than the unconfined parameter of specific yield). However, unlike a truly confined system, the storativity values expected for the ESPAM would be in the range of .001 to .3, a range much more typical of specific yield. For a truly confined aquifer, storativity values would be several orders of magnitude smaller.

During the coupled steady state/transient calibration, aquifer storage was calibrated at 28 pilot points (Figure 56) and interpolated to every model cell. Aquifer storage has a much lower degree of spatial variation, so fewer pilot points are required for calibration. The aquifer storage distribution ranges from 5.2×10^{-3} to 0.280 (Figure 87).

Drain Elevation

After the coupled steady state/transient calibration, drain elevations, which were modified as part of the calibration, were assessed relative to the ending steady state heads. It was noted that some of the ending drain elevations were within a few feet of the ending steady state heads. The ESHMC discussed the fact that the ending drain elevations were high relative to the ending steady state aquifer levels, with the potential result that drains would shut off with minor declines in aquifer water level. It was agreed that the true elevations of the drains are unknown but that an absolute discontinuation of

major portions of spring discharge due to a minor change in aquifer water level would be unreasonable.

As previously noted, Equation 7 is the governing equation for aquifer discharge through a drain. Inspection of Equation 7 shows that discharge is directly proportional to the conductance of the drain as well as to the elevation differential between the aquifer level and the drain elevation. The ESHMC discussed the fact that drain elevations could be changed with a corresponding change in drain conductance to alleviate this concern without changing the calibration or any major functionality of the model. To achieve this modification, all drain elevations were checked against the ending aquifer water levels in the same model cell. Any drain elevation which was within 30 feet of the ending steady state aquifer water level was adjusted to an elevation 30 feet lower than the ending state aquifer water level at the drain location. A corresponding adjustment was made to the drain conductance in that model cell to keep the drain discharge the same. Table 4 lists the final values for drain conductance and drain elevation for each model cell representing a drain.

This modification was deemed a reasonable representation of the physical system of springs. In the ESPAM, all model cells, including drain cells, are 1-mile square. A model cell representing a drain should not be considered to represent an individual spring but rather the collective spring discharge along a 1-mile segment of the canyon wall. In the physical system, springs at high elevations will shut off with significant water level declines. This will still be represented in the model as a decline in the spring discharge represented in a model cell. However, it was deemed that the total discharge of a 1-mile segment was more likely to be reduced than to be eliminated by a realistic change in

aquifer water level. Clearly, really significant changes (30 ft or more) in aquifer water levels from the steady state ending heads would result in the wholesale discontinuation of spring discharge in a model cell.

Model Limitations

As with any model of a natural system, the ESPAM has a degree of limitation and uncertainty. Simplifying assumptions must be made to model complex, natural systems. Components of the aquifer water budget which have the least certainty are irrigation return flows, recharge on non-irrigated lands and tributary underflow. As discussed in the Water Budget section, these elements were estimated based on the collective professional judgement of the modeling team and the ESHMC using existing published material. As previously discussed, there is a shortage of data on spring discharges and irrigation return flows. The ESPAM calibration would have been enhanced by the existence of additional measured or estimated spring discharge data and irrigation return flow measurements.

The ESPAM is a regional ground-water model. For this reason, the model is best used for broad-scale predictions. As previously noted, the user should avoid the temptation to model localized impacts, such as impacts to a specific spring.

A primary objective of the model development and calibration was the characterization of the interaction between the aquifer and the river. Although thousands of aquifer water level observations were used during the model calibration the model was optimized for prediction of impacts to the river due to water use on the plain. The model can be used to provide a general sense of ground-water to ground-water impacts,

however, the model is best used for prediction of impacts to surface water resources at a regional scale due to ground-water use.

Despite these noted limitations, the ESPAM is the most thoroughly calibrated model in existence of the eastern Snake River Plain Aquifer. The extensive use of model calibration tools and the prevalence of available data yielded an excellent model calibration.

Related Reports

During ESPAM design and development, a total of thirty-five design documents were written to document important model and water budget decisions. Each design document chronicled the design alternatives, the final design and the rationale for selecting the final design. The design documents were distributed in draft form to the ESHMC for review and feedback. Many of the design documents went through multiple iterations as a result of feedback from ESHMC members either during or after design reviews. Throughout the ESPAM project, draft and final design documents were made available to the ESHMC via the IWRRI web site. If, in the course of final model development or calibration, the documented final design had to be changed, an 'as-built' version of the pertinent design document was released to document the change. Table 26 lists the ESPAM design documents and their status as of this writing.

Summary and Conclusions

This report documents the successful reformulation and calibration of the numerical ground-water model used for water management on the eastern Snake River Plain. The ESPAM was calibrated to 22 years of recharge and discharge data, as compared with the previous SRPAM model, which was calibrated to only one year of

data. Calibration to a long span of years which include some of the driest and wettest years on record ensures that the model is capable of accurately simulating the response of the river/aquifer system to a broader spectrum of stresses.

The ESPAM was calibrated using the PEST suite of parameter estimation tools. Using PEST enabled the modeling team to optimize the fit of the model to thousands of observed aquifer water levels and streamflow measurements. The final calibrated ESPAM shows a significantly better fit to observed data than the previous SRPAM model.

A significant aspect of the ESPAM reformulation and calibration was the involvement of the ESHMC. The ESHMC, comprised of interested parties representing agencies, private industry and water user groups, oversaw the ESPAM reformulation and calibration process. Although the collaborative process used to develop the ESPAM took more time than the more streamlined, conventional model development process, it allowed ESHMC members an active voice in model design and implementation decisions and helped to eliminate bias. By including a broad spectrum of interested parties in the model reformulation and calibration, the committee members were able to gain a better understanding of model design details. The ultimate goal of the process was to allow discussions about future aquifer management decisions to center on policy interpretation and not on the scientific tools used in support of those decisions.

The outcome of any ground-water modeling effort is enhanced insight into the hydrologic processes being modeled. This was also true for the ESPAM reformulation and calibration. Development of the ESPAM underscored several significant gaps in

either data or our understanding of the underlying hydrologic processes. Recommendations for further work include:

a) Long-term collection of spring discharge data in the Thousand Springs area and in the Near Blackfoot to Neeley reach
b) Long-term collection of irrigation return flow data and development of numerical relationships between the collected data and measured surface irrigation diversion data
c) Continued refinement of estimates of evapotranspiration
d) Improved estimates of river gains and losses, including the use of new technology such as acoustic Doppler-based stream gaging instruments
e) Further research on the interaction between the river and the aquifer, particularly in the Thousand Springs and American Falls areas
f) Improved estimates of the contribution to the aquifer from tributary basins

Although every model represents a simplification of complex processes, with the ESPAM being no exception, the ESPAM is the best available tool for understanding the interaction between ground water and surface water on the eastern Snake River Plain. The science underlying the reformulation and calibration of the ESPAM reflects the best knowledge of the aquifer system available at this time. The ESPAM was calibrated to approximately 11,000 observed aquifer water levels and river gain and loss estimates. Calibration parameters indicate an excellent fit to the observed data, providing confidence that the ESPAM provides an excellent representation of the complex hydrologic system of the eastern Snake River Plain.

Complex water management decisions on the eastern Snake River Plain will be greatly enhanced by use of the ESPAM. The participation of the ESHMC members in the model design and calibration process provided members with unprecedented insight into the details of this complex numerical ground-water model, allowing committee members to make informed judgements regarding how the model is applied to aquifer management.

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Table 1. Managed recharge volumes for eastern Snake River Plain.

Year	Volume (ac-ft)
1995	180,000
1996	169,000
1997	230,000
1998	201,000
1999	153,000
2000	70,000
2001 and later	none

Table 2. Start and end date for model stress periods. Irrigation season stress periods start on May 1 and end on October 31 of the same year. Non-irrigation season stress periods start on November 1 and end on April 30 of the following year.

Period	Start Month	End Month	Length (days)	Period	Start Month	End Month	Length (days)
SP001	May, 1980	Oct, 1980	182	SP023	May, 1991	Oct, 1991	182
SP002	Nov, 1980	April, 1981	183	SP024	Nov, 1991	April, 1992	183
SP003	May, 1981	Oct, 1981	182	SP025	May, 1992	Oct, 1992	182
SP004	Nov, 1981	April, 1982	183	SP026	Nov, 1992	April, 1993	183
SP005	May, 1982	Oct, 1982	182	SP027	May, 1993	Oct, 1993	182
SP006	Nov, 1982	April, 1983	183	SP028	Nov, 1993	April, 1994	183
SP007	May,1983	Oct, 1983	182	SP029	May, 1994	Oct, 1994	182
SP008	Nov, 1983	April, 1984	183	SP030	Nov, 1994	April, 1995	183
SP009	May, 1984	Oct, 1984	182	SP031	May, 1995	Oct, 1995	182
SP010	Nov, 1984	April, 1985	183	SP032	Nov, 1995	April, 1996	183
SP011	May, 1985	Oct, 1985	182	SP033	May, 1996	Oct, 1996	182
SP012	Nov, 1985	April, 1986	183	SP034	Nov, 1996	April, 1997	183
SP013	May, 1986	Oct, 1986	182	SP035	May, 1997	Oct, 1997	182
SP014	Nov, 1986	April, 1987	183	SP036	Nov, 1997	April, 1998	183
SP015	May, 1987	Oct, 1987	182	SP037	May, 1998.	Oct, 1998	182
SP016	Nov, 1987	April, 1988	183	SP038	Nov, 1998	April, 1999	183
SP017	May, 1988	Oct, 1988	182	SP039	May, 1999	Oct, 1999	182
SP018	Nov, 1988	April, 1989	183	SP040	Nov, 1999	April, 2000	183
SP019	May, 1989	Oct, 1989	182	SP041	May, 2000	Oct, 2000	182
SP020	Nov, 1989	April, 1990	183	SP042	Nov, 2000	April, 2001	183
SP021	May, 1990	Oct, 1990	182	SP043	May, 2001	Oct, 2001	182
SP022	Nov, 1990	April, 1991	183	SP044	Nov, 2001	April, 2002	183

Table 3. List of model cells containing river cells representing the Snake River.

Row	Column	Stage (ft)	Riverbed Conductance (ft^2/day)	River Bottom Elevation (ft)	Reach
52	200	5059.56	1.01E+06	5020.45	Ashton to Rexburg
52	201	5072.45	1.01E+06	5034.25	Ashton to Rexburg
53	197	5018.37	1.01E+06	4977.65	Ashton to Rexburg
53	198	5034.22	1.01E+06	4993.48	Ashton to Rexburg
53	199	5045.92	1.01E+06	5005.63	Ashton to Rexburg
54	182	4826.99	1.01E+06	4790.52	Ashton to Rexburg
54	183	4828.79	1.01E+06	4792.48	Ashton to Rexburg
54	184	4836.26	1.01E+06	4800.14	Ashton to Rexburg
54	185	4840.07	1.01E+06	4803.99	Ashton to Rexburg
54	186	4848.72	1.01E+06	4812.76	Ashton to Rexburg
54	187	4859.43	1.01E+06	4823.79	Ashton to Rexburg
54	188	4866.33	1.01E+06	4831.1	Ashton to Rexburg
54	189	4876.77	1.01E+06	4842.16	Ashton to Rexburg
54	190	4901.92	1.01E+06	4867.95	Ashton to Rexburg
54	191	4914.41	1.01E+06	4880.7	Ashton to Rexburg
54	192	4945.66	1.01E+06	4912.51	Ashton to Rexburg
54	193	4963.37	1.01E+06	4928.95	Ashton to Rexburg
54	194	4980.06	1.01E+06	4942.81	Ashton to Rexburg
54	195	4994.97	1.01E+06	4954.97	Ashton to Rexburg
54	196	5007.84	1.01E+06	4967.19	Ashton to Rexburg
55	180	4818.69	1.01E+06	4781.67	Ashton to Rexburg
55	181	4823.2	1.01E+06	4786.41	Ashton to Rexburg
56	178	4814.93	1.01E+06	4777.38	Ashton to Rexburg
56	179	4816.46	1.01E+06	4779.12	Ashton to Rexburg
56	168	4770.82	1.10E+05	4730.46	Heise to Shelley
56	169	4775.57	1.10E+05	4735.15	Heise to Shelley
56	170	4779.76	1.10E+05	4739.28	Heise to Shelley
57	166	4763.71	1.10E+05	4723.57	Heise to Shelley
57	167	4766.42	1.10E+05	4726.23	Heise to Shelley
57	170	4784.37	1.10E+05	4743.82	Heise to Shelley
57	177	4813.42	1.10E+05	4775.62	Heise to Shelley
58	166	4764.36	1.10E+05	4724.34	Heise to Shelley
58	167	4764.85	1.10E+05	4724.8	Heise to Shelley
58	171	4790.95	1.10E+05	4750.3	Heise to Shelley
58	174	4807.07	1.10E+05	4766.88	Heise to Shelley
58	175	4809.3	1.10E+05	4769.74	Heise to Shelley
58	176	4810.94	1.10E+05	4772.55	Heise to Shelley
59	165	4762.48	1.10E+05	4722.56	Heise to Shelley
59	166	4764.36	1.10E+05	4724.4	Heise to Shelley
59	171	4794.72	1.10E+05	4754.03	Heise to Shelley
59	174	4807.5	1.10E+05	4774.5	Heise to Shelley
60	164	4759.23	1.10E+05	4719.36	Heise to Shelley
60	172	4797.76	1.10E+05	4757.04	Heise to Shelley

Table 3 (contd.). List of model cells containing river cells representing the Snake River.

Row	Column	Stage (ft)	Riverbed Conductance (ft^2/day)	River Bottom Elevation (ft)	Reach
60	173	4802.84	1.10E+05	4762.07	Heise to Shelley
60	174	4811.5	1.10E+05	4778.5	Heise to Shelley
61	164	4758.28	1.10E+05	4718.46	Heise to Shelley
61	175	4830	1.10E+05	4797	Heise to Shelley
62	164	4755.48	1.10E+05	4715.76	Heise to Shelley
62	175	4837.5	1.10E+05	4804.5	Heise to Shelley
63	164	4753.39	1.10E+05	4713.72	Heise to Shelley
63	175	4844.5	1.10E+05	4811.5	Heise to Shelley
64	164	4749.19	1.10E+05	4709.61	Heise to Shelley
64	176	4865.5	1.10E+05	4832.5	Heise to Shelley
65	164	4744.68	1.10E+05	4705.43	Heise to Shelley
65	176	4873.5	1.10E+05	4840.5	Heise to Shelley
65	177	4884	1.10E+05	4851	Heise to Shelley
66	163	4739.41	1.10E+05	4700.6	Heise to Shelley
66	177	4896.5	1.10E+05	4863.5	Heise to Shelley
67	163	4737.56	1.10E+05	4699.08	Heise to Shelley
67	178	4912.5	1.10E+05	4879.5	Heise to Shelley
68	163	4735.39	1.10E+05	4697.22	Heise to Shelley
68	178	4926.5	1.10E+05	4893.5	Heise to Shelley
69	162	4720.53	1.10E+05	4682.79	Heise to Shelley
69	178	4788.82	1.10E+05	4755.82	Heise to Shelley
70	161	4707.02	1.10E+05	4669.82	Heise to Shelley
70	179	4770.5	1.10E+05	4737.5	Heise to Shelley
71	161	4701.45	1.10E+05	4664.52	Heise to Shelley
71	180	4786	1.10E+05	4753	Heise to Shelley
72	161	4690.55	1.10E+05	4654.02	Heise to Shelley
72	180	4797	1.10E+05	4764	Heise to Shelley
73	160	4677.21	1.10E+05	4641.1	Heise to Shelley
73	180	4809	1.10E+05	4776	Heise to Shelley
74	157	4647.71	1.10E+05	4612.6	Heise to Shelley
74	158	4658.3	1.10E+05	4622.86	Heise to Shelley
74	159	4665.72	1.10E+05	4630.04	Heise to Shelley
74	180	4816	1.10E+05	4783	Heise to Shelley
74	181	4818	1.10E+05	4785	Heise to Shelley
75	153	4606.84	1.10E+05	4572.26	Heise to Shelley
75	156	4629.01	1.10E+05	4594.46	Heise to Shelley
75	181	4818	1.10E+05	4785	Heise to Shelley
76	154	4610.81	1.10E+05	4576.84	Heise to Shelley
76	155	4617.41	1.10E+05	4583.2	Heise to Shelley
76	181	4818	1.10E+05	4785	Heise to Shelley
76	152	4598.48	1.57E+05	4561.11	Shelley to Near Blackfoot
77	151	4589.92	1.57E+05	4548.08	Shelley to Near Blackfoot
77	152	4595.78	1.57E+05	4556.51	Shelley to Near Blackfoot

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Table 3 (contd.). List of model cells containing river cells representing the Snake River.

Row	Column	Stage (ft)	Riverbed Conductance (ft^2/day)	River Bottom Elevation (ft)	Reach
78	150	4575.03	1.57E+05	4532.01	Shelley to Near Blackfoot
79	149	4569.54	1.57E+05	4526.38	Shelley to Near Blackfoot
80	147	4553.89	1.57E+05	4510.25	Shelley to Near Blackfoot
80	148	4560.89	1.57E+05	4517.62	Shelley to Near Blackfoot
81	139	4491.97	1.57E+05	4453.9	Shelley to Near Blackfoot
81	140	4501.35	1.57E+05	4461.96	Shelley to Near Blackfoot
81	141	4513.71	1.57E+05	4472.78	Shelley to Near Blackfoot
81	142	4521.68	1.57E+05	4478.88	Shelley to Near Blackfoot
81	143	4527.72	1.57E+05	4484.18	Shelley to Near Blackfoot
81	144	4535.9	1.57E+05	4491.21	Shelley to Near Blackfoot
81	145	4541.93	1.57E+05	4497.1	Shelley to Near Blackfoot
81	146	4547.91	1.57E+05	4503.68	Shelley to Near Blackfoot
82	128	4418.1	1.57E+05	4383.03	Shelley to Near Blackfoot
82	129	4423.53	1.57E+05	4388.8	Shelley to Near Blackfoot
82	130	4431.3	1.57E+05	4396.07	Shelley to Near Blackfoot
82	131	4435.75	1.57E+05	4400.34	Shelley to Near Blackfoot
82	132	4442.82	1.57E+05	4407.11	Shelley to Near Blackfoot
82	133	4448.35	1.57E+05	4412.2	Shelley to Near Blackfoot
82	134	4456.59	1.57E+05	4419.38	Shelley to Near Blackfoot
82	135	4464.03	1.57E+05	4425.76	Shelley to Near Blackfoot
82	136	4472.21	1.57E+05	4433.43	Shelley to Near Blackfoot
82	137	4477.15	1.57E+05	4438.74	Shelley to Near Blackfoot
82	138	4485.21	1.57E+05	4447.49	Shelley to Near Blackfoot
83	127	4408.11	1.57E+05	4372.24	Shelley to Near Blackfoot
83	115	4354.09	9.90E+04	4314.81	Near Blackfoot to Neeley
83	116	4357.37	9.90E+04	4318.34	Near Blackfoot to Neeley
83	126	4402.41	9.90E+04	4365.84	Near Blackfoot to Neeley
84	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
84	115	4354.09	9.90E+04	4314.81	Near Blackfoot to Neeley
84	116	4357.37	9.90E+04	4318.34	Near Blackfoot to Neeley
84	125	4393.24	9.90E+04	4354.98	Near Blackfoot to Neeley
84	126	4399.29	9.90E+04	4361.92	Near Blackfoot to Neeley
85	112	4353.76	9.90E+04	4313.88	Near Blackfoot to Neeley
85	113	4353.66	9.90E+04	4314.01	Near Blackfoot to Neeley
85	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
85	115	4354.09	9.90E+04	4314.81	Near Blackfoot to Neeley
85	116	4357.37	9.90E+04	4318.34	Near Blackfoot to Neeley
85	122	4378.63	9.90E+04	4336.98	Near Blackfoot to Neeley
85	123	4382.95	9.90E+04	4342.12	Near Blackfoot to Neeley
85	124	4387.28	9.90E+04	4347.59	Near Blackfoot to Neeley
86	112	4353.76	9.90E+04	4313.88	Near Blackfoot to Neeley
86	113	4353.66	9.90E+04	4314.01	Near Blackfoot to Neeley
86	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley

Table 3 (contd.). List of model cells containing river cells representing the Snake River.

Row	Column	Stage (ft)	Riverbed Conductance (ft^2/day)	River Bottom Elevation (ft)	Reach
86	115	4353.66	9.90E+04	4314.27	Near Blackfoot to Neeley
86	116	4357.37	9.90E+04	4318.34	Near Blackfoot to Neeley
86	117	4359.68	9.90E+04	4320.81	Near Blackfoot to Neeley
86	118	4360.26	9.90E+04	4320.66	Near Blackfoot to Neeley
86	119	4363.43	9.90E+04	4323.18	Near Blackfoot to Neeley
86	120	4365.87	9.90E+04	4325.32	Near Blackfoot to Neeley
86	121	4373.64	9.90E+04	4332.18	Near Blackfoot to Neeley
87	111	4353.66	9.90E+04	4313.61	Near Blackfoot to Neeley
87	112	4353.76	9.90E+04	4313.88	Near Blackfoot to Neeley
87	113	4353.66	9.90E+04	4314.01	Near Blackfoot to Neeley
87	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
88	107	4353.56	9.90E+04	4311.31	Near Blackfoot to Neeley
88	109	4353.67	9.90E+04	4313.3	Near Blackfoot to Neeley
88	110	4353.66	9.90E+04	4313.41	Near Blackfoot to Neeley
88	111	4353.66	9.90E+04	4313.61	Near Blackfoot to Neeley
88	112	4353.7	9.90E+04	4313.73	Near Blackfoot to Neeley
88	113	4353.66	9.90E+04	4314.01	Near Blackfoot to Neeley
88	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
88	115	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
89	106	4353.18	9.90E+04	4310.06	Near Blackfoot to Neeley
89	107	4353.56	9.90E+04	4311.31	Near Blackfoot to Neeley
89	108	4353.66	9.90E+04	4312.48	Near Blackfoot to Neeley
89	109	4353.67	9.90E+04	4313.3	Near Blackfoot to Neeley
89	110	4353.66	9.90E+04	4313.41	Near Blackfoot to Neeley
89	111	4353.66	9.90E+04	4313.61	Near Blackfoot to Neeley
89	112	4353.7	9.90E+04	4313.73	Near Blackfoot to Neeley
89	113	4353.66	9.90E+04	4314.01	Near Blackfoot to Neeley
89	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
89	115	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
90	104	4353.12	9.90E+04	4308.02	Near Blackfoot to Neeley
90	105	4352.87	9.90E+04	4308.82	Near Blackfoot to Neeley
90	106	4353.18	9.90E+04	4310.06	Near Blackfoot to Neeley
90	107	4353.56	9.90E+04	4311.31	Near Blackfoot to Neeley
90	108	4353.66	9.90E+04	4312.48	Near Blackfoot to Neeley
90	109	4353.67	9.90E+04	4313.16	Near Blackfoot to Neeley
90	110	4353.66	9.90E+04	4313.41	Near Blackfoot to Neeley
90	111	4353.66	9.90E+04	4313.61	Near Blackfoot to Neeley
90	112	4353.7	9.90E+04	4313.73	Near Blackfoot to Neeley
90	113	4353.66	9.90E+04	4314.01	Near Blackfoot to Neeley
90	114	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
90	115	4353.66	9.90E+04	4314.18	Near Blackfoot to Neeley
91	103	4352.68	9.90E+04	4306.46	Near Blackfoot to Neeley
91	104	4353.12	9.90E+04	4308.02	Near Blackfoot to Neeley

Table 3 (contd.). List of model cells containing river cells representing the Snake River.

Row	Column	Stage (ft)	Riverbed Conductance (ft^2/day)	River Bottom Elevation (ft)	Reach
91	105	4353.29	9.90E+04	4308.74	Near Blackfoot to Neeley
91	106	4353.18	9.90E+04	4310.06	Near Blackfoot to Neeley
91	107	4353.56	9.90E+04	4311.31	Near Blackfoot to Neeley
91	108	4353.66	9.90E+04	4312.48	Near Blackfoot to Neeley
91	109	4353.67	9.90E+04	4313.16	Near Blackfoot to Neeley
91	110	4353.66	9.90E+04	4313.41	Near Blackfoot to Neeley
92	100	4348.82	9.90E+04	4299.47	Near Blackfoot to Neeley
92	101	4350.99	9.90E+04	4302.4	Near Blackfoot to Neeley
92	102	4352.79	9.90E+04	4305.13	Near Blackfoot to Neeley
92	103	4352.77	9.90E+04	4306.06	Near Blackfoot to Neeley
92	104	4353.12	9.90E+04	4308.02	Near Blackfoot to Neeley
92	105	4353.29	9.90E+04	4308.74	Near Blackfoot to Neeley
92	106	4353.18	9.90E+04	4310.06	Near Blackfoot to Neeley
92	107	4353.56	9.90E+04	4311.31	Near Blackfoot to Neeley
92	108	4353.66	9.90E+04	4312.48	Near Blackfoot to Neeley
92	109	4353.67	9.90E+04	4313.16	Near Blackfoot to Neeley
93	99	4327.91	9.90E+04	4277.3	Near Blackfoot to Neeley
93	100	4348.46	9.90E+04	4298.4	Near Blackfoot to Neeley
93	101	4350.99	9.90E+04	4302.4	Near Blackfoot to Neeley
93	102	4352.79	9.90E+04	4305.13	Near Blackfoot to Neeley
93	103	4352.77	9.90E+04	4306.06	Near Blackfoot to Neeley
94	99	4273.49	9.90E+04	4222.01	Near Blackfoot to Neeley
95	98	4240.65	9.90E+04	4188	Near Blackfoot to Neeley
95	99	4248.08	9.90E+04	4196.01	Near Blackfoot to Neeley
85	68	4172.75	3.51E+04	4123.2	Neeley to Minidoka
85	69	4190.45	3.51E+04	4140.28	Neeley to Minidoka
85	70	4192.86	3.51E+04	4141.68	Neeley to Minidoka
86	71	4195.25	3.51E+04	4142.87	Neeley to Minidoka
86	72	4195.28	3.51E+04	4141.95	Neeley to Minidoka
86	73	4195.02	3.51E+04	4141.09	Neeley to Minidoka
87	74	4195.44	3.51E+04	4140.29	Neeley to Minidoka
88	74	4196.01	3.51E+04	4140.01	Neeley to Minidoka
89	75	4195.99	3.51E+04	4138.93	Neeley to Minidoka
90	75	4196.08	3.51E+04	4138.09	Neeley to Minidoka
91	75	4195.54	3.51E+04	4136.65	Neeley to Minidoka
92	75	4195.62	3.51E+04	4135.82	Neeley to Minidoka
93	76	4196.07	3.51E+04	4134.87	Neeley to Minidoka
93	78	4196.18	3.51E+04	4133.16	Neeley to Minidoka
94	77	4195.92	3.51E+04	4132.94	Neeley to Minidoka
94	79	4196.18	3.51E+04	4133.16	Neeley to Minidoka
94	80	4196.18	3.51E+04	4133.49	Neeley to Minidoka
95	81	4196.18	3.51E+04	4134.13	Neeley to Minidoka
95	95	4196.6	3.51E+04	4140.24	Neeley to Minidoka

Table 3 (concluded). List of model cells containing river cells representing the Snake River.

Row	Column	Stage (ft)	Riverbed Conductance (ft^2/day)	River Bottom Elevation (ft)	Reach
95	96	4202.58	3.51E+04	4147.47	Neeley to Minidoka
95	97	4217.18	3.51E+04	4163.29	Neeley to Minidoka
96	82	4196.17	3.51E+04	4134.81	Neeley to Minidoka
96	83	4196.18	3.51E+04	4135.79	Neeley to Minidoka
96	90	4195.04	3.51E+04	4133.79	Neeley to Minidoka
96	93	4194.75	3.51E+04	4135.54	Neeley to Minidoka
96	94	4195.68	3.51E+04	4137.93	Neeley to Minidoka
97	84	4196.18	3.51E+04	4135.79	Neeley to Minidoka
97	85	4196.18	3.51E+04	4136.22	Neeley to Minidoka
97	86	4196.18	3.51E+04	4136.67	Neeley to Minidoka
97	87	4196.18	3.51E+04	4137.15	Neeley to Minidoka
97	88	4196.18	3.51E+04	4137.5	Neeley to Minidoka
97	89	4196.11	3.51E+04	4137.54	Neeley to Minidoka
97	91	4195.04	3.51E+04	4133.79	Neeley to Minidoka
97	92	4195.87	3.51E+04	4135.33	Neeley to Minidoka

Table 4. List of model cells containing drains representing springs in the Thousand Springs region.

Row	Column	Drain Elevation (ft) Elevation (ft)	Drain Conductance (ft^2/d)	Reach
70	30	3693.77	87.56523	Devils Washbowl to Buhl
69	29	3682	10.34861	Devils Washbowl to Buhl
68	29	3661	68.46006	Devils Washbowl to Buhl
66	28	3645.97	31711.91	Devils Washbowl to Buhl
65	28	3622.07	72169.5	Devils Washbowl to Buhl
65	27	3608.07	7904.277	Devils Washbowl to Buhl
64	26	3591	1273.676	Devils Washbowl to Buhl
62	24	3540.61	453546.3	Devils Washbowl to Buhl
61	23	3506	3502.608	Devils Washbowl to Buhl
59	22	3455	278.6165	Devils Washbowl to Buhl
58	21	3419.59	1512.49	Devils Washbowl to Buhl
57	20	3372	604.996	Devils Washbowl to Buhl
54	18	3250.03	941722.4	Devils Washbowl to Buhl
53	17	3241.2	103486.1	Devils Washbowl to Buhl
51	14	3180	254.8987	Buhl to Thousand Springs
50	13	3150.01	185533.5	Buhl to Thousand Springs
50	12	3128.01	456229.9	Buhl to Thousand Springs
49	11	3100.02	189105	Buhl to Thousand Springs
48	11	3100	1058810	Buhl to Thousand Springs
47	13	3128.27	149180.1	Buhl to Thousand Springs
47	12	3107.83	641034.8	Buhl to Thousand Springs
46	13	3115.92	179172.9	Buhl to Thousand Springs
46	12	3094.06	307529.7	Buhl to Thousand Springs
45	12	3075	404081.1	Thousand Springs
44	12	3059.08	15649154	Thousand Springs
43	12	3050	500578.1	Thousand Springs
42	12	3072.47	29734.38	Thousand Springs
42	13	3096.3	24060.39	Thousand Springs to Malad
41	13	3098.59	2168.47	Thousand Springs to Malad
40	13	3095.04	944.3784	Thousand Springs to Malad
39	14	3074.71	33836.27	Thousand Springs to Malad
38	14	3072.87	949.0182	Thousand Springs to Malad
37	14	3047	11480.96	Thousand Springs to Malad
37	13	3058	34838.79	Thousand Springs to Malad
36	14	3016	9501.488	Thousand Springs to Malad
36	16	3072.35	1118337	Malad
36	15	2998.77	1158866	Malad
35	14	3007	19541.74	Malad to Bancroft
34	14	2978.97	78008.92	Malad to Bancroft
33	14	2949.78	21851.87	Malad to Bancroft
32	14	2931.01	14574.1	Malad to Bancroft
31	14	2939.88	6660.319	Malad to Bancroft
31	13	2923.55	12483.49	Malad to Bancroft
30	13	2957.8	1236.11	Malad to Bancroft
25	6	2787	75081.41	Malad to Bancroft

Table 5. List of tributary basins.

Basin	Average Annual Tributary Valley Underflow for ESPAM Model (acre feet)	Average Annual Tributary Valley Underflow for ESPAM Model (ft^3)	Average Tributary Valley Underflow for ESPAM Model (ft^3/stress period)
American Falls	20,000	8.51E+08	4.25E+08
Big Lost River	48,000	2.09E+09	1.04E+09
Big Wood River	8,900	3.87E+08	1.93E+08
Birch Creek	69,000	3.02E+09	1.51E+09
Blackfoot River	12,000	5.03E+08	2.51E+08
Camas/Beaver Creeks	193,000	8.39E+09	4.20E+09
Clover Creek	8,900	3.87E+08	1.93E+08
Goose Creek	24,000	1.04E+09	5.22E+08
Henrys Fork	98,000	4.25E+09	2.13E+09
Lincoln/Ross Creeks	3,600	1.55E+08	7.73E+07
Little Lost River	138,000	5.99E+09	3.00E+09
Little Wood River	21,000	9.28E+08	4.64E+08
Medicine Lodge Creek	8,000	3.48E+08	1.74E+08
Palisades	6,200	2.71E+08	1.35E+08
Portneuf River	56,000	2.44E+09	1.22E+09
Raft River	75,000	3.25E+09	1.62E+09
Rexburg Bench	16,000	6.96E+08	3.48E+08
Rock Creek	45,000	1.97E+09	9.86E+08
Silver Creek	47,000	2.05E+09	1.02E+09
Teton River	2,700	1.16E+08	5.80E+07
Thorn Creek	5,300	2.32E+08	1.16E+08
Willow Creek	26,000	1.12E+09	5.61E+08

Table 6. List of perched non-Snake River reaches.

Reach	Acre Feet/Stress Period	Acre Feet/Year
Basin 31 Flood Control	1,929	3,857
Below Magic Reservoir	41,023	82,046
Big Lost River 1	7,279	14,557
Big Lost River 2	3,651	7,302
Big Lost River 3	4,511	9,022
Big Lost River 4	2,084	4,168
Big Lost River Flood Control	6,435	12,870
Big Wood River Below Gooding	3,493	6,985
Birch Creek	4,144	8,288
Birch Creek Hydropower Discharge	6,227	12,455
Camas Creek	13,827	27,654
Camas National Wildlife Refuge	3,712	7,425
Little Lost River	3,088	6,175
Little Lost River Flood Control	3,723	7,446
Little Wood River 1	2,436	4,873
Little Wood River 2	1,095	2,190
Little Wood River 3	1,699	3,397
Lone Tree Flood Control (Camas Creek)	3,079	6,157
Medicine Lodge Creek	16,202	32,404
Milner-Pickets (TFCC)	1,408	2,815
Mud Lake	4,514	9,028
Murtaugh Lake	1,675	3,351
Total	137,233	274,466

Table 7. List of canals represented with specified flux.

Canal Name
Northside Main
Northside Wilson Lake
Milner-Gooding
Aberdeen-Springfield
Northside Laterals above Rim

Table 8. Six-year average of measured lysimeter winter ET for Kimberly, Idaho.

Month	Average ET, mm/day	Average ET, ft/month
November	0.7	0.069
December	0.4	0.041
January	0.6	0.061
February	1.0	0.093

Table 9. Calculated Winter-Time ET Rates, Feet Per Month

Station	County	ID	Elev (ft)	Nov ET (ft)	Dec ET (ft)	Jan ET (ft)	Feb ET (ft)
Aberdeen Exp	Bingham	100010	4400	0.069	0.041	0.061	0.072
American Falls 3 NW	Power	100227	4320	0.069	0.041	0.061	0.075
Arco 3 SW	Butte	100375	5330	0.050	0.041	0.042	0.042
Ashton	Fremont	100470	5110	0.059	0.041	0.049	0.049
Blackfoot Fire Dept	Bingham	100915	4320	0.069	0.041	0.061	0.075
Bliss	Gooding	101002	3270	0.069	0.041	0.061	0.109
Burley FAA AP	Cassia	101303	4160	0.069	0.041	0.061	0.080
Dubois Exp	Clark	102707	5460	0.046	0.038	0.038	0.038
Fort Hall Indian Age	Bingham	103297	4500	0.069	0.041	0.061	0.069
Hamer 4 NW	Jefferson	103964	4800	0.069	0.041	0.060	0.060
Hazelton	Jerome	104140	3770	0.069	0.041	0.061	0.093
IF 16 SE	Bonneville	104456	5720	0.036	0.030	0.030	0.030
IF FAA AP	Bonneville	104457	4740	0.069	0.041	0.061	0.061
Jerome	Jerome	104670	3770	0.069	0.041	0.061	0.093
MacKay Ranger St	Custer	105462	5910	0.029	0.024	0.024	0.024
Minidoka Dam	Minidoka	105980	4210	0.069	0.041	0.061	0.079
Paul	Minidoka	106877	4150	0.069	0.041	0.061	0.080
Picabo	Blaine	107040	4880	0.068	0.041	0.057	0.057
Poc WB AP	Bannock	107211	4770	0.069	0.041	0.060	0.060
Richfield	Lincoln	107673	4310	0.069	0.041	0.061	0.075
Shoshone	Lincoln	108380	3970	0.069	0.041	0.061	0.086
St Anthony	Fremont	108022	4970	0.065	0.041	0.054	0.054

Table 10. Irrigation Entity Table

Entity ID	Entity Name	Irrigation Company(ies) Included in Entity
IESW01	A & B 1	A & B Irrigation District
IESW02	Aberdeen Springfield 1	Aberdeen Springfield Canal Co
IESW03	Arcadia 1	Arcadia Reservoir & Canal Co Ltd
IESW04	Bell Rapids 1	Bell Rapids Mutual Irrigation Co
IESW05	Big Lost River 3	Big Lost River Irrigation District
		Moore Water Users Association
		Darlington Land & Irrigation Co
IESW06	Big Spring 3	Banbury Pipe Company Inc
		Big Spring Water Users Assn
		Hagerman Water Users Association
IESW07	Big Wood 4	Justice Ditch Co
		Thorpe Ditch Co
		Big Wood Canal Company
		Mullins Canal & Reservoir Co
IESW08	Blaine 1	Blaine County Canal Co
IESW09	Burgess 5	Burgess Canal & Irrigating Co
		North Rigby Irrigation & Canal Co Inc
		Parks & Lewisville Irrigation Co Inc
		Rigby Canal & Irrigation Co
		Clark & Edwards Canal Company
IESW10	Burley 1	Burley Irrigation District
IESW11	Butte and Market 1	Butte & Market Lake Canal Co
IESW12	Canyon Creek 3	Enterprise Irrigation District
		Canyon Creek Lateral Ditch Assn
		Canyon Creek Canal Co Inc
IESW13	Consolidated Farmers 4	Roxana Canal Co
		Consolidated Farmers Canal Co Ltd
		Saurey-Sommer Ditch
		Island Ward Canal Co

Entity ID	Entity Name	Irrigation Company(ies) Included in Entity
IESW14	Corbett 4	Corbett Slough Ditch Company
		Eastern Idaho Water Co
		Little Butte Irrigation Co Ltd
		Younie Ditch Co
IESW15	Dewey 1	Dewey Canal Co
IESW16	Egin 2	Egin Bench Canals Inc
		St Anthony Union Canal Co
IESW17	Fall River 1	Fall River Irrigation Co
IESW18	Falls 3	Falls Irrigation District
		Warm Creek Irrigation Co
		Fort Hall Indian Reservation
IESW20	Harrison 5	Rudy Irrigation Canal Co Ltd
		Harrison Canal & Irrigation Co
		Kite And Nord Ditch
		Enterprise Canal Co Ltd
		Butler Island Canal Co
IESW21	Heise 1	Heise Canal
IESW22	Idaho 2	Snake River Valley Irrigation District
		Idaho Irrigation District
IESW23	Independent 6	Lowder Slough Canal Co
		West Labelle Irrigation Co Ltd
		Dilts Irrigation Company
		Ellis-Bramwell Ditch C0
		Independent Irrigation Co
		Labelle Irrigating Co
IESW24	Island 1	Island Irrigation Co
IESW25	Little Wood 2	Fish Creek Reservoir Company Inc
		Little Wood River Canal Co
IESW26	Long Island 1	Long Island Irrigation Co
IESW27	Milner 1	Milner Irrigation District
IESW28	Minidoka 1	Minidoka Irrigation District
		Owsley Canal Company
		Holley Water Users Assn
Entity ID	**Entity Name**	**Irrigation Company(ies) Included in Entity**
IESW29	Mud Lake 4	Level Canal Co Inc
		Mud Lake Water Users Inc
IESW30	New Sweden 7	Smith-Maxwell Ditch Co
		New Sweden Irrigation District
		Shattuck Irrigation Co.
		Stattuck Irrigation Co
		Long Island Canal Co
		Blackfoot Irrigation Co
		Woodville Canal Co
IESW31	North Fremont 1	North Fremont Canal Systems Inc
IESW32	North Side 4	King Hill Irrigation District
		North Side Canal Company Ltd
		American Falls Reservoir Dist #2
		Dba Bs Farms & Irrigation Co
IESW33	Osgood 4	Owners Mutual Irrigation Co
		Osgood Canal Co Inc

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		H & W Water Users Association
		Bear Island Water Assn
IESW34	Peoples 8	Watson Slough Ditch And Irrigation Companies
		Peoples Canal & Irrigation Co
		Parsons Ditch Co
		Wearyrick Ditch Co
		Trego Ditch Co
		Danskin Ditch Company
		New Lavaside Ditch Company Limited
		Riverside Canal Co
IESW35	Progressive 2	Poplar Irrigation District
		Progressive Irrigation District
IESW36	Reid 6	Consolidated Feeder Canal Co
		Liberty Park Irrigation Co Inc
		Texas Slough Irrigating Canal Co
		Reid Canal Co
		Lenroot Canal Co
		Sunnydell Irrigation District

Entity ID	Entity Name	Irrigation Company(ies) Included in Entity
IESW37	Reno 1	Reno Ditch Company Inc
IESW38	Rexburg 1	Rexburg Irrigation Co C/O Keith Erikson
IESW39	Silky 2	Silky Lateral Ditch Water Users Assn
		Silky Irrigation District
IESW40	Southwest 2	Oakley Canal Co
		Southwest Irrigation District
IESW41	Twin Falls 1	Twin Falls Canal Co
IESW42	Twin Groves 6	Wilford Irrigation And Mfg Co
		Pioneer Ditch Co Ltd
		Twin Groves Irrigation & Manufacturing
		Salem Union Canal Co Ltd
		Farmers Friend Irrigation Co Ltd
		North Salem Agr & Mill Canal Inc
IESW43	Woodmansee Johnson 6	Woodmansee-Johnson Canal Company
		Teton Irrigation And Manufacturing Co
		Pincock Garner Ditch Association
		Pincock-Byington Ditch Co
		Wolf Ditch Company
		Teton Island Feeder Canal Co
IESW44	Jefferson 3	Jefferson Irrigation Co
		Producers Irrigation Co
		Monteview Canal Co Inc
		Monteview Canal Co Inc

Table 11. Sprinkler ratios used for interpolation between specific years.

ENTITY_ID	May-80	May-82	May-87	May-92	May-97	Oct-00
IEGW501	0.150	0.254	0.520	0.686	0.710	0.720
IEGW502	0.200	0.230	0.310	0.389	0.500	0.550
IEGW503	0.875	0.885	0.910	0.934	0.960	0.975
IEGW504	0.981	0.982	0.986	0.989	0.992	0.994
IEGW505	0.983	0.986	0.992	0.997	0.999	1.000
IEGW506	0.770	0.803	0.880	0.917	0.945	0.960
IEGW507	0.580	0.657	0.830	0.904	0.920	0.930
IEGW508	0.530	0.617	0.840	0.940	0.963	0.970
IEGW509	0.640	0.692	0.810	0.864	0.880	0.890
IEGW600	1.000	1.000	1.000	1.000	1.000	1.000
IESW000	0.333	0.373	0.499	0.555	0.610	0.634
IESW001	0.150	0.311	0.520	0.676	0.710	0.720
IESW002	0.825	0.847	0.900	0.919	0.930	0.936
IESW005	0.700	0.731	0.810	0.880	0.934	0.970
IESW007	0.147	0.165	0.215	0.239	0.263	0.276
IESW008	0.540	0.570	0.650	0.729	0.800	0.840
IESW009	0.015	0.050	0.130	0.185	0.220	0.250
IESW010	0.010	0.150	0.600	0.733	0.850	0.910
IESW011	0.440	0.467	0.530	0.560	0.590	0.610
IESW012	0.867	0.870	0.875	0.879	0.897	0.897
IESW014	0.210	0.286	0.450	0.545	0.640	0.700
IESW015	0.000	0.000	0.010	0.015	0.025	0.030
IESW016	0.050	0.136	0.750	0.808	0.860	0.890
IESW018	1.000	1.000	1.000	1.000	1.000	1.000
IESW019	1.000	1.000	1.000	1.000	1.000	1.000
IESW020	0.050	0.082	0.190	0.226	0.260	0.280
IESW022	0.250	0.384	0.650	0.763	0.850	0.900
IESW025	0.210	0.318	0.600	0.700	0.800	0.860
IESW027	0.000	0.000	0.230	0.307	0.360	0.380
IESW028	0.130	0.219	0.550	0.714	0.800	0.840
IESW029	0.035	0.068	0.150	0.240	0.320	0.420
IESW030	0.180	0.292	0.630	0.801	0.910	0.960
IESW031	0.950	0.961	0.980	0.998	1.000	1.000
IESW032	0.000	0.000	0.600	0.750	0.840	0.900
IESW033	0.970	0.976	0.990	0.996	1.000	1.000
IESW034	0.540	0.582	0.690	0.741	0.800	0.830
IESW035	0.020	0.056	0.190	0.278	0.360	0.410
IESW036	0.020	0.049	0.120	0.149	0.180	0.195
IESW037	0.145	0.229	0.420	0.608	1.000	1.000
IESW038	0.251	0.286	0.251	0.216	0.251	0.251
IESW039	0.270	0.296	0.270	0.243	0.270	0.270
IESW040	0.400	0.528	0.800	0.921	1.000	1.000
IESW041	0.000	0.017	0.120	0.188	0.250	0.285
IESW044	0.020	0.041	0.100	0.161	0.300	0.370
IESW051	0.000	0.000	0.000	0.000	0.040	0.070

IESW052	0.000	0.000	0.000	0.000	0.040	0.070
IESW053	0.530	0.560	0.610	0.630	0.645	0.660
IESW054	0.319	0.359	0.467	0.510	0.560	0.588
IESW055	0.000	0.007	0.026	0.041	0.059	0.072
IESW056	0.451	0.468	0.507	0.536	0.571	0.584
IESW057	0.648	0.676	0.767	0.813	0.813	0.813

Table 12. Measured Return Flow Sites.

Site #	Station #	Site Name	Location	
Henry's Fork River basin:				
1	13055300	Farmers Own Canal - Black Spring	Lat. 44 02'59"	Long. 111 32'20"
2	13055337	Rexburg Canal drain nr Thornton	Lat. 43 48'55"	Long. 111 53'15"
3	13050543	Independent Canal drain		
4	13056550	Texas Slough Canal nr Thornton	Lat. 43 47' 58"	Long. 111 54' 49"
5	13056600	Texas Slough nr Rexburg	Lat. 43 47'17"	Long. 111 53'45.
6	13056650	Liberty Park Canal	Lat. 43 47'24"	Long. 111 55'27"
7	13056850	Bannock Jim Spring Slough	Lat. 43 46'30"	Long. 111 56'11"
Snake River to American Falls Reservoir:				
8	13057000	Scott's Slough	Lat. 42 44'32"	Long. 111 58'20"
9	13057020	Dry Bed	Lat. 43 42'11"	Long. 112 04'13"
10	13057030	South Parks	Lat. 43 41'19"	Long. 112 03'47"
11	13057045	Butte Market Lake Canal	Lat. 43 39'20"	Long. 112 05'27"
12	13057100	Burgess drain nr Idaho Falls	Lat. 43 36'60"	Long. 112 03'03"
Near to and just below American Falls Reservoir:				
13	13069548	Sterling Waste	Lat. 43 01'49"	Long. 112 43'40"
14	13069565	Aberdeen Waste Drain	Lat.	Long.
15	13076210	Tartar Waste	Lat. 42 52'40"	Long. 112 51'23"
16	13077650	Rock Creek nr American Falls	Lat. 42 39'10"	Long. 113 01'00"

Table 12 (continued). Measured Return Flow Sites.

Site #	Station #	Site Name	Location	
Below American Falls Reservoir to King Hill:				
17	13082060	F drain nr Declo	Lat. 42 32' 48"	Long. 113 37' 14"
18	13082032	D-3 drain	Lat. 42 36'49"	Long. 113 36'10"
19	13082062	D-5 drain nr Rupert	Lat. 42 33'15"	Long. 113 38'38"
20	13082064	D-4 drain nr Rupert	Lat. 42 34'15"	Long. 113 38'25"
21	13082320	Marsh Creek nr Declo	Lat. 42 31'26"	Long. 113 40'02"
22	13082330	Spring Creek nr Declo	Lat. 42 31'01"	Long. 113 41'03"
23	13084705	D-16 drain nr Heyburn	Lat. 42 32'30"	Long. 113 45'24"
24	13084707	B drain nr Heyburn	Lat. 42 33'33"	Long. 113 47'01"
25	13085060	D-17 drain nr Heyburn	Lat. 42 32'53"	Long. 113 50'51"
26	13085065	Main drain North nr Heyburn	Lat. 42 33'02"	Long. 113 51'59"
27	13085070	G drain nr Burley	Lat. 42 31'56"	Long. 113 53'12"
28	13085080	J drain nr Burley	Lat. 42 31'53"	Long. 113 53'29"
29	13089690	Irr drain nr Hansen	Lat.	Long.
30	13089695	Twin Falls Coulee	Lat. 42 34'11"	Long. 114 20'32"
31	13090370	Fish Hatchery Waste 0	Lat. 42 35'29"	Long. 114 26'03"
32	13090460	Perrine Coulee nr Twin Falls	Lat. 42 35'53"	Long. 114 28'20"
33	13091733	Jerome Golf Course Drain 1	Lat. 42 38 03"	Long. 114 31'03"
34	13093150	Sonnickson drain	Lat. 42 38'40"	Long. 114 33'26"
35	13093190	Sucker Flat drain nr Filer (LSLQ)	Lat. 42 38'25"	Long. 114 35'30"
36	13093550	Cedar Draw nr Filer	Lat. 42 39'13"	Long. 114 39'15"
37	13093900	Waste I nr Buhl	Lat. 42 39'33"	Long. 114 41'28"
38	13094050	J8 at Rivers Edge	Lat. 42 40'27"	Long. 114 44'27"
39	13094700	Mud Creek nr Buhl	Lat. 42 39'33"	Long. 114 47'20"
40	13095060	Fish Hatchery drain upper	Lat. 42 32'60"	Long. 114 49'21"
41	13095061	Fish Hatchery drain lower	Lat. 42 40'01"	Long. 114 48' 60
42	13095360	S. Coulee (Cedar Draw)	Lat. 42 41'46	Long. 114 48'19"
43	13095490	Irr Ditch to Blind Canyon	Lat. 42 42'28"	Long. 114 4730"
44	13133785	Drain nr Bickel Springs	Lat. 42 45'28"	Long. 114 50'48"
45	13152450	Irr Ditch nr Bliss	Lat. 42 55'56"	Long. 115 00'19"
46	13152895	W. drain nr Tuttle (Drain to Malad River)	Lat. 42 51'50"	Long. 114 51' 58"

Table 13. Assignment of return flows, diversions to surface water entities.

Below American Falls:

Group	Irr. Entity	Assigned Return flows		Water Supply: Historic Diversions
1	IESW032	13152450	Irr. Ditch nr Bliss	13087000 T. F. Northside
		13152895	W. Dr. nr Tuttle (to Malad)	13086510 'A' Lateral in Gooding
		13133785	Drain nr Bickel Srings	13086520 N. Side Cross-cut
		13094050	J8 at Rivers Edge	
		13095490	Irr. Drain to Blind Canyon	
		13095360	S. Coulee(Ceder Draw)	
		13093150	Sonnickson drain	
		13091733	Jerome Golf drain	
2	IESW028	13085060	D-17 drain nr Heyburn	13080000 Minidoka Northside
		13085065	Main drain North nr Heyburn	
		13084707	B drain nr Heyburn	
		13084705	D-16 drain nr Heyburn	
		13082064	D-4 drain nr Rupert	
		13082062	D-5 drain nr Rupert	
		13082032	D-3 drain	
3	IESW010	13082060	F drain nr Declo	Minidoka South (13080500)
		13082320	Marsh Creek nr Declo	
		13082330	Spring Creek nr Declo	
		13085070	G drain nr Burley	
		13085080	J drain nr Burley	
4	IESW041	13089690	Irr drain nr Hansen	13087500 Twin Falls Southside Canal
		13089695	Twin Falls Coulee	
		13090370	Fish Hatchery Waste 0	
		13090460	Perrine Coulee nr Twin Falls	
		13093190	Sucker Flat drain nr Filer (LSLQ)	
		13093550	Cedar Draw nr Filer	
		13093900	Waste I nr Buhl	
		13094700	Mud Creek nr Buhl	
		13095061	Fish Hatchery drain lower	
		13095060	Fish Hatchery drain upper	

Table 13(continued). Assignment of return flows, diversions to surface water entities.

Above American Falls

Group	Irr. Entity	Assigned Return flows	Water Supply: Historic Diversions
5	IESW002	13069548 Sterling Waste 13069565 Aberdeen Waste Drain 13076210 Tartar Waste	13061610 Aberdeen Springfield Canal
6	IESW031	13055300 Farmers Own Canal - Black Spring	13047575 Farmers Own 13047305 Yellowstone 13047415 Marysville
7	IESW016	13050543 Independent Canal drain (Ave. of 1989-90 USGS Data)	13049725 St Anthony Canal 13049550 Last Chance 13050525 Egin Canal 13050530 St Anthony Union Fdr 13050535 Independant Canal
8	IESW011	13057045 Butte Market Lake Canal	13057025 Butte Market Lake
9	IESW036	13056550 Texas Slough Canal nr Thornton 13056650 Liberty Park Canal 13056850 Bannock Jim Spring Slough 13056600 Texas Slough nr Rexburg	13038392 Sunnydell Canal 13038426 Lenroot Canal 13038431 Reid Canal 13038435 Bannock Jim 13038436 Hill Pitinger 13038437 Nelson Cory 13038434 Texas Feeder 13055323 Rexburg Canal 13055334 Rexburg Irr.

Table 13(concluded). Assignment of return flows, diversions to surface water entities.

Above American Falls

Group	Irr. Entity		Assigned Return flows	Water Supply: Historic Diversions
10	IESW009	13057000	Scott's Slough	13038110 Burgess
	IESW020	13057020	Dry Bed	13038115 Clark & Edwards
	IESW023	13057030	South Parks	13038180 Rigby Canal
	IESW024	13057100	Burgess drain nr Idaho Falls	13037975 Eagle Rock
	IESW026			13037977 Eagle Rock ab Will Cr
				13037985 Enterprise
				13038025 Butler Island
`				13038030 Ross and Rand
				13038050 Steele Canal
				13038055 Harrison Canal
				13038065 Cheny Canal
				13038080 Butler Island #2
				13038095 Boomer Canal
				13038098 Kite & Nord
				13038145 Croft Pump
				13038387 Nelson Canal
				13038388 Mattson Creg
				1303838150 East Labelle
				13038205 Dilts Canal
				13038225 W. Labelle Long Is
				13038340 White Canal
				13038360 Bramwell
				13038362 Ellis Canal
				13038210 Island Canal

Table 14. Estimated return flow lags for the ten groups of surface irrigation entities.

Group	Irr. Entity	Results: Ann. Return and Lags					
1	IESW032	Total Annual Returned (%) =>		4.6			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	3	1.6	0	0	0
2	IESW028	Total Annual Returned (%) =>		4.80			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	2	1	1	1	0
3	IESW010	Total Annual Returned (%) =>		10.0			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	4	3	3	0	0
4	IESW041	Total Annual Returned (%) =>		6.4			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	3	2	1.5	0	0
5	IESW002	Total Annual Returned (%) =>		5.9			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	3	2	1	0	0
6	IESW031	Total Annual Returned (%) =>		19.5			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	7	4	3	3	2
7	IESW016	Total Annual Returned (%) =>		1.6			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	1	0.6	0	0	0
8	IESW011	Total Annual Returned (%) =>		1.8			
		Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	1.8	0	0	0	0
9	IESW036	Total Annual Returned (%) =>		29.2			
	IESW038	Month =>	1	2	3	4	5
		Lag. Ret. (%) =>	12	10	5	2	1
10	IESW009	Total Annual Returned (%) =>		27.2			
	IESW020	Month =>	1	2	3	4	5
	IESW023	Lag. Ret. (%) =>	11	7	4	4	0
	IESW024						
	IESW026						

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Table 15. Normalized annual Silver Creek flows.

Year	Annual (ac-ft)	Normalized Flux	Dampened Normalized Flux
1980/81	32383	1.17	1.06
1981/82	26539	0.96	0.99
1982/83	38543	1.39	1.13
1983/84	38628	1.39	1.13
1984/85	35633	1.29	1.1
1985/86	30812	1.11	1.04
1986/87	31684	1.14	1.05
1987/88	22700	0.82	0.94
1988/89	20691	0.75	0.92
1989/90	23278	0.84	0.95
1990/91	21075	0.76	0.92
1991/92	20976	0.76	0.92
1992/93	18595	0.67	0.89
1993/94	27301	0.99	1
1994/95	18327	0.66	0.89
1995/96	31272	1.13	1.04
1996/97	32242	1.16	1.05
1997/98	33892	1.22	1.07
1998/99	33167	1.2	1.07
1999/00	30072	1.09	1.03
2000/01	22677	0.82	0.94
2001/02	19090	0.69	0.9
Av Annual	27708	1	1

Table 16. Minor land use types.

Classification	Acres	Percent of Study Area	Recharge Rate
Dry Farm	95,000	1.3%	zero
Water and Wetlands	65,000	0.9%	Precipitation minus three feet/year
Cities and Industrial Areas	48,000	0.7%	Negative 1.2 feet/year

Table 17. Apportionment of Mud Lake fixed point pumpage.

Fixed Point	No. Wells	Adjusted No. Wells	Percent of Total Volume
Buck Springs	7	7	18%
Bybee	13	14	35%
Holley	6	8	21%
North Lake, East	12	7	18%
North Lake, West	3	3	8%

Table 18. Fixed point pumpage by stress period (ac-ft/stress period).

Stress Period	Snake/Teton Exchange Wells	Mud Lake Exchange Wells	Recharge Adjustment	Wetlands Adjustment
S1	-6,590	-76,926	0	-11,241
S2	0	-34,089	0	-5,294
S3	-13,082	-73,313	0	-11,241
S4	0	-17,936	0	-5,294
S5	-1,437	-57,902	0	-11,241
S6	0	0	0	-5,294
S7	-914	-23,598	0	-11,241
S8	0	0	0	-5,294
S9	-687	-15,563	0	-11,241
S10	0	0	0	-5,294
S11	-5,800	-69,008	0	-11,241
S12	0	0	0	-5,294
S13	-1,786	-60,730	0	-11,241
S14	0	0	0	-5,294
S15	-2,045	-112,847	0	-11,241
S16	0	0	417	-5,294
S17	-22,395	-167,982	12,933	-11,241
S18	0	-21,792	8,344	-5,294
S19	-7,379	-145,601	0	-11,241
S20	0	-42,358	0	-5,294
S21	-3,709	-159,949	626	-11,241
S22	-9,177	-52,773	8,344	-5,294
S23	-18,657	-145,528	12,725	-11,241
S24	-3,098	-40,742	8,344	-5,294
S25	-47,842	-163,418	30,246	-11,241
S26	0	-36,997	8,344	-5,294
S27	-998	-77,893	0	-11,241
S28	0	-49,972	0	-5,294
S29	-19,020	-156,706	0	-11,241
S30	0	0	0	-5,294
S31	-253	-34,435	0	-11,241
S32	0	-33,359	7,092	-5,294
S33	-448	-149,394	0	-11,241
S34	0	0	417	-5,294
S35	-103	-87,188	0	-11,241
S36	0	-14,917	1,669	-5,294
S37	-281	-52,254	0	-11,241
S38	0	0	0	-5,294
S39	-345	-62,114	0	-11,241
S40	0	0	0	-5,294
S41	-6,774	-166,460	0	-11,241
S42	-434	-43,060	0	-5,294
S43	-51,473	-175,595	37,963	-8,267
S44	0	0	12,308	-8,267
Average	-5,107	-59,600	3,404	-8,268
Annual Average	-10,215	-119,200	6,808	-16,535

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Table 19. Evapotranspiration-indexed scale used to vary off-site pumping rates.

Year	Index	Year	Index
1980	0.94	1991	1.03
1981	0.98	1992	1.11
1982	0.97	1993	0.94
1983	0.96	1994	1.09
1984	0.94	1995	0.94
1985	1.01	1996	0.97
1986	1.03	1997	0.94
1987	1.07	1998	0.93
1988	1.10	1999	0.96
1989	1.03	2000	1.01

Table 20. Off-site well pumping for each model stress period (acre-ft per stress period).

Well ID	Location Name	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	Jefferson	-12,709	-410	-13,248	-405	-13,115	-401	-12,980	-393	-12,709	-422
2	Jefferson	-12,709	-410	-13,248	-405	-13,115	-401	-12,980	-393	-12,709	-422
3	Jefferson	-12,709	-410	-13,248	-405	-13,115	-401	-12,980	-393	-12,709	-422
4	Monteview	-6,338	-204	-6,609	-202	-6,540	-200	-6,474	-196	-6,338	-211
5	Monteview	-6,338	-204	-6,609	-202	-6,540	-200	-6,474	-196	-6,338	-211
6	Monteview	-6,338	-204	-6,609	-202	-6,540	-200	-6,474	-196	-6,338	-211
7	Producers	-1,479	-48	-1,542	-47	-1,526	-47	-1,510	-46	-1,479	-49
8	Producers	-1,479	-48	-1,542	-47	-1,526	-47	-1,510	-46	-1,479	-49

Well ID	Location Name	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
1	Jefferson	-13,655	-431	-13,926	-447	-14,465	-460	-14,874	-431	-13,926	-447
2	Jefferson	-13,655	-431	-13,926	-447	-14,465	-460	-14,874	-431	-13,926	-447
3	Jefferson	-13,655	-431	-13,926	-447	-14,465	-460	-14,874	-431	-13,926	-447
4	Monteview	-6,811	-215	-6,947	-223	-7,218	-229	-7,420	-215	-6,947	-223
5	Monteview	-6,811	-215	-6,947	-223	-7,218	-229	-7,420	-215	-6,947	-223
6	Monteview	-6,811	-215	-6,947	-223	-7,218	-229	-7,420	-215	-6,947	-223
7	Producers	-1,589	-50	-1,620	-52	-1,683	-54	-1,730	-50	-1,620	-52
8	Producers	-1,589	-50	-1,620	-52	-1,683	-54	-1,730	-50	-1,620	-52

Well ID	Location Name	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30
1	Jefferson	-14,465	-431	-13,926	-464	-15,009	-393	-12,709	-456	-14,736	-393
2	Jefferson	-14,465	-431	-13,926	-464	-15,009	-393	-12,709	-456	-14,736	-393
3	Jefferson	-14,465	-431	-13,926	-464	-15,009	-393	-12,709	-456	-14,736	-393
4	Monteview	-7,218	-215	-6,947	-232	-7,484	-196	-6,338	-227	-7,353	-196
5	Monteview	-7,218	-215	-6,947	-232	-7,484	-196	-6,338	-227	-7,353	-196
6	Monteview	-7,218	-215	-6,947	-232	-7,484	-196	-6,338	-227	-7,353	-196
7	Producers	-1,683	-50	-1,620	-54	-1,746	-46	-1,479	-53	-1,715	-46
8	Producers	-1,683	-50	-1,620	-54	-1,746	-46	-1,479	-53	-1,715	-46

Well ID	Location Name	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
1	Jefferson	-12,709	-405	-13,115	-393	-12,709	-389	-12,573	-401	-12,980	-422
2	Jefferson	-12,709	-405	-13,115	-393	-12,709	-389	-12,573	-401	-12,980	-422
3	Jefferson	-12,709	-405	-13,115	-393	-12,709	-389	-12,573	-401	-12,980	-422
4	Monteview	-6,338	-202	-6,540	-196	-6,338	-194	-6,274	-200	-6,474	-211
5	Monteview	-6,338	-202	-6,540	-196	-6,338	-194	-6,274	-200	-6,474	-211
6	Monteview	-6,338	-202	-6,540	-196	-6,338	-194	-6,274	-200	-6,474	-211
7	Producers	-1,479	-47	-1,526	-46	-1,479	-45	-1,463	-47	-1,510	-49
8	Producers	-1,479	-47	-1,526	-46	-1,479	-45	-1,463	-47	-1,510	-49

Well ID	Location Name	S41	S42	S43	S44
1	Jefferson	-13,655	-464	-15,009	-418
2	Jefferson	-13,655	-464	-15,009	-418
3	Jefferson	-13,655	-464	-15,009	-418
4	Monteview	-6,811	-232	-7,484	-209
5	Monteview	-6,811	-232	-7,484	-209
6	Monteview	-6,811	-232	-7,484	-209
7	Producers	-1,589	-54	-1,746	-49
8	Producers	-1,589	-54	-1,746	-49

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Table 21. Annual spring discharge (north side only) in the Milner to King Hill reach.

Water Year	Discharge (cfs)
1980	6110
1981	5860
1982	5760
1983	5690
1984	6030
1985	5830
1986	6350
1987	6260
1988	5960
1989	5820
1990	5610
1991	5460
1992	5190
1993	5090
1994	5320
1995	5120
1996	5040
1997	5430
1998	5870
1999	5660
2000	5830
2001	5870
2002	5440

Table 22. Estimated spring discharge by sub-reach in the Milner to King Hill reach.

Subreach Name	Number of Model Cells	Total Discharge (cfs)	Subreach Proportion of Milner to King Hill Discharge
Devil's Washbowl to Buhl Gage	17	1075	0.17
Buhl Gage to Thousand Springs	12	1700	0.28
Thousand Springs	4	1879	0.31
Billingsley Creek	10	204	0.03
Malad Gorge	2	1199	0.19
Malad Gorge to Bancroft Springs	10	97	0.02

Table 23. Model cells representing individually measured or estimated springs.

Spring	Row	Column
Devils Washbowl	66	28
Devils Corral	65	28
Blue Lakes	62	24
Crystal	54	18
Clear Lakes	50	12
	50	13
Briggs	49	11
Box	47	12
	47	13
Thousand Springs	44	12
Malad	36	15
	36	16

Table 24. Summary of spring discharge calibration target data.

Spring Name	Number of Observations	Start Date	End Date
Devils Washbowl	5657	4/6/85	9/30/00
Devils Corral	35	11/6/80	3/6/01
Blue Lakes	7470	5/1/80	9/15/02
Crystal	1802	6/3/85	2/18/02
Clear Lakes	56	10/13/82	1/16/02
Briggs	3462	5/19/80	9/30/98
Box	7458	5/1/80	9/30/00
Malad	217	12/1/84	12/1/02
Thousand Springs	236	5/1/80	12/1/02

Table 25. Steady state river gain and spring calibration targets and model predictions.

Spring or Reach Name	Steady State Target Discharge (ft^3/d)	Steady State Discharge (ft^3/d)
Ashton to Rexburg	2.72E+07	2.67E+07
Heise to Shelley	-5.14E+07	-5.19E+07
Shelley to Near Blackfoot	-6.43E+07	-6.35E+07
Near Blackfoot to Neeley	2.27E+08	2.28E+08
Neeley to Minidoka	7.08E+06	6.97E+06
Devils Washbowl to Buhl	8.66E+07	6.24E+07
Buhl to Thousand Springs	1.37E+08	1.32E+08
Thousand Ssprings	1.51E+08	1.70E+08
Thousand Springs to Malad	6.63E+06	5.34E+06
Malad	9.65E+07	1.04E+08
Malad to Bancroft	7.84E+06	1.14E+07

Table 26. Eastern Snake Plain Aquifer Model Enhancement Design Document Topics

Revised May, 2006

Model Design and Calibration Topic	Author	ESPAM Project Document Number	IWRRI Document Number	Status
Model Design Objectives	Paul Castelin, Donna Cosgrove	DDM-001		Final
Model Boundary	Allan Wylie	DDM-002	IWRRI04-016	Final
Model Layers	Allan Wylie	DDM-003	IWRRI04-019	Final
Model River Representation	Allan Wylie	DDM-010	IWRRI04-017	Final
Estimating Elevation of Wellheads and River Surface	Allan Wylie	DDM-011	IWRRI04-021	Final
Delineating the Bottom of the Aquifer	Allan Wylie	DDM-012	IWRRI04-015	Final
Steady State Response Functions	Donna Cosgrove, Gary Johnson	DDM-013		In Preparation
Transient Response Functions	Donna Cosgrove, Gary Johnson	DDM-014		In Preparation
Model Grid and Grid Orientation	Allan Wylie	DDM-015	IWRRI04-018	Final
Confined vs. Unconfined Aquifer Representation	Allan Wylie	DDM-016	IWRRI04-020	Final

Estimating Reach Gains in the Ashton/Heise to Milner Reach	Brenda Gilliland	DDM-017	IWRRI04-011	Final
Estimating Reach Gains in the Milner to King Hill Reach	Gary Johnson	DDM-018		In Revision
ESPAM Final Report	Donna Cosgrove	DDM-019	IWRRI06-002	Final

Recharge Calculation Topic	Author	ESPAM Project Document Number	IWRRI Document Number	Status
Determination of Crop Mix	Bryce Contor	DDW-001	IWRRI04-025	Final
Percolation, Runoff and Deficit Irrigation	Bryce Contor	DDW-002	IWRRI04-004	Final
Recharge from Precipitation on Non-Irrigated Lands	Bryce Contor	DDW-003	IWRRI04-006	Final
Tributary Underflow	Allan Wylie	DDW-004	IWRRI06-004	Final
Calculating Return Flow Lag Factors	Dick Lutz	DDW-005	N/A	Final
Aggregating Surface Water Canal Companies into Surface Water Irrigation Entities	Brenda Gilliland	DDW-008	IWRRI04-014	Final
Ground Water Irrigation Entities for Recharge Calculation	Bryce Contor	DDW-009	IWRRI04-026	Final
Traditional Evapotranspiration Calculation	Bryce Contor	DDW-010	IWRRI04-009	Final
PRISM Precipitation Maps	Brenda Gilliland	DDW-011	IWRRI04-013	Final
Estimating Irrigation Entity Diversions—Snake	Brenda Gilliland	DDW-012	IWRRI04-012	Final
Historical Gaging Station Locations	Brenda Gilliland	DDW-013	IWRRI04-022	Final

Historical Water Level Measurements	Suzy Shaub	DDW-014	Not assigned	Final
Land Use	Bryce Contor	DDW-015	IWRRI04-007	Final
Estimating ET Using SEBAL	Rick Allen	DDW-016		
Determining Source of Irrigation Water	Bryce Contor	DDW-017	IWRRI04-010	Final
Irrigation Conveyance Losses	Bryce Contor	DDW-020	IWRRI04-008	Final
ET Adjustment Factors	Bryce Contor	DDW-021	IWRRI06-005	Final
Discerning Method of Irrigation Water Application	Bryce Contor	DDW-022	IWRRI04-005	As-Built Version
Non-Snake Perched River Reach Seepage Estimates and Irrigation Diversions	Nathan Erickson	DDW-024	IWRRI06-003	Final
Fixed Point Pumping	Bryce Contor	DDW-026	IWRRI04-027	Final

Recharge Program Topic	Author	ESPAM Project Document Number	IWRRI Document Number	Status
GIS-Based Recharge Program Component Design	Jim Oakleaf	DDR-001	N/A	Final (incorporated in Recharge Tool as help files)
Preparing GIS Recharge Component Inputs	Bryce Contor	DDR-002	N/A	Available as May, 2004 training notes
Fortran-Based Recharge Program Component User's Guide	Donna Cosgrove	DDR-003		In preparation

Field Work Topic	Author	ESPAM Project Document Number	IWRRI Document Number	Status
ADCP Reach Gain Measurement Report—Spring/Fall, 2001	Idaho Power/USGS	DDF-001	N/A	Final
ADCP Reach Gain Measurement Final Report	Idaho Power/USGS	DDF-005	N/A	Final
Return Flow Measurement Plan	Idaho Power	DDF-006	N/A	Final
Return Flow Measurement Data Report—Year 1	Idaho Power	DDF-007	N/A	Final
Return Flow Measurement Data Report—Year 2	Idaho Power	DDF-008	N/A	Final

Scenario Topic	Author	ESPAM Project Document Number	IWRRI Document Number	Status
Base Case Scenario	IWRRI	DDS-001	IWRRI04-001	Final
Curtailment Scenario	IWRRI	DDS-004	IWRRI04-023	Final
No Changes in Surface Water Practices Scenario	IWRRI	DDS-003	IWRRI04-003	Final
Managed Recharge Scenario	IWRRI	DDS-002	IWRRI04-002	Final
Drought Scenario	IWRRI	DDS-005	IWRRI04-024	In preparation
Strawman Scenario	IWRRI	DDS-006	IWRRI05-003	In preparation
A&B Irrigation District Scenario	IWRRI	DDS-007		

Notes:

Web site for obtaining documents:

http://www.if.uidaho.edu/~johnson/ifiwrri/srpmrpts/index.html

DDM-nnn document number for model design documents

DDW-nnn document number for water budget design documents

DDR-nnn document number for recharge program design documents

DDF-nnn document number for field work design documents

DDS-nnn document number for scenario documents

Appendix A—Appendix Tables

Tables in Appendix

Table A-1. Mapping of tributaries to model cells.
Table A-2. Mapping of perched reaches to model cells.
Table A-3. Mapping of canal reaches to model cells.
Table A-4. Crop mix by county for each year.
Table A-5. Sprinkler percentage by irrigation entity for each model stress period.
Table A-6. Surface water diversions for each irrigation entity by stress period
Table A-7. Return flow volume by model stress period.
Table A-8. Canal leakage fraction applied to diversion volume, by model stress period.
Table A-9. Fixed point pumping cells represented in model.

Table A-1. List of tributary basins and associated model cells.

Tributary	Model Row	Model Column	Tributary	Model Row	Model Column
Bannock Creek	100	110	Little Wood River	33	71
Bannock Creek	100	111	Little Wood River	33	72
Big Lost River	5	106	Medicine Lodge Cr.	19	171
Big Lost River	5	107	Medicine Lodge Cr.	19	172
Big Wood River	30	50	Palisades	75	181
Big Wood River	30	51	Palisades	75	182
Big Wood River	30	52	Palisades	76	180
Big Wood River	30	53	Palisades	76	181
Big Wood River	30	54	Palisades	77	180
Birch Creek	26	145	Portneuf River	102	121
Birch Creek	26	146	Raft River	93	77
Birch Creek	26	147	Raft River	93	78
Birch Creek	26	148	Raft River	93	79
Blackfoot River	85	152	Raft River	94	76
Blackfoot River	85	153	Raft River	94	77
Blackfoot River	86	151	Raft River	94	79
Blackfoot River	86	152	Raft River	94	80
Blackfoot River	87	151	Raft River	94	81
Camas/Beaver Creeks	19	183	Raft River	95	81
Camas/Beaver Creeks	19	184	Raft River	95	82
Camas/Beaver Creeks	19	185	Raft River	96	82
Camas/Beaver Creeks	20	198	Raft River	96	83
Camas/Beaver Creeks	20	199	Rexburg Bench	65	194
Camas/Beaver Creeks	21	199	Rexburg Bench	65	195
Camas/Beaver Creeks	21	200	Rexburg Bench	65	196
Camas/Beaver Creeks	22	200	Rexburg Bench	65	197
Camas/Beaver Creeks	22	201	Rexburg Bench	66	192
Clover Creek	23	15	Rexburg Bench	66	193
Clover Creek	23	16	Rexburg Bench	66	194
Goose Creek	100	34	Rexburg Bench	66	197
Goose Creek	100	35	Rexburg Bench	67	190
Goose Creek	101	36	Rexburg Bench	67	191
Goose Creek	101	37	Rexburg Bench	67	192
Henrys Fork	35	200	Rexburg Bench	68	187
Henrys Fork	36	200	Rexburg Bench	68	188
Henrys Fork	37	200	Rexburg Bench	68	189
Henrys Fork	38	200	Rexburg Bench	68	190
Henrys Fork	38	201	Rock Creek	96	90
Henrys Fork	39	201	Rock Creek	97	88

Tributary	Model Row	Model Column
Henrys Fork	40	201
Henrys Fork	41	202
Henrys Fork	42	202
Henrys Fork	43	202
Henrys Fork	44	202
Henrys Fork	45	201
Henrys Fork	46	201
Henrys Fork	47	201
Henrys Fork	48	202
Henrys Fork	49	202
Henrys Fork	50	202
Henrys Fork	51	201
Henrys Fork	52	201
Henrys Fork	53	200
Henrys Fork	54	199
Henrys Fork	54	200
Henrys Fork	55	199
Henrys Fork	56	199
Lincoln/Ross Creeks	93	141
Lincoln/Ross Creeks	93	142
Lincoln/Ross Creeks	95	135
Lincoln/Ross Creeks	95	136
Lincoln/Ross Creeks	96	134
Lincoln/Ross Creeks	96	135
Lincoln/Ross Creeks	97	133
Lincoln/Ross Creeks	97	134
Lincoln/Ross Creeks	98	132
Lincoln/Ross Creeks	98	133
Little Lost River	23	126
Little Lost River	23	127
Little Lost River	24	127
Little Lost River	24	128
Little Lost River	24	129
Little Lost River	25	129
Little Lost River	25	130
Little Lost River	25	131
Rock Creek	97	89
Rock Creek	97	91
Rock Creek	97	92
Rock Creek	98	92
Rock Creek	98	93
Rock Creek	99	93
Rock Creek	99	94
Silver Creek	33	65
Silver Creek	33	66
Silver Creek	33	67
Teton River	61	202
Teton River	62	199
Teton River	62	200
Teton River	62	201
Teton River	62	202
Teton River	63	199
Teton River	64	199
Teton River	65	199
Teton River	66	199
Teton River	67	198
Teton River	67	199
Thorn Creek	61	202
Thorn Creek	62	199
Thorn Creek	62	200
Thorn Creek	62	201
Thorn Creek	62	202
Thorn Creek	63	199
Thorn Creek	64	199
Thorn Creek	65	199
Thorn Creek	66	199
Thorn Creek	67	198
Thorn Creek	67	199
Thorn Creek	32	32
Thorn Creek	33	33
Thorn Creek	33	34
Willow Creek	76	175
Willow Creek	76	176
Willow Creek	77	176
Willow Creek	77	177
Willow Creek	77	178
Willow Creek	75	173
Willow Creek	75	174
Willow Creek	75	175

Table A-2. List of Perched reaches and associated model cells.

Tributary Name	Row	Column	Tributary Name	Row	Column
Basin 31 Flood Control	45	149	Basin 31 Flood Control	45	149
Basin 31 Flood Control	45	150	Basin 31 Flood Control	45	150
Below Magic Reservoir	34	50	Below Magic Reservoir	34	50
Below Magic Reservoir	30	50	Below Magic Reservoir	30	50
Below Magic Reservoir	31	50	Below Magic Reservoir	31	50
Below Magic Reservoir	31	51	Below Magic Reservoir	31	51
Below Magic Reservoir	33	51	Below Magic Reservoir	33	51
Below Magic Reservoir	32	51	Below Magic Reservoir	32	51
Below Magic Reservoir	34	51	Below Magic Reservoir	34	51
Big Lost River 1	24	112	Big Lost River 1	24	112
Big Lost River 1	24	113	Big Lost River 1	24	113
Big Lost River 1	26	111	Big Lost River 1	26	111
Big Lost River 1	5	107	Big Lost River 1	5	107
Big Lost River 1	8	107	Big Lost River 1	8	107
Big Lost River 1	33	110	Big Lost River 1	33	110
Big Lost River 1	18	113	Big Lost River 1	18	113
Big Lost River 1	22	113	Big Lost River 1	22	113
Big Lost River 1	22	114	Big Lost River 1	22	114
Big Lost River 1	6	107	Big Lost River 1	6	107
Big Lost River 1	7	107	Big Lost River 1	7	107
Big Lost River 1	9	107	Big Lost River 1	9	107
Big Lost River 1	9	108	Big Lost River 1	9	108
Big Lost River 1	10	108	Big Lost River 1	10	108
Big Lost River 1	11	108	Big Lost River 1	11	108
Big Lost River 1	11	109	Big Lost River 1	11	109
Big Lost River 1	12	109	Big Lost River 1	12	109
Big Lost River 1	12	110	Big Lost River 1	12	110
Big Lost River 1	13	110	Big Lost River 1	13	110
Big Lost River 1	13	111	Big Lost River 1	13	111
Big Lost River 1	15	111	Big Lost River 1	15	111
Big Lost River 1	15	112	Big Lost River 1	15	112
Big Lost River 1	14	111	Big Lost River 1	14	111
Big Lost River 1	29	109	Big Lost River 1	29	109
Big Lost River 1	16	112	Big Lost River 1	16	112
Big Lost River 1	17	112	Big Lost River 1	17	112
Big Lost River 1	17	113	Big Lost River 1	17	113
Big Lost River 1	19	113	Big Lost River 1	19	113
Big Lost River 1	20	113	Big Lost River 1	20	113
Big Lost River 1	20	114	Big Lost River 1	20	114
Big Lost River 1	21	114	Big Lost River 1	21	114
Big Lost River 1	23	113	Big Lost River 1	23	113
Big Lost River 1	25	111	Big Lost River 1	25	111
Big Lost River 1	25	112	Big Lost River 1	25	112
Big Lost River 1	30	109	Big Lost River 1	30	109
Big Lost River 1	30	110	Big Lost River 1	30	110
Big Lost River 1	27	110	Big Lost River 1	27	110
Big Lost River 1	27	111	Big Lost River 1	27	111
Big Lost River 1	28	109	Big Lost River 1	28	109
Big Lost River 1	28	110	Big Lost River 1	28	110
Big Lost River 1	31	110	Big Lost River 1	31	110

Table A-2 (continued). List of Perched reaches and associated model cells.

Tributary Name	Row	Column	Tributary Name	Row	Column
Big Lost River 1	32	110	Big Wood River Below Gooding	37	17
Big Lost River 1	34	109	Big Wood River Below Gooding	37	18
Big Lost River 1	34	110	Big Wood River Below Gooding	37	19
Big Lost River 1	35	110	Big Wood River Below Gooding	36	19
Big Lost River 2	38	110	Big Wood River Below Gooding	36	20
Big Lost River 2	38	111	Big Wood River Below Gooding	35	20
Big Lost River 2	42	112	Big Wood River Below Gooding	38	17
Big Lost River 2	42	113	Big Wood River Below Gooding	38	18
Big Lost River 2	42	114	Birch Creek	27	144
Big Lost River 2	39	111	Birch Creek	27	145
Big Lost River 2	39	112	Birch Creek	26	145
Big Lost River 2	36	110	Birch Creek	28	144
Big Lost River 2	37	110	Birch Creek Hydropower Discharge	25	149
Big Lost River 2	40	111	Birch Creek Hydropower Discharge	25	150
Big Lost River 2	40	112	Birch Creek Hydropower Discharge	26	147
Big Lost River 2	41	112	Birch Creek Hydropower Discharge	26	148
Big Lost River 2	43	115	Birch Creek Hydropower Discharge	26	149
Big Lost River 2	43	114	Camas Creek	29	193
Big Lost River 2	44	115	Camas Creek	29	194
Big Lost River 3	45	116	Camas Creek	33	180
Big Lost River 3	45	117	Camas Creek	33	181
Big Lost River 3	45	118	Camas Creek	33	182
Big Lost River 3	45	119	Camas Creek	33	183
Big Lost River 3	45	120	Camas Creek	33	184
Big Lost River 3	45	121	Camas Creek	35	172
Big Lost River 3	45	122	Camas Creek	35	173
Big Lost River 3	45	123	Camas Creek	35	174
Big Lost River 3	45	124	Camas Creek	35	175
Big Lost River 4	39	131	Camas Creek	30	190
Big Lost River 4	39	132	Camas Creek	30	191
Big Lost River 4	42	129	Camas Creek	30	192
Big Lost River 4	42	130	Camas Creek	30	193
Big Lost River 4	38	132	Camas Creek	31	189
Big Lost River 4	41	130	Camas Creek	31	190
Big Lost River 4	41	131	Camas Creek	31	191
Big Lost River 4	40	131	Camas Creek	31	192
Big Lost River 4	43	128	Camas Creek	32	184
Big Lost River 4	43	129	Camas Creek	32	185
Big Lost River 4	44	127	Camas Creek	32	186
Big Lost River 4	44	128	Camas Creek	32	187
Big Lost River 4	45	125	Camas Creek	32	188
Big Lost River 4	45	126	Camas Creek	32	189
Big Lost River 4	45	127	Camas Creek	34	173
Big Lost River Flood Control	48	115	Camas Creek	34	174
Big Lost River Flood Control	47	115	Camas Creek	34	175
Big Lost River Flood Control	46	115	Camas Creek	34	176
Big Lost River Flood Control	46	116	Camas Creek	34	177
Big Wood River Below Gooding	34	20	Camas Creek	34	178
Big Wood River Below Gooding	34	21	Camas Creek	34	179
Big Wood River Below Gooding	37	16	Camas Creek	34	180

Table A-2 (continued). List of Perched reaches and associated model cells.

Tributary Name	Row	Column	Tributary Name	Row	Column
Camas Creek	34	181	Little Wood River 1	43	59
Camas Creek	36	172	Little Wood River 1	43	60
Camas Creek	37	171	Little Wood River 1	44	57
Camas Creek	37	172	Little Wood River 1	44	58
Camas Creek	38	170	Little Wood River 1	44	59
Camas Creek	38	171	Little Wood River 1	45	54
Camas National Wildlife Refuge	41	165	Little Wood River 1	45	55
Camas National Wildlife Refuge	41	166	Little Wood River 1	45	56
Camas National Wildlife Refuge	41	167	Little Wood River 1	45	57
Camas National Wildlife Refuge	40	166	Little Wood River 2	45	53
Camas National Wildlife Refuge	42	165	Little Wood River 2	46	41
Camas National Wildlife Refuge	42	167	Little Wood River 2	46	42
Little Lost River	24	128	Little Wood River 2	46	43
Little Lost River	29	128	Little Wood River 2	44	39
Little Lost River	29	129	Little Wood River 2	44	48
Little Lost River	25	128	Little Wood River 2	45	38
Little Lost River	26	128	Little Wood River 2	45	39
Little Lost River	27	128	Little Wood River 2	45	40
Little Lost River	28	128	Little Wood River 2	45	41
Little Lost River	30	129	Little Wood River 2	45	43
Little Lost River	31	129	Little Wood River 2	45	44
Little Lost River	33	129	Little Wood River 2	45	45
Little Lost River	32	129	Little Wood River 2	45	46
Little Lost River Flood Control	24	128	Little Wood River 2	45	47
Little Wood River 1	35	71	Little Wood River 2	45	48
Little Wood River 1	39	65	Little Wood River 2	45	49
Little Wood River 1	39	66	Little Wood River 2	45	50
Little Wood River 1	39	67	Little Wood River 2	45	51
Little Wood River 1	39	68	Little Wood River 2	45	52
Little Wood River 1	33	71	Little Wood River 2	45	53
Little Wood River 1	34	71	Little Wood River 3	44	38
Little Wood River 1	36	71	Little Wood River 3	34	22
Little Wood River 1	36	72	Little Wood River 3	34	23
Little Wood River 1	37	71	Little Wood River 3	34	24
Little Wood River 1	37	72	Little Wood River 3	39	31
Little Wood River 1	38	67	Little Wood River 3	39	32
Little Wood River 1	38	68	Little Wood River 3	39	33
Little Wood River 1	38	69	Little Wood River 3	39	34
Little Wood River 1	38	70	Little Wood River 3	41	35
Little Wood River 1	38	71	Little Wood River 3	41	36
Little Wood River 1	40	62	Little Wood River 3	35	24
Little Wood River 1	40	63	Little Wood River 3	42	36
Little Wood River 1	40	64	Little Wood River 3	42	37
Little Wood River 1	40	65	Little Wood River 3	36	24
Little Wood River 1	41	60	Little Wood River 3	36	25
Little Wood River 1	41	61	Little Wood River 3	36	26
Little Wood River 1	41	62	Little Wood River 3	37	26
Little Wood River 1	41	63	Little Wood River 3	37	27
Little Wood River 1	42	60	Little Wood River 3	38	27
Little Wood River 1	42	61	Little Wood River 3	38	28

Table A-2 (concluded). List of Perched reaches and associated model cells.

Tributary Name	Row	Column
Little Wood River 3	38	29
Little Wood River 3	38	30
Little Wood River 3	38	31
Little Wood River 3	40	33
Little Wood River 3	40	34
Little Wood River 3	40	35
Little Wood River 3	43	37
Little Wood River 3	43	38
Little Wood River 3	44	38
Lone Tree Flood Control (Camas Cree	31	191
Lone Tree Flood Control (Camas Cree	32	191
Medicine Lodge Creek	22	170
Medicine Lodge Creek	22	171
Medicine Lodge Creek	21	171
Medicine Lodge Creek	19	171
Medicine Lodge Creek	20	171
Medicine Lodge Creek	23	169
Medicine Lodge Creek	23	170
Medicine Lodge Creek	24	169
Medicine Lodge Creek	25	167
Medicine Lodge Creek	25	168
Medicine Lodge Creek	25	169
Medicine Lodge Creek	26	167
Milner-Pickets (TFCC)	79	33
Milner-Pickets (TFCC)	79	39
Milner-Pickets (TFCC)	78	34
Milner-Pickets (TFCC)	78	35
Milner-Pickets (TFCC)	78	36
Milner-Pickets (TFCC)	78	37
Milner-Pickets (TFCC)	78	38
Mud Lake	39	156
Mud Lake	39	157
Mud Lake	41	158
Mud Lake	41	159
Mud Lake	41	160
Mud Lake	40	157
Mud Lake	40	158
Mud Lake	40	159
Mud Lake	40	160
Murtaugh Lake	79	33
Murtaugh Lake	80	33

Table A-3. List of canals and associated model cells.

Canal Name	Row	Column	Canal Name	Row	Column
Northside Main	54	31	Milner Gooding	58	38
Northside Main	54	32	Milner Gooding	60	39
Northside Main	41	25	Milner Gooding	60	40
Northside Main	41	26	Milner Gooding	59	38
Northside Main	42	26	Milner Gooding	59	39
Northside Main	46	27	Milner Gooding	61	40
Northside Main	40	24	Milner Gooding	61	41
Northside Main	40	25	Milner Gooding	62	41
Northside Main	43	26	Milner Gooding	63	41
Northside Main	44	26	Milner Gooding	63	42
Northside Main	44	27	Milner Gooding	64	40
Northside Main	45	27	Milner Gooding	64	41
Northside Main	69	37	Milner Gooding	65	40
Northside Main	47	27	Milner Gooding	73	43
Northside Main	53	31	Milner Gooding	73	44
Northside Main	55	32	Milner Gooding	74	42
Northside Main	55	33	Milner Gooding	74	43
Northside Main	56	33	Milner Gooding	75	43
Northside Main	57	33	Aberdeen Springfield	79	115
Northside Main	60	33	Aberdeen Springfield	79	116
Northside Main	60	34	Aberdeen Springfield	79	117
Northside Main	59	33	Aberdeen Springfield	79	126
Northside Main	61	34	Aberdeen Springfield	78	127
Northside Main	62	34	Aberdeen Springfield	78	128
Northside Main	62	35	Aberdeen Springfield	78	129
Northside Main	63	35	Aberdeen Springfield	78	130
Northside Main	63	36	Aberdeen Springfield	78	131
Northside Main	64	36	Aberdeen Springfield	78	132
Northside Main	65	36	Aberdeen Springfield	78	133
Northside Main	66	35	Aberdeen Springfield	78	134
Northside Main	66	36	Aberdeen Springfield	78	135
Northside Main	67	35	Aberdeen Springfield	78	136
Northside Main	67	36	Aberdeen Springfield	78	137
Northside Main	68	36	Aberdeen Springfield	78	138
Northside Main	68	37	Aberdeen Springfield	79	139
Northside Wilson Lake	72	39	Aberdeen Springfield	79	140
Northside Wilson Lake	70	37	Aberdeen Springfield	79	141
Northside Wilson Lake	70	38	Aberdeen Springfield	80	118
Northside Wilson Lake	71	38	Aberdeen Springfield	80	119
Northside Wilson Lake	71	39	Aberdeen Springfield	80	120
Milner Gooding	54	40	Aberdeen Springfield	80	121
Milner Gooding	54	41	Aberdeen Springfield	80	124
Milner Gooding	53	41	Aberdeen Springfield	80	125
Milner Gooding	55	39	Aberdeen Springfield	80	142
Milner Gooding	55	40	Aberdeen Springfield	80	143
Milner Gooding	56	39	Aberdeen Springfield	80	144
Milner Gooding	56	40	Aberdeen Springfield	80	145
Milner Gooding	57	38	Aberdeen Springfield	81	122
Milner Gooding	57	39	Aberdeen Springfield	81	123

Table A-3 (concluded). List of canals and associated model cells.

Canal Name	Row	Column
Northside Laterals Above Rim	48	14
Northside Laterals Above Rim	48	15
Northside Laterals Above Rim	48	25
Northside Laterals Above Rim	48	26
Northside Laterals Above Rim	41	15
Northside Laterals Above Rim	41	16
Northside Laterals Above Rim	41	17
Northside Laterals Above Rim	42	17
Northside Laterals Above Rim	46	21
Northside Laterals Above Rim	49	15
Northside Laterals Above Rim	49	16
Northside Laterals Above Rim	49	17
Northside Laterals Above Rim	49	18
Northside Laterals Above Rim	39	18
Northside Laterals Above Rim	40	18
Northside Laterals Above Rim	40	19
Northside Laterals Above Rim	40	22
Northside Laterals Above Rim	40	23
Northside Main	40	24
Northside Laterals Above Rim	45	13
Northside Laterals Above Rim	45	14
Northside Laterals Above Rim	43	14
Northside Laterals Above Rim	43	17
Northside Laterals Above Rim	43	18
Northside Laterals Above Rim	44	13
Northside Laterals Above Rim	44	14
Northside Laterals Above Rim	46	14
Northside Laterals Above Rim	46	15
Northside Laterals Above Rim	50	14
Northside Laterals Above Rim	50	18
Northside Laterals Above Rim	50	19
Northside Laterals Above Rim	50	20
Northside Laterals Above Rim	47	15
Northside Laterals Above Rim	47	16
Northside Laterals Above Rim	47	17
Northside Laterals Above Rim	47	21
Northside Laterals Above Rim	47	22
Northside Laterals Above Rim	47	23
Northside Laterals Above Rim	47	24
Northside Laterals Above Rim	47	25
Northside Laterals Above Rim	51	15
Northside Laterals Above Rim	51	16
Northside Laterals Above Rim	51	20
Northside Laterals Above Rim	52	16
Northside Laterals Above Rim	52	17
Northside Laterals Above Rim	52	18
Northside Laterals Above Rim	52	19
Northside Laterals Above Rim	53	19

Table A-4. Crop Mix Fractions for Irrigated Crops in the Eastern Snake Plain Aquifer Model Enhancement Project

Study Area.

County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Bannock	1980	0.12	0.23	0.000	0.000	0.000	0.006	0.036	0.000	0.21	0.40
Bingham	1980	0.15	0.11	0.000	0.001	0.013	0.007	0.185	0.024	0.34	0.17
Blaine	1980	0.51	0.34	0.000	0.000	0.000	0.026	0.000	0.000	0.09	0.03
Bonneville	1980	0.12	0.26	0.000	0.001	0.005	0.005	0.167	0.000	0.19	0.25
Butte	1980	0.52	0.29	0.000	0.000	0.000	0.023	0.053	0.000	0.09	0.02
Cassia	1980	0.17	0.15	0.024	0.002	0.032	0.005	0.097	0.087	0.12	0.31
Clark	1980	0.42	0.18	0.000	0.000	0.000	0.000	0.093	0.000	0.10	0.20
Fremont	1980	0.08	0.55	0.000	0.000	0.000	0.008	0.185	0.000	0.14	0.04
Gooding	1980	0.36	0.07	0.033	0.093	0.083	0.009	0.104	0.015	0.10	0.12
Jefferson	1980	0.40	0.24	0.000	0.000	0.015	0.008	0.109	0.000	0.22	0.00
Jerome	1980	0.30	0.08	0.091	0.024	0.027	0.004	0.088	0.044	0.25	0.09
Lincoln	1980	0.39	0.16	0.004	0.016	0.054	0.009	0.061	0.075	0.18	0.06
Madison	1980	0.09	0.36	0.000	0.000	0.014	0.006	0.201	0.000	0.22	0.11
Minidoka	1980	0.12	0.19	0.043	0.004	0.035	0.004	0.088	0.209	0.25	0.05
Power	1980	0.04	0.04	0.000	0.000	0.000	0.002	0.084	0.040	0.32	0.47
Twin Falls	1980	0.28	0.10	0.205	0.039	0.036	0.005	0.061	0.044	0.10	0.13
Bannock	1981	0.13	0.27	0.000	0.000	0.000	0.010	0.040	0.000	0.15	0.40
Bingham	1981	0.14	0.14	0.000	0.001	0.010	0.006	0.199	0.027	0.31	0.16
Blaine	1981	0.50	0.38	0.000	0.000	0.000	0.018	0.000	0.000	0.08	0.03
Bonneville	1981	0.12	0.28	0.000	0.000	0.001	0.006	0.183	0.000	0.11	0.30
Butte	1981	0.52	0.32	0.000	0.000	0.000	0.023	0.054	0.000	0.06	0.02
Cassia	1981	0.17	0.15	0.025	0.002	0.028	0.005	0.109	0.084	0.10	0.31
Clark	1981	0.41	0.22	0.000	0.000	0.000	0.000	0.109	0.000	0.10	0.16
Fremont	1981	0.08	0.58	0.000	0.000	0.000	0.007	0.185	0.000	0.13	0.03
Gooding	1981	0.40	0.06	0.036	0.096	0.081	0.012	0.122	0.018	0.09	0.09
Jefferson	1981	0.39	0.28	0.000	0.001	0.016	0.008	0.120	0.000	0.18	0.00
Jerome	1981	0.30	0.12	0.090	0.028	0.022	0.004	0.099	0.041	0.21	0.09

County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Lincoln	1981	0.38	0.21	0.004	0.012	0.051	0.008	0.064	0.056	0.17	0.05
Madison	1981	0.08	0.43	0.000	0.000	0.009	0.005	0.200	0.000	0.16	0.12
Minidoka	1981	0.13	0.21	0.044	0.002	0.029	0.002	0.097	0.208	0.23	0.06
Power	1981	0.04	0.05	0.000	0.000	0.000	0.002	0.095	0.030	0.31	0.47
Twin Falls	1981	0.28	0.12	0.200	0.050	0.031	0.004	0.065	0.053	0.08	0.12
Bannock	1982	0.12	0.30	0.000	0.000	0.000	0.010	0.041	0.000	0.17	0.36
Bingham	1982	0.15	0.14	0.000	0.000	0.010	0.006	0.214	0.022	0.30	0.16
Blaine	1982	0.50	0.40	0.000	0.000	0.000	0.014	0.000	0.000	0.07	0.03
Bonneville	1982	0.11	0.32	0.000	0.000	0.002	0.007	0.181	0.000	0.11	0.27
Butte	1982	0.52	0.31	0.000	0.000	0.000	0.020	0.057	0.000	0.07	0.02
Cassia	1982	0.16	0.15	0.022	0.001	0.023	0.004	0.101	0.071	0.16	0.31
Clark	1982	0.34	0.23	0.000	0.000	0.000	0.000	0.091	0.000	0.24	0.10
Fremont	1982	0.08	0.60	0.000	0.000	0.000	0.006	0.196	0.000	0.09	0.02
Gooding	1982	0.39	0.10	0.035	0.085	0.066	0.014	0.121	0.021	0.06	0.11
Jefferson	1982	0.38	0.28	0.000	0.001	0.019	0.009	0.121	0.000	0.18	0.00
Jerome	1982	0.29	0.12	0.089	0.032	0.019	0.004	0.099	0.037	0.20	0.10
Lincoln	1982	0.36	0.20	0.004	0.013	0.043	0.008	0.062	0.068	0.17	0.07
Madison	1982	0.07	0.46	0.000	0.000	0.005	0.003	0.181	0.000	0.19	0.09
Minidoka	1982	0.12	0.22	0.043	0.002	0.025	0.001	0.096	0.191	0.23	0.07
Power	1982	0.04	0.09	0.000	0.000	0.000	0.002	0.095	0.034	0.30	0.44
Twin Falls	1982	0.27	0.12	0.195	0.061	0.025	0.004	0.066	0.054	0.09	0.12
Bannock	1983	0.14	0.35	0.000	0.000	0.000	0.010	0.026	0.000	0.11	0.36
Bingham	1983	0.17	0.14	0.000	0.001	0.014	0.013	0.223	0.025	0.24	0.17
Blaine	1983	0.51	0.35	0.000	0.000	0.000	0.014	0.000	0.000	0.10	0.03
Bonneville	1983	0.12	0.30	0.000	0.000	0.004	0.004	0.174	0.000	0.11	0.29
Butte	1983	0.54	0.29	0.000	0.000	0.000	0.027	0.048	0.000	0.07	0.02
Cassia	1983	0.17	0.13	0.024	0.001	0.036	0.004	0.116	0.073	0.17	0.28
Clark	1983	0.34	0.25	0.000	0.000	0.000	0.000	0.034	0.000	0.27	0.11
Fremont	1983	0.08	0.58	0.000	0.000	0.000	0.005	0.213	0.000	0.09	0.03
Gooding	1983	0.43	0.08	0.038	0.094	0.062	0.006	0.098	0.024	0.08	0.09
Jefferson	1983	0.40	0.27	0.000	0.000	0.023	0.008	0.106	0.000	0.19	0.01
Jerome	1983	0.31	0.12	0.094	0.035	0.024	0.004	0.093	0.040	0.18	0.10
Lincoln	1983	0.40	0.18	0.005	0.014	0.049	0.009	0.069	0.065	0.15	0.06
Madison	1983	0.07	0.48	0.000	0.000	0.011	0.012	0.219	0.000	0.11	0.10
Minidoka	1983	0.14	0.19	0.048	0.003	0.023	0.006	0.070	0.221	0.23	0.07

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Power	1983	0.05	0.15	0.001	0.000	0.000	0.004	0.096	0.039	0.23	0.43
Twin Falls	1983	0.29	0.10	0.208	0.053	0.020	0.002	0.046	0.073	0.09	0.12
Bannock	1984	0.21	0.55	0.000	0.000	0.000	0.023	0.033	0.000	0.12	0.06
Bingham	1984	0.15	0.19	0.000	0.000	0.006	0.006	0.208	0.022	0.23	0.18
Blaine	1984	0.44	0.49	0.000	0.000	0.000	0.020	0.000	0.000	0.04	0.01
Bonneville	1984	0.13	0.54	0.000	0.001	0.004	0.007	0.189	0.000	0.08	0.05
Butte	1984	0.47	0.41	0.000	0.000	0.000	0.019	0.045	0.000	0.06	0.00
Cassia	1984	0.18	0.25	0.025	0.002	0.023	0.005	0.129	0.083	0.11	0.20
Clark	1984	0.43	0.23	0.000	0.000	0.000	0.000	0.043	0.000	0.19	0.10
Fremont	1984	0.08	0.61	0.000	0.000	0.000	0.007	0.224	0.000	0.06	0.01
Gooding	1984	0.42	0.11	0.038	0.109	0.066	0.018	0.096	0.026	0.03	0.08
Jefferson	1984	0.39	0.32	0.000	0.001	0.028	0.010	0.112	0.000	0.13	0.01
Jerome	1984	0.31	0.16	0.093	0.026	0.027	0.004	0.092	0.042	0.13	0.11
Lincoln	1984	0.38	0.26	0.004	0.014	0.041	0.010	0.059	0.081	0.08	0.07
Madison	1984	0.08	0.51	0.000	0.000	0.006	0.004	0.249	0.000	0.11	0.04
Minidoka	1984	0.13	0.26	0.045	0.002	0.027	0.002	0.070	0.197	0.14	0.12
Power	1984	0.06	0.34	0.001	0.000	0.000	0.000	0.130	0.051	0.23	0.19
Twin Falls	1984	0.26	0.18	0.192	0.067	0.028	0.005	0.045	0.060	0.05	0.11
Bannock	1985	0.26	0.49	0.000	0.000	0.000	0.022	0.039	0.000	0.15	0.04
Bingham	1985	0.17	0.15	0.000	0.001	0.007	0.006	0.242	0.023	0.25	0.15
Blaine	1985	0.39	0.49	0.000	0.000	0.000	0.022	0.000	0.000	0.08	0.01
Bonneville	1985	0.14	0.47	0.000	0.001	0.002	0.008	0.214	0.000	0.10	0.07
Butte	1985	0.48	0.35	0.000	0.000	0.000	0.022	0.047	0.000	0.11	0.00
Cassia	1985	0.17	0.25	0.026	0.002	0.026	0.004	0.139	0.099	0.11	0.18
Clark	1985	0.44	0.26	0.000	0.000	0.000	0.000	0.034	0.000	0.18	0.09
Fremont	1985	0.08	0.62	0.000	0.000	0.000	0.006	0.227	0.000	0.06	0.00
Gooding	1985	0.38	0.07	0.042	0.121	0.071	0.017	0.145	0.030	0.06	0.06
Jefferson	1985	0.36	0.31	0.000	0.002	0.027	0.010	0.112	0.000	0.18	0.00
Jerome	1985	0.24	0.17	0.096	0.031	0.036	0.003	0.100	0.052	0.19	0.08
Lincoln	1985	0.31	0.26	0.005	0.022	0.051	0.009	0.069	0.078	0.14	0.05
Madison	1985	0.08	0.45	0.000	0.000	0.003	0.003	0.246	0.000	0.19	0.03
Minidoka	1985	0.10	0.27	0.044	0.002	0.021	0.001	0.076	0.214	0.17	0.10
Power	1985	0.05	0.34	0.001	0.000	0.000	0.000	0.161	0.054	0.24	0.15
Twin Falls	1985	0.27	0.14	0.201	0.073	0.031	0.004	0.048	0.062	0.08	0.09
Bannock	1986	0.27	0.49	0.000	0.000	0.000	0.016	0.040	0.000	0.14	0.04

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Bingham	1986	0.17	0.16	0.000	0.000	0.004	0.005	0.228	0.026	0.23	0.18
Blaine	1986	0.41	0.46	0.000	0.000	0.000	0.013	0.000	0.000	0.09	0.02
Bonneville	1986	0.13	0.51	0.000	0.001	0.003	0.011	0.182	0.000	0.09	0.07
Butte	1986	0.50	0.33	0.000	0.000	0.000	0.014	0.066	0.000	0.09	0.01
Cassia	1986	0.19	0.24	0.030	0.004	0.020	0.004	0.098	0.112	0.12	0.19
Clark	1986	0.48	0.22	0.000	0.000	0.000	0.002	0.039	0.000	0.21	0.05
Fremont	1986	0.09	0.62	0.000	0.000	0.000	0.002	0.217	0.000	0.07	0.00
Gooding	1986	0.40	0.07	0.044	0.080	0.060	0.010	0.143	0.033	0.08	0.08
Jefferson	1986	0.39	0.29	0.000	0.000	0.021	0.006	0.109	0.000	0.18	0.01
Jerome	1986	0.24	0.13	0.094	0.027	0.023	0.005	0.130	0.062	0.18	0.11
Lincoln	1986	0.34	0.25	0.005	0.016	0.043	0.016	0.039	0.071	0.16	0.06
Madison	1986	0.10	0.40	0.000	0.000	0.000	0.002	0.273	0.000	0.20	0.04
Minidoka	1986	0.10	0.25	0.045	0.001	0.016	0.001	0.077	0.232	0.17	0.11
Power	1986	0.06	0.30	0.001	0.005	0.005	0.002	0.187	0.058	0.24	0.14
Twin Falls	1986	0.27	0.14	0.203	0.059	0.021	0.004	0.048	0.068	0.08	0.10
Bannock	1987	0.31	0.43	0.000	0.000	0.000	0.020	0.053	0.000	0.14	0.05
Bingham	1987	0.18	0.13	0.000	0.000	0.003	0.008	0.247	0.027	0.21	0.19
Blaine	1987	0.50	0.40	0.000	0.000	0.000	0.016	0.000	0.000	0.06	0.02
Bonneville	1987	0.15	0.46	0.000	0.000	0.000	0.016	0.209	0.000	0.08	0.08
Butte	1987	0.55	0.27	0.000	0.000	0.000	0.039	0.076	0.000	0.05	0.01
Cassia	1987	0.21	0.17	0.033	0.003	0.014	0.006	0.148	0.124	0.09	0.20
Clark	1987	0.53	0.20	0.000	0.000	0.000	0.004	0.044	0.000	0.15	0.07
Fremont	1987	0.10	0.57	0.000	0.000	0.000	0.004	0.268	0.000	0.06	0.00
Gooding	1987	0.44	0.07	0.048	0.063	0.063	0.005	0.162	0.035	0.05	0.07
Jefferson	1987	0.43	0.23	0.000	0.000	0.012	0.013	0.139	0.000	0.17	0.01
Jerome	1987	0.26	0.11	0.103	0.022	0.025	0.007	0.168	0.068	0.14	0.10
Lincoln	1987	0.36	0.21	0.005	0.004	0.037	0.021	0.083	0.079	0.13	0.06
Madison	1987	0.11	0.33	0.000	0.000	0.000	0.011	0.341	0.000	0.16	0.04
Minidoka	1987	0.11	0.22	0.050	0.001	0.012	0.001	0.094	0.259	0.13	0.12
Power	1987	0.07	0.20	0.001	0.000	0.000	0.007	0.240	0.068	0.26	0.16
Twin Falls	1987	0.30	0.11	0.223	0.050	0.022	0.004	0.054	0.085	0.07	0.08
Bannock	1988	0.45	0.14	0.000	0.000	0.000	0.020	0.086	0.000	0.22	0.09
Bingham	1988	0.16	0.12	0.000	0.000	0.004	0.008	0.247	0.026	0.21	0.22
Blaine	1988	0.51	0.39	0.000	0.000	0.000	0.007	0.000	0.000	0.07	0.02
Bonneville	1988	0.19	0.34	0.000	0.000	0.004	0.029	0.255	0.000	0.11	0.08

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Butte	1988	0.55	0.24	0.000	0.000	0.000	0.045	0.066	0.000	0.09	0.00
Cassia	1988	0.19	0.16	0.034	0.006	0.013	0.005	0.169	0.128	0.07	0.23
Clark	1988	0.45	0.14	0.000	0.000	0.000	0.002	0.128	0.000	0.21	0.07
Fremont	1988	0.14	0.41	0.000	0.000	0.000	0.019	0.311	0.000	0.11	0.00
Gooding	1988	0.38	0.07	0.044	0.078	0.072	0.006	0.159	0.041	0.08	0.06
Jefferson	1988	0.40	0.23	0.000	0.000	0.014	0.013	0.138	0.000	0.20	0.01
Jerome	1988	0.22	0.13	0.094	0.013	0.042	0.002	0.170	0.069	0.16	0.09
Lincoln	1988	0.38	0.21	0.006	0.009	0.028	0.019	0.097	0.071	0.15	0.03
Madison	1988	0.12	0.31	0.000	0.000	0.000	0.012	0.332	0.000	0.18	0.05
Minidoka	1988	0.11	0.21	0.048	0.001	0.018	0.003	0.091	0.254	0.13	0.13
Power	1988	0.11	0.04	0.001	0.000	0.000	0.003	0.251	0.079	0.32	0.19
Twin Falls	1988	0.26	0.13	0.220	0.053	0.031	0.008	0.063	0.081	0.07	0.08
Bannock	1989	0.45	0.14	0.000	0.000	0.000	0.013	0.078	0.000	0.25	0.06
Bingham	1989	0.15	0.11	0.000	0.000	0.005	0.012	0.217	0.025	0.23	0.26
Blaine	1989	0.47	0.37	0.000	0.000	0.000	0.037	0.000	0.000	0.09	0.03
Bonneville	1989	0.19	0.31	0.000	0.000	0.004	0.027	0.255	0.000	0.15	0.06
Butte	1989	0.49	0.22	0.000	0.000	0.000	0.033	0.073	0.000	0.18	0.00
Cassia	1989	0.19	0.14	0.030	0.002	0.013	0.008	0.165	0.124	0.07	0.25
Clark	1989	0.39	0.14	0.000	0.000	0.000	0.002	0.183	0.000	0.22	0.07
Fremont	1989	0.13	0.38	0.000	0.000	0.000	0.031	0.261	0.000	0.19	0.00
Gooding	1989	0.39	0.06	0.040	0.060	0.103	0.013	0.143	0.047	0.07	0.07
Jefferson	1989	0.37	0.24	0.000	0.001	0.018	0.018	0.132	0.000	0.21	0.01
Jerome	1989	0.21	0.12	0.088	0.009	0.055	0.006	0.173	0.064	0.17	0.10
Lincoln	1989	0.34	0.21	0.005	0.008	0.051	0.022	0.082	0.092	0.15	0.04
Madison	1989	0.12	0.36	0.000	0.000	0.000	0.005	0.316	0.000	0.16	0.04
Minidoka	1989	0.11	0.18	0.043	0.000	0.017	0.004	0.104	0.235	0.19	0.12
Power	1989	0.10	0.03	0.001	0.000	0.000	0.006	0.251	0.076	0.40	0.13
Twin Falls	1989	0.27	0.12	0.220	0.050	0.039	0.006	0.043	0.086	0.07	0.11
Bannock	1990	0.46	0.15	0.000	0.000	0.000	0.012	0.094	0.000	0.23	0.06
Bingham	1990	0.13	0.08	0.000	0.000	0.003	0.002	0.259	0.036	0.21	0.27
Blaine	1990	0.52	0.43	0.000	0.000	0.000	0.010	0.000	0.000	0.03	0.01
Bonneville	1990	0.19	0.31	0.000	0.000	0.004	0.018	0.301	0.000	0.12	0.06
Butte	1990	0.54	0.25	0.000	0.000	0.000	0.017	0.062	0.000	0.13	0.00
Cassia	1990	0.19	0.11	0.028	0.001	0.010	0.002	0.154	0.118	0.15	0.24
Clark	1990	0.27	0.14	0.000	0.000	0.000	0.002	0.293	0.000	0.28	0.01

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Fremont	1990	0.12	0.42	0.000	0.000	0.000	0.009	0.312	0.000	0.14	0.00
Gooding	1990	0.41	0.05	0.036	0.043	0.094	0.005	0.155	0.052	0.08	0.07
Jefferson	1990	0.39	0.24	0.000	0.000	0.017	0.004	0.137	0.000	0.18	0.03
Jerome	1990	0.21	0.12	0.089	0.017	0.062	0.003	0.196	0.074	0.13	0.11
Lincoln	1990	0.37	0.20	0.005	0.002	0.034	0.004	0.093	0.099	0.14	0.05
Madison	1990	0.13	0.30	0.000	0.000	0.004	0.001	0.349	0.000	0.17	0.05
Minidoka	1990	0.11	0.18	0.043	0.000	0.010	0.002	0.100	0.257	0.17	0.13
Power	1990	0.05	0.03	0.001	0.000	0.000	0.003	0.290	0.070	0.22	0.33
Twin Falls	1990	0.30	0.11	0.212	0.026	0.024	0.001	0.062	0.076	0.04	0.15
Bannock	1991	0.51	0.14	0.000	0.000	0.000	0.017	0.093	0.000	0.10	0.14
Bingham	1991	0.13	0.09	0.000	0.000	0.003	0.004	0.239	0.031	0.30	0.21
Blaine	1991	0.53	0.44	0.000	0.000	0.000	0.011	0.000	0.000	0.02	0.00
Bonneville	1991	0.21	0.32	0.000	0.000	0.005	0.014	0.249	0.000	0.16	0.04
Butte	1991	0.62	0.23	0.000	0.000	0.000	0.023	0.051	0.000	0.08	0.00
Cassia	1991	0.22	0.12	0.029	0.000	0.015	0.004	0.155	0.136	0.11	0.21
Clark	1991	0.24	0.11	0.000	0.000	0.000	0.012	0.333	0.000	0.29	0.01
Fremont	1991	0.14	0.41	0.000	0.000	0.000	0.010	0.312	0.000	0.13	0.00
Gooding	1991	0.43	0.05	0.034	0.086	0.089	0.011	0.135	0.046	0.06	0.05
Jefferson	1991	0.38	0.25	0.000	0.000	0.021	0.010	0.152	0.000	0.16	0.02
Jerome	1991	0.29	0.10	0.107	0.056	0.055	0.006	0.132	0.104	0.06	0.09
Lincoln	1991	0.44	0.12	0.005	0.034	0.061	0.013	0.084	0.109	0.09	0.05
Madison	1991	0.11	0.30	0.000	0.000	0.005	0.002	0.277	0.000	0.13	0.18
Minidoka	1991	0.12	0.21	0.039	0.000	0.010	0.007	0.143	0.239	0.14	0.10
Power	1991	0.08	0.03	0.001	0.000	0.000	0.007	0.293	0.076	0.26	0.24
Twin Falls	1991	0.31	0.14	0.218	0.039	0.019	0.004	0.057	0.081	0.05	0.09
Bannock	1992	0.41	0.14	0.000	0.000	0.000	0.006	0.089	0.000	0.19	0.17
Bingham	1992	0.13	0.09	0.000	0.000	0.002	0.002	0.232	0.036	0.24	0.26
Blaine	1992	0.48	0.48	0.000	0.000	0.000	0.008	0.000	0.000	0.03	0.01
Bonneville	1992	0.16	0.23	0.000	0.000	0.000	0.003	0.266	0.000	0.30	0.05
Butte	1992	0.52	0.21	0.000	0.000	0.000	0.008	0.064	0.000	0.20	0.00
Cassia	1992	0.17	0.11	0.026	0.000	0.012	0.002	0.134	0.135	0.22	0.19
Clark	1992	0.37	0.08	0.000	0.000	0.000	0.011	0.229	0.000	0.29	0.02
Fremont	1992	0.12	0.33	0.000	0.000	0.000	0.005	0.272	0.000	0.23	0.04
Gooding	1992	0.41	0.05	0.033	0.033	0.097	0.011	0.141	0.051	0.10	0.06
Jefferson	1992	0.35	0.19	0.000	0.000	0.012	0.004	0.117	0.000	0.25	0.08

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Jerome	1992	0.19	0.13	0.082	0.032	0.048	0.001	0.127	0.087	0.21	0.09
Lincoln	1992	0.30	0.14	0.004	0.000	0.066	0.005	0.086	0.125	0.17	0.11
Madison	1992	0.10	0.27	0.000	0.000	0.003	0.003	0.298	0.000	0.17	0.15
Minidoka	1992	0.09	0.20	0.039	0.000	0.007	0.002	0.122	0.230	0.21	0.10
Power	1992	0.06	0.02	0.001	0.000	0.000	0.001	0.246	0.072	0.35	0.24
Twin Falls	1992	0.22	0.13	0.221	0.027	0.021	0.002	0.051	0.087	0.08	0.16
Bannock	1993	0.43	0.14	0.000	0.000	0.000	0.011	0.094	0.000	0.14	0.20
Bingham	1993	0.15	0.08	0.000	0.000	0.002	0.001	0.227	0.044	0.24	0.26
Blaine	1993	0.49	0.41	0.000	0.000	0.000	0.007	0.000	0.059	0.02	0.01
Bonneville	1993	0.18	0.25	0.000	0.000	0.000	0.004	0.266	0.000	0.25	0.05
Butte	1993	0.55	0.22	0.000	0.000	0.000	0.008	0.058	0.000	0.17	0.00
Cassia	1993	0.21	0.11	0.034	0.001	0.017	0.003	0.133	0.131	0.15	0.21
Clark	1993	0.39	0.10	0.000	0.000	0.000	0.002	0.255	0.000	0.24	0.02
Fremont	1993	0.17	0.32	0.000	0.000	0.000	0.008	0.309	0.000	0.20	0.01
Gooding	1993	0.47	0.05	0.042	0.048	0.111	0.004	0.099	0.039	0.06	0.08
Jefferson	1993	0.46	0.20	0.000	0.000	0.020	0.002	0.122	0.000	0.19	0.01
Jerome	1993	0.20	0.14	0.121	0.018	0.058	0.001	0.102	0.097	0.16	0.10
Lincoln	1993	0.29	0.14	0.025	0.014	0.087	0.011	0.078	0.131	0.15	0.08
Madison	1993	0.11	0.31	0.000	0.000	0.003	0.003	0.320	0.000	0.10	0.14
Minidoka	1993	0.09	0.20	0.056	0.002	0.007	0.002	0.137	0.228	0.19	0.09
Power	1993	0.07	0.02	0.000	0.000	0.000	0.002	0.281	0.080	0.23	0.31
Twin Falls	1993	0.23	0.12	0.253	0.024	0.029	0.001	0.062	0.082	0.07	0.13
Bannock	1994	0.41	0.13	0.000	0.000	0.000	0.014	0.096	0.000	0.15	0.20
Bingham	1994	0.16	0.08	0.000	0.000	0.001	0.001	0.238	0.041	0.28	0.19
Blaine	1994	0.45	0.40	0.000	0.000	0.000	0.016	0.040	0.059	0.03	0.01
Bonneville	1994	0.17	0.29	0.000	0.000	0.000	0.005	0.247	0.000	0.24	0.04
Butte	1994	0.54	0.23	0.000	0.000	0.000	0.008	0.065	0.000	0.15	0.01
Cassia	1994	0.20	0.12	0.039	0.002	0.017	0.002	0.135	0.127	0.19	0.17
Clark	1994	0.35	0.10	0.000	0.000	0.000	0.002	0.259	0.000	0.27	0.02
Fremont	1994	0.14	0.31	0.000	0.000	0.000	0.011	0.314	0.000	0.23	0.00
Gooding	1994	0.45	0.04	0.079	0.032	0.091	0.001	0.130	0.042	0.07	0.06
Jefferson	1994	0.43	0.23	0.000	0.000	0.013	0.004	0.122	0.000	0.19	0.01
Jerome	1994	0.23	0.10	0.134	0.019	0.047	0.001	0.132	0.091	0.15	0.09
Lincoln	1994	0.36	0.14	0.017	0.006	0.043	0.011	0.092	0.142	0.16	0.02
Madison	1994	0.13	0.32	0.000	0.000	0.000	0.002	0.320	0.000	0.21	0.02

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Minidoka	1994	0.10	0.20	0.057	0.001	0.006	0.001	0.135	0.217	0.19	0.09
Power	1994	0.06	0.03	0.000	0.000	0.000	0.000	0.280	0.079	0.34	0.21
Twin Falls	1994	0.22	0.13	0.257	0.019	0.028	0.001	0.068	0.079	0.06	0.13
Bannock	1995	0.41	0.13	0.000	0.000	0.000	0.013	0.107	0.000	0.13	0.21
Bingham	1995	0.18	0.09	0.000	0.000	0.000	0.002	0.226	0.041	0.23	0.23
Blaine	1995	0.44	0.40	0.000	0.000	0.000	0.011	0.045	0.061	0.02	0.03
Bonneville	1995	0.20	0.31	0.000	0.000	0.000	0.003	0.241	0.000	0.21	0.04
Butte	1995	0.53	0.26	0.000	0.000	0.000	0.008	0.065	0.000	0.13	0.01
Cassia	1995	0.22	0.10	0.026	0.000	0.019	0.002	0.137	0.133	0.15	0.21
Clark	1995	0.38	0.02	0.000	0.000	0.000	0.005	0.343	0.000	0.22	0.02
Fremont	1995	0.15	0.34	0.000	0.000	0.000	0.005	0.299	0.000	0.20	0.01
Gooding	1995	0.46	0.04	0.034	0.045	0.082	0.005	0.134	0.038	0.07	0.09
Jefferson	1995	0.43	0.23	0.000	0.000	0.007	0.004	0.125	0.000	0.20	0.01
Jerome	1995	0.28	0.12	0.110	0.017	0.038	0.001	0.130	0.093	0.11	0.10
Lincoln	1995	0.35	0.16	0.000	0.010	0.051	0.010	0.087	0.119	0.18	0.03
Madison	1995	0.14	0.38	0.000	0.000	0.000	0.000	0.281	0.000	0.18	0.02
Minidoka	1995	0.11	0.22	0.040	0.000	0.008	0.001	0.129	0.220	0.16	0.11
Power	1995	0.07	0.02	0.000	0.000	0.000	0.003	0.273	0.086	0.28	0.27
Twin Falls	1995	0.24	0.15	0.206	0.021	0.030	0.002	0.069	0.077	0.05	0.15
Bannock	1996	0.31	0.12	0.000	0.000	0.000	0.026	0.143	0.000	0.18	0.22
Bingham	1996	0.14	0.08	0.000	0.000	0.000	0.002	0.226	0.048	0.22	0.28
Blaine	1996	0.41	0.41	0.000	0.000	0.000	0.010	0.051	0.068	0.04	0.01
Bonneville	1996	0.16	0.30	0.000	0.000	0.000	0.004	0.254	0.000	0.23	0.04
Butte	1996	0.44	0.25	0.000	0.000	0.000	0.023	0.049	0.000	0.21	0.02
Cassia	1996	0.20	0.10	0.017	0.002	0.012	0.003	0.151	0.130	0.21	0.18
Clark	1996	0.29	0.04	0.000	0.000	0.000	0.002	0.343	0.000	0.31	0.01
Fremont	1996	0.12	0.25	0.000	0.000	0.000	0.004	0.277	0.000	0.34	0.01
Gooding	1996	0.38	0.06	0.034	0.054	0.084	0.005	0.148	0.044	0.10	0.09
Jefferson	1996	0.43	0.20	0.000	0.000	0.000	0.003	0.131	0.000	0.24	0.01
Jerome	1996	0.26	0.10	0.074	0.013	0.060	0.001	0.135	0.087	0.18	0.09
Lincoln	1996	0.27	0.13	0.000	0.008	0.051	0.008	0.057	0.135	0.31	0.03
Madison	1996	0.13	0.26	0.000	0.000	0.000	0.000	0.301	0.000	0.29	0.03
Minidoka	1996	0.10	0.21	0.030	0.000	0.007	0.002	0.138	0.221	0.18	0.11
Power	1996	0.05	0.03	0.000	0.000	0.000	0.000	0.269	0.075	0.32	0.25
Twin Falls	1996	0.23	0.13	0.190	0.021	0.032	0.001	0.070	0.071	0.10	0.15

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Bannock	1997	0.40	0.13	0.000	0.000	0.000	0.026	0.103	0.000	0.14	0.21
Bingham	1997	0.19	0.07	0.000	0.000	0.000	0.001	0.218	0.073	0.20	0.24
Blaine	1997	0.39	0.50	0.000	0.000	0.000	0.009	0.043	0.026	0.03	0.00
Bonneville	1997	0.16	0.33	0.000	0.000	0.000	0.004	0.226	0.000	0.23	0.05
Butte	1997	0.49	0.26	0.000	0.000	0.000	0.008	0.038	0.000	0.19	0.01
Cassia	1997	0.20	0.12	0.020	0.003	0.019	0.002	0.131	0.151	0.14	0.22
Clark	1997	0.36	0.06	0.000	0.000	0.000	0.000	0.242	0.000	0.27	0.07
Fremont	1997	0.12	0.32	0.000	0.000	0.000	0.003	0.300	0.000	0.25	0.01
Gooding	1997	0.42	0.05	0.037	0.028	0.104	0.000	0.156	0.057	0.06	0.09
Jefferson	1997	0.39	0.21	0.000	0.000	0.011	0.004	0.142	0.000	0.24	0.01
Jerome	1997	0.31	0.12	0.000	0.010	0.083	0.002	0.140	0.115	0.12	0.10
Lincoln	1997	0.30	0.14	0.000	0.009	0.063	0.005	0.076	0.168	0.17	0.08
Madison	1997	0.11	0.28	0.000	0.000	0.000	0.000	0.319	0.000	0.26	0.03
Minidoka	1997	0.11	0.21	0.034	0.000	0.007	0.000	0.129	0.222	0.17	0.11
Power	1997	0.06	0.02	0.000	0.000	0.000	0.000	0.266	0.116	0.29	0.24
Twin Falls	1997	0.24	0.16	0.199	0.028	0.038	0.000	0.081	0.071	0.04	0.15
Bannock	1998	0.41	0.14	0.000	0.000	0.000	0.041	0.131	0.000	0.09	0.19
Bingham	1998	0.19	0.07	0.000	0.000	0.000	0.002	0.222	0.072	0.21	0.23
Blaine	1998	0.38	0.47	0.000	0.000	0.000	0.020	0.050	0.040	0.04	0.00
Bonneville	1998	0.16	0.34	0.000	0.000	0.000	0.006	0.223	0.000	0.23	0.04
Butte	1998	0.51	0.34	0.000	0.000	0.000	0.017	0.035	0.000	0.11	0.00
Cassia	1998	0.23	0.11	0.020	0.001	0.033	0.002	0.141	0.152	0.11	0.20
Clark	1998	0.41	0.05	0.000	0.000	0.000	0.000	0.276	0.000	0.24	0.02
Fremont	1998	0.14	0.33	0.000	0.000	0.000	0.004	0.290	0.000	0.23	0.00
Gooding	1998	0.39	0.04	0.018	0.076	0.170	0.000	0.145	0.054	0.06	0.05
Jefferson	1998	0.41	0.21	0.000	0.000	0.013	0.004	0.132	0.000	0.22	0.01
Jerome	1998	0.31	0.09	0.095	0.021	0.092	0.001	0.116	0.110	0.08	0.08
Lincoln	1998	0.30	0.18	0.000	0.009	0.063	0.009	0.087	0.144	0.17	0.04
Madison	1998	0.12	0.33	0.000	0.000	0.000	0.003	0.300	0.000	0.22	0.03
Minidoka	1998	0.15	0.18	0.042	0.000	0.009	0.001	0.135	0.235	0.15	0.10
Power	1998	0.07	0.03	0.000	0.000	0.000	0.000	0.301	0.136	0.24	0.23
Twin Falls	1998	0.29	0.13	0.172	0.033	0.058	0.002	0.080	0.073	0.03	0.13
Bannock	1999	0.39	0.13	0.000	0.000	0.000	0.033	0.125	0.000	0.12	0.20
Bingham	1999	0.20	0.07	0.000	0.000	0.000	0.003	0.217	0.078	0.20	0.23
Blaine	1999	0.43	0.46	0.000	0.000	0.000	0.010	0.049	0.000	0.05	0.00

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Bonneville	1999	0.19	0.30	0.000	0.000	0.000	0.007	0.214	0.000	0.25	0.05
Butte	1999	0.50	0.28	0.000	0.000	0.000	0.005	0.043	0.000	0.15	0.02
Cassia	1999	0.22	0.11	0.029	0.002	0.035	0.002	0.138	0.152	0.15	0.16
Clark	1999	0.37	0.03	0.000	0.000	0.000	0.000	0.127	0.000	0.45	0.02
Fremont	1999	0.14	0.29	0.000	0.000	0.000	0.006	0.303	0.000	0.26	0.00
Gooding	1999	0.47	0.03	0.024	0.064	0.191	0.003	0.093	0.048	0.05	0.03
Jefferson	1999	0.41	0.18	0.000	0.000	0.012	0.003	0.130	0.000	0.25	0.01
Jerome	1999	0.33	0.09	0.093	0.013	0.121	0.001	0.106	0.110	0.08	0.06
Lincoln	1999	0.31	0.16	0.000	0.005	0.075	0.005	0.098	0.150	0.17	0.03
Madison	1999	0.12	0.30	0.000	0.000	0.000	0.003	0.281	0.000	0.26	0.03
Minidoka	1999	0.14	0.16	0.041	0.000	0.012	0.001	0.141	0.226	0.22	0.06
Power	1999	0.07	0.02	0.000	0.000	0.000	0.000	0.275	0.115	0.35	0.17
Twin Falls	1999	0.29	0.14	0.162	0.037	0.070	0.001	0.072	0.083	0.04	0.11
Bannock	2000	0.35	0.13	0.000	0.000	0.000	0.027	0.142	0.000	0.14	0.20
Bingham	2000	0.17	0.08	0.000	0.001	0.006	0.002	0.227	0.074	0.22	0.23
Blaine	2000	0.43	0.46	0.000	0.000	0.000	0.010	0.051	0.000	0.05	0.01
Bonneville	2000	0.17	0.33	0.000	0.000	0.000	0.005	0.211	0.000	0.23	0.05
Butte	2000	0.53	0.30	0.000	0.000	0.000	0.004	0.049	0.000	0.12	0.01
Cassia	2000	0.19	0.10	0.018	0.001	0.052	0.001	0.148	0.145	0.15	0.19
Clark	2000	0.39	0.05	0.000	0.000	0.000	0.002	0.154	0.000	0.40	0.00
Fremont	2000	0.15	0.33	0.000	0.000	0.000	0.003	0.313	0.000	0.20	0.00
Gooding	2000	0.45	0.04	0.011	0.038	0.193	0.002	0.103	0.053	0.05	0.05
Jefferson	2000	0.45	0.22	0.000	0.000	0.016	0.002	0.141	0.000	0.16	0.01
Jerome	2000	0.33	0.12	0.057	0.019	0.155	0.001	0.107	0.085	0.05	0.07
Lincoln	2000	0.30	0.18	0.000	0.010	0.088	0.008	0.100	0.115	0.16	0.04
Madison	2000	0.13	0.32	0.000	0.000	0.000	0.003	0.273	0.000	0.25	0.02
Minidoka	2000	0.13	0.21	0.027	0.000	0.018	0.001	0.159	0.218	0.17	0.07
Power	2000	0.06	0.02	0.008	0.000	0.000	0.000	0.306	0.106	0.32	0.18
Twin Falls	2000	0.29	0.16	0.127	0.037	0.082	0.001	0.082	0.066	0.04	0.12
Bannock	2001	0.38	0.08	0.000	0.000	0.000	0.024	0.110	0.000	0.13	0.27
Bingham	2001	0.19	0.07	0.000	0.000	0.008	0.002	0.207	0.080	0.18	0.26
Blaine	2001	0.56	0.36	0.000	0.000	0.000	0.013	0.041	0.000	0.02	0.01
Bonneville	2001	0.18	0.36	0.000	0.001	0.013	0.007	0.211	0.000	0.20	0.03
Butte	2001	0.61	0.23	0.000	0.000	0.000	0.022	0.033	0.000	0.11	0.00
Cassia	2001	0.22	0.11	0.018	0.006	0.047	0.001	0.129	0.145	0.12	0.20

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County	Year	Alfalfa	Barley	DrBean	GrCorn	SilCorn	Oats	Potatoes	SugBeet	SprWht	WinWht
Clark	2001	0.44	0.05	0.000	0.000	0.000	0.022	0.131	0.000	0.35	0.00
Fremont	2001	0.16	0.33	0.000	0.000	0.000	0.005	0.277	0.000	0.23	0.00
Gooding	2001	0.44	0.02	0.006	0.058	0.264	0.004	0.064	0.064	0.04	0.04
Jefferson	2001	0.45	0.21	0.000	0.000	0.017	0.013	0.149	0.000	0.15	0.01
Jerome	2001	0.35	0.13	0.052	0.023	0.169	0.000	0.082	0.104	0.04	0.04
Lincoln	2001	0.38	0.12	0.000	0.011	0.077	0.007	0.034	0.152	0.12	0.10
Madison	2001	0.15	0.30	0.000	0.000	0.000	0.003	0.261	0.000	0.26	0.03
Minidoka	2001	0.15	0.23	0.025	0.000	0.017	0.002	0.176	0.237	0.11	0.05
Power	2001	0.08	0.03	0.000	0.024	0.001	0.002	0.282	0.120	0.23	0.23
Twin Falls	2001	0.33	0.18	0.090	0.032	0.088	0.003	0.071	0.074	0.02	0.12

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Table A-5. Sprinkler Fraction by Model Stress Period

ENTITY_ID	SP001	SP002	SP003	SP004	SP005	SP006	SP007	SP008	SP009	SP010
Start Date	May-80	Oct-80	May-81	Oct-81	May-82	Oct-82	May-83	Oct-83	May-84	Oct-84
IEGW501	0.150	0.150	0.202	0.202	0.254	0.254	0.307	0.307	0.360	0.360
IEGW502	0.200	0.200	0.215	0.215	0.230	0.230	0.246	0.246	0.262	0.262
IEGW503	0.875	0.875	0.880	0.880	0.885	0.885	0.890	0.890	0.895	0.895
IEGW504	0.981	0.981	0.981	0.981	0.982	0.982	0.983	0.983	0.983	0.983
IEGW505	0.983	0.983	0.984	0.984	0.986	0.986	0.987	0.987	0.988	0.988
IEGW506	0.770	0.770	0.786	0.786	0.803	0.803	0.818	0.818	0.834	0.834
IEGW507	0.580	0.580	0.619	0.619	0.657	0.657	0.692	0.692	0.726	0.726
IEGW508	0.530	0.530	0.573	0.573	0.617	0.617	0.661	0.661	0.706	0.706
IEGW509	0.640	0.640	0.666	0.666	0.692	0.692	0.715	0.715	0.739	0.739
IEGW600	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW000	0.333	0.333	0.353	0.353	0.373	0.373	0.399	0.399	0.424	0.424
IESW001	0.150	0.150	0.230	0.230	0.311	0.311	0.353	0.353	0.394	0.394
IESW002	0.825	0.825	0.836	0.836	0.847	0.847	0.858	0.858	0.868	0.868
IESW005	0.700	0.700	0.716	0.716	0.731	0.731	0.747	0.747	0.763	0.763
IESW007	0.147	0.147	0.156	0.156	0.165	0.165	0.175	0.175	0.185	0.185
IESW008	0.540	0.540	0.555	0.555	0.570	0.570	0.586	0.586	0.602	0.602
IESW009	0.015	0.015	0.033	0.033	0.050	0.050	0.066	0.066	0.082	0.082
IESW010	0.010	0.010	0.080	0.080	0.150	0.150	0.240	0.240	0.330	0.330
IESW011	0.440	0.440	0.454	0.454	0.467	0.467	0.480	0.480	0.492	0.492
IESW012	0.867	0.867	0.868	0.868	0.870	0.870	0.871	0.871	0.872	0.872
IESW014	0.210	0.210	0.248	0.248	0.286	0.286	0.319	0.319	0.352	0.352
IESW015	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.004	0.004
IESW016	0.050	0.050	0.093	0.093	0.136	0.136	0.258	0.258	0.381	0.381
IESW018	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW019	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW020	0.050	0.050	0.066	0.066	0.082	0.082	0.104	0.104	0.125	0.125
IESW022	0.250	0.250	0.317	0.317	0.384	0.384	0.437	0.437	0.490	0.490

ENTITY_ID	SP001	SP002	SP003	SP004	SP005	SP006	SP007	SP008	SP009	SP010
Start Date	May-80	Oct-80	May-81	Oct-81	May-82	Oct-82	May-83	Oct-83	May-84	Oct-84
IESW025	0.210	0.210	0.264	0.264	0.318	0.318	0.374	0.374	0.431	0.431
IESW027	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.046	0.092	0.092
IESW028	0.130	0.130	0.174	0.174	0.219	0.219	0.285	0.285	0.351	0.351
IESW029	0.035	0.035	0.052	0.052	0.068	0.068	0.085	0.085	0.101	0.101
IESW030	0.180	0.180	0.236	0.236	0.292	0.292	0.360	0.360	0.427	0.427
IESW031	0.950	0.950	0.955	0.955	0.961	0.961	0.965	0.965	0.968	0.968
IESW032	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.120	0.240	0.240
IESW033	0.970	0.970	0.973	0.973	0.976	0.976	0.979	0.979	0.982	0.982
IESW034	0.540	0.540	0.561	0.561	0.582	0.582	0.603	0.603	0.625	0.625
IESW035	0.020	0.020	0.038	0.038	0.056	0.056	0.083	0.083	0.110	0.110
IESW036	0.020	0.020	0.034	0.034	0.049	0.049	0.063	0.063	0.077	0.077
IESW037	0.145	0.145	0.187	0.187	0.229	0.229	0.267	0.267	0.305	0.305
IESW038	0.251	0.251	0.269	0.269	0.286	0.286	0.279	0.279	0.272	0.272
IESW039	0.270	0.270	0.283	0.283	0.296	0.296	0.291	0.291	0.285	0.285
IESW040	0.400	0.400	0.464	0.464	0.528	0.528	0.582	0.582	0.637	0.637
IESW041	0.000	0.000	0.008	0.008	0.017	0.017	0.038	0.038	0.058	0.058
IESW044	0.020	0.020	0.030	0.030	0.041	0.041	0.052	0.052	0.064	0.064
IESW051	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IESW052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IESW053	0.530	0.530	0.545	0.545	0.560	0.560	0.570	0.570	0.580	0.580
IESW054	0.319	0.319	0.339	0.339	0.359	0.359	0.381	0.381	0.402	0.402
IESW055	0.000	0.000	0.004	0.004	0.007	0.007	0.011	0.011	0.015	0.015
IESW056	0.451	0.451	0.460	0.460	0.468	0.468	0.476	0.476	0.484	0.484
IESW057	0.648	0.648	0.662	0.662	0.676	0.676	0.694	0.694	0.712	0.712

ENTITY_ID	SP011	SP012	SP013	SP014	SP015	SP016	SP017	SP018	SP019	SP020
Start Date	May-85	Oct-85	May-86	Oct-86	May-87	Oct-87	May-88	Oct-88	May-89	Oct-89
IEGW501	0.414	0.414	0.467	0.467	0.520	0.520	0.553	0.553	0.586	0.586
IEGW502	0.278	0.278	0.294	0.294	0.310	0.310	0.326	0.326	0.341	0.341
IEGW503	0.900	0.900	0.905	0.905	0.910	0.910	0.915	0.915	0.920	0.920

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ENTITY_ID	SP011	SP012	SP013	SP014	SP015	SP016	SP017	SP018	SP019	SP020
Start Date	May-85	Oct-85	May-86	Oct-86	May-87	Oct-87	May-88	Oct-88	May-89	Oct-89
IEGW504	0.984	0.984	0.985	0.985	0.986	0.986	0.986	0.986	0.987	0.987
IEGW505	0.990	0.990	0.991	0.991	0.992	0.992	0.993	0.993	0.994	0.994
IEGW506	0.849	0.849	0.865	0.865	0.880	0.880	0.887	0.887	0.895	0.895
IEGW507	0.761	0.761	0.795	0.795	0.830	0.830	0.845	0.845	0.860	0.860
IEGW508	0.751	0.751	0.795	0.795	0.840	0.840	0.860	0.860	0.880	0.880
IEGW509	0.763	0.763	0.786	0.786	0.810	0.810	0.821	0.821	0.832	0.832
IEGW600	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW000	0.449	0.449	0.474	0.474	0.499	0.499	0.511	0.511	0.522	0.522
IESW001	0.436	0.436	0.478	0.478	0.520	0.520	0.551	0.551	0.583	0.583
IESW002	0.879	0.879	0.889	0.889	0.900	0.900	0.904	0.904	0.907	0.907
IESW005	0.779	0.779	0.794	0.794	0.810	0.810	0.824	0.824	0.838	0.838
IESW007	0.195	0.195	0.205	0.205	0.215	0.215	0.220	0.220	0.225	0.225
IESW008	0.618	0.618	0.634	0.634	0.650	0.650	0.666	0.666	0.681	0.681
IESW009	0.098	0.098	0.114	0.114	0.130	0.130	0.141	0.141	0.152	0.152
IESW010	0.420	0.420	0.510	0.510	0.600	0.600	0.627	0.627	0.653	0.653
IESW011	0.505	0.505	0.517	0.517	0.530	0.530	0.536	0.536	0.542	0.542
IESW012	0.873	0.873	0.874	0.874	0.875	0.875	0.875	0.875	0.876	0.876
IESW014	0.385	0.385	0.417	0.417	0.450	0.450	0.469	0.469	0.488	0.488
IESW015	0.006	0.006	0.008	0.008	0.010	0.010	0.011	0.011	0.012	0.012
IESW016	0.504	0.504	0.627	0.627	0.750	0.750	0.762	0.762	0.773	0.773
IESW018	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW019	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW020	0.147	0.147	0.168	0.168	0.190	0.190	0.197	0.197	0.204	0.204
IESW022	0.543	0.543	0.597	0.597	0.650	0.650	0.673	0.673	0.695	0.695
IESW025	0.487	0.487	0.544	0.544	0.600	0.600	0.620	0.620	0.640	0.640
IESW027	0.138	0.138	0.184	0.184	0.230	0.230	0.245	0.245	0.261	0.261
IESW028	0.417	0.417	0.484	0.484	0.550	0.550	0.583	0.583	0.616	0.616
IESW029	0.117	0.117	0.134	0.134	0.150	0.150	0.168	0.168	0.186	0.186
IESW030	0.495	0.495	0.562	0.562	0.630	0.630	0.664	0.664	0.698	0.698
IESW031	0.972	0.972	0.976	0.976	0.980	0.980	0.984	0.984	0.987	0.987
IESW032	0.360	0.360	0.480	0.480	0.600	0.600	0.630	0.630	0.660	0.660
IESW033	0.985	0.985	0.987	0.987	0.990	0.990	0.991	0.991	0.992	0.992

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ENTITY_ID	SP011	SP012	SP013	SP014	SP015	SP016	SP017	SP018	SP019	SP020
Start Date	May-85	Oct-85	May-86	Oct-86	May-87	Oct-87	May-88	Oct-88	May-89	Oct-89
IESW034	0.647	0.647	0.668	0.668	0.690	0.690	0.700	0.700	0.710	0.710
IESW035	0.136	0.136	0.163	0.163	0.190	0.190	0.208	0.208	0.225	0.225
IESW036	0.092	0.092	0.106	0.106	0.120	0.120	0.126	0.126	0.132	0.132
IESW037	0.344	0.344	0.382	0.382	0.420	0.420	0.458	0.458	0.495	0.495
IESW038	0.265	0.265	0.258	0.258	0.251	0.251	0.244	0.244	0.237	0.237
IESW039	0.280	0.280	0.275	0.275	0.270	0.270	0.265	0.265	0.259	0.259
IESW040	0.691	0.691	0.746	0.746	0.800	0.800	0.824	0.824	0.849	0.849
IESW041	0.079	0.079	0.099	0.099	0.120	0.120	0.134	0.134	0.147	0.147
IESW044	0.076	0.076	0.088	0.088	0.100	0.100	0.112	0.112	0.124	0.124
IESW051	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IESW052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IESW053	0.590	0.590	0.600	0.600	0.610	0.610	0.614	0.614	0.618	0.618
IESW054	0.424	0.424	0.446	0.446	0.467	0.467	0.476	0.476	0.484	0.484
IESW055	0.018	0.018	0.022	0.022	0.026	0.026	0.029	0.029	0.032	0.032
IESW056	0.491	0.491	0.499	0.499	0.507	0.507	0.512	0.512	0.518	0.518
IESW057	0.730	0.730	0.749	0.749	0.767	0.767	0.776	0.776	0.785	0.785

ENTITY_ID	SP021	SP022	SP023	SP024	SP025	SP026	SP027	SP028	SP029	SP030
Start Date	May-90	Oct-90	May-91	Oct-91	May-92	Oct-92	May-93	Oct-93	May-94	Oct-94
IEGW501	0.620	0.620	0.653	0.653	0.686	0.686	0.691	0.691	0.696	0.696
IEGW502	0.357	0.357	0.373	0.373	0.389	0.389	0.411	0.411	0.433	0.433
IEGW503	0.924	0.924	0.929	0.929	0.934	0.934	0.939	0.939	0.944	0.944
IEGW504	0.987	0.987	0.988	0.988	0.989	0.989	0.989	0.989	0.990	0.990
IEGW505	0.995	0.995	0.996	0.996	0.997	0.997	0.997	0.997	0.998	0.998
IEGW506	0.902	0.902	0.909	0.909	0.917	0.917	0.922	0.922	0.928	0.928
IEGW507	0.874	0.874	0.889	0.889	0.904	0.904	0.907	0.907	0.910	0.910
IEGW508	0.900	0.900	0.920	0.920	0.940	0.940	0.944	0.944	0.949	0.949
IEGW509	0.842	0.842	0.853	0.853	0.864	0.864	0.867	0.867	0.870	0.870
IEGW600	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW000	0.533	0.533	0.544	0.544	0.555	0.555	0.566	0.566	0.577	0.577
IESW001	0.614	0.614	0.645	0.645	0.676	0.676	0.683	0.683	0.690	0.690
IESW002	0.911	0.911	0.915	0.915	0.919	0.919	0.921	0.921	0.923	0.923
IESW005	0.852	0.852	0.866	0.866	0.880	0.880	0.891	0.891	0.902	0.902
IESW007	0.229	0.229	0.234	0.234	0.239	0.239	0.244	0.244	0.248	0.248
IESW008	0.697	0.697	0.713	0.713	0.729	0.729	0.743	0.743	0.757	0.757
IESW009	0.163	0.163	0.174	0.174	0.185	0.185	0.192	0.192	0.199	0.199
IESW010	0.680	0.680	0.707	0.707	0.733	0.733	0.757	0.757	0.780	0.780
IESW011	0.548	0.548	0.554	0.554	0.560	0.560	0.566	0.566	0.572	0.572
IESW012	0.877	0.877	0.878	0.878	0.879	0.879	0.883	0.883	0.886	0.886
IESW014	0.507	0.507	0.526	0.526	0.545	0.545	0.564	0.564	0.583	0.583
IESW015	0.013	0.013	0.014	0.014	0.015	0.015	0.017	0.017	0.019	0.019
IESW016	0.785	0.785	0.797	0.797	0.808	0.808	0.819	0.819	0.829	0.829
IESW018	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW019	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW020	0.211	0.211	0.219	0.219	0.226	0.226	0.233	0.233	0.239	0.239
IESW022	0.718	0.718	0.740	0.740	0.763	0.763	0.780	0.780	0.798	0.798
IESW025	0.660	0.660	0.680	0.680	0.700	0.700	0.720	0.720	0.740	0.740
IESW027	0.276	0.276	0.292	0.292	0.307	0.307	0.318	0.318	0.328	0.328

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ENTITY_ID	SP021	SP022	SP023	SP024	SP025	SP026	SP027	SP028	SP029	SP030
Start Date	May-90	Oct-90	May-91	Oct-91	May-92	Oct-92	May-93	Oct-93	May-94	Oct-94
IESW028	0.648	0.648	0.681	0.681	0.714	0.714	0.731	0.731	0.748	0.748
IESW029	0.204	0.204	0.222	0.222	0.240	0.240	0.256	0.256	0.272	0.272
IESW030	0.733	0.733	0.767	0.767	0.801	0.801	0.823	0.823	0.845	0.845
IESW031	0.991	0.991	0.994	0.994	0.998	0.998	0.998	0.998	0.999	0.999
IESW032	0.690	0.690	0.720	0.720	0.750	0.750	0.768	0.768	0.786	0.786
IESW033	0.994	0.994	0.995	0.995	0.996	0.996	0.997	0.997	0.998	0.998
IESW034	0.721	0.721	0.731	0.731	0.741	0.741	0.753	0.753	0.765	0.765
IESW035	0.243	0.243	0.260	0.260	0.278	0.278	0.294	0.294	0.311	0.311
IESW036	0.137	0.137	0.143	0.143	0.149	0.149	0.155	0.155	0.161	0.161
IESW037	0.533	0.533	0.570	0.570	0.608	0.608	0.686	0.686	0.765	0.765
IESW038	0.230	0.230	0.223	0.223	0.216	0.216	0.223	0.223	0.230	0.230
IESW039	0.254	0.254	0.249	0.249	0.243	0.243	0.249	0.249	0.254	0.254
IESW040	0.873	0.873	0.897	0.897	0.921	0.921	0.937	0.937	0.953	0.953
IESW041	0.161	0.161	0.175	0.175	0.188	0.188	0.201	0.201	0.213	0.213
IESW044	0.137	0.137	0.149	0.149	0.161	0.161	0.189	0.189	0.217	0.217
IESW051	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.008	0.016	0.016
IESW052	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.008	0.016	0.016
IESW053	0.622	0.622	0.626	0.626	0.630	0.630	0.633	0.633	0.636	0.636
IESW054	0.493	0.493	0.501	0.501	0.510	0.510	0.520	0.520	0.530	0.530
IESW055	0.035	0.035	0.038	0.038	0.041	0.041	0.045	0.045	0.048	0.048
IESW056	0.524	0.524	0.530	0.530	0.536	0.536	0.543	0.543	0.550	0.550
IESW057	0.795	0.795	0.804	0.804	0.813	0.813	0.813	0.813	0.813	0.813

ENTITY_ID	SP031	SP032	SP033	SP034	SP035	SP036	SP037	SP038	SP039	SP040
Start Date	May-95	Oct-95	May-96	Oct-96	May-97	Oct-97	May-98	Oct-98	May-99	Oct-99
IEGW501	0.700	0.700	0.705	0.705	0.710	0.710	0.713	0.713	0.717	0.717
IEGW502	0.455	0.455	0.478	0.478	0.500	0.500	0.517	0.517	0.533	0.533
IEGW503	0.950	0.950	0.955	0.955	0.960	0.960	0.965	0.965	0.970	0.970
IEGW504	0.991	0.991	0.991	0.991	0.992	0.992	0.993	0.993	0.993	0.993
IEGW505	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	1.000	1.000
IEGW506	0.934	0.934	0.939	0.939	0.945	0.945	0.950	0.950	0.955	0.955
IEGW507	0.914	0.914	0.917	0.917	0.920	0.920	0.923	0.923	0.927	0.927
IEGW508	0.954	0.954	0.958	0.958	0.963	0.963	0.965	0.965	0.968	0.968
IEGW509	0.874	0.874	0.877	0.877	0.880	0.880	0.883	0.883	0.887	0.887
IEGW600	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW000	0.588	0.588	0.599	0.599	0.610	0.610	0.618	0.618	0.626	0.626
IESW001	0.697	0.697	0.703	0.703	0.710	0.710	0.713	0.713	0.717	0.717
IESW002	0.925	0.925	0.928	0.928	0.930	0.930	0.932	0.932	0.934	0.934
IESW005	0.912	0.912	0.923	0.923	0.934	0.934	0.946	0.946	0.958	0.958
IESW007	0.253	0.253	0.258	0.258	0.263	0.263	0.267	0.267	0.271	0.271
IESW008	0.771	0.771	0.786	0.786	0.800	0.800	0.813	0.813	0.827	0.827
IESW009	0.206	0.206	0.213	0.213	0.220	0.220	0.230	0.230	0.240	0.240
IESW010	0.803	0.803	0.827	0.827	0.850	0.850	0.870	0.870	0.890	0.890
IESW011	0.578	0.578	0.584	0.584	0.590	0.590	0.597	0.597	0.603	0.603
IESW012	0.890	0.890	0.894	0.894	0.897	0.897	0.897	0.897	0.897	0.897
IESW014	0.602	0.602	0.621	0.621	0.640	0.640	0.660	0.660	0.680	0.680
IESW015	0.021	0.021	0.023	0.023	0.025	0.025	0.027	0.027	0.028	0.028
IESW016	0.839	0.839	0.850	0.850	0.860	0.860	0.870	0.870	0.880	0.880
IESW018	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW019	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW020	0.246	0.246	0.253	0.253	0.260	0.260	0.267	0.267	0.273	0.273
IESW022	0.815	0.815	0.833	0.833	0.850	0.850	0.867	0.867	0.883	0.883
IESW025	0.760	0.760	0.780	0.780	0.800	0.800	0.820	0.820	0.840	0.840
IESW027	0.339	0.339	0.349	0.349	0.360	0.360	0.367	0.367	0.373	0.373

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ENTITY_ID	SP031	SP032	SP033	SP034	SP035	SP036	SP037	SP038	SP039	SP040
Start Date	May-95	Oct-95	May-96	Oct-96	May-97	Oct-97	May-98	Oct-98	May-99	Oct-99
IESW028	0.766	0.766	0.783	0.783	0.800	0.800	0.813	0.813	0.827	0.827
IESW029	0.288	0.288	0.304	0.304	0.320	0.320	0.353	0.353	0.387	0.387
IESW030	0.866	0.866	0.888	0.888	0.910	0.910	0.927	0.927	0.943	0.943
IESW031	0.999	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
IESW032	0.804	0.804	0.822	0.822	0.840	0.840	0.860	0.860	0.880	0.880
IESW033	0.998	0.998	0.999	0.999	1.000	1.000	1.000	1.000	1.000	1.000
IESW034	0.776	0.776	0.788	0.788	0.800	0.800	0.810	0.810	0.820	0.820
IESW035	0.327	0.327	0.344	0.344	0.360	0.360	0.377	0.377	0.393	0.393
IESW036	0.168	0.168	0.174	0.174	0.180	0.180	0.185	0.185	0.190	0.190
IESW037	0.843	0.843	0.922	0.922	1.000	1.000	1.000	1.000	1.000	1.000
IESW038	0.237	0.237	0.244	0.244	0.251	0.251	0.251	0.251	0.251	0.251
IESW039	0.259	0.259	0.265	0.265	0.270	0.270	0.270	0.270	0.270	0.270
IESW040	0.969	0.969	0.984	0.984	1.000	1.000	1.000	1.000	1.000	1.000
IESW041	0.225	0.225	0.238	0.238	0.250	0.250	0.262	0.262	0.273	0.273
IESW044	0.244	0.244	0.272	0.272	0.300	0.300	0.323	0.323	0.347	0.347
IESW051	0.024	0.024	0.032	0.032	0.040	0.040	0.050	0.050	0.060	0.060
IESW052	0.024	0.024	0.032	0.032	0.040	0.040	0.050	0.050	0.060	0.060
IESW053	0.639	0.639	0.642	0.642	0.645	0.645	0.650	0.650	0.655	0.655
IESW054	0.540	0.540	0.550	0.550	0.560	0.560	0.569	0.569	0.579	0.579
IESW055	0.052	0.052	0.056	0.056	0.059	0.059	0.064	0.064	0.068	0.068
IESW056	0.557	0.557	0.564	0.564	0.571	0.571	0.575	0.575	0.580	0.580
IESW057	0.813	0.813	0.813	0.813	0.813	0.813	0.813	0.813	0.813	0.813

ENTITY_ID	SP041	SP042	SP043	SP044
Start Date	May-00	Oct-00	May-01	Oct-01
IEGW501	0.720	0.720	0.723	0.723
IEGW502	0.550	0.550	0.567	0.567
IEGW503	0.975	0.975	0.980	0.980
IEGW504	0.994	0.994	0.995	0.995
IEGW505	1.000	1.000	1.000	1.000
IEGW506	0.960	0.960	0.965	0.965
IEGW507	0.930	0.930	0.933	0.933
IEGW508	0.970	0.970	0.972	0.972
IEGW509	0.890	0.890	0.893	0.893
IEGW600	1.000	1.000	1.000	1.000
IESW000	0.634	0.634	0.642	0.642
IESW001	0.720	0.720	0.723	0.723
IESW002	0.936	0.936	0.938	0.938
IESW005	0.970	0.970	0.982	0.982
IESW007	0.276	0.276	0.280	0.280
IESW008	0.840	0.840	0.853	0.853
IESW009	0.250	0.250	0.260	0.260
IESW010	0.910	0.910	0.930	0.930
IESW011	0.610	0.610	0.617	0.617
IESW012	0.897	0.897	0.897	0.897
IESW014	0.700	0.700	0.720	0.720
IESW015	0.030	0.030	0.032	0.032
IESW016	0.890	0.890	0.900	0.900
IESW018	1.000	1.000	1.000	1.000
IESW019	1.000	1.000	1.000	1.000
IESW020	0.280	0.280	0.287	0.287
IESW022	0.900	0.900	0.917	0.917
IESW025	0.860	0.860	0.880	0.880
IESW027	0.380	0.380	0.387	0.387

ENTITY_ID	SP041	SP042	SP043	SP044
Start Date	May-00	Oct-00	May-01	Oct-01
IESW028	0.840	0.840	0.853	0.853
IESW029	0.420	0.420	0.453	0.453
IESW030	0.960	0.960	0.977	0.977
IESW031	1.000	1.000	1.000	1.000
IESW032	0.900	0.900	0.920	0.920
IESW033	1.000	1.000	1.000	1.000
IESW034	0.830	0.830	0.840	0.840
IESW035	0.410	0.410	0.427	0.427
IESW036	0.195	0.195	0.200	0.200
IESW037	1.000	1.000	1.000	1.000
IESW038	0.251	0.251	0.251	0.251
IESW039	0.270	0.270	0.270	0.270
IESW040	1.000	1.000	1.000	1.000
IESW041	0.285	0.285	0.297	0.297
IESW044	0.370	0.370	0.393	0.393
IESW051	0.070	0.070	0.080	0.080
IESW052	0.070	0.070	0.080	0.080
IESW053	0.660	0.660	0.665	0.665
IESW054	0.588	0.588	0.597	0.597
IESW055	0.072	0.072	0.077	0.077
IESW056	0.584	0.584	0.589	0.589
IESW057	0.813	0.813	0.813	0.813

Table A-6. Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 1	Stress Per 2	Stress Per 3	Stress Per 4	Stress Per 5	Stress Per 6	Stress Per 7	Stress Per 8	Stress Per 9	Stress Per 10
IESW000	162,902	0	162,902	0	162,902	0	162,902	0	162,902	0
IESW001	50,482	0	56,933	0	44,835	0	46,327	0	43,457	0
IESW002	304,408	0	316,804	99	280,762	0	287,420	0	264,463	0
IESW005	200,115	0	193,549	0	169,467	0	93,205	0	107,874	0
IESW007	871,442	12,103	903,122	0	846,878	12,002	830,579	13,193	853,765	5,457
IESW008	11,508	0	11,616	0	17,163	0	25,666	0	19,839	0
IESW009	523,646	23,806	447,888	10,712	489,669	24,105	479,109	19,839	456,152	19,146
IESW010	315,427	0	348,714	0	305,326	0	314,509	0	308,310	0
IESW011	72,498	0	76,492	0	67,447	0	68,641	0	61,295	694
IESW012	25,000	794	24,013	99	23,714	496	28,558	298	27,181	0
IESW014	50,689	0	50,184	0	44,444	1,091	47,704	0	42,952	1,190
IESW015	42,264	1,587	103,168	13,294	67,562	5,457	61,501	20,436	38,384	4,465
IESW016	372,819	121,924	380,624	104,959	346,878	111,593	331,726	124,495	348,485	42,769
IESW018	23,301	0	24,793	0	21,428	0	17,957	0	17,261	0
IESW019	246,556	0	188,476	0	206,428	0	239,440	0	243,113	0
IESW020	720,615	18,648	682,736	6,846	671,717	12,202	667,815	14,185	591,827	13,193
IESW022	595,730	7,640	621,442	5,259	521,350	13,689	493,802	17,360	441,001	18,352
IESW025	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241
IESW027	60,308	0	49,288	0	58,930	0	50,872	0	51,286	0
IESW028	382,461	0	404,500	0	358,815	0	371,901	0	364,096	0
IESW029	65,358	0	91,529	0	81,313	0	82,185	0	70,523	0
IESW030	339,302	2,578	327,365	6,745	334,252	9,522	339,991	9,920	306,933	9,621
IESW031	1,992	104	2,316	209	1,950	93	1,710	101	1,706	116
IESW032	1,082,415	31,244	1,049,816	298	1,028,926	33,540	1,016,299	41,070	963,728	37,190
IESW033	13,393	0	17,557	0	15,078	0	15,675	0	13,294	0
IESW034	306,244	1,686	321,625	1,289	300,275	1,786	291,781	2,879	275,941	2,083

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 1	Stress Per 2	Stress Per 3	Stress Per 4	Stress Per 5	Stress Per 6	Stress Per 7	Stress Per 8	Stress Per 9	Stress Per 10
IESW035	221,304	3,967	283,287	5,753	227,273	15,872	209,298	1,885	255,051	5,852
IESW036	237,144	6,249	213,590	2,182	227,663	15,078	231,175	9,125	220,317	15,774
IESW037	9,066	0	10,546	0	4,442	0	6,846	0	7,365	0
IESW038	50,275	893	62,879	2,775	59,320	5,358	46,028	5,654	43,365	4,068
IESW039	17,957	1,984	19,047	2,381	17,656	1,190	16,368	2,083	18,848	1,190
IESW040	63,315	2,709	40,680	2,567	38,499	2,757	41,391	9,380	140,680	2,925
IESW041	48,875	183	52,066	0	46,281	59	48,095	0	44,835	0
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	37,741	0	28,489	0	41,896	0	40,932	0	49,357	0
IESW052	21,809	0	15,831	0	20,039	0	20,296	0	16,320	0
IESW053	27,663	0	28,398	0	28,168	0	24,656	0	43,251	0
IESW054	158,035	0	145,340	0	161,983	0	159,206	0	158,930	0
IESW055	251,607	11,607	230,257	8,331	238,292	8,331	228,650	12,401	217,241	17,062
IESW056	484,160	120,523	505,510	132,530	546,373	126,171	518,136	141,047	498,393	81,244
IESW057	323,691	0	268,136	0	296,143	0	318,641	0	314,279	0

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 11	Stress Per 12	Stress Per 13	Stress Per 14	Stress Per 15	Stress Per 16	Stress Per 17	Stress Per 18	Stress Per 19	Stress Per 20
IESW000	162,902	0	162,902	0	161,134	0	127,755	0	127,755	0
IESW001	48,508	0	49,105	0	51,882	0	53,375	0	53,972	0
IESW002	294,536	0	280,762	0	326,676	0	315,427	1,190	323,232	0
IESW005	140,955	0	157,828	0	136,983	0	106,451	0	112,511	0
IESW007	877,410	4,465	936,410	47,521	870,753	0	759,871	0	876,492	9,920
IESW008	8,336	0	16,490	0	10,976	0	7,677	0	9,238	0
IESW009	462,121	11,607	475,436	25,184	465,335	2,182	422,176	99	503,444	12,895
IESW010	336,777	0	320,248	0	337,236	0	322,544	0	314,968	0
IESW011	63,590	0	64,187	1,289	71,120	0	88,292	0	73,898	99
IESW012	24,105	0	27,273	0	29,959	99	29,362	0	29,775	0
IESW014	49,977	1,190	49,587	99	53,880	496	56,244	0	56,451	298
IESW015	84,114	4,860	64,004	5,950	114,968	3,076	128,466	5,057	93,044	7,739
IESW016	338,154	88,682	346,878	66,667	347,337	35,009	357,897	23,209	336,547	57,140
IESW018	20,535	0	20,930	0	22,617	0	28,168	0	26,171	0
IESW019	237,144	0	246,097	0	258,724	0	250,000	0	256,198	0
IESW020	705,234	9,325	751,377	18,749	712,580	3,671	687,787	496	811,754	6,846
IESW022	550,964	6,350	458,907	26,584	663,682	0	627,640	397	639,807	6,350
IESW025	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241
IESW027	63,085	0	59,619	0	64,394	0	65,978	0	58,815	0
IESW028	348,026	0	361,341	0	375,115	0	379,477	2,182	364,555	99
IESW029	77,089	0	75,000	0	83,861	0	89,761	0	77,020	0
IESW030	318,641	8,331	327,824	4,465	365,243	0	331,497	0	358,127	397
IESW031	1,675	74	1,989	0	1,741	8	1,153	0	1,138	0
IESW032	1,006,428	21,527	1,000,000	36,800	1,003,903	893	971,993	1,289	1,062,213	10,813
IESW033	15,576	0	15,675	0	17,163	0	17,163	0	14,681	0
IESW034	285,583	198	317,034	893	331,038	1,091	308,081	298	306,703	595

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 11	Stress Per 12	Stress Per 13	Stress Per 14	Stress Per 15	Stress Per 16	Stress Per 17	Stress Per 18	Stress Per 19	Stress Per 20
IESW035	226,676	2,677	249,770	5,753	280,073	99	261,478	0	255,739	496
IESW036	192,746	5,852	218,044	12,300	203,168	595	186,295	0	229,155	6,646
IESW037	7,052	0	7,241	0	13,147	0	15,216	0	14,330	0
IESW038	52,296	2,677	56,749	3,671	51,377	2,083	57,828	1,190	59,022	3,770
IESW039	16,864	893	21,329	1,488	21,127	397	17,557	198	18,648	992
IESW040	43,871	4,688	70,294	2,452	36,777	1,391	20,863	1,793	26,882	1,356
IESW041	50,413	780	51,469	602	49,725	61	29,293	94	31,428	283
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	39,807	0	46,212	0	41,368	0	20,585	0	33,379	0
IESW052	10,494	0	17,778	0	12,704	0	9,839	0	11,033	0
IESW053	24,679	0	27,479	0	28,352	0	24,839	0	26,194	0
IESW054	155,464	0	176,860	0	128,168	0	56,336	0	148,600	0
IESW055	213,292	5,950	217,355	15,177	236,685	794	244,031	496	245,409	7,241
IESW056	468,320	60,514	505,051	55,647	491,965	23,118	466,713	18,253	509,412	57,828
IESW057	312,443	0	325,298	0	339,302	0	332,874	0	335,399	0

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 21	Stress Per 22	Stress Per 23	Stress Per 24	Stress Per 25	Stress Per 26	Stress Per 27	Stress Per 28	Stress Per 29	Stress Per 30
IESW000	127,755	0	127,755	0	127,755	0	127,755	0	127,755	0
IESW001	59,619	0	54,362	0	61,685	0	49,403	0	57,828	0
IESW002	336,088	0	310,606	0	282,599	0	268,595	0	345,271	0
IESW005	125,528	0	140,381	0	98,416	0	184,252	0	111,685	0
IESW007	832,874	0	754,591	8,928	599,403	0	793,618	8,632	757,576	0
IESW008	9,828	0	8,044	0	3,365	0	13,122	0	2,149	0
IESW009	430,670	8,730	440,771	3,770	348,485	0	425,849	17,360	391,414	397
IESW010	317,723	0	291,552	0	294,536	0	275,482	0	292,700	0
IESW011	82,323	99	68,756	99	75,505	0	57,645	198	76,584	99
IESW012	31,451	0	28,650	0	21,527	0	24,105	0	28,788	0
IESW014	65,381	0	48,003	0	47,612	0	56,451	0	50,781	0
IESW015	127,571	8,134	100,000	8,432	123,209	6,547	79,270	38,085	150,781	10,317
IESW016	354,913	1,389	335,859	27,365	319,559	6,249	280,992	47,016	331,038	14,881
IESW018	27,181	0	24,702	0	27,273	0	19,047	0	27,571	0
IESW019	253,903	0	209,894	0	180,051	0	204,545	0	249,082	0
IESW020	772,039	694	705,464	298	698,347	0	626,033	3,274	761,478	198
IESW022	622,360	397	544,077	397	530,303	0	514,463	4,663	604,454	0
IESW025	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241
IESW027	64,187	0	56,451	0	59,619	0	52,594	0	58,815	0
IESW028	382,002	0	339,073	0	332,415	0	285,583	0	334,711	0
IESW029	84,894	0	76,699	0	82,920	0	57,461	0	77,732	0
IESW030	369,835	0	293,618	298	267,447	0	271,579	2,879	279,844	0
IESW031	1,194	0	1,001	0	691	0	918	0	1,155	0
IESW032	1,128,788	595	1,062,443	496	966,253	0	1,078,053	18,154	1,101,010	7,837
IESW033	18,154	0	13,788	0	16,963	0	12,103	0	17,856	0
IESW034	321,166	198	263,774	198	280,533	0	237,603	794	286,731	0

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 21	Stress Per 22	Stress Per 23	Stress Per 24	Stress Per 25	Stress Per 26	Stress Per 27	Stress Per 28	Stress Per 29	Stress Per 30
IESW035	258,035	0	204,545	0	200,872	0	204,660	0	213,981	0
IESW036	218,044	496	200,069	2,381	180,142	0	184,711	2,182	188,567	893
IESW037	14,451	0	9,596	0	12,794	0	13,811	0	15,510	0
IESW038	59,022	1,885	50,987	992	52,181	397	45,638	2,182	53,581	99
IESW039	19,543	595	18,253	694	16,368	1,190	14,881	992	14,385	694
IESW040	20,344	1,584	23,760	1,084	16,270	2,118	31,772	1,339	20,083	2,143
IESW041	32,691	286	31,474	81	27,158	0	29,362	150	29,477	0
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	19,881	0	20,441	0	13,891	0	22,649	0	13,611	0
IESW052	12,392	0	10,916	0	7,229	0	19,869	0	6,814	0
IESW053	30,624	0	22,369	0	19,814	0	27,571	0	19,711	0
IESW054	71,419	0	51,997	0	27,870	0	167,355	0	84,711	0
IESW055	238,751	1,587	200,275	4,959	232,782	0	218,825	9,325	221,602	794
IESW056	505,280	21,228	490,129	42,172	394,399	20,634	484,848	56,543	418,503	20,634
IESW057	327,824	0	272,268	0	227,571	0	259,412	0	310,147	0

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 31	Stress Per 32	Stress Per 33	Stress Per 34	Stress Per 35	Stress Per 36	Stress Per 37	Stress Per 38	Stress Per 39	Stress Per 40
IESW000	127,755	0	128,076	0	134,343	0	134,343	0	134,343	0
IESW001	49,587	0	56,152	0	51,171	0	50,482	0	53,076	0
IESW002	316,804	0	342,287	0	316,804	0	336,547	0	354,454	0
IESW005	204,339	0	181,267	0	161,501	0	143,411	0	146,878	0
IESW007	827,365	5,950	930,900	10,317	907,254	20,436	909,550	12,895	916,208	0
IESW008	17,133	0	10,565	0	14,263	0	12,172	0	11,616	0
IESW009	466,024	29,775	484,848	29,568	476,584	6,449	466,942	8,829	471,074	8,432
IESW010	252,296	0	283,517	1,686	275,712	0	258,953	595	273,416	0
IESW011	62,397	99	76,791	0	61,387	0	62,489	0	57,438	198
IESW012	27,755	0	30,073	0	30,073	0	29,959	0	35,308	99
IESW014	48,393	397	59,114	1,488	47,406	1,885	58,035	1,488	62,787	1,686
IESW015	88,682	13,590	91,850	11,309	64,486	12,599	70,041	18,648	79,063	15,872
IESW016	300,735	32,438	329,660	34,320	309,917	51,079	300,964	56,933	314,050	40,680
IESW018	21,921	0	25,184	0	22,220	0	22,817	0	24,311	0
IESW019	203,558	0	231,635	0	220,317	0	221,993	0	221,901	0
IESW020	775,023	15,774	799,357	15,576	718,549	8,432	743,572	7,837	772,039	6,547
IESW022	547,291	4,167	564,968	198	476,354	4,860	467,860	1,389	494,261	3,967
IESW025	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241	81,841	7,241
IESW027	50,390	0	58,724	0	59,022	0	53,375	0	55,464	0
IESW028	279,385	0	325,987	0	314,738	0	300,964	99	302,571	0
IESW029	58,333	0	81,084	0	89,302	0	82,622	0	83,333	0
IESW030	286,731	595	327,824	198	296,373	0	320,018	1,686	319,559	893
IESW031	996	5	1,328	0	1,019	0	1,021	0	1,179	3
IESW032	974,747	27,571	1,060,147	45,638	1,060,376	24,197	1,037,649	4,663	1,064,509	893
IESW033	13,590	0	18,154	0	15,177	0	15,576	0	13,294	0
IESW034	261,478	595	292,470	0	274,105	1,488	271,809	595	275,712	694

Table A-6 (cont'd). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 31	Stress Per 32	Stress Per 33	Stress Per 34	Stress Per 35	Stress Per 36	Stress Per 37	Stress Per 38	Stress Per 39	Stress Per 40
IESW035	209,596	0	255,051	1,786	232,094	298	202,961	397	218,526	198
IESW036	197,016	7,539	205,533	4,959	197,016	3,274	194,330	3,868	199,679	4,465
IESW037	16,129	0	14,387	0	12,741	0	9,832	0	21,490	0
IESW038	51,997	992	48,990	3,372	50,574	3,471	32,943	694	49,495	2,083
IESW039	15,275	1,190	20,037	1,389	17,459	1,984	16,566	1,389	17,261	1,786
IESW040	32,140	2,553	38,315	2,736	41,047	3,281	49,219	3,563	53,444	2,702
IESW041	29,890	380	32,300	958	30,808	1,736	28,512	1,586	30,556	139
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	37,902	0	27,732	0	26,676	0	28,788	0	33,930	0
IESW052	16,722	0	10,647	0	13,898	0	17,950	0	20,009	0
IESW053	30,831	0	24,885	0	27,250	0	27,663	0	25,298	0
IESW054	163,085	0	169,146	0	168,251	0	153,857	0	189,463	0
IESW055	206,635	6,745	213,981	8,432	210,882	9,325	207,415	9,027	213,292	7,043
IESW056	491,736	42,470	498,163	51,079	493,802	54,270	460,514	47,314	492,883	72,498
IESW057	256,887	0	290,634	0	275,253	0	275,482	0	276,171	0

Table A-6 (concluded). Diversion volumes by irrigation entity for each model stress period (acre-feet).

Entity	Stress Per 41	Stress Per 42	Stress Per 43	Stress Per 44
IESW000	134,343	0	134,343	0
IESW001	61,983	0	62,580	0
IESW002	382,002	0	258,035	0
IESW005	127,112	0	101,377	0
IESW007	937,098	0	737,374	8,124
IESW008	13,184	0	5,002	0
IESW009	469,927	0	366,621	0
IESW010	318,871	0	260,790	0
IESW011	81,841	0	65,588	0
IESW012	33,425	0	24,311	0
IESW014	56,152	0	40,771	0
IESW015	115,657	8,232	92,952	8,035
IESW016	312,443	60,399	267,447	0
IESW018	27,181	0	25,482	0
IESW019	269,284	0	231,405	0
IESW020	886,134	1,389	677,916	0
IESW022	579,890	0	490,588	0
IESW025	81,841	7,241	81,841	7,241

Entity	Stress Per 41	Stress Per 42	Stress Per 43	Stress Per 44
IESW027	66,873	0	63,797	0
IESW028	358,356	0	331,956	0
IESW029	96,281	0	95,271	0
IESW030	329,660	0	235,308	0
IESW031	1,094	0	722	0
IESW032	1,108,127	1,587	972,222	0
IESW033	17,957	0	15,576	0
IESW034	291,781	0	264,004	0
IESW035	235,767	0	186,180	0
IESW036	214,761	99	166,873	0
IESW037	22,555	0	22,257	0
IESW038	52,686	0	52,686	99
IESW039	16,664	1,091	13,887	893
IESW040	40,565	1,963	29,454	2,785
IESW041	32,231	0	28,099	0
IESW044	0	0	0	0
IESW051	17,410	0	12,408	0
IESW052	10,140	0	8,372	0
IESW053	31,061	0	23,508	0
IESW054	188,567	0	56,635	0
IESW055	221,006	1,190	212,672	0
IESW056	462,580	17,856	318,871	11,012
IESW057	340,680	0	260,331	0

Table A-7. Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 1	Stress Per 2	Stress Per 3	Stress Per 4	Stress Per 5	Stress Per 6	Stress Per 7	Stress Per 8	Stress Per 9	Stress Per 10
IESW000	0	0	0	0	0	0	0	0	0	0
IESW001	0	0	0	0	0	0	0	0	0	0
IESW002	23,049	0	24,059	8	21,391	0	21,958	0	20,259	0
IESW005	0	0	0	0	0	0	0	0	0	0
IESW007	299,816	0	270,891	0	261,938	0	234,389	0	273,646	0
IESW008	0	0	0	0	0	0	0	0	0	0
IESW009	81,382	3,912	73,898	1,868	85,836	4,447	88,866	3,859	89,233	3,916
IESW010	17,534	0	20,847	0	19,534	0	21,465	0	22,383	0
IESW011	1,206	0	1,282	0	1,140	0	1,169	0	1,052	12
IESW012	0	0	0	0	0	0	0	0	0	0
IESW014	9,910	0	10,117	0	9,242	233	10,216	0	9,467	269
IESW015	0	0	0	0	0	0	0	0	0	0
IESW016	3,540	1,230	3,852	1,124	3,721	1,265	3,763	1,488	4,176	538
IESW018	0	0	0	0	0	0	0	0	0	0
IESW019	30,693	0	22,096	0	24,518	0	29,936	0	30,831	0
IESW020	127,732	3,441	126,194	1,317	129,454	2,445	134,022	2,957	123,646	2,851
IESW022	114,853	1,517	123,737	1,078	107,071	2,897	104,729	3,783	96,373	4,121
IESW025	0	0	0	0	0	0	0	0	0	0
IESW027	3,287	0	2,904	0	3,714	0	3,432	0	3,687	0
IESW028	12,736	0	14,093	0	13,085	0	14,155	0	14,449	0
IESW029	0	0	0	0	0	0	0	0	0	0
IESW030	60,675	480	61,019	1,307	64,922	1,920	68,733	2,077	64,463	2,090
IESW031	3	0	3	0	3	0	1	0	2	0
IESW032	31,979	991	33,425	10	35,193	1,220	37,144	1,591	37,511	1,528
IESW033	3,457	0	4,536	0	3,898	0	4,056	0	3,441	0
IESW034	71,786	399	76,171	309	71,809	431	70,523	702	67,424	513

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 1	Stress Per 2	Stress Per 3	Stress Per 4	Stress Per 5	Stress Per 6	Stress Per 7	Stress Per 8	Stress Per 9	Stress Per 10
IESW035	33,815	644	46,166	993	39,325	2,902	38,338	364	49,449	1,190
IESW036	44,766	1,241	42,470	457	47,865	3,317	51,033	2,105	51,079	3,806
IESW037	0	0	0	0	0	0	0	0	0	0
IESW038	15,087	268	18,866	833	17,796	1,607	13,809	1,696	13,005	1,220
IESW039	5,388	595	5,714	714	5,298	357	4,910	625	5,654	357
IESW040	0	0	0	0	0	0	0	0	0	0
IESW041	2,110	8	2,424	0	2,314	3	2,571	0	2,551	0
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	0	0	0	0	0	0	0	0	0	0
IESW052	0	0	0	0	0	0	0	0	0	0
IESW053	0	0	0	0	0	0	0	0	0	0
IESW054	58,632	0	64,187	0	45,432	0	61,593	0	65,680	0
IESW055	35,836	1,771	35,308	1,366	39,233	1,460	40,243	2,312	40,771	3,375
IESW056	8,193	2,051	8,602	2,269	9,355	2,173	8,923	2,443	8,639	1,416
IESW057	0	0	0	0	0	0	0	0	0	0

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 11	Stress Per 12	Stress Per 13	Stress Per 14	Stress Per 15	Stress Per 16	Stress Per 17	Stress Per 18	Stress Per 19	Stress Per 20
IESW000	0	0	0	0	0	0	0	0	0	0
IESW001	0	0	0	0	0	0	0	0	0	0
IESW002	22,624	0	21,635	0	25,230	0	24,426	92	25,092	0
IESW005	0	0	0	0	0	0	0	0	0	0
IESW007	278,007	0	279,155	0	281,221	0	254,132	0	270,202	0
IESW008	0	0	0	0	0	0	0	0	0	0
IESW009	94,972	2,491	102,548	5,663	104,913	512	99,541	24	123,921	3,287
IESW010	25,849	0	25,941	0	28,788	0	28,903	0	29,568	0
IESW011	1,099	0	1,118	23	1,248	0	1,561	0	1,316	2
IESW012	0	0	0	0	0	0	0	0	0	0
IESW014	11,327	276	11,552	24	12,874	121	13,786	0	14,183	76
IESW015	0	0	0	0	0	0	0	0	0	0
IESW016	4,256	1,171	4,589	921	4,809	506	5,179	350	5,083	896
IESW018	0	0	0	0	0	0	0	0	0	0
IESW019	28,696	0	30,877	0	31,244	0	29,660	0	30,831	0
IESW020	152,755	2,091	168,779	4,353	165,794	881	165,565	123	202,043	1,752
IESW022	123,875	1,466	106,152	6,311	157,759	0	153,214	99	160,354	1,630
IESW025	0	0	0	0	0	0	0	0	0	0
IESW027	4,805	0	4,800	0	5,466	0	5,891	0	5,503	0
IESW028	14,357	0	15,491	0	16,683	0	17,489	104	17,381	5
IESW029	0	0	0	0	0	0	0	0	0	0
IESW030	69,330	1,874	73,898	1,039	85,170	0	79,821	0	89,187	102
IESW031	2	0	1	0	1	0	0	0	1	0
IESW032	41,483	935	43,572	1,685	46,051	43	46,901	65	53,811	571
IESW033	4,036	0	4,063	0	4,451	0	4,456	0	3,813	0
IESW034	70,432	49	78,994	224	83,264	277	78,260	76	78,627	154

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 11	Stress Per 12	Stress Per 13	Stress Per 14	Stress Per 15	Stress Per 16	Stress Per 17	Stress Per 18	Stress Per 19	Stress Per 20
IESW035	46,235	572	53,489	1,289	62,833	23	61,387	0	62,672	126
IESW036	46,556	1,475	55,073	3,230	53,489	163	50,987	0	65,358	1,958
IESW037	0	0	0	0	0	0	0	0	0	0
IESW038	15,684	803	17,022	1,101	15,416	625	17,348	357	17,707	1,131
IESW039	5,057	268	6,400	447	6,341	119	5,269	60	5,595	298
IESW040	0	0	0	0	0	0	0	0	0	0
IESW041	3,044	50	3,283	40	3,338	4	2,068	7	2,328	22
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	0	0	0	0	0	0	0	0	0	0
IESW052	0	0	0	0	0	0	0	0	0	0
IESW053	0	0	0	0	0	0	0	0	0	0
IESW054	64,486	0	59,711	0	47,704	0	21,921	0	54,752	0
IESW055	42,332	1,245	45,684	3,345	52,388	184	56,864	121	59,894	1,842
IESW056	8,163	1,061	8,861	982	8,685	410	8,283	326	9,098	1,038
IESW057	0	0	0	0	0	0	0	0	0	0

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 21	Stress Per 22	Stress Per 23	Stress Per 24	Stress Per 25	Stress Per 26	Stress Per 27	Stress Per 28	Stress Per 29	Stress Per 30
IESW000	0	0	0	0	0	0	0	0	0	0
IESW001	0	0	0	0	0	0	0	0	0	0
IESW002	26,171	0	24,265	0	22,144	0	21,102	0	27,181	0
IESW005	0	0	0	0	0	0	0	0	0	0
IESW007	258,724	0	258,264	0	202,571	0	238,751	0	271,579	0
IESW008	0	0	0	0	0	0	0	0	0	0
IESW009	110,078	2,314	117,332	1,037	95,960	0	121,993	5,124	115,725	121
IESW010	31,175	0	29,867	0	31,382	0	30,601	0	33,655	0
IESW011	1,477	2	1,243	2	1,374	0	1,057	4	1,414	2
IESW012	0	0	0	0	0	0	0	0	0	0
IESW014	16,827	0	12,668	0	12,837	0	15,595	0	14,320	0
IESW015	0	0	0	0	0	0	0	0	0	0
IESW016	5,579	23	5,494	463	5,425	110	4,952	855	6,026	280
IESW018	0	0	0	0	0	0	0	0	0	0
IESW019	31,061	0	25,872	0	21,887	0	25,161	0	30,601	0
IESW020	198,003	183	186,846	81	190,129	0	175,689	942	219,399	59
IESW022	160,078	104	143,457	107	143,044	0	142,424	1,317	170,983	0
IESW025	0	0	0	0	0	0	0	0	0	0
IESW027	6,286	0	5,774	0	6,359	0	5,838	0	6,777	0
IESW028	18,822	0	17,254	0	17,427	0	15,452	0	18,620	0
IESW029	0	0	0	0	0	0	0	0	0	0
IESW030	94,858	0	77,663	81	72,727	0	76,194	826	80,441	0
IESW031	1	0	1	0	0	0	2	0	0	0
IESW032	59,780	33	58,770	29	55,693	0	64,761	1,129	68,641	506
IESW033	4,718	0	3,586	0	4,415	0	3,152	0	4,653	0
IESW034	83,173	52	68,985	52	74,059	0	63,338	213	77,089	0

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 21	Stress Per 22	Stress Per 23	Stress Per 24	Stress Per 25	Stress Per 26	Stress Per 27	Stress Per 28	Stress Per 29	Stress Per 30
IESW035	65,909	0	54,408	0	55,395	0	58,655	0	63,453	0
IESW036	64,417	151	61,341	753	57,002	0	60,514	736	63,682	311
IESW037	0	0	0	0	0	0	0	0	0	0
IESW038	17,707	565	15,296	298	15,654	119	13,689	655	16,070	30
IESW039	5,863	179	5,475	208	4,910	357	4,465	298	4,316	208
IESW040	0	0	0	0	0	0	0	0	0	0
IESW041	2,534	23	2,546	7	2,292	0	2,578	14	2,686	0
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	0	0	0	0	0	0	0	0	0	0
IESW052	0	0	0	0	0	0	0	0	0	0
IESW053	0	0	0	0	0	0	0	0	0	0
IESW054	24,403	0	16,963	0	10,317	0	70,041	0	27,571	0
IESW055	60,904	422	53,466	1,374	64,738	0	63,384	2,792	66,529	247
IESW056	9,073	383	8,852	766	7,163	377	8,859	1,038	7,684	381
IESW057	0	0	0	0	0	0	0	0	0	0

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 31	Stress Per 32	Stress Per 33	Stress Per 34	Stress Per 35	Stress Per 36	Stress Per 37	Stress Per 38	Stress Per 39	Stress Per 40
IESW000	0	0	0	0	0	0	0	0	0	0
IESW001	0	0	0	0	0	0	0	0	0	0
IESW002	25,023	0	27,112	0	25,138	0	26,791	0	28,306	0
IESW005	0	0	0	0	0	0	0	0	0	0
IESW007	210,698	0	278,696	0	240,817	0	262,856	0	270,661	0
IESW008	0	0	0	0	0	0	0	0	0	0
IESW009	142,769	9,385	153,398	9,621	155,601	2,163	157,071	3,051	163,338	3,000
IESW010	30,119	0	35,078	215	35,262	0	34,206	81	37,305	0
IESW011	1,160	2	1,438	0	1,158	0	1,187	0	1,098	4
IESW012	0	0	0	0	0	0	0	0	0	0
IESW014	13,960	117	17,431	447	14,256	578	17,819	465	19,667	538
IESW015	0	0	0	0	0	0	0	0	0	0
IESW016	5,668	630	6,421	688	6,228	1,056	6,233	1,212	6,706	891
IESW018	0	0	0	0	0	0	0	0	0	0
IESW019	25,046	0	27,709	0	26,446	0	26,033	0	26,263	0
IESW020	229,798	4,791	243,343	4,853	224,449	2,695	238,062	2,567	253,444	2,197
IESW022	158,471	1,231	167,287	60	144,146	1,499	144,559	437	156,038	1,275
IESW025	0	0	0	0	0	0	0	0	0	0
IESW027	6,033	0	7,289	0	7,578	0	7,082	0	7,603	0
IESW028	15,999	0	19,199	0	19,022	0	18,664	6	19,263	0
IESW029	0	0	0	0	0	0	0	0	0	0
IESW030	84,826	180	99,518	62	92,218	0	102,089	550	104,454	298
IESW031	1	0	1	0	1	0	1	0	2	0
IESW032	63,154	1,845	71,120	3,161	73,669	1,733	74,518	345	78,926	68
IESW033	3,545	0	4,736	0	3,962	0	4,070	0	3,476	0
IESW034	70,983	163	80,028	0	75,712	414	75,758	167	77,571	197

Table A-7 (cont'd). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 31	Stress Per 32	Stress Per 33	Stress Per 34	Stress Per 35	Stress Per 36	Stress Per 37	Stress Per 38	Stress Per 39	Stress Per 40
IESW035	64,348	0	80,877	584	76,033	100	68,572	138	76,148	71
IESW036	68,733	2,704	73,852	1,832	72,865	1,244	73,990	1,511	78,168	1,792
IESW037	0	0	0	0	0	0	0	0	0	0
IESW038	15,595	298	14,702	1,012	15,177	1,042	9,881	208	14,851	625
IESW039	4,582	357	6,010	417	5,239	595	4,970	417	5,179	536
IESW040	0	0	0	0	0	0	0	0	0	0
IESW041	2,831	37	3,173	97	3,129	182	2,996	172	3,315	16
IESW044	0	0	0	0	0	0	0	0	0	0
IESW051	0	0	0	0	0	0	0	0	0	0
IESW052	0	0	0	0	0	0	0	0	0	0
IESW053	0	0	0	0	0	0	0	0	0	0
IESW054	64,187	0	71,120	0	67,447	0	70,225	0	70,523	0
IESW055	64,486	2,173	69,146	2,810	70,546	3,216	71,694	3,214	76,217	2,587
IESW056	9,086	789	9,256	954	9,226	1,019	8,650	893	9,311	1,377
IESW057	0	0	0	0	0	0	0	0	0	0

Table A-7 (concluded). Return flow volumes by irrigation entity for each model stress period.

Entity	Stress Per 41	Stress Per 42	Stress Per 43	Stress Per 44
IESW000	0	0	0	0
IESW001	0	0	0	0
IESW002	30,601	0	20,714	0
IESW005	0	0	0	0
IESW007	151,676	0	122,314	0
IESW008	0	0	0	0
IESW009	167,585	0	134,229	0
IESW010	44,835	0	37,764	0
IESW011	1,576	0	1,270	0
IESW012	0	0	0	0
IESW014	17,943	0	13,260	0
IESW015	0	0	0	0
IESW016	6,857	1,361	6,038	0
IESW018	0	0	0	0
IESW019	32,966	0	28,145	0
IESW020	297,980	477	233,012	0
IESW022	186,639	0	160,904	0
IESW025	0	0	0	0

Entity	Stress Per 41	Stress Per 42	Stress Per 43	Stress Per 44
IESW027	9,456	0	9,298	0
IESW028	23,393	0	22,179	0
IESW029	0	0	0	0
IESW030	110,216	0	80,418	0
IESW031	0	0	0	0
IESW032	84,711	125	76,584	0
IESW033	4,697	0	4,079	0
IESW034	82,691	0	75,528	0
IESW035	84,527	0	68,572	0
IESW036	86,341	41	68,825	0
IESW037	0	0	0	0
IESW038	15,803	0	15,803	30
IESW039	4,998	327	4,167	268
IESW040	0	0	0	0
IESW041	3,604	0	3,242	0
IESW044	0	0	0	0
IESW051	0	0	0	0
IESW052	0	0	0	0
IESW053	0	0	0	0
IESW054	73,301	0	20,436	0
IESW055	81,428	451	80,693	0
IESW056	8,786	341	6,088	211
IESW057	0	0	0	0

Table A-8. Leakage Fraction Applied to Diversion Volume, By Stress Period

CANAL_ID	Name	SP001	SP002	SP003	SP004	SP005	SP006	SP007	SP008	SP009	SP010
	Start Month	May-80	Oct-80	May-81	Oct-81	May-82	Oct-82	May-83	Oct-83	May-84	Oct-84
007-Canal	Milner-Gooding	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
032-Canal	Northside Main	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
032-Lake	Wilson Lake	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
002-Canal	Aberdeen-Springfield	0.26	0.40	0.42	0.37	0.39	0.31	0.33	0.33	0.30	0.30
032-Rim	Northside Laterals	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

CANAL_ID	Name	SP011	SP012	SP013	SP014	SP015	SP016	SP017	SP018	SP019	SP020
	Start Month	May-85	Oct-85	May-86	Oct-86	May-87	Oct-87	May-88	Oct-88	May-89	Oct-89
007-Canal	Milner-Gooding	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
032-Canal	Northside Main	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
032-Lake	Wilson Lake	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
002-Canal	Aberdeen-Springfield	0.36	0.36	0.26	0.26	0.40	0.40	0.42	0.42	0.37	0.37
032-Rim	Northside Laterals	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

CANAL_ID	Name	SP021	SP022	SP023	SP024	SP025	SP026	SP027	SP028	SP029	SP030
	Start Month	May-90	Oct-90	May-91	Oct-91	May-92	Oct-92	May-93	Oct-93	May-94	Oct-94
007-Canal	Milner-Gooding	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
032-Canal	Northside Main	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
032-Lake	Wilson Lake	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
002-Canal	Aberdeen-Springfield	0.39	0.39	0.31	0.31	0.51	0.51	0.43	0.43	0.47	0.47
032-Rim	Northside Laterals	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

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CANAL_ID	Name	SP031	SP032	SP033	SP034	SP035	SP036	SP037	SP038	SP039	SP040
	Start Month	May-95	Oct-95	May-96	Oct-96	May-97	Oct-97	May-98	Oct-98	May-99	Oct-99
007-Canal	Milner-Gooding	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
032-Canal	Northside Main	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
032-Lake	Wilson Lake	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
002-Canal	Aberdeen-Springfield	0.43	0.43	0.41	0.41	0.38	0.38	0.39	0.39	0.39	0.39
032-Rim	Northside Laterals	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

CANAL_ID	Name	SP041	SP042	SP043	SP044						
	Start Month	May-00	Oct-00	May-01	Oct-01						
007-Canal	Milner-Gooding	0.15	0.15	0.15	0.15						
032-Canal	Northside Main	0.05	0.05	0.05	0.05						
032-Lake	Wilson Lake	0.05	0.05	0.05	0.05						
002-Canal	Aberdeen-Springfield	0.42	0.42	0.49	0.49						
032-Rim	Northside Laterals	0.10	0.10	0.10	0.10						

Table A-9. Model cells with fixed pumping represented.

Row	Column	Type of Fixed Point
58	190	Exchange Wells
58	191	Exchange Wells
58	192	Exchange Wells
54	182	Exchange Wells
54	186	Exchange Wells
55	199	Exchange Wells
56	177	Exchange Wells
59	185	Exchange Wells
59	186	Exchange Wells
58	182	Exchange Wells
59	188	Exchange Wells
60	186	Exchange Wells
67	198	Exchange Wells
71	179	Exchange Wells
38	159	Mud Lake Wells
40	164	Mud Lake Wells
42	163	Mud Lake Wells
38	160	Mud Lake Wells
35	48	Richfield Recharge Adjustment
35	49	Richfield Recharge Adjustment
35	50	Richfield Recharge Adjustment
35	51	Richfield Recharge Adjustment
33	51	Richfield Recharge Adjustment
34	48	Richfield Recharge Adjustment
34	49	Richfield Recharge Adjustment
34	50	Richfield Recharge Adjustment
34	51	Richfield Recharge Adjustment
36	53	Richfield Recharge Adjustment
36	54	Richfield Recharge Adjustment
37	51	Richfield Recharge Adjustment
37	52	Richfield Recharge Adjustment
37	53	Richfield Recharge Adjustment
37	54	Richfield Recharge Adjustment
37	55	Richfield Recharge Adjustment
37	56	Richfield Recharge Adjustment
38	50	Richfield Recharge Adjustment
38	51	Richfield Recharge Adjustment
38	54	Richfield Recharge Adjustment
38	55	Richfield Recharge Adjustment
38	56	Richfield Recharge Adjustment
38	57	Richfield Recharge Adjustment
39	50	Richfield Recharge Adjustment
39	51	Richfield Recharge Adjustment
39	52	Richfield Recharge Adjustment
39	55	Richfield Recharge Adjustment
39	56	Richfield Recharge Adjustment
39	57	Richfield Recharge Adjustment
40	50	Richfield Recharge Adjustment
40	51	Richfield Recharge Adjustment
40	52	Richfield Recharge Adjustment
40	55	Richfield Recharge Adjustment
40	56	Richfield Recharge Adjustment
40	57	Richfield Recharge Adjustment
41	50	Richfield Recharge Adjustment
41	51	Richfield Recharge Adjustment
41	52	Richfield Recharge Adjustment
41	53	Richfield Recharge Adjustment
41	54	Richfield Recharge Adjustment
41	55	Richfield Recharge Adjustment
41	56	Richfield Recharge Adjustment
41	57	Richfield Recharge Adjustment
42	48	Richfield Recharge Adjustment
42	49	Richfield Recharge Adjustment
42	50	Richfield Recharge Adjustment
42	51	Richfield Recharge Adjustment
42	52	Richfield Recharge Adjustment
42	53	Richfield Recharge Adjustment
42	54	Richfield Recharge Adjustment
42	55	Richfield Recharge Adjustment
42	56	Richfield Recharge Adjustment
42	57	Richfield Recharge Adjustment
43	48	Richfield Recharge Adjustment
43	49	Richfield Recharge Adjustment
43	50	Richfield Recharge Adjustment
43	51	Richfield Recharge Adjustment
43	52	Richfield Recharge Adjustment
43	53	Richfield Recharge Adjustment
43	54	Richfield Recharge Adjustment
43	55	Richfield Recharge Adjustment
43	56	Richfield Recharge Adjustment
44	48	Richfield Recharge Adjustment
44	49	Richfield Recharge Adjustment
44	50	Richfield Recharge Adjustment
44	51	Richfield Recharge Adjustment
44	52	Richfield Recharge Adjustment
44	53	Richfield Recharge Adjustment
44	54	Richfield Recharge Adjustment
44	55	Richfield Recharge Adjustment
44	56	Richfield Recharge Adjustment
45	45	Richfield Recharge Adjustment
45	47	Richfield Recharge Adjustment
45	48	Richfield Recharge Adjustment
45	50	Richfield Recharge Adjustment
45	51	Richfield Recharge Adjustment
45	54	Richfield Recharge Adjustment
46	47	Richfield Recharge Adjustment

Table A-9 (continued). Model cells with fixed pumping represented.

Row	Column	Type of Fixed Point
10	107	Wetland Adjustment
10	108	Wetland Adjustment
11	108	Wetland Adjustment
11	109	Wetland Adjustment
12	108	Wetland Adjustment
12	109	Wetland Adjustment
12	110	Wetland Adjustment
13	110	Wetland Adjustment
13	111	Wetland Adjustment
14	110	Wetland Adjustment
14	111	Wetland Adjustment
14	112	Wetland Adjustment
15	112	Wetland Adjustment
15	113	Wetland Adjustment
16	112	Wetland Adjustment
16	113	Wetland Adjustment
16	116	Wetland Adjustment
17	113	Wetland Adjustment
18	113	Wetland Adjustment
18	114	Wetland Adjustment
20	114	Wetland Adjustment
20	196	Wetland Adjustment
21	113	Wetland Adjustment
21	114	Wetland Adjustment
22	113	Wetland Adjustment
22	114	Wetland Adjustment
23	12	Wetland Adjustment
23	16	Wetland Adjustment
24	12	Wetland Adjustment
24	14	Wetland Adjustment
24	15	Wetland Adjustment
25	12	Wetland Adjustment
25	13	Wetland Adjustment
25	14	Wetland Adjustment
25	170	Wetland Adjustment
26	12	Wetland Adjustment
26	167	Wetland Adjustment
26	170	Wetland Adjustment
26	171	Wetland Adjustment
27	167	Wetland Adjustment
28	10	Wetland Adjustment
29	10	Wetland Adjustment
29	11	Wetland Adjustment
30	50	Wetland Adjustment
30	51	Wetland Adjustment
31	51	Wetland Adjustment
31	157	Wetland Adjustment
31	158	Wetland Adjustment
32	23	Wetland Adjustment
32	156	Wetland Adjustment
32	157	Wetland Adjustment
33	23	Wetland Adjustment
33	110	Wetland Adjustment
33	156	Wetland Adjustment
33	157	Wetland Adjustment
34	14	Wetland Adjustment
34	73	Wetland Adjustment
34	78	Wetland Adjustment
34	79	Wetland Adjustment
34	156	Wetland Adjustment
35	95	Wetland Adjustment
35	94	Wetland Adjustment
35	93	Wetland Adjustment
35	92	Wetland Adjustment
35	91	Wetland Adjustment
36	90	Wetland Adjustment
36	89	Wetland Adjustment
36	87	Wetland Adjustment
36	86	Wetland Adjustment
36	85	Wetland Adjustment
37	84	Wetland Adjustment
37	83	Wetland Adjustment
37	82	Wetland Adjustment
37	81	Wetland Adjustment
37	80	Wetland Adjustment
38	79	Wetland Adjustment
38	78	Wetland Adjustment
38	77	Wetland Adjustment
38	76	Wetland Adjustment
38	75	Wetland Adjustment
39	74	Wetland Adjustment
39	73	Wetland Adjustment
39	72	Wetland Adjustment
39	71	Wetland Adjustment
39	70	Wetland Adjustment
40	69	Wetland Adjustment
40	68	Wetland Adjustment
40	67	Wetland Adjustment
40	66	Wetland Adjustment
41	65	Wetland Adjustment
41	64	Wetland Adjustment
41	63	Wetland Adjustment
41	62	Wetland Adjustment
41	61	Wetland Adjustment
42	60	Wetland Adjustment
42	59	Wetland Adjustment
42	58	Wetland Adjustment
42	57	Wetland Adjustment
42	56	Wetland Adjustment
42	164	Wetland Adjustment

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Table A-9 (continued). Model cells with fixed pumping represented.

Row	Column	Type of Fixed Point	Row	Column	Type of Fixed Point
42	166	Wetland Adjustment	68	176	Wetland Adjustment
42	167	Wetland Adjustment	68	177	Wetland Adjustment
42	168	Wetland Adjustment	69	177	Wetland Adjustment
43	38	Wetland Adjustment	70	177	Wetland Adjustment
43	164	Wetland Adjustment	70	178	Wetland Adjustment
43	165	Wetland Adjustment	71	178	Wetland Adjustment
43	166	Wetland Adjustment	73	175	Wetland Adjustment
45	46	Wetland Adjustment	73	181	Wetland Adjustment
45	53	Wetland Adjustment	74	175	Wetland Adjustment
51	200	Wetland Adjustment	74	176	Wetland Adjustment
51	201	Wetland Adjustment	78	114	Wetland Adjustment
52	25	Wetland Adjustment	78	115	Wetland Adjustment
52	26	Wetland Adjustment	79	115	Wetland Adjustment
53	181	Wetland Adjustment	80	123	Wetland Adjustment
53	182	Wetland Adjustment	81	112	Wetland Adjustment
53	195	Wetland Adjustment	81	123	Wetland Adjustment
54	27	Wetland Adjustment	81	129	Wetland Adjustment
55	169	Wetland Adjustment	81	141	Wetland Adjustment
55	170	Wetland Adjustment	82	111	Wetland Adjustment
55	182	Wetland Adjustment	82	112	Wetland Adjustment
56	180	Wetland Adjustment	82	113	Wetland Adjustment
57	179	Wetland Adjustment	82	118	Wetland Adjustment
58	180	Wetland Adjustment	82	127	Wetland Adjustment
58	181	Wetland Adjustment	83	118	Wetland Adjustment
59	175	Wetland Adjustment	84	50	Wetland Adjustment
60	173	Wetland Adjustment	84	110	Wetland Adjustment
60	197	Wetland Adjustment	85	110	Wetland Adjustment
60	198	Wetland Adjustment	85	111	Wetland Adjustment
60	199	Wetland Adjustment	85	125	Wetland Adjustment
61	195	Wetland Adjustment	85	126	Wetland Adjustment
61	196	Wetland Adjustment	85	127	Wetland Adjustment
61	198	Wetland Adjustment	85	137	Wetland Adjustment
61	199	Wetland Adjustment	85	140	Wetland Adjustment
62	171	Wetland Adjustment	85	141	Wetland Adjustment
62	172	Wetland Adjustment	85	142	Wetland Adjustment
62	175	Wetland Adjustment	86	123	Wetland Adjustment
62	200	Wetland Adjustment	86	126	Wetland Adjustment
63	35	Wetland Adjustment	86	137	Wetland Adjustment
63	172	Wetland Adjustment	86	141	Wetland Adjustment
63	199	Wetland Adjustment	86	144	Wetland Adjustment
64	35	Wetland Adjustment	87	124	Wetland Adjustment
64	199	Wetland Adjustment	87	125	Wetland Adjustment
65	174	Wetland Adjustment	88	58	Wetland Adjustment
65	175	Wetland Adjustment	88	122	Wetland Adjustment
65	176	Wetland Adjustment	88	123	Wetland Adjustment
65	199	Wetland Adjustment	88	124	Wetland Adjustment
66	175	Wetland Adjustment	89	121	Wetland Adjustment
66	198	Wetland Adjustment	90	121	Wetland Adjustment
67	176	Wetland Adjustment	90	122	Wetland Adjustment
67	177	Wetland Adjustment	90	123	Wetland Adjustment

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Table A-9 (concluded). Model cells with fixed pumping represented.

Row	Column	Type of Fixed Point
90	124	Wetland Adjustment
90	125	Wetland Adjustment
90	126	Wetland Adjustment
90	127	Wetland Adjustment
91	120	Wetland Adjustment
91	123	Wetland Adjustment
91	124	Wetland Adjustment
91	125	Wetland Adjustment
91	127	Wetland Adjustment
92	105	Wetland Adjustment
92	112	Wetland Adjustment
92	118	Wetland Adjustment
92	119	Wetland Adjustment
93	88	Wetland Adjustment
93	96	Wetland Adjustment
93	104	Wetland Adjustment
93	111	Wetland Adjustment
93	112	Wetland Adjustment
93	113	Wetland Adjustment
93	119	Wetland Adjustment
94	96	Wetland Adjustment
94	98	Wetland Adjustment
94	100	Wetland Adjustment
94	101	Wetland Adjustment
94	102	Wetland Adjustment
94	104	Wetland Adjustment
94	113	Wetland Adjustment
94	114	Wetland Adjustment
94	119	Wetland Adjustment
95	119	Wetland Adjustment
95	124	Wetland Adjustment
95	125	Wetland Adjustment
96	97	Wetland Adjustment
96	119	Wetland Adjustment
96	120	Wetland Adjustment
98	120	Wetland Adjustment
99	110	Wetland Adjustment
99	111	Wetland Adjustment
100	110	Wetland Adjustment
100	111	Wetland Adjustment

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Appendix B—Description of the GIS/Fortran Recharge Tool

As part of the ESPAM upgrade, the Idaho Water Resources Research Institute at University of Idaho developed a tool for calculating recharge and discharge for MODFLOW ground water models using spatial data. The GIS/Fortran Recharge Tool uses a combination of geographical information system (GIS) technology and a Fortran program to process spatial data to calculate recharge and discharge to each model cell for a ground water model.

The GIS Recharge Tool is independent of model grid or aquifer basin. The tool was designed for use in basins with arid irrigation; however, the tool can easily be adapted to basins with no irrigation. Spatial data inputs to the tool include the model grid, precipitation, evapotranspiration, recharge on non-irrigated lands, land use, soil type and irrigation. Additionally, line source and point source data such as canal seepage, river seepage, tributary underflow and municipal pumping are entered as spatial data. The GIS component of the tool intersects each component of data with the model grid and generates ASCII output files which are input to the Fortran program. Figure B-1 shows schematically how the GIS component of the tool functions.

The Fortran program uses the cell-by-cell information to calculate net aquifer recharge/discharge for each model cell for each stress period and generates the MODFLOW input files. Figure B-2 shows conceptually the individual components of aquifer recharge and discharge which are accounted for by the GIS Recharge Tool.

The tool was developed primarily for use with the Enhanced Snake Plain Aquifer Model but was designed to be applied in other basins as well. The tool design divides functionality between spatial data analysis (the GIS component) and background

computer processing (the Fortran component). This split of functionality allows the analyst maximum flexibility in the processing of the aquifer recharge/discharge. By segregating the background computer processing into a separate Fortran program, the GIS/Fortran Recharge Tool can be used with a parameter estimation package such as PEST enabling dual calibration of aquifer model parameters (transmissivity and storativity) with model recharge.

GIS Component

The GIS component of the recharge tool allows creation of a new simulation and scenario or creation of a simulation based on an existing simulation. Figure B-3 shows the user interface for the GIS component of the tool. As the user builds a recharge data set, the GIS component provides the user with pull-down menus for selection of desired data files or data fields within a file. Figure B-4 shows the user interface for the GIS component of the tool.

The GIS component of the recharge tool allows creation of a new simulation and scenario or creation of a simulation based on an existing simulation. As the user begins building a recharge data set, the GIS component provides the user with pull-down menus for selection of desired data components. Figure B-3 shows the user interface for the GIS component of the tool. Figure B-4 shows the selection of recharge components which the user can choose to analyze. After selecting the recharge component to be analyzed, the user is guided through selecting data files and fields within each file to be used for the analysis. Figure B-5 shows a sample navigation window for locating a data file.

Figure B-6 shows a sample of the data components from the selected file available for analysis. After identifying the data sources, the user selects the

RunAnalysis button and the GIS component processes the selected data, generating the input files for the Fortran component.

The GIS component is designed in a modular fashion, so that part of a recharge data set can be built or modified independently of the rest of the data set. The user can build part of a data set, close the tool, and resume processing of the same data set at a later time. The tool also allows easy modification of an existing data set, for scenario generation. The tool was built for maximum flexibility in generation of model recharge/discharge data.

Fortran Component

The Fortran component calculates recharge and discharge for each individual ground water model cell for each stress period, based on the input data from the GIS component. The Fortran component reads all of the data files created by the GIS component which contain recharge and discharge information for each model grid cell. Outputs of the Fortran component include the MODFLOW Well File or Recharge File, in either binary or ASCII format, (for direct input to the ground water model) as well as output of intermediate recharge variables such as evapotranspiration, precipitation, or applied irrigation water for each model cell for each stress period, which can be viewed using GIS software. This allows the analyst to graph the components of recharge spatially or to graph totals through time, enabling full analysis of the recharge data for error-checking as well as for hydrological analysis.

The Fortran component can be run solely to calculate recharge and discharge values for a single model scenario, or it can be run in conjunction with parameter estimation sofware such as PEST. Figure B-7 shows a flow diagram of how the

GIS/Fortran Recharge Tool would be used for generation of recharge/discharge for a single model scenario.

The recharge tool has also been designed to be run along with the model during parameter estimation. Figure B-8 shows how the Fortran component would be included in a parameter estimation loop using PEST. Inclusion in a parameter estimation loop enables the user to estimate model recharge parameters such as tributary underflow, percentage of canal leakage or aquifer recharge on non-irrigated lands along with the traditional model parameters of transmissivity and storativity.

Tool Use

The GIS Recharge Tool provides an analyst with a powerful tool for generation of model scenarios and different conceptual representations of aquifer recharge and discharge. The feature of the tool which allows a scenario to be based on an existing scenario enables the user to retain most of the input variables constant, varying only selected items, in order to test different conceptual models of recharge and discharge. This allows rapid generation of complex recharge/discharge scenarios for a ground water model, which is particularly useful during both model parameterization and model use.

In addition to generation of recharge and discharge for ground water models, the GIS Recharge Tool can be used to estimate the impacts to a regional aquifer from large-scale changes such as climate changes or changes in land use. By modifying the spatial inputs to the GIS Component, the user can create scenarios which represent significant changes in land use or natural precipitation or evaporation, then linking with the Fortran Component to predict the changes to aquifer recharge/discharge caused by these basin

changes. This makes the GIS Recharge Tool a powerful tool for assessing natural and management changes of a groundwater basin.

DRAFT 2

Determination of Source of Irrigation Water for Calibration of Eastern Snake Plain Aquifer Model Version 2

University of Idaho
Idaho Water Resources Research Institute

Bryce A. Contor
Paul L. Pelot
April 2008



Idaho Water Resources Research Institute Technical Report 200805
ESPAM2 Design Document DDW-V2-02 “Source of Irrigation Water”

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Determination of Source of Irrigation Water for Calibration of Eastern Snake Plain Aquifer Model Version 2

DESIGN DOCUMENT OVERVIEW

During calibration of the Eastern Snake Plain Aquifer Model Version 1.1 (ESPAM1.1), a series of Design Documents were produced to document data sources, conceptual model decisions and calculation methods. These documents served two important purposes; they provided a vehicle to communicate decisions and solicit input from members of the Eastern Snake Hydrologic Modeling Committee (ESHMC) and other interested parties, and they provided far greater detail of particular aspects of the modeling process than would have been possible in a single final report. Many of the Design Documents were presented first in a draft form, then in revised form following input and discussion, and finally in an "as-built" form describing the actual implementation.

This report is a Design Document for the calibration of the Eastern Snake Plain Aquifer Model Version 2 (ESPAM2). Its goals are similar to the goals of Design Documents for ESPAM1.1: To provide full transparency of modeling data, decisions and calibration; and to seek input from representatives of various stakeholders so that the resulting product can be the best possible technical representation of the physical system (given constraints of time, funding and personnel). It is anticipated that for some topics, a single Design Document will serve these purposes prior to issuance of a final report. For other topics, a draft document will be followed by one or more revisions and a final "as-built" Design Document. Superceded Design Documents will be maintained in a "superceded" file folder on the project Website, and successive versions will be maintained in a "current" folder. This will provide additional documentation of project history and the development of ideas.

INTRODUCTION

The ESPAM1.1 Design Document stated: "Recharge from surface-water irrigation is the largest component of aquifer recharge, and a large source of model uncertainty. The second-largest component of aquifer discharge is net withdrawals (calculated as consumptive use, or evapotranspiration) due to ground-water irrigation. The source of water for individual parcels must be identified so that diverted volumes of surface water are applied to the appropriate spatial locations" (Contor, 2004). Additional parameters for water-budget calculation, such as evapotranspiration adjustment coefficients, could potentially depend on the source of water assigned to a particular parcel.

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Net extraction from ground-water pumping, on lands with no surface-water source, is calculated in the Recharge Tool using equation (1):

$$R_p = P - ET \quad (1)$$

Where R_p = net impact of pumping
P = precipitation
ET = crop evapotranspiration

In the Eastern Snake River Plain, precipitation is generally low enough that R_p is negative. Pumping is not explicitly represented; R_p implicitly includes gross pumpage and percolation returns to the aquifer. R_p is spatially distributed across the irrigated area, which is a reasonable approximation when the distance from wells to irrigated lands is small relative to model grid size, as is the case in the model grid used for ESPAM1.1.

Net recharge from surface-water irrigation is calculated in the Recharge Tool using equation (2):

$$R_n = (D - R - C + P_o + P - ET) \quad (2)$$

Where R_n = net recharge from irrigation
D = diversions from surface water
R = irrigation returns to surface water bodies
C = canal leakage separately represented[1]
P_o = offsite ground-water pumping separately represented[2]
(P and ET as defined above)

R_n is generally positive.

Careful inspection of equation (2) shows that if all the activities that do not occur on ground-water-irrigated parcels are set to zero, equation (2) is equivalent to equation (1) and can be validly applied to all irrigated lands.[3] If one considers a geographic region that includes the canals and offsite wells, equation (2) can be expanded to equation (3) to represent the full regional impact of irrigation

[1] Since canal leakage is represented elsewhere in the recharge tool as a recharge at the location of the leaky canal, this term does not change the water budget but simply adjusts the spatial distribution of recharge.
[2] Since offsite pumping is represented elsewhere in the recharge tool as an extraction at the location of the offsite well, this term also affects only the spatial distribution of impact.
[3] On an individual model cell, equations (1) and (2) are applied on a pro-rata basis according to irrigated acreage in each irrigation entity. On mixed source parcels, R_p is multiplied by the ground-water source fraction and R_n is multiplied by the surface-water-source fraction. Because of the way source fractions are used in calculating diversion depth for surface-water entities, the mass balance implied in equations (2), (3) and (4) is preserved for all irrigated lands.

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upon the aquifer. The first set of parenthesis encloses on-farm impacts and the second set encloses off-farm activities.

$$R_n = (D - R - C + P_o + P - ET) + (C - P_o) \quad (3)$$

By combining like terms, equation (3) can be reduced to equation (4) which represents the regional net impact of irrigation, including ground-water, surface-water and mixed-source effects.

$$R_n = (D - R + P_o - ET) \quad (4)$$

This equation holds for a region as long as the four inputs on the right-hand side are correct. The location of ground-water-irrigated, surface-water-irrigated, and mixed-source parcels does not affect equation (4) nor the water budget, but simply the spatial distribution of R_n within the geographic region represented. With the current configuration of the Recharge Tool, this region is an irrigation entity.

Representation of the source of irrigation water in ESPAM1.1 was based on the authorized source of irrigation water according to Idaho Department of Water Resources water right, adjudication claim and adjudication recommendation data available in 2001 and 2002 (Contor, 2004). In ESPAM1.1, all parcels having only surface-water irrigation water rights were designated "surface-water irrigated," all parcels having only ground-water rights were designated "ground-water irrigated," and all parcels having both surface- and ground-water rights were designated "mixed source." On mixed-source lands, a fraction of supply was assigned to each source, with ground-water and surface-water fractions summing to 1.0 for each mixed-source parcel. A particular entity, for instance, might have a source fraction of 0.30 for ground-water irrigation and 0.70 for surface-water irrigation. Source fractions were based on surface-water diversion data and were assigned on an irrigation-entity-wide basis. The ESPAM1.1 Design Document (Contor, 2004) describes in more detail how the source fractions were determined and applied. Figure 1 shows the spatial distribution of ground-water fraction on mixed-source irrigated lands used in ESPAM1.1.

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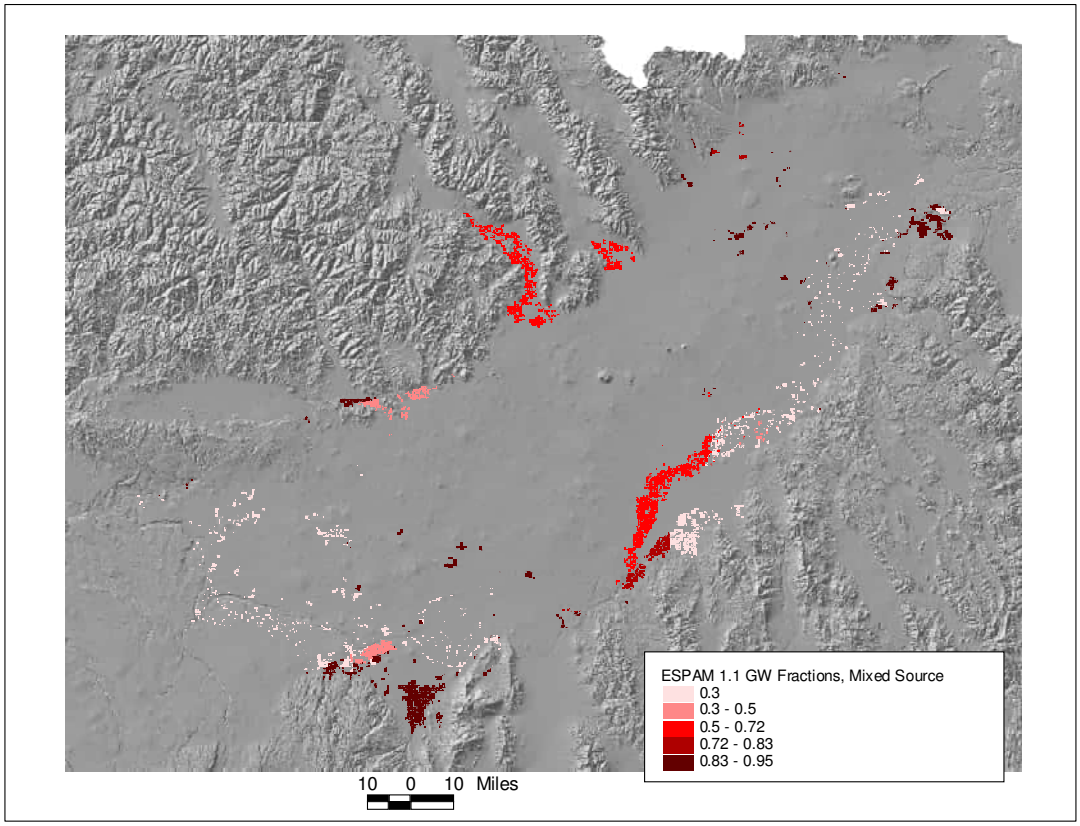

Figure 1. ESPAM1.1 ground-water fraction on mixed-source lands.[4]

During the fall of 2007, Idaho Water Resources Research Institute (IWRRI) reviewed aerial imagery, water rights GIS data and scanned images of paper water-right files for a statistical sampling of approximately 300 mixed-source irrigated parcels in south eastern Idaho, along with field inspection of a random sub-sample of parcels with access to Snake River water (Contor and others, 2008). An important outcome of this study was that very few parcels are physically mixed source; nearly all the parcels with both ground-water and surface-water rights are physically supplied from only one source or the other. This and other results are considered in light of the following questions for calibration of ESPAM2:

1. Is the ESPAM1.1 determination of source consistent with current water rights, claims and recommendations data?
2. Is there a possibility that the uniform representation of ground-water fraction across mixed-source irrigation entities distorts the representation of the impact of irrigation upon springs and reaches of the Snake River?
3. Can the source of irrigation water be represented with finer spatial resolution than was used in ESPAM1.1?

[4] Mixed-source lands that are served by wells for which actual diversion data are available are omitted from this figure. This affects organized irrigation companies in the Mud Lake area.

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The first question is important because the first water-right determination was made during a period of rapid processing of claims, recommendations and partial decrees in the Snake River Basin Adjudication. Consequently, today's water-rights, claims and recommendations data bases are significantly different from those used in ESPAM1.1. One important difference is that many claims polygons used in ESPAM1.1 included detailed representation of individual parcels as either irrigated or not irrigated under a particular surface-water company or district's shares. However, in the process of the Snake River Basin Adjudication, many of these polygons have been superceded by large polygons that cast a broad boundary over entire service areas, obscuring the parcel-by-parcel detail that was present in the older data. This precludes simply repeating the analysis; if the ESPAM1.1 determination must be replaced, a new method, which will undoubtedly be more extensive and costly than the ESPAM1.1 evaluation, must be identified and applied.

The second question is whether the uniform representation of mixed-source lands distorts the spatial distribution of recharge. This is important because the primary purpose of ESPAM2 is to estimate impacts that stresses upon the aquifer (for instance, recharge or irrigation pumping) will have upon surface-water bodies. The process of calibration involves using known time series of impacts and known time series of spring discharges and river gains and losses. Figure 1 reveals that in ESPAM1.1, the ground-water extraction fraction was applied uniformly over large areas of mixed-source lands within some entities. The reality could be that there are discrete locations within these entities predominantly irrigated only by surface water, with other locations predominantly supplied from ground water. If true, this could distort the "known" data used to calibrate the model and therefore reduce the quality of the resulting calibration.

The third question is essentially a follow-up question to the second: Can we develop a more realistic method to represent the actual source of irrigation water on these mixed-source parcels?

This design document discusses these three questions and presents a proposal for the determination of source of irrigation water for calibration of ESPAM2. It is presented to provide transparency, stimulate discussion and seek input from the ESHMC.

APPLICATION OF DATA TO THREE QUESTIONS

Is the ESPAM1.1 Determination of Water Source Consistent With Current Data?

All the sample points were chosen to correspond to lands identified as "mixed source" in ESPAM1.1. Approximately seven percent of the sample points were in locations where gaps occurred in the water-rights GIS data (primarily

associated with lands under Native American sovereign jurisdiction). Of the remaining points, the current water-right status agreed with ESPAM1.1 determination on 88% to 95% of the points[5]. In every case, the change in status was due determinations made in the Snake River Basin Adjudication. Table 1 shows the status of the 24 points (5% to 12% of the total) where ESPAM1.1 disagreed with current data.

Table 1
Points where current data disagreed with ESPAM1.1 determination of water-right status. All points are on or very near the Eastern Snake Plain Aquifer.

ESPAM1.1	Current Data	No. Points
Mixed-source	Ground-water only	8
Mixed-source	Surface-water only	15
Mixed-source	No irrigation rights	1

Changes in the IDWR water-rights representation of canal company and irrigation district service areas indicate that repeating the analysis would require extensive effort. Discrepancies in identification of irrigation water source only introduce changes in spatial distribution of recharge and not in the water budget. Approximately 90% of the points for which a current water-right determination could be made agreed with the ESPAM1.1 determination of source. Therefore, it is proposed to use the ESPAM1.1 water-rights extraction as a basis for source maps for ESPAM2 calibration.

Does the current uniform representation of ground water on mixed-source lands distort spatial distribution of recharge within individual entities?

If a tract of mixed-source land the size of an irrigation entity had a concentration of ground-water irrigation in one location and a concentration of surface-water irrigation in another, the ESPAM1.1 representation of uniform distribution of ground water and surface water could represent a spatial distortion of recharge and discharge. Since ground-water irrigation depletes the aquifer during time periods when surface-water irrigation replenishes it, this distortion could adversely affect the ability of the model to match temporal variation in reach gains. During the January 2008 ESHMC meeting, participants identified Springfield, Idaho as the location where this effect would be likely to be of greatest concern within the study area, illustrated in Figure 2 (from Contor, 2008).

[5] The range is the alpha = 0.05 confidence interval for a binomial experiment (Snedecor and Cochran, 1980)

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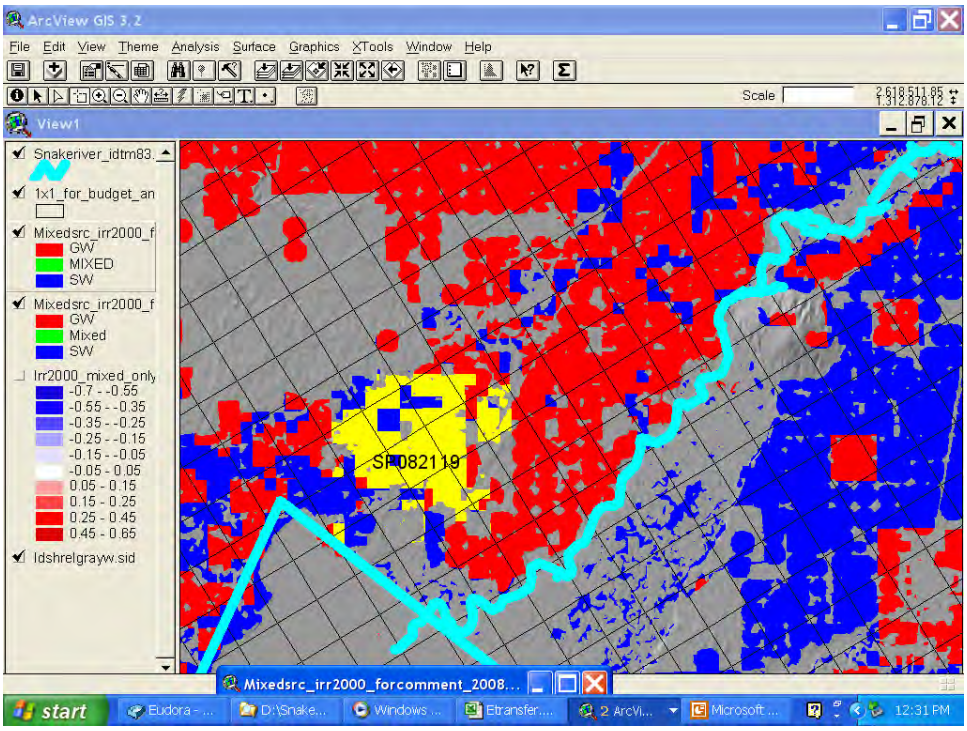

Figure 2. Yellow-coded lands are the subject of the test. Red (ground water) and blue (surface water) colors are preliminary determinations under "proximity" method.

The yellow-colored lands are the subject of the test. In ESPAM1.1 these were represented as mixed-source with uniform distribution of ground-water and surface-water irrigation according to the local irrigation entity's source fractions. Evidence suggests that in reality this area is predominantly ground-water irrigated. The analysis assumed the worst-case scenario, which would be that the lands colored yellow are actually irrigated solely from ground water. If that were the case, the estimated local distortion in stress due to the uniform representation of ESPAM1.1 could be two feet per year (Contor, 2008). A corresponding volume of water (based on irrigated acreage of the yellow-colored lands) was applied to the cell labeled in the Figure, using the Eastern Snake Plain Aquifer recharge tool (Cosgrove and others, 2007). The simulation results indicate that the distortion in representation of reach gains to the Near Blackfoot to Neeley reach of the river is about 12 cubic feet per second (cfs) in the summer, seven cfs in the winter and five cfs in the spring. This over-estimates the actual distortion, because the offsetting reductions that would occur elsewhere within the irrigation entity were not represented. Relative to total gains in the reach and uncertainties in the target data, this distortion is minimal. This test indicates the practical impact of the ESPAM1.1 simplification upon matching reach gains is minor. However, the impact on matching water levels in wells is also important.

Can the source of irrigation water be represented with finer spatial resolution than was done in ESPAM1.1?

To refine the spatial distribution of water source, a heterogeneous scheme of source fractions must be imposed on mixed-source lands within any given irrigation entity. Several possibilities exist, including the following (Contor, 2008):

1. A "proximity" method. Mixed source lands within 400 meters of an irrigation well[6] are deemed to be ground-water supplied and all others are deemed to be surface-water supplied.
2. A "dual radius" method. All mixed-source parcels within 100 meters of an irrigation well are deemed to be ground-water supplied, all parcels further than 1000 meters from an irrigation well are deemed to be surface-water supplied, and all other parcels are listed as "mixed-source undetermined," with the fraction of supply from ground water set at 50%.
3. "Dual 2," a modified dual radius method where all parcels within 100 meters of a well are assigned 90% ground-water source fraction, parcels further than 1000 meters are assigned a 10% ground-water fraction, and other mixed-source parcels are assigned 50%.
4. A "variable radius" method where the ground-water fraction of parcels ranges from 10% to 80% depending on distance from irrigation wells.[7]
5. A "no company" method where mixed-source lands are deemed to be surface-water irrigated if the ground-water right is in the name of a canal company or irrigation district, and deemed to be ground-water irrigated otherwise.

These methods all produce overall percentages of ground-water-only and surface-water-only parcels consistent with field inspection. The methods that assign parcels as solely ground water or solely surface water correctly represent up to 70% of individual parcels. This means, however, that they will be incorrect on 30% or more of individual parcels examined. This is probably too high an error rate from a perception standpoint. Based on this reasoning, the "proximity," "dual radius" and "no company" methods are rejected. Further, while the "no company" method produced a useful spatial distribution, assigning physical water source based on ownership could be construed to mean any number of things that the modeling project would certainly not intend to assert.

The "dual 2" and "variable radius" methods both avoid assigning any individual parcel as 100% ground-water irrigated or 100% surface-water irrigated. From a perception standpoint, the ground-water fraction on these parcels can be presented as a *probability* that an individual parcel is irrigated by ground water, rather than an actual determination for each parcel. The "dual 2" method is preferred above "variable radius" because it is more straightforward to apply.

[6] Irrigation wells are identified from IDWR water-rights GIS data available on the Internet.
[7] Zero to 100 meters = 80%, 900 to 1000 meters = 20%, over 1000 meters = 10%. Between 100 meters and 900 meters, the fraction is linearly interpolated between 20% and 80% at increments of ten percentage points.

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Further, since it uses only three different percentages, it conveys the appropriate precision in our ability to estimate physical water source on a parcel-by-parcel basis.

OTHER CONSIDERATIONS

Source of irrigation water could be a required input for some model uses. Though not absolutely necessary, in model use it is attractive to use data and methods consistent with calibration. Of particular concern to the ESHMC is the use of water-source data in evaluation of potential administrative actions. In this context, some comparisons were made between the ESPAM1.1 representation and the alternate methods. Two points are important:

1. In any evaluation of administrative actions, the relevant irrigation water source will be the *post-action* condition. Proper evaluation of this must include adjustment for the expected response of owners of mixed-source lands to the administrative action. Even if current source fractions were perfectly represented in calibration data, these would not be likely to represent the post-action condition.
2. ESPAM1.1 represents the best effort at the time of the last calibration, but it is not a perfect representation. Comparisons between it and alternate methods are interesting, but simply finding a difference between ESPAM1.1 and an alternate method does not provide guidance for whether the alternate method should be adopted.

All the alternate methods reasonably represented the overall fraction of mixed-source parcels physically supplied by ground water. Figure 3 shows the comparison of acres in the vicinity of the Near Blackfoot to Neeley reach, a reach important to river gains. Figure 4 and Figure 5 compare the indicated effective ground-water acreage on mixed-source lands by entity, for the entire plain.[8]

[8] Figures 3 through 5 are from Contor, 2008.

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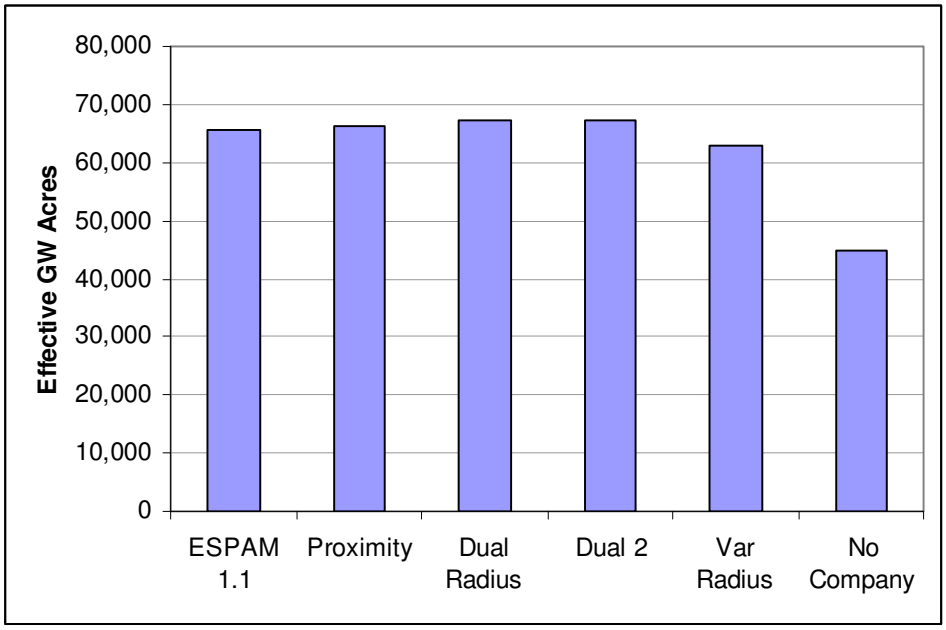

Figure 3. Effective ground-water acreage indicated on mixed-source lands in the vicinity of the Near Blackfoot to Neeley reach of the Snake River.

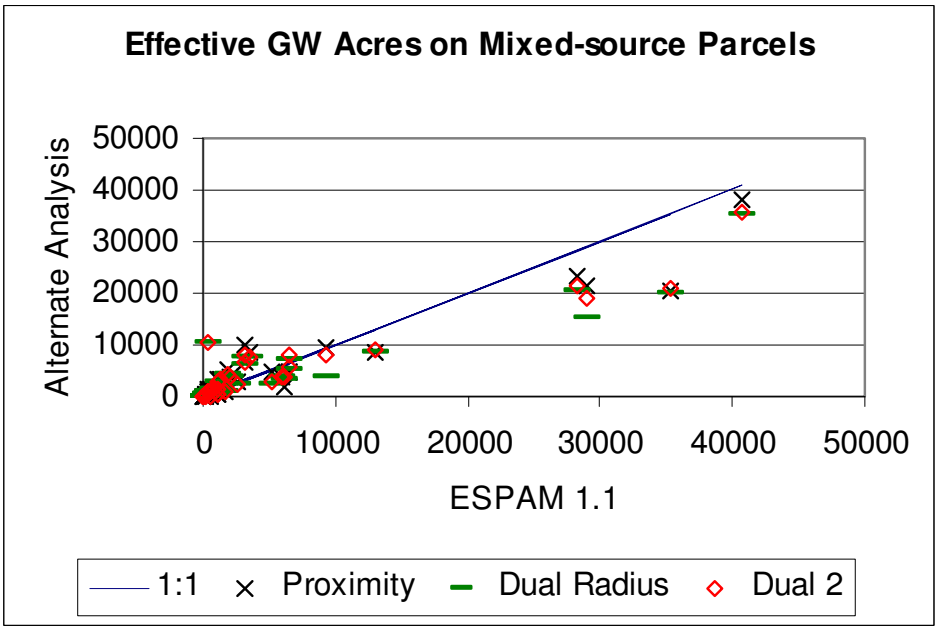

Figure 4. Cross Plot of total effective ground-water acreage by irrigation entity for alternate methods.

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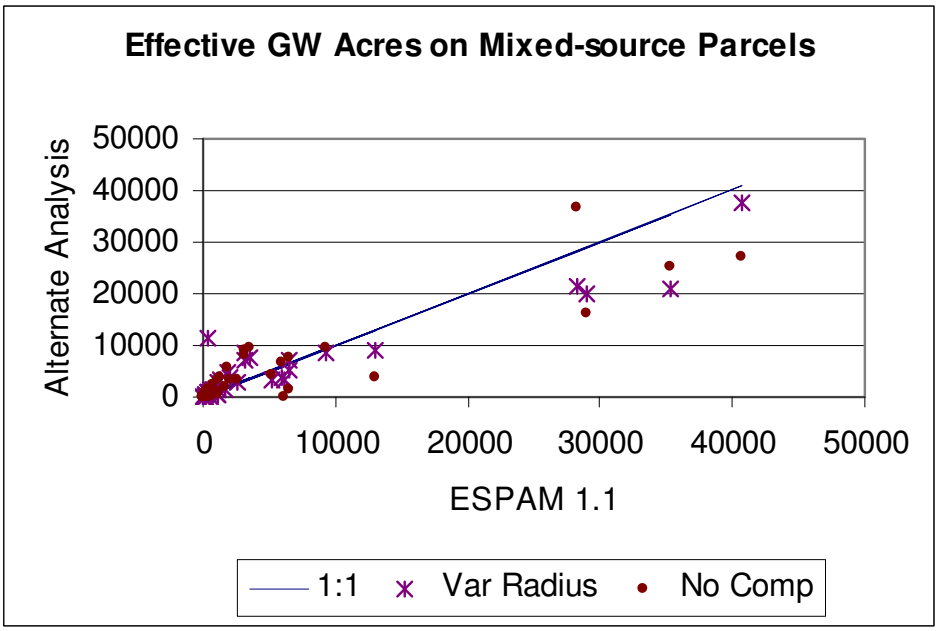

Figure 5. Cross Plot of total effective ground-water acreage by irrigation entity for alternate methods.

An additional consideration is that it would be desirable to identify a method that could be easily updated as new water-rights data become available. All the methods considered are essentially equivalent in this respect, though the "no company" method would require a small amount of hand processing.

DISCUSSION

In considering these results, several points are important:

1. The treatment of mixed-source lands will not affect the total calibration water budget.
2. The treatment of mixed-source lands will not change the distribution or allocation of water between irrigation entities.
3. The water budgets of individual irrigation entities will not change.
4. The only effect on calibration will be on the spatial distribution of recharge within each irrigation entity.
5. The ESHMC identified one location where the spatial distribution within an entity might make a difference in reach-gains matching. The test described above indicated that the potential effect is small.
6. More properly assigning source to individual parcels should aid in aquifer-head matching throughout the study area.
7. While comparisons with the ESPAM1.1 representation are interesting, we have no reason to believe the ESPAM1.1 representation is more correct than the alternate methods.

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It does not appear that there is any strong technical reason to favor any of the methods over another. However, perceptions of the resulting representations may be important. These favor the "dual 2" method.

DESIGN DECISION

It is proposed that the "dual 2" method be used to calculate the ground-water fraction on mixed-source lands for calibration of ESPAM2. Details include:

1. Lands identified as mixed-source in the ESPAM1.1 water-rights analysis will be represented as mixed-source in ESPAM2. Some manual adjustment will be made based on investigation of paper water-right files for suspect parcels. A list of adjustments made will be provided as an appendix to a revision of this design document.
2. The fraction of supply from ground water on mixed-source lands will be assigned according to proximity to irrigation wells in the current IDWR water rights, claims and recommendations data bases.
    a) Parcels within 100 meters of irrigation wells will be assigned 90% probability of being served by ground water (ground-water source fraction equals 90%).
    b) Parcels greater than 1000 meters from irrigation wells will be assigned 10% probability of being served by ground water (ground-water fraction equals 10%).
    c) All other mixed-source parcels will be assigned 50% ground water, 50% surface water.
3. The existing recharge-tool calculation methods will be retained.
4. As with ESPAM1.1, actual pumping and surface-water diversion data will be used to calculate the impact of mixed-source irrigation in the Mud Lake area, for parcels within organized companies and districts.

Figure 6 shows preliminary results of the proposed method in the Near Blackfoot to Neeley area. IWRRI requests input from the ESHMC on these proposals.

EXHIBIT "515"
Page No. 13 of 15

002374

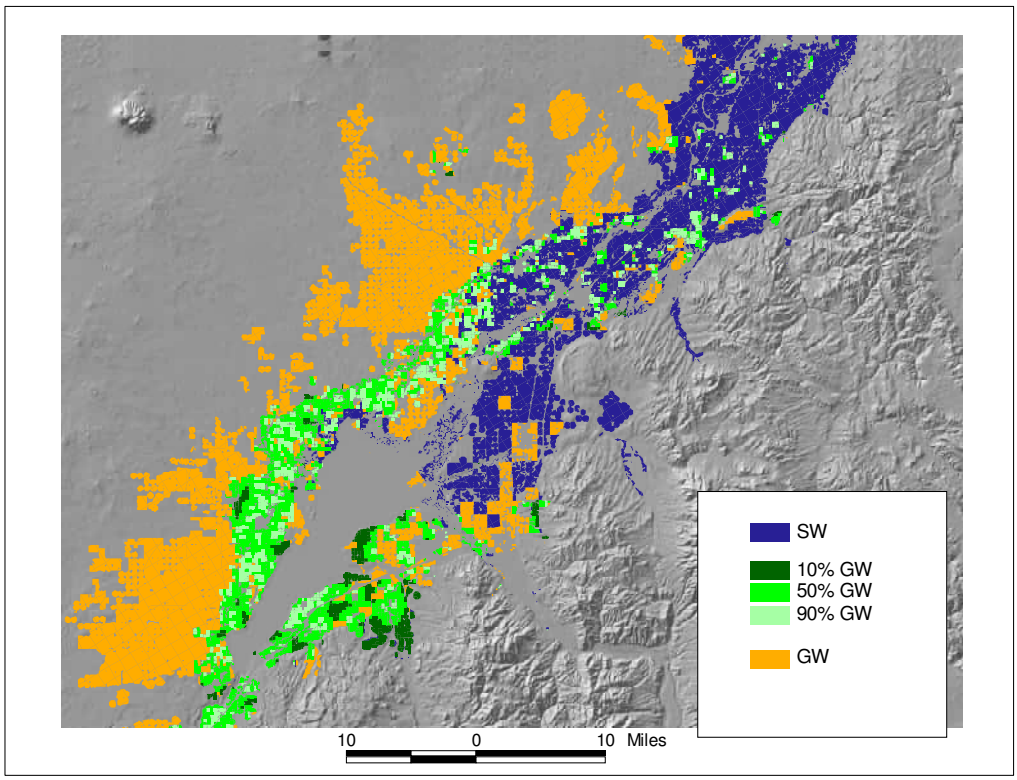

Figure 6. Source fraction by the Dual 2 method, Near Blackfoot to Neeley area.

EXHIBIT "515"
Page No. 14 of 15

REFERENCES

Contor, B.A., P. L. Pelot and G.L Moore. 2008. The Potential Application of Additional Surface Water to Irrigated Lands Having Both Surface-water and Ground-water Irrigation Rights, to Benefit the Eastern Snake Plain Aquifer: Soft Conversions. Idaho Water Resources Research Institute Technical Completion Report 2008-002. http://www.iwrri.uidaho.edu/default.aspx?pid=91431 accessed 7 April 2008.

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Contor, B. 2004. Determining the Source of Irrigation Water for Recharge Calculation. Idaho Water Resources Research Institute Technical Report 04-010, ESPAM1.1 Design Document DDW-017 Final As Built. http://www.if.uidaho.edu/~johnson/DDW-017_Wtr_Src_9_04.pdf accessed 7 April 2008

Cosgrove, D.M., G.S. Johnson and B.A. Contor. 2007. Enhanced Eastern Snake Plain Aquifer Ground-water Rights Transfer Worksheet. Idaho Water Resources Research Institute. http://www.if.uidaho.edu/~johnson/ifiwrri/projects.html accessed 15 April 2008.

Snedecor, G.W. and W.G. Cochran. 1980. Statistical Methods, Seventh Edition. Iowa State University Press. p 121.

2005 MAY 06 PM 02:00
DISTRICT COURT - SRBA
TWIN FALLS CO., IDAHO
FILED

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE
STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

In Re SRBA	}	PARTIAL DECREE PURSUANT TO
	}	I.R.C.P. 54(b) FOR
Case No. 39576	}	
	}	Water Right 45-02747

NAME AND ADDRESS: MC CAIN FOODS USA INC
ATTN JAY ULRICH
PO BOX 10
BURLEY, ID 83318

SOURCE: GROUND WATER

QUANTITY: 4.00 CFS
2062.80 AFY

PRIORITY DATE: 03/15/1960

POINT OF DIVERSION: T10S R22E S23 LOT 2 (SWSESW) Within Cassia County
LOT 2 (SESESW)
LOT 1 (SESWSE)
LOT 1 (SWSWSE)
LOT 3 (SWSW)

PURPOSE AND PERIOD OF USE:

PURPOSE OF USE	PERIOD OF USE	QUANTITY
Industrial	01-01 TO 12-31	4.00 CFS 2062.80 AFY

PLACE OF USE: Industrial Within Cassia County
T10S R22E S23 LOT 3 (SWSW) LOT 2 (SESW)
LOT 1 (SWSE)

OTHER PROVISIONS NECESSARY FOR DEFINITION OR ADMINISTRATION OF THIS WATER RIGHT:

This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code.

THIS PARTIAL DECREE IS SUBJECT TO SUCH GENERAL PROVISIONS NECESSARY FOR THE DEFINITION OF THE RIGHTS OR FOR THE EFFICIENT ADMINISTRATION OF THE WATER RIGHTS AS MAY BE ULTIMATELY DETERMINED BY THE COURT AT A POINT IN TIME NO LATER THAN THE ENTRY OF A FINAL UNIFIED DECREE. I.C. SECTION 42-1412(6).

RULE 54(b) CERTIFICATE

With respect to the issues determined by the above judgment or order, it is hereby CERTIFIED, in accordance with Rule 54(b), I.R.C.P., that the court has determined that there is no just reason for delay of the entry of a final judgment and that the court has and does hereby direct that the above judgment or order shall be a final judgment upon which execution may issue and an appeal may be taken as provided by the Idaho Appellate Rules.

John M. Melanson
Presiding Judge of the
Snake River Basin Adjudication

2005 MAY 06 PM 02:00
DISTRICT COURT - SRBA
TWIN FALLS CO., IDAHO
FILED _____

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE
STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

In Re SRBA)
)
Case No. 39576)
)

PARTIAL DECREE PURSUANT TO
I.R.C.P. 54(b) FOR

Water Right 45-02748

NAME AND ADDRESS: MC CAIN FOODS USA INC
ATTN JAY ULRICH
PO BOX 10
BURLEY, ID 83318

SOURCE: GROUND WATER

QUANTITY: 0.60 CFS
309.40 AFY

PRIORITY DATE: 03/06/1961

POINT OF DIVERSION: T10S R22E S23 LOT 2 (SWSESW) Within Cassia County
LOT 2 (SESESW)
LOT 1 (SESWSE)
LOT 1 (SWSWSE)
LOT 3 (SWSW)

PURPOSE AND PERIOD OF USE:

PURPOSE OF USE	PERIOD OF USE	QUANTITY
Industrial	01-01 TO 12-31	0.60 CFS
		309.40 AFY

PLACE OF USE: Industrial Within Cassia County
T10S R22E S23 LOT 3 (SWSW) LOT 2 (SESW)
LOT 1 (SWSE)

OTHER PROVISIONS NECESSARY FOR DEFINITION OR ADMINISTRATION OF THIS WATER RIGHT:

This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code.

THIS PARTIAL DECREE IS SUBJECT TO SUCH GENERAL PROVISIONS NECESSARY FOR THE DEFINITION OF THE RIGHTS OR FOR THE EFFICIENT ADMINISTRATION OF THE WATER RIGHTS AS MAY BE ULTIMATELY DETERMINED BY THE COURT AT A POINT IN TIME NO LATER THAN THE ENTRY OF A FINAL UNIFIED DECREE. I.C. SECTION 42-1412(6).

RULE 54(b) CERTIFICATE

With respect to the issues determined by the above judgment or order, it is hereby CERTIFIED, in accordance with Rule 54(b), I.R.C.P., that the court has determined that there is no just reason for delay of the entry of a final judgment and that the court has and does hereby direct that the above judgment or order shall be a final judgment upon which execution may issue and an appeal may be taken as provided by the Idaho Appellate Rules.

John M. Melanson
Presiding Judge of the
Snake River Basin Adjudication

2005 MAY 06 PM 02:00
DISTRICT COURT - SRBA
TWIN FALLS CO., IDAHO
FILED _____

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE
STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

In Re SRBA	)	PARTIAL DECREE PURSUANT TO
	)	I.R.C.P. 54(b) FOR
Case No. 39576	)	
	)	Water Right 45-02758

NAME AND ADDRESS: MC CAIN FOODS USA INC
ATTN JAY ULRICH
PO BOX 10
BURLEY, ID 83318

SOURCE: GROUND WATER

QUANTITY: 2.08 CFS
1072.70 AFY

PRIORITY DATE: 03/15/1960

POINT OF DIVERSION: T10S R22E S23 LOT 2 (SWSESW) Within Cassia County
LOT 2 (SESESW)
LOT 1 (SWSWSE)
LOT 1 (SESWSE)
LOT 3 (SWSW)

PURPOSE AND PERIOD OF USE:

PURPOSE OF USE	PERIOD OF USE	QUANTITY
Commercial	01-01 TO 12-31	2.08 CFS
		1072.70 AFY

PLACE OF USE: Commercial Within Cassia County
T10S R22E S23 LOT 3 (SWSW) LOT 2 (SESW)
LOT 1 (SWSE)

OTHER PROVISIONS NECESSARY FOR DEFINITION OR ADMINISTRATION OF THIS WATER RIGHT:

This partial decree is subject to such general provisions necessary for the definition of the rights or for the efficient administration of the water rights as may be ultimately determined by the Court at a point in time no later than the entry of a final unified decree. Section 42-1412(6), Idaho Code.

THIS PARTIAL DECREE IS SUBJECT TO SUCH GENERAL PROVISIONS NECESSARY FOR THE DEFINITION OF THE RIGHTS OR FOR THE EFFICIENT ADMINISTRATION OF THE WATER RIGHTS AS MAY BE ULTIMATELY DETERMINED BY THE COURT AT A POINT IN TIME NO LATER THAN THE ENTRY OF A FINAL UNIFIED DECREE. I.C. SECTION 42-1412(6).

RULE 54(b) CERTIFICATE

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John M. Melanson
Presiding Judge of the
Snake River Basin Adjudication

2008 APR 18 PM 02:00
DISTRICT COURT - SRBA
TWIN FALLS CO., IDAHO
FILED _____

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE
STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

In Re SRBA	)	PARTIAL DECREE PURSUANT TO
	)	I.R.C.P. 54(b) FOR
Case No. 39576	)	
	)	Water Right 45-13970

NAME AND ADDRESS: MCCAIN FOODS USA INC
C/O DAVID HINES
PO BOX 10
BURLEY, ID 83318

SOURCE: GROUND WATER

QUANTITY: 2.66 CFS
1371.80 AFY

PRIORITY DATE: 09/01/1957

POINT OF DIVERSION: T10S R22E S23 LOT 2 (SWSESW) Within Cassia County
LOT 2 (SESESW)
LOT 1 (SWSWSE)
LOT 1 (SESWSE)
LOT 3 (SWSW)

PURPOSE AND PERIOD OF USE:

PURPOSE OF USE	PERIOD OF USE	QUANTITY
Industrial	01-01 TO 12-31	2.66 CFS
		1371.80 AFY

PLACE OF USE: Industrial Within Cassia County
T10S R22E S23 LOT 3 (SWSW) LOT 2 (SESW)
LOT 1 (SWSE)

OTHER PROVISIONS NECESSARY FOR DEFINITION OR ADMINISTRATION OF THIS WATER RIGHT:

THIS PARTIAL DECREE IS SUBJECT TO SUCH GENERAL PROVISIONS NECESSARY FOR THE DEFINITION OF THE RIGHTS OR FOR THE EFFICIENT ADMINISTRATION OF THE WATER RIGHTS AS MAY BE ULTIMATELY DETERMINED BY THE COURT AT A POINT IN TIME NO LATER THAN THE ENTRY OF A FINAL UNIFIED DECREE. I.C. SECTION 42-1412(6).

RULE 54(b) CERTIFICATE

With respect to the issues determined by the above judgment or order, it is hereby CERTIFIED, in accordance with Rule 54(b), I.R.C.P., that the court has determined that there is no just reason for delay of the entry of a final judgment and that the court has and does hereby direct that the above judgment or order shall be a final judgment upon which execution may issue and an appeal may be taken as provided by the Idaho Appellate Rules.

John M. Melanson
Presiding Judge of the
Snake River Basin Adjudication

McHUGH BROMLEY
ATTORNEYS AT LAW, PLLC

Candice M. McHugh
cmchugh@mchughbromley.com

380 S. 4th Street, Ste. 103
Boise, Idaho 83702
(208) 287-0991

Chris M. Bromley
cbromley@mchughbromley.com

May 2, 2023

Southwest Irrigation District
PO Box 668
Burley, ID 83318

via email: wparsons@pmt.org

Re: Petition to Join Southwest Irrigation District

Dear Chairman and Board Members:

I am writing on behalf of McCain Foods USA, Inc. (the "Company") asking that the Company be allowed to join Southwest Irrigation District for mitigation as soon as possible. The water rights owned by the company and for which it is asking to be covered are listed below in Table 1.

As of the date of this letter, I understand via conversations with Mr. Higgs, that the rate for non-irrigation rights is $900.00 per cfs. He provided me with a spreadsheet of what he understood the costs would be to the Company. This spreadsheet is attached as Exhibit A. The Company is ready to remit payment as required by the Board in order to be covered by Southwest Irrigation District mitigation plan this year and as an ongoing member of the Irrigation District. Mr. Higgs indicated that the Board may consider asking the Company for back assessments. If the Board elects to charge back assessments, please let the Company know what those charges will be so that these additional charges can be considered and proper payment remitted. As you know, and as reflected in Exhibit A, the Company has not been using its most junior water rights for several years but under the Director's April 21, 2023, *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") its most senior water rights are now subject to curtailment. (See Table 1).

Water Right	PRIORITY DATE	OWNER	CFS	Water Use
45-2747	3/15/1960	MCCAIN FOODS USA INC	4.00	industrial
45-2748	3/6/1961	MCCAIN FOODS USA INC	0.60	industrial
45-2758	3/15/1960	MCCAIN FOODS USA INC	2.08	commercial
45-13970	9/1/1957	MCCAIN FOODS USA INC	2.66	industrial

Table 1.

Time is of the essence as the Company has a May 5, 2023 deadline to respond to IDWR's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover*, and *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order"). Thus, the Company requests that a decision be provided as soon as possible and requests the Irrigation Districts' permission to inform the Idaho Department of Water Resources that we will be members of the Southwest Irrigation District and covered under its Mitigation Plan.

If you have any questions or concerns, please contact me at 208-870-3911 or 208-287-0991. Your prompt attention and consideration of this matter is greatly appreciated.

Sincerely,

Candice McHugh

cc:
McCain Foods USA, Inc.

SOUTH WEST IRRIGATION DISTRICT

2022 WATER MEASUREMENT REPORT

SUMMARY SHEET

MCCAIN FOODS

EXHIBIT A

WaterRight	PRIORITY DATE	OWNER	CFS	Volume	Combined Limit	WaterUse	Condition	SWID Assessment	WMIS #	POD	DIVERSION NAME	5 yr Avg (AF)
45-2747	3/15/1960	MC CAIN FOODS USA INC	4.00	2062.8	-	industrial	-	$ 3,600.00	401712	10S 22E 23 SWSE	maintanance well	633.7
45-2748	3/6/1961	MC CAIN FOODS USA INC	0.60	309.4	-	industrial	-	$ 540.00	401713	10S 22E 23 SESWSE 1	east well	1201.5
45-2749	8/13/1965	MC CAIN FOODS USA INC	2.85	734.7	-	industrial	-	$ 2,565.00	401870	10S 22E 23 SESESW 2	HCL well	1149.8
45-2758	3/15/1960	MC CAIN FOODS USA INC	2.08	1072.7	-	commercial	-	$ 1,872.00	401872	10S 22E 23 SWSESW 2	irrigation system	20.4
45-7137	5/24/1973	MC CAIN FOODS USA INC	3.43	884.5	-	industrial	-	$ 3,087.00	1003844	11S 26E 28 NWNE		0.0
45-7241	5/27/1975	MC CAIN FOODS USA INC	0.25	72	-	commercial/fire	-	$ 225.00				
45-13970	9/1/1957	MC CAIN FOODS USA INC	2.66	1371.8	-	industrial	-	$ 2,394.00				
45-12462	8/7/1981	MC CAIN FOODS USA INC	0.04	-	-	domestic	deminimis	$ -				
		Totals:	**15.91**	**6507.9**				**$ 14,283.00**			**Totals:**	**3005.4**

Non-Curtailed Assessment: $ 8,406.00

Current WD140 Assessment*: $ 2,277.43

Red text are rights that are currently curtailed under the Thousand Springs water calls.

*WD140 assessment is included in SWID assessment. If McCain joined SWID, WD140 would not send a separate assessment.

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for McCain Foods USA, Inc.

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **MCCAIN FOODS USA, INC.'S NOTICE OF MITIGATION**

REQUEST FOR HEARING

Pursuant to the *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") issued April 21, 2023 demand that:

> On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of75,200 acre-feet in accordance with an approved mitigation plan.

McCain Foods USA, Inc., ("McCain") by and through its attorney of record, submits this *Notice of Mitigation*. McCain owns and uses water rights junior to the December 30, 1953,

date. On Tuesday, May 2, 2023 McCain petitioned Southwest Irrigation District ("SWID") to become a member of SWID and to be covered by its approved mitigation plan. Counsel for McCain was informed by letter on May 3, 2023, that McCain has been approved to join SWID as a member and that McCain will be covered under its mitigation plan. A copy of the letter is attached hereto as Exhibit A and incorporated herein. SWID also indicated that a letter was sent to IDWR informing IDWR of this fact.

McCain requests an order, or some other applicable document, from IDWR that it has established to the "satisfaction of the Director, that they can mitigation for their proportionate share … with an approved mitigation plan" by becoming members of SWID.

Submitted this 4th day of May, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for McCain

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of April, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

EXHIBIT A

PARSONS, LOVELAND, SHIRLEY & LINDSTROM
LLP
ATTORNEYS AT LAW
137 WEST 13TH STREET
P.O. BOX 910
BURLEY, IDAHO 83318
TELEPHONE (208) 878-8382
www.pssislaw.com

WILLIAM A. PARSONS
LANCE A. LOVELAND
DAVID F. SHIRLEY

SCOTT B. LINDSTROM
RHETT M. MILLER

May 3, 2023

Candice M. McHugh
380 S. 4th Street, Ste 103
Boise, Idaho 83702
cmchugh@mchughbromley.com

RE: Petition to Join Southwest Irrigation District for Mitigation

Dear Candice:

Pursuant to your request of May 2, 2023, the Board approved the mitigation for the following water rights:

WaterRight	Priority Date	Owner	CFS	Volume	Combined Limit	WaterUse	Condition
45-2747	3/15/1960	McCain Foods*	4.00	2062.80	-	Industrial	-
45-2748	3/6/1961	McCain Foods	0.60	309.40	-	Industrial	-
45-2758	3/15/1960	McCain Foods	2.08	1072.70	-	Commercial	-
45-13970	9/1/1957	McCain Foods	2.66	1371.80	-	Industrial	-
		Totals:	9.34	4816.70			

* McCain Foods USA Inc.

Southwest charges $900 per CFS per year billed in arrears.

It is the policy of Southwest Irrigation District to charge new participants in mitigation for the previous three years. In keeping with that procedure, the back fees for McCains would be $25,218.00. It may be paid over three years if necessary.

The 2023 assessment will be billed in the spring of 2024.

We have forwarded a letter to the Idaho Department of Water Resources indicating the

WAP/ar

approval of McCain Foods USA Inc. for mitigation.

I have sent a copy of this letter to you by email and I placed one in regular mail to your office.

Very truly yours,

PARSONS, LOVELAND, SHIRLEY & LINDSTROM, LLP



William A. Parsons
wparsons@pmt.org

WAP/ar

From: Baxter, Garrick
To: Candice McHugh (cmchugh@mchughbromley.com)
Subject: McCain Foods
Date: Wednesday, May 24, 2023 9:55:52 AM
Attachments: image001.png

IDWR was able to confirm with Bill Parsons (attorney for SWID) that four rights in the name of McCain Foods were brought into SWID for mitigation:

- 45-2747
- 45-2748
- 45-2758
- 45-13970

IDWR also confirmed with Bill there are three other rights in the name of McCain foods that were NOT brought into SWID for mitigation.

- 45-2749, 8/13/1965, Industrial, 2.85 cfs, 734.7 acre feet
- 45-7137, 5/24/1973, Industrial, 3.43 cfs, 884.5 acre feet
- 45-7241, 5/27/1975, commercial & fire protection, 0.25 cfs, 72 acre feet

IDWR has updated its records to show that the four mitigated rights are covered by SWID. So long as SWID is in compliance with its approved mitigation plan, the four rights should be protected from curtailment.

Garrick Baxter | Lead Deputy Attorney General
Idaho Department of Water Resources | Energy and Natural Resources Division
Office of the Attorney General | State of Idaho
208-287-4811 | ag.idaho.gov

NOTICE: This message, including any attachments, is intended only for the individual(s) or entity(ies) named above and may contain information that is confidential, privileged, attorney work product, or otherwise exempt from disclosure under applicable law. If you are not the intended recipient, please reply to the sender that you have received this transmission in error, and then please delete this email.

IDAHO DEPARTMENT OF
WATER RESOURCES

322 E Front Street, Suite 648, Boise ID 83702 • PO Box 83720, Boise ID 83720-0098
Phone: 208-287-4800 • Fax: 208-287-6700 • Email: idwrinfo@idwr.idaho.gov • Website: idwr.idaho.gov

Governor Brad Little Director Gary Spackman

May 1, 2023

RE: Notice of Possible Curtailment of Ground Water Rights with Priority Dates Junior to December 30, 1953 - Surface Water Coalition Delivery Call

Dear Water Right Holder,

You are receiving this letter because, according to the records of the Idaho Department of Water Resources ("Department"), you are the holder of one or more water rights authorizing diversion of ground water from the Eastern Snake Plain Aquifer Area of Common Ground Water Supply ("ESPA") that are not covered by an approved and effectively operating mitigation plan. Because your water right(s) are not currently covered by an approved and effectively operating mitigation plan, **your water right(s) *may* be subject to curtailment this 2023 irrigation season.**

On April 21, 2023, the Director of the Department issued the *Final Order Regarding April 2023 Forecast Supply (Methodology Steps 1-3)* ("As-Applied Order"). The As-Applied Order predicts a shortfall in the water supply for senior priority Snake River water rights during the 2023 irrigation season, which will result in mitigation requirements or curtailment for ground water rights with priority dates junior to (later than) **December 30, 1953**.

The Department scheduled a hearing for the parties to the As-Applied Order on **June 6–10, 2023.** After the hearing the Director will decide whether to issue a curtailment order. If the Director issues a curtailment order, ground water rights junior to December 30, 1953, could be subject to curtailment unless the holders of junior priority ground water rights mitigate for ground water diverted pursuant to an approved mitigation plan.

Holders of ground water rights affected by a curtailment order may participate in an approved mitigation plan. See Idaho Code § 42-5259. If you are already a member of a ground water district, please contact and work with the district to ensure the district's records are up to date. If you are not a member of a ground water district, you may want to contact the nearest ground water district to inquire if the district will allow you to join.

Holders of ground water rights potentially subject to curtailment may also submit a proposed mitigation plan to the Director in accordance with Conjunctive Management Rule 43.[1] See IDAPA 37.03.11.043. However, please be aware the approval process for a mitigation plan is time-consuming. A proposed mitigation plan submitted now may not be approved in time for the 2023 irrigation season. Upon receipt of a proposed mitigation plan, the Director will publish notice for two successive weeks, after which ten days will be allowed for the filing of protests. The Director may hold a hearing if necessary to determine whether a proposed mitigation plan will mitigate injury to the SWC caused by diversions of ground water authorized by junior priority ground water rights. If the proposed mitigation plan is protested, the Director will hold a hearing. Please be advised that a curtailment order is not stayed pending evaluation of a mitigation plan.

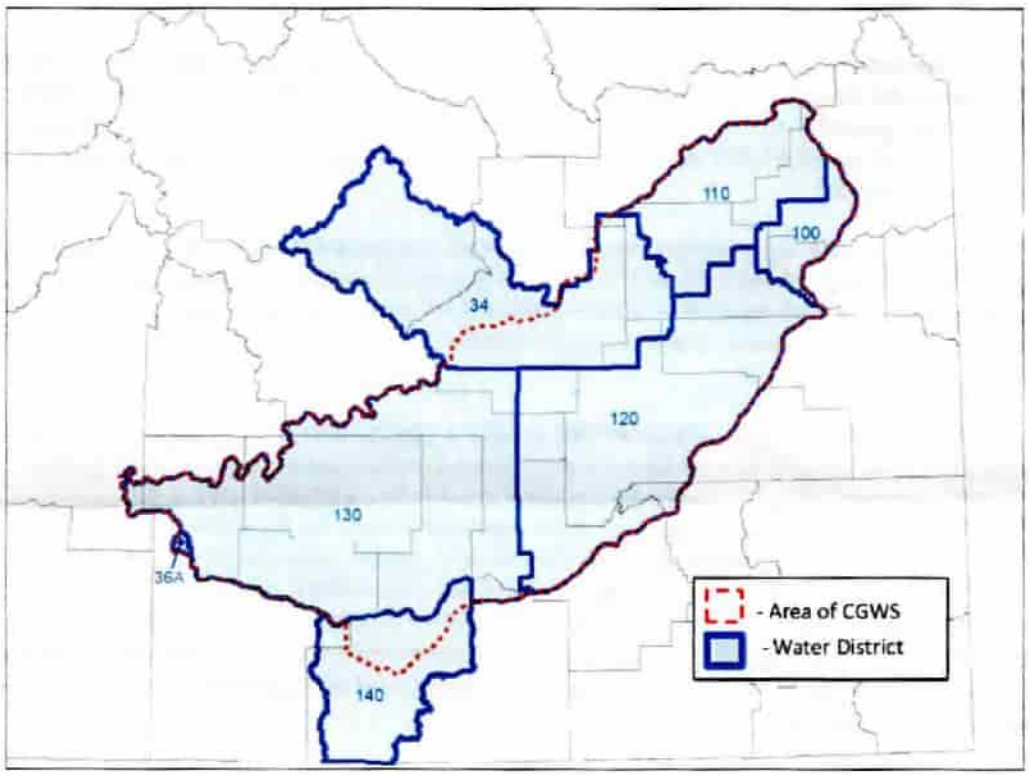
[1] For example, a copy of the proposed mitigation plan submitted by the SWC & IGWA can be found here: https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-MP-2016-001/CM-MP-2016-001-20160309-SWCs-and-IGWAs-Stipulated-Mitigation-Plan-and-Request-for-Order.pdf

Information regarding the ongoing status of this matter may be found under the Current Topics section of the Department's website at: https://idwr.idaho.gov/ If you have questions concerning this notice, please contact the Department's State Office in Boise at 208-287-4800, or the water district watermaster in your area who regulates ground water within the ESPA and copied below. Water district boundaries can be found on the web at https://idwr.idaho.gov/water-rights/water-districts/map/, and Watermaster contact information can be found on the web at https://research.idwr.idaho.gov/files/ExternalReports/wdcontactsrpt.pdf

Respectfully,

GARY SPACKMAN
Director

c. Blake Jordan, Watermaster, Water Districts 100, 110 and 120
Brian Ragan, Watermaster, Water District 130
Jaxon Higgs, Watermaster, Water District 140
Greg Shenton, Watermaster, Water District 31
Preston Marcroft, Watermaster, Water District 34



AMALGAMATED EX. 700

Basin	Sequence	Basis	Priority Date	Div. Rate (cfs)	Source	Water Use
36	2237	Decreed	11/14/1953	3.32	GROUND WATER	COMMERCIAL, COMMERCIAL
36	2238	Decreed	11/14/1953	3.77	GROUND WATER	COMMERCIAL
36	2271	Decreed	11/15/1954	3.77	GROUND WATER	COMMERCIAL
36	2272	Decreed	11/15/1954	4	GROUND WATER	COMMERCIAL
36	4144	Decreed	3/1/1953	0.48	GROUND WATER	COMMERCIAL
36	4145	Decreed	3/3/1956	0.69	GROUND WATER	COMMERCIAL
36	4178	Decreed	6/1/1959	0.01	GROUND WATER	COMMERCIAL
36	4254	Decreed	3/20/1961	0.09	GROUND WATER	INDUSTRIAL
36	4255	Decreed	11/15/1956	0.2	GROUND WATER	INDUSTRIAL
36	8364	License	6/10/1988	0.22	GROUND WATER	INDUSTRIAL

McHUGH BROMLEY
ATTORNEYS AT LAW, PLLC

Candice M. McHugh
cmchugh@mchughbromley.com

380 S. 4th Street, Ste. 103
Boise, Idaho 83702
(208) 287-0991

Chris M. Bromley
cbromley@mchughbromley.com

May 2, 2023

Magic Valley Ground Water District
PO Box 430
Paul, ID 83341

via email: mvgwd@hotmail.com
desteve@pmt.org

Re: Joining Magic Valley GWD

Dear Chairman and Board:

I am writing on behalf of the Amalgamated Sugar Company (the "Company") asking that the Company be allowed to join Magic Valley Ground Water District as a mitigation only member effective immediately. The water rights owned by the company and for which it is asking to be covered are listed below:

Water Right No.	Priority Date	CFS	Use
36- 2237	11/14/1953	3.32*	COMM, COMM
36- 2238	11/14/1953	3.77*	COMM
36- 2271	11/15/1954	3.77*	COMM
36- 2272	11/15/1954	4*	COMM
36- 4144	3/1/1953	0.48	COMM
36- 4145	3/3/1956	0.69*	COMM
36- 4178	6/1/1959	0.01	COMM
36- 4254	3/20/1961	0.09	INDUST
36- 4255	11/15/1956	0.2	INDUST
36- 8364	6/10/1988	0.22	INDUST
	TOTAL CFS	5.46	

* Combined limit of 4.46

Water Right Nos. 36-2237, 36-2238, 36-2271, 36-2272 and 36-4145 have combined use limitations of 4.46 cfs. Thus, making the total 5.46 cfs for the water rights owned by the company within Basin 36.

As of the date of this letter, I understand that the rate for non-irrigation rights is $1,113.00 per cfs. The Company is ready to remit payment for the assessment to be covered by Magic Valley GWD's mitigation plan and requests that it not have to pay for back assessments. However, in

the event the Board elects to charge back assessments, please let the Company know what those charges will be so that these additional charges can be considered and remitted.

you know, time is of the essence and the Company has a May 5, 2023, deadline coming up this Friday to respond to IDWR's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover*, and *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order"). Thus, the Company requests that a preliminary decision be given along with the required payment as soon as possible and have the Ground Water District's permission to inform the Idaho Department of Water Resources that we will be members of the Magic Valley Ground Water District.

If you have any questions or concerns, please contact me at 208-870-3911 or 208-287-0991. Your prompt attention and consideration of this matter is greatly appreciated.

sincerely,



Candice McHugh

cc:
Amalgamated Sugar Company

Exhibit 702

RECEIVED
May 04, 2023
DEPARTMENT OF
WATER RESOURCES

CANDICE MCHUGH
IDAHO STATE BAR NO. 5908
MCHUGH BROMLEY, PLLC
Attorneys at Law
380 S. 4th St., Ste. 103
Boise, ID 83702
Telephone: (208) 287-0991
Facsimile: (208) 287-0864
cmchugh@mchughbromley.com

Attorney for Amalgamated Sugar Company

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**Docket No. CM-DC-2010-001** **AMALGAMATED SUGAR COMPANY'S REQUEST FOR HEARING, OBJECTION, IDENTIFICATION OF ISSUES AND NOTICE OF MITIGATION**

REQUEST FOR HEARING

Pursuant to Idaho Code § 42-1701(A)(3), Amalgamated Sugar Company ("Amalgamated") through its undersigned attorney, requests a hearing on the Department's *Fifth Amended Methodology Order Regarding Methodology For Determining Material Injury to Reasonable In-Season Demand And Reasonable Carryover* and *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") both issued April 21, 2023.

OBJECTION TO ORDER

Amalgamated objects to the *Fifth Amended Order* and the 2023 As-Applied Order's implementation this upcoming season for the reasons set forth below which it also identifies as issues for hearing. Amalgamated reserves the right to revise the issues as more information becomes available.

STATEMENT OF ISSUES FOR HEARING

Among the issues the Amalgamated has identified for hearing are:

a) IDWR's new reliance on transient modeling;

b) IDWR's failure to consider the Twin Falls Canal Company's increase in diversions over the last twenty years;

d) IDWR's failure to consider changes in the efficiency of the SWC's operations;

e) IDWR's failure to consider all sources of supply available to the SWC;

f) IDWR's use of 2018 as the new baseline year; and

g) IDWR's violation of Amalgamated's due process rights by not providing it actual notice of the order and requisite deadlines, and even if it was deemed that it was given "notice" because it shared an attorney with the Coalition of Cities, by giving it less than 10 business days to provide a mitigation solution after a wholesale change in methodology, by depriving it of the ability to develop its own mitigation plan to protect its water rights, by requiring compliance with a deadline to avoid curtailment without actual notice of the deadline and in a non-drought year, by setting the hearing without regard to the time required for discovery and without consideration of the existing obligations of the parties, their legal representatives and consultants.

NOTICE OF MITIGATION

Pursuant to the *Final Order Regarding April 2023 Forecast Supply* ("2023 As-Applied Order") issued April 21, 2023 demand that:

> On or before May 5, 2023, ground water users holding consumptive water rights bearing priority dates junior to December 30, 1953, within the Eastern Snake Plain Aquifer area of common ground water supply shall establish, to the satisfaction of the Director, that they can mitigate for their proportionate share of the predicted DS of 75,200 acre-feet in accordance with an approved mitigation plan.

Amalgamated submits this *Notice of Mitigation*. Amalgamated owns and uses water rights junior to the December 30, 1953, date. On Tuesday, May 2, 2023 Amalgamated petitioned Magic Valley Ground Water District ("MVGWD") to become a member of MVGWD and to be covered by its approved mitigation plan. Counsel for Amalgamated was informed by the Chairman of MVGWD, Dean Stevenson, that the letter had been received, that he had spoken to the board members and that they will take up Amalgamated petition at its Tuesday, May 9, 2023 meeting. Chairman Stevenson also indicated to counsel for Amalgamated that he expected the petition to be approved on Tuesday and that MVGWD would send a letter to IDWR and Amalgamated' s counsel to that effect next week. Aff. of McHugh filed herewith.

Amalgamated requests an order, or some other applicable document, from IDWR that it has met the May 5, 2023 deadline and established to the "satisfaction of the Director, that they can mitigation for their proportionate share … with an approved mitigation plan" by becoming members of MVGWD.

Submitted this 4th day of May, 2023

MCHUGH BROMLEY, PLLC

/s/ *Candice M. McHugh*
Candice M. McHugh
Attorney for Amalgamated

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 4th day of May, 2023, the above and foregoing, was served by email to the following:

Idaho Dept. of Water Res.
file@idwr.idaho.gov
gbaxter@idwr.idaho.gov

Kathleen Marion Carr
US Dept. Interior 960 Broadway Ste 400
Boise, ID 83706
kathleenmarion.carr@sol.doi.gov

John K. Simpson
MARTEN LAW LLP
P.O. Box 2139 Boise, ID 83701-2139
jsimpson@martenlaw.com

David W. Gehlert
Natural Resources Section Environment and Natural Resources Division U.S. Department of Justice
999 18th St., South Terrace, Suite 370
Denver, CO 80202
david.gehlert@usdoj.gov

Travis L. Thompson
MARTEN LAW LLP P.O. Box 63
Twin Falls, ID 83303-0063
tthompson@martenlaw.com
jnielsen@martenlaw.com

Matt Howard
US Bureau of Reclamation
1150 N Curtis Road Boise, ID 83706-1234
mhoward@usbr.gov

W. Kent Fletcher
FLETCHER LAW OFFICE
P.O. Box 248 Burley, ID 83318
wkf@pmt.org

Sarah A Klahn
Somach Simmons & Dunn
1155 Canyon Blvd, Ste. 110 Boulder, CO 80302 sklahn@somachlaw.com
dthompson@somachlaw.com

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON
P.O. Box 1391 Pocatello, ID 83204-1391
tj@racineolson.com
elisheva@racineolson.com

Rich Diehl
City of Pocatello
P.O. Box 4169 Pocatello, ID 83205
rdiehl@pocatello.us

Candice McHugh
MCHUGH BROMLEY, PLLC
380 South 4th Street, Suite 103 Boise, ID 83702 cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Robert L. Harris
HOLDEN, KIDWELL, HAHN & CRAPO, PLLC
P.O. Box 50130 Idaho Falls, ID 83405
rharris@holdenlegal.com

Robert E. Williams
WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338
rewilliams@wmlattys.com

Skyler C. Johns
Nathan M. Olsen Steven L. Taggart
OLSEN TAGGART PLLC P.O. Box 3005
Idaho Falls, ID 83403
sjohns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com

Randall D. Fife City
Attorney, City of Idaho Falls
P.O. Box 50220 Idaho Falls, ID 83405
rfife@idahofallsidaho.gov

Corey Skinner
IDWR—Southern Region
1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033
corey.skinner@idwr.idaho.gov

Tony Olenichak IDWR—Eastern Region
900 N. Skyline Drive, Ste. A Idaho Falls, ID 83402
Tony.Olenichak@idwr.idaho.gov

William A. Parsons
PARSONS SMITH & STONE
P.O. Box 910 Burley, ID 83318
wparsons@pmt.org

/s/ *Candice M. McHugh*
Candice M. McHugh

From: Baxter, Garrick
To: Candice McHugh (cmchugh@mchughbromley.com)
Subject: FW: Amalgamated
Date: Wednesday, May 24, 2023 1:22:18 PM
Attachments: image001.png

Candice,
IDWR spoke to Ryan Shurtliff of Water Well Consultants who are consultants for Magic Valley Ground Water District. Ryan confirmed Amalgamated has joined the ground water district for the following ten water rights:

- 36-2237
- 36-2238
- 36-2271
- 36-2272
- 36-4144
- 36-4145
- 36-4178
- 36-4254
- 36-4255
- 36-8364

IDWR has updated its records to show Amalgamated has joined MVGWD. These water rights will not be subject to curtailment so long as MVGWD is in compliance with an approved mitigation plan.

IDWR did identify three other water rights: 29-14014, 35-13990, 45-13580. Two rights are in the name of "Amalgamated Sugar Co LLC" and one right is in the name of "The Amalgamated Sugar Co LLC." IDWR's records show that two of these rights are part of IGWA through the American Falls-Aberdeen GWD, and the other right being covered by Southwest Irrigation District. Can you confirm that these rights continue to be part of AFAGWD and SWID?

Garrick Baxter | Lead Deputy Attorney General
Idaho Department of Water Resources | Energy and Natural Resources Division
Office of the Attorney General | State of Idaho
208-287-4811 | ag.idaho.gov

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From: Baxter, Garrick
Sent: Wednesday, May 24, 2023 9:56 AM
To: Candice McHugh (cmchugh@mchughbromley.com) <cmchugh@mchughbromley.com>
Subject: Amalgamated

IDWR has reached out to Magic Valley and is waiting to hear back.

Garrick Baxter | Lead Deputy Attorney General
Idaho Department of Water Resources | Energy and Natural Resources Division
Office of the Attorney General | State of Idaho
208-287-4811 | ag.idaho.gov

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Table 3-1. Results of Jaxon Higgs Analysis on IGWA's Proportionate Share Related to Reach Gain Benefits and Acres Curtailed for the April 2023 As-Applied Order

GWD	IDWR % of IGWA's proportionate share	IDWR Portion of April 2023 predicted demand shortfall		Transient May - Sept Impact[1]	May - Sept Curtailed Volume[2]	Ratio of Curtailed to Benefit	Jr. to 12/1953[3]	District Total	% of Acres Curtailed	Baseline Volume[4]
	%	AF	%	AF	AF	AF	acres	acres	-	AF
American Falls Aberdeen	33.4%	21,214	28.2%	38,328	313,075	8:1	124,112	149,259	83%	283,815
Bingham	20.9%	13,384	17.8%	27,841	206,552	7:1	105,815	148,799	71%	277,011
Bonneville Jefferson	13.4%	8,469	11.3%	1,085	179,607	166:1	92,471	95,531	97%	158,133
Carey Valley	0.0%	5	0.0%	0.00	6,901	-	-	3,669	-	5,671
Henry's Fork	0.2%	90	0.1%	0.00	13,719	-	-	40,192	-	73,901
Jefferson Clark	10.8%	6,939	9.2%	69.9	247,765	3,547:1	111,792	174,039	64%	445,393
Madison	0.0%	4	0.0%	0.00	w/HF	w/HF	-	64,045	-	78,095
Magic Valley	16.1%	10,277	13.7%	23.1	227,879	9,856:1	99,110	137,466	72%	256,188
North Snake	5.1%	3,262	4.3%	0.06	217,151	3,619,180:1	88,320	101,358	87%	208,795
Sub-Total	100.0%	63,645	84.6%	67,347	1,412,649	21:1	621,620	914,358	68%	1,787,002
SWID	-	-	-	0.02	153,292	7,664,595:1	-	-	-	-
No District	-	-	-	7,373.6	31,498	4:1	-	-	-	-
Grand Total				**74,720.8**	**1,597,439**	**21:1**				

1. Impact broken down by geographic boundary. Some non-members are included in each district. For example, the A&B usage is included in Magic Valley and North Snake GWDs. See accompanying map. Acre-ft rounded to 2 decimal places.
2. Total volume split geographically as described in note 1 from IDWR model input files from Jr12301953 run. Some slight conversion and rounding errors.
3. Acres provided by each district except Carey, Henry's Fork, and Madison. Based on breakdown of combined acres to provide effective acres per water right. 4. Baseline volume taken from 2022 Settlement Report submitted by IGWA to IDWR and the Surface Water Coalition. Represents average usage from 2010-2014.

Electronically Filed
11/5/2026 8:15 PM
Seventh Judicial District, Bingham County
Pamela W. Eckhardt, Clerk of the Court
By: Brandee Cammack, Deputy Clerk

EXPERT REPORT

CV06-26-1801

Hydrology, Water Rights, and Groundwater Modeling Evaluation of the Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("Fifth Methodology Order") and the Final Order Regarding April 2023 Forecast Supply ("April 2023 As-Applied Order") issued April 21, 2023, in the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the Surface Water Coalition

Prepared For Racine Olson, PLLP

On behalf of

Idaho Ground Water Appropriators, Inc.

May 30, 2023

Submitted To:

Idaho Ground Water Appropriators, Inc. (IGWA)
Attention: T.J. Budge, General Counsel

Submitted By:

Lynker
Sophia C. Sigstedt, Senior Hydrologist, PH-GW
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301



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1 Introduction

This report has been prepared on behalf of the Idaho Groundwater Appropriates Inc., ("IGWA") in connection with the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fifth Methodology Order*") and the *Final Order Regarding April 2023 Forecast Supply* ("*April 2023 As-Applied Order*") issued by the Director of the Idaho Department of Water Resources ("IDWR" or "Department") on April 21, 2023.

The *Fifth Methodology Order* defines the process and calculations utilized by the Director to predict material injury incurred by the Surface Water Coalition ("SWC"). The SWC comprises A&B Irrigation District ("A&B"), American Falls Reservoir District #2 ("AFRD2"), Burley Irrigation District ("BID"), Milner Irrigation District ("Milner"), Minidoka Irrigation District ("MID"), North Side Canal Company ("NSCC") and Twin Falls Canal Company ("TFCC"). The *April 2023 As-Applied Order* implements steps 1-3 of the Fifth Methodology Order to the conditions in existence at the beginning of the 2023 irrigation season.

The SWC entities divert surface waters of the Snake River at Minidoka Dam and Milner Dam. In 2005, the SWC filed a petition ("delivery call") with the Director seeking curtailment of junior-priority ground water rights that allegedly cause depletions of the Snake River and material injury to the SWC. The petition is governed by IDWR's Rules for Conjunctive Management of Surface and Ground Water Resources ("Conjunctive Management Rules) (IDAPA 37.03.11).

After an evidentiary hearing held in 2008, the hearing officer issued an *Opinion Constituting Findings of Fact, Conclusion of Law and Recommendations* on April 29, 2008 ("Hearing Officer Recommendation"). On September 5, 2008, the Director issued a final order in this matter ("2008 Final Order"), in which he ruled on all issues raised at the hearing with the exception of stating his methodology for determining material injury to the SWC reasonable in-season demand ("RISD") and reasonable carryover. On April 7, 2010, the Director issued the *Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("First Methodology Order")* setting forth the methodology for calculating material injury to RISD and reasonably carryover. A series of amendments to the First Methodology Order were made in subsequent years.

From 2016-2022, the Director administered water rights under the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fourth Methodology Order*"). On April 21st, 2023, the Director issued the *Fifth Methodology Order.* This expert report addresses changes made to the methodology in the *Fifth Methodology Order*, as well as the implementation of the new methodology in the *April 2023 As-Applied Order*, in preparation for a hearing currently scheduled for June 6-10th, 2023, concerning these orders.

In forming my opinions I have relied on review of the First Methodology Order and subsequent amendments thereto, my participation in the SWC Methodology Technical Working Group (TWG) meetings held by the Department in 2015 and 2022, my participation since 2012 as a member of the Eastern Snake Hydrologic Modeling Committee (ESHMC) which gives technical support to the Department on the development of the Eastern Snake Plain Aquifer Model (ESPAM), and my professional expertise as a hydrologist and groundwater modeler. I have examined maps and cross-sections of portions of the Eastern Snake Plain Aquifer (ESPA) and tabulations and diagrams of ESPA water rights, and I have drawn upon my accumulated knowledge of the water rights and hydrology of

the ESPA. To the extent that other information becomes available, the Director or the Department modifies any information presented, or new analysis and information becomes available, I reserve the right to modify or expand upon my opinions related to this case.

1.1 Report Organization

This report is organized into 5 sections, beginning with this introduction. Section 2 presents analysis and opinions related to the Fifth Methodology and the April 2023 As-Applied Order, including components of the RISD calculation involving irrigated acres, baseline year, and reasonable carryover. Section 3 discusses the simulation of curtailment of junior groundwater rights using the ESPAM model, including background and overview of the ESPAM model development, calibration, uncertainty, and recommendations for its application in the Fifth Methodology Order. Section 4 is a summary of my conclusions, and section 5 presents sources of information relied upon for my analysis.

2 Director's Methodology and As-Applied Order

2.1 Reasonable In-Season Demand (RISD)

2.1.1 Background

The First Methodology Order laid out the Director's methodology for determining material injury to SWC's Reasonable In-Season Demand (RISD) and Reasonable Carryover. The First Methodology Order provides a brief overview of the methodology for RISD starting with paragraph 11, explaining that material injury is the product of the SWC's predicted water supply and predicted water demand stating:

> In-season demand shortfalls will be computed by taking the difference between the RISD and forecast supply ("FS"). Initially RISD will be equal to the historic demands associated with a baseline year or years ("BLY") as selected by the Director, but will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions. The above description is represented by the following equation:
>
> In-Season Demand Shortfall = RISD – Forecast Supply (FS)

In April, at the start of the irrigation season, RISD is determined solely by the BLY. As the irrigation season progresses, weather and canal system operations are taken into account to make adjustments to RISD according to the following equation:

$$(1)\ RISD_{milestone\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p_j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in-season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month, j
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j= index variable , and
m= upper bound of summation, equal to the month calculation occurs, where April =1, May =2, … October -7

Crop Water Need ("CWN") is the project-wide volume of irrigation water required for crop growth as calculated by the following equation:

(2) $CWN = \sum_{i=1}^{n}(ET_i - W_e)A_i$

Where:

CWN= crop water need,
ET_i= consumptive use of specific crop type,
W_e= estimate effective rainfall,
A_i= total irrigated area of specific crop type,
I= index variable representing the different specific crop types grown within the irrigation entity, and
n=upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

2.1.2 Irrigated Acres

2.1.2.1 Background on Irrigated Acres

For the purpose of water rights administration, the Hearing Officer stated in the Hearing Officer's Recommendation at page 53 states: "Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members." This recommendation was adopted in the 2008 Final Order, and was sustained on appeal. Accordingly, the First Methodology Order, paragraph 25 states:

> Estimates of irrigated acres from the hearing show a trend of decreasing irrigated acreage. R. Vol. 28, 5205-15; R. Vol. 37 at 7100. According to the Hearing Officer, beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated. R. Vol. 37 at 7100.

2.1.2.2 2015 TWG regarding Irrigated Acres

On January 30, 2015, the Director instructed Department staff to convene a committee to recommend specific technical changes to the *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-season Demand and Reasonable Carryover ("*Second Methodology Order") issued June 23, 2010. The Director requested improvements to the following components of the methodology:

1) Revising natural flow forecast methods for Twin Falls Canal Company.
2) Identifying more accurate and current crop data to determine crop water need.
3) Improving the mid-season reasonable in-season demand forecast.

In response, Department employee Matt Anders gave a presentation on February 19, 2015, to outside consultants, referred to as the Technical Working Group ("TWG"), titled *Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Irrigated Acres for SWC Members*. Table 2-1 shows the actual irrigated acres of each SWC entity presented to the TWG. The TWG was also provided a spreadsheet titled "DS_RISD Calculator_2014" with data used to

calculate the DS and RISD which included a summary of irrigated acres utilized in Protocol Calculations as shown in Table 2-2.

The acreage figures shown for BID, MID, and TFCC reflect the evidence that Scott King with SPF Water Engineering[1] provided at the evidentiary hearing in 2008 which analyzed hardened acres. It was my understanding in 2015 that these would be the irrigated acres used in the Methodology Order. However, my recent review of the Department's RISD calculation spreadsheet indicates that these acres were only applied to calculations 2000-2014. Note that the Methodology was not adopted until 2010 but the Department's RISD calculation sheet includes a hindcast starting in 2000.

In the Department staff presentations to the 2015 TWG it was made clear that the Department had not adopted any type of process for reviewing the irrigated acre figures reported annually by the SWC. Consequently, there was no incentive for SWC entities to keep an accurate accounting of irrigated acres, and few SWC entities provide annual updates to their irrigated acreage figures; most simply report that there has been no change in irrigated acreage. To ensure that the Department does not include non-irrigated acres in its calculation of RISD, I submitted comments to the TWG in 2015 stating that irrigate acres should by verified using satellite and/or aerial imagery. A copy of my comments in 2015 is included as ATTACHMENT A.

Table 2-1. Summary of SWC irrigated acres 2015 TWG.

SWC Member	2005-2007 SPF	2012 Partial Decrees	2013 SWC Submitted Shapefiles	2013 RISD
A&B		14,637 (2006 PD= 15,924)		15,924
AFRD2		62,361		62,361
Burley	44,715	47,643	46,084	44,715
Milner		13,335		13,335
Minidoka	70,144	75,093	74,112	70,144
NSCC		154,067		154,067
TFCC	183,589	196,162	194,778	183,589

[1] SPF (2007), *Estimate of Non-Irrigated Acres within the Twin Falls Canal Company Service Area*, prepared for IGWA

Table 2-2. Summary of irrigated acres utilized in protocol calculations.

Summary of Irrigated Acres Utilized in Protocol Calculations

Member ID	Area of Surface Water Irr (ac)	Year Acreage Established	Reference Document
AFRD2	62,361	5/11/2006	Director's Report
A&B*	15,924	5/11/2006	Director's Report
Milner	13,335	5/11/2006	Director's Report
Minidoka	70,144	12/29/2005	Exhibit 4300 Claimed POU Analysis (BID, TFCC, NSCC),Table 6 [15], SPF - 12/29/05
BID	44,715	12/29/2005	Exhibit 4300 Claimed POU Analysis (BID, TFCC, NSCC),Table 6 [15], SPF - 12/29/05
TFCC	183,589	3/20/2007	Exhibit 4310 Estimate of Non-irrigated acres w/in the TFCC Service Area, Table 10 [25], SPF - 3/20/07
NSCC	154,067	5/11/2006	Director's Report

*For A&B the "area of surface water irr" value (15,924 ac) includes 1,176 enlargement acres that were included in the Department's recommendation.

Among the documents produced by the Department in connection with the upcoming hearing concerning the Fifth Methodology Order is a document titled *"DRAFT_SWC_Mapping_Procedures_Revised_Nov2014_v2_matt"* which appears to have been created in preparation for the 2015 TWG. The stated purpose of the document is to map the irrigated land for each of the seven SWC entities and establish a procedure for reviewing irrigated lands data submitted by SWC entities and for utilizing irrigated lands data developed by IDWR if SWC members do not submit irrigated lands data. The document indicates that irrigated lands data developed by IDWR will be used if SWC members do not submit irrigated lands data. It further indicates that as of October 2014, the latest irrigated lands data is from 2010. The document identifies information that may be utilized to identify actual irrigated acreage including the Place of Use (POU) of water rights with surface water as a source, POU of water rights with groundwater as a source, and the most recent Crop Data Layer (CDL) developed by USDA NASS which is released January for the previous year.

Under "Background Information" the document notes that irrigated lands data is not submitted by SWC members on an annual basis. That the last data for BID, MID, and TFCC is from 2013, and it does not indicate whether the source is surface water, groundwater, or mixed source. The document notes that the irrigated acres can change slightly from year to year because of permissible POU but that these should be minor changes. It also recommends that supplemental groundwater use be addressed, identifying the GIS 2006 groundwater and mixed source data layer used in ESPAM as a potential source of such information.

Consistent with this document, the irrigated acreage information in Table 2-1 was presented to the 2015 TWG with the inference that it would be utilized in the RISD component of the methodology. The use of the CDL USDA NASS data for crop mix was also presented and recommended by Department staff for incorporation in the RISD calculation. Department staff ultimately determined there was insufficient time for the committee to evaluate supplemental groundwater use given the extremely compressed timeframe of the 2015 TWG.

2.1.2.3 2022 TWG regarding Irrigated Acres

In a status conference held August 5, 2022, the Director issued a directive to Department staff to convene a TWG to review and provide comments on potential technical changes to the Fourth Methodology Order. Department staff were again tasked with RISD refinements, and Department staff presented some of their analysis on the differences between the current RISD method for CWN employing USDA NASS CDL data compared to Near Real Time METRIC (Mapping EvapoTranspiration at high Resolution and Internalized Calibration).

On November 17, 2022, Department staff gave a presentation on Near Real Time METRIC which included, as slide 6, an outline of the current method for calculating CWN, including "Remove non-irrigated land from CDL using the IDWR Irrigated Lands Dataset." Near Real Time METRIC provides a high-resolution data set that documents irrigated acreage in "near real time," making accurate irrigated acreage data available from the previous irrigation season and potentially in the current season.

However, in a subsequent presentation given on December 1, 2022, titled *Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time Metric*, the acreage information shown in Table 2-3 was presented.

Table 2-3. Summary of SWC irrigated acres 2022 TWG.

SWC Member	Shapefile Acres	If Removed Non-Irrigated Acres with 2011 Irrigated Lands Dataset (IDWR)	If Removed Non-Irrigated Acres with 2017 Irrigated Lands Dataset (IDWR)	NRT METRIC Processing Acres 2021 (IDWR)	Methodology Acres
A&B	21,976 (PPU, 2010)	21,585	21,634	21,625	15,924 (SRBA Partial Decree)
AFRD2	69,279 (PPU, 2010)	68,368	66,606	68,384	62,361 (SRBA Partial Decree)
Burley	46,035 (SWC, 2013)	44,113	44,168	44,139	46,035 (SWC, 2013)
Milner	14,844 (PPU, 2010)	13,239	13,202	13,233	13,335 (SRBA Partial Decree)
Minidoka	75,340 (SWC, 2022)	71,295	72,016	71,073	75,340 (SWC, 2022)
NSCC	224,463 (PPU, 2010)	220,935	218,498	220,937	154,067 (SRBA Partial Decree)
TFCC	194,732 (SWC, 2013)	179,486	180,956	179,456	194,732 (SWC, 2013)

It became clear from this presentation that since 2015 the Department has not utilized the most accurate irrigated acreage data to calculate RISD, but has instead utilized the lesser of either the decreed acreage or the acreage reported by SWC, without making any effort to insure that non-irrigated acres are not being accounted for in the IDWR's calculation of RISD. The Department's RISD calculation sheet show that the "Methodology Acres" from Table 2-3 are used in calculation of CWN 2015-2022.

Department staff could not explain why the more accurate and reliable acreage data was not being used in the methodology.

Every technical analysis of irrigated acres consistently shows that TFCC is irrigating approximately 15,000 acres less than the 194,732 acre figure that TFCC reports to IDWR as being irrigated. The expert report of SPF Water Engineering submitted in 2008, IDWR's irrigated lands data sets from 2011 and 2017, and Near Real Time METRIC data from 2021, consistently demonstrate actual irrigated acreage of approximately 180,000 acres. (The IDWR irrigated lands data sets and Near Real Time METRIC are discussed further below.) It is clear that the Department is not using the best science available to determine irrigated acres in the Fifth Methodology Order, relying instead on outdated acreage figures provided by the SWC entities.

2.1.2.4 IDWR's High Resolution Irrigated Lands Dataset

The IDWR has invested years of time and staff to produce a large archive of high-resolution irrigated lands data. IDWR's Irrigated Lands dataset is a three-class land-use classification including irrigated, semi-irrigated and non-irrigated areas. This data set was developed at the request of the ESHMC. It is used to calculate the ET and consumptive use components that make up one of the most important input parameters to the ESPAM. Irrigated lands acreage, as defined by the IDWR Irrigated Lands dataset, directly affects the volume of evapotranspiration (ET) in the ESPAM model. Similarly, irrigated acreage directly affects the volume of ET used to calculate RISD.

IDWR's Irrigated Lands data set utilizes satellite imagery, National Agricultural Imagery Program (NAIP) imagery, Digital Orth Photo Quadrangle (DOQQ) imagery, and other in-house, scanned aerial imagery for determining irrigation status. Attribute assignment for the irrigation status (irrigated, non-irrigated, and semi-irrigated) is determined using satellite imagery. Landsat and Sentinel Imagery provides the analyst the ability to monitor ground, moisture, and vegetation conditions over the entire growing season. Hand digitizing field boundaries using the satellite data and imagery produces a very accurate and precise depiction of irrigated acres.

In conjunction with the image data, IDWR analysts use Common Land Unit (CLU) polygons of individual fields that were digitized from the National Agricultural Inventory Program (NAIP) imagery by the Farm Services Administration (FSA). IDWR uses the unattributed CLU polygons because they are an existing, recent, highly-detailed, vector dataset the IDWR could attribute easily as irrigated or non-irrigated. These polygons were then hand edited when IDWR began working with the CLU data. IDWR then goes through a three-step classification (Figure 2-1) where step 1) used Landsat satellite data, 2) used a combination of Landsat and NAIP digital photography, and 3) used NAIP photography and CLU data.

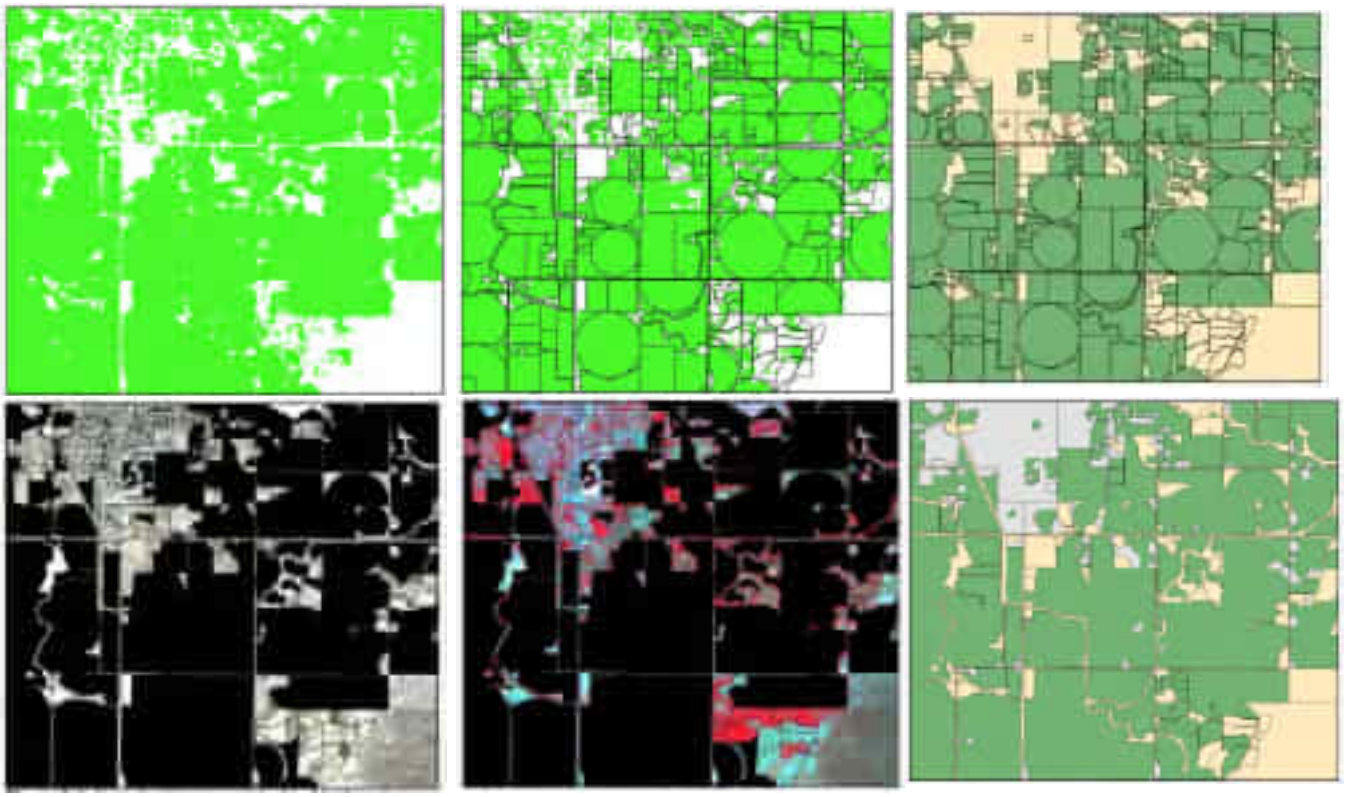

Figure 2-1: Sequence of IDWR Irrigated Land dataset processing from top left to bottom right 1)initial landsat-based classification out, 2) Landsat output with CLU polygons superimposed, 3) initial CLU polygon classification from irrigated (green) or non-irrigated based on 75% or greater rule, 4) irrigated polygons masked to black and superimposed on NAIP image, 5) irrigated polygons masked black and superimposed on Landsat data, 6) final edit classification with irrigated in green, non-irrigated in beige, and semi-irrigated (residential) in gray. (Source 2006 Irrigated Land Classification for the Eastern Snake Plain Aquifer Model, IDWR)

IDWR Irrigated Lands data sets for the ESPA include 1986, 1996, 2000, 2002, 2006, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, and 2017. Department staff have reported that the Irrigated Lands data set 2021 could be complete by next year.

2.1.2.5 IDWR METRIC Dataset

IDWR and the University of Idaho worked under a NASA grant to develop the procedures to map ET from satellite data (Landsat) for water resources applications. The METRIC energy balance model was developed to compute and map ET using Landsat images. Dr. Rick Allen, Dr. M. Tasumi, and Dr. R. Trezza, of the University of Idaho, developed METRIC by making refinements to the Surface Energy Balance Algorithm for Land (SEBAL). Landsat measures visible, near-infrared, and thermal infrared radiation and has a pixel size small enough to map individual agricultural fields. METRIC also incorporates USBR AgirMet weather data into the modeling process. IDWR uses METRIC data (in years it is available) to calculate the ET rate for the ESPAM model (Figure 2-2). METRIC ET maps for eastern southern Idaho have been generated for 1986, 1996, 2000, 2006, 2008, 2009, 2010, 2011, 2013, 2016, 2017 and 2018. The partnership is also responsible for the NRT METRIC processing for 2019, 2020, and 2021.

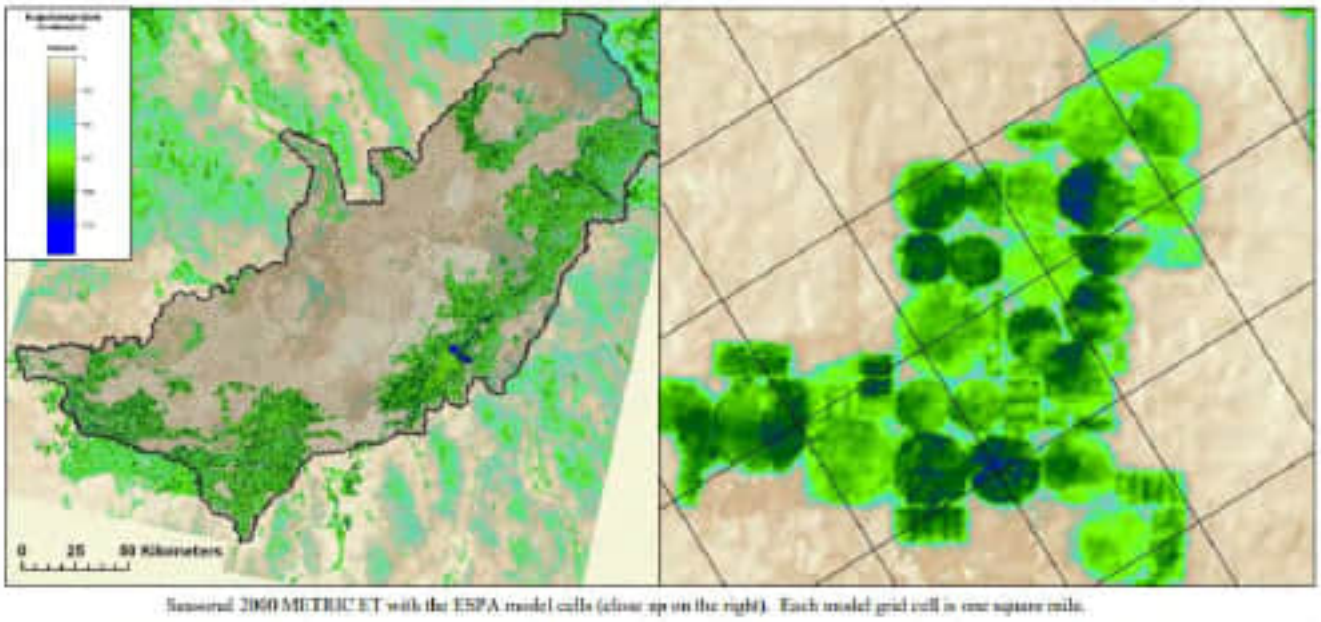

Figure 2-2: Example of seasonal 2002 METRIC ET within the ESPAM boundary (close up on the right). Each model grid cell is one square mile (Source IDWR Mapping Evapotranspiration; Hydrological Modeling https://idwr.idaho.gov/gis/mapping-evapotranspiration/).

2.1.2.6 Conclusions Regarding Irrigated Acres

The presentation by IDWR staff in November 2022 regarding NRT METRIC application revealed a significant shortcoming in the Fourth Methodology Order in that SWC irrigated acre datasets sometimes represent service areas as opposed to the actual irrigated land. If non-irrigated acres are to be excluded in calculating RISD, the Department should implement a review process in Step 1 of the Methodology Order that compares the irrigated acreage figures reported by SWC entities with the irrigated acreage data in the most recent Irrigated Lands data set and METRIC data. In any case, the Department should use the most accurate and reliable source of irrigated acreage data to calculate RISD in the Methodology Order.

As mentioned above, the most recent Irrigated Lands data set and the most recent METRIC data show that actual irrigated acreage within TFCC is approximately 15,000 acres less than the 194,732 acre figure that TFCC reports as irrigated. If the NRT METRIC acreage figure of 179,456 irrigated acres is utilized in the Department's RISD calculation sheet for 2022, the "Actual November Shortfall" calculated is reduced by 84,732 acre-feet (af). This underscores how critical it is that IDWR use care to identify actual irrigated acreage and calculate RISD based on actual irrigated acreage.

The Department's use of outdated irrigated acreage data highlights another problem of the Methodology Order relying on inferior data. The ESPAM is considered the best science available, and it utilizes the IDWR Irrigated Lands datasets and METRIC to calculate ET along with PRISM (Parameter-elevation Relationships on Independent Slopes Model) for precipitation. By contrast, in addition to using outdated irrigated acreage data, the Methodology Order uses an outdated approach with CDL data for crop mix, and Agrimet station data for the ET rate and precipitation. The ESPAM model also uses IDWR's determination for mixed sources lands where a groundwater fraction is applied on lands that have been designated as irrigated by both surface water and groundwater. The Fifth Methodology Order does not distinguish mixed source lands.

2.1.3 Baseline Year

In the First Methodology Order the BLY is characterized as a year or group of year(s) where water demands and water supplies can be used to as a benchmark to predict water demands in the current year at the start of the irrigation season. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the actual water conditions for the irrigation season. The BLY selection criteria were based on three factors 1) climate, 2) available water supply, and 3) irrigation practices, to ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

BLY selection criteria concerning available water supply include above-average SWC diversions (Figure 2-3**Error! Reference source not found.**) and available SWC supply (Figure 2-4). BLY criteria concerning climate include above-average evapotranspiration (ET) (

Figure 2-5) and Growing Degree Days (GDD) (Figure 2-6), both of which are a function of temperature, and below-average precipitation (Figure 2-7) to ensure the increased diversions in that year(s) were a function of crop water need (CWN) and not other factors. To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. Id. at 7096.

These BLY selection criteria have been carried through from First Methodology Order to the Fifth Methodology Order; however, the BLY selected as the benchmark changed in the Third Methodology Order and the Fifth Methodology Order.

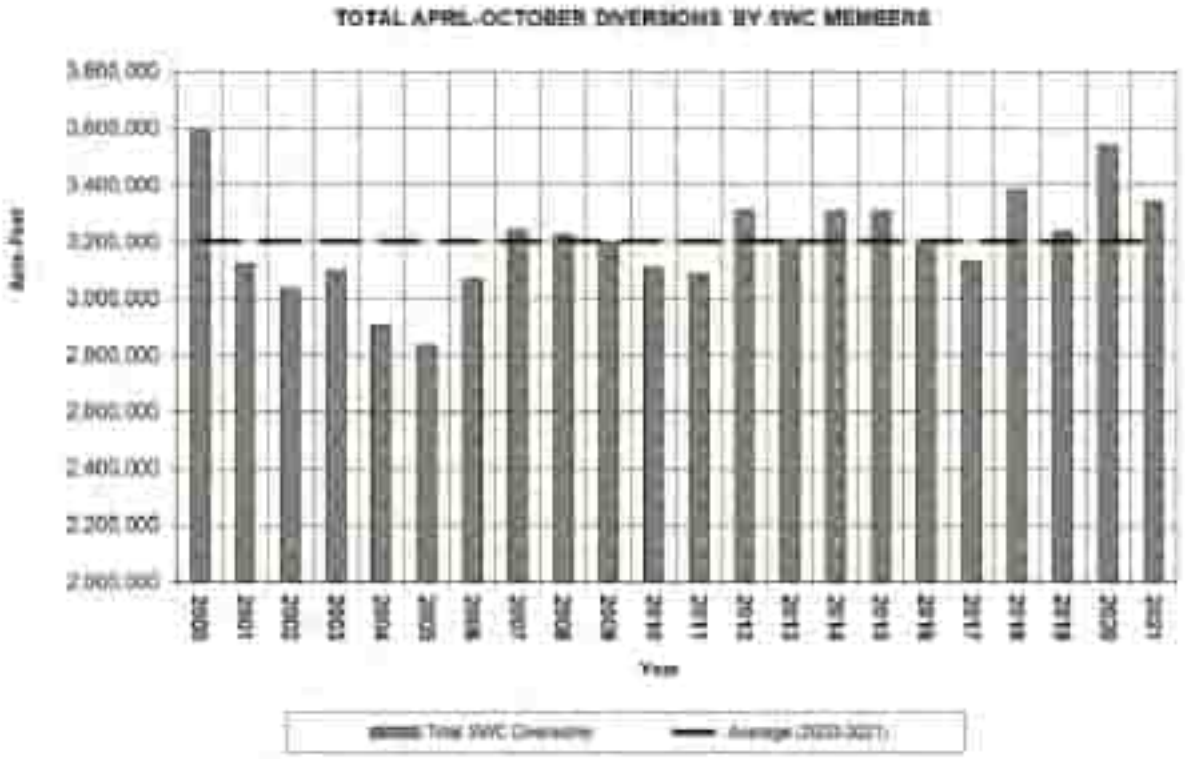

Figure 2-3. *Total SWC April-October Diversion 1992-2021.*



Figure 2-4. *The sum of the Heise natural flow and the storage allocation for the Snake River above Milner 1992-2021.*

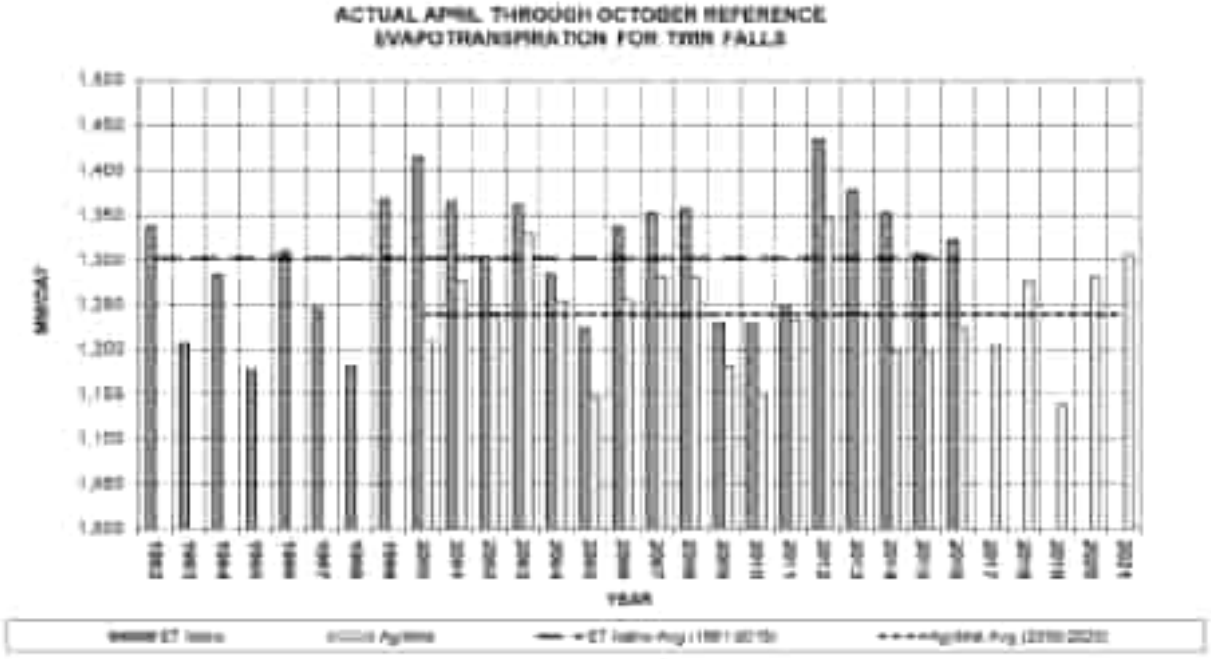

Figure 2-5. Reference ET for Twin Falls (Kimberly) with both AgriMet and ETIdaho data 1992-2021.

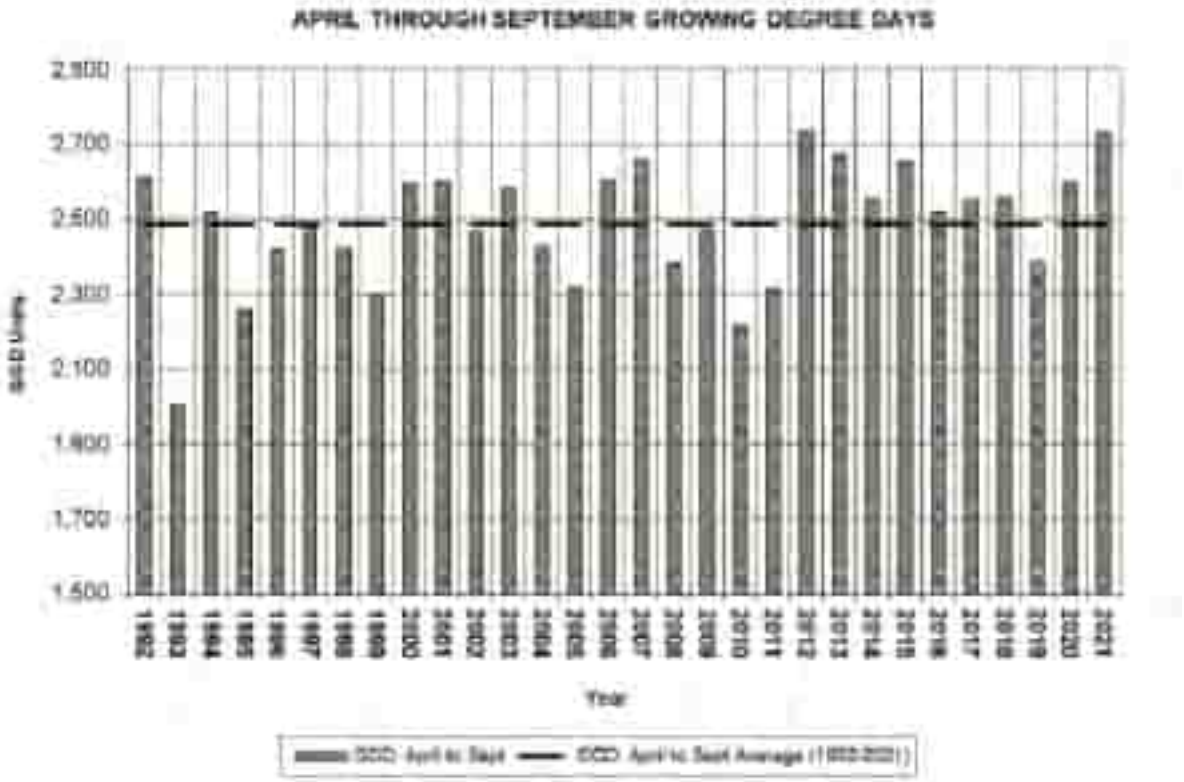

Figure 2-6. *Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1992-2021.*

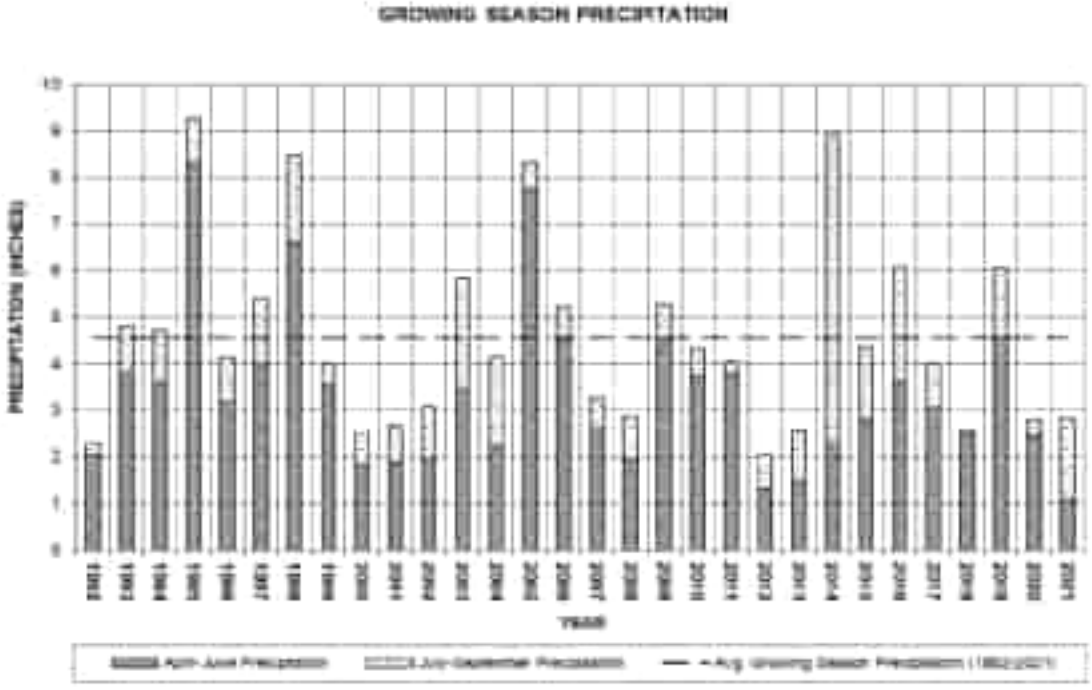

Figure 2-7. *Growing Season Precipitation at National Weather Service's Twin Falls Weather Station 1992– 2021.*

2.1.3.1 BLY First Methodology Order

In the First Methodology Order, paragraphs 27 and 28, found that "from the standpoint of total annual SWC diversion volumes, 2006 is an appropriate BLY with 97% of 2000-2008 total SWC diversion". The Director found that it would also be appropriate to use the values of 2006 and 2008 (06/08) to arrive at an average BLY that more strongly fits selection criteria for all members of the SWC. The First Methodology Order determined 06/08 as the appropriate average of years for the BLY selection. The 06/08 average is 100% of the average for 2000-2008 total SWC entity diversions. Both 2006 and the 06/08 average were determined to be appropriate BLYs.

They are appropriate because they are both so close to the BLY selection criteria averages, it is not necessary to make a determination with bias beyond that. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the particular water conditions for the irrigation season. The average for the BLY criteria ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

2.1.3.2 BLY 2015 Third Amended Order Determination

In the 2015 Third Amended Final Oder the period of record for consideration of the BLY was extended to 2000-2014. It was found that the 06/08 average no longer met the criteria for the BLY.

The 2015 Third Amended Final Order determined 06/08/12 as the appropriate average of years for the BLY which is 101% of the average 2000-2014 total SWC entity diversions. The Director found that 2012 would also met the criteria for the BLY which is 105% of the average 2000-2014 total SWC entity diversions. However, the Director found that because 2012 represents the maximum values for some of the BLY criteria during the period of analysis, 2012 is not an appropriate single-year BLY candidate.

In terms of total SWC diversions an 08/12 average for the BLY would have resulted in 104% of the average 2000-2014 SWC entity diversions. The 06/08/12 average (101% of average) appears to be preferred because it is nearer to the average BLY selection criteria for SWC diversions. Again indicating it is not necessary to make a determination with bias beyond that. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the particular water conditions for the irrigation season. The average for the BLY criteria ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

2.1.3.3 BLY 2023 Fifth Methodology Order

In the 2023 Fifth Methodology Order the period of record for consideration of the BLY was extended to 2000-2021. The Department found that as individual years 2018 and 2020 satisfy all the BLY selection criteria. Additionally, the Department found that 2020 ranks as the second-highest year of total diversions for the SWC and is more than one standard deviation above the average for the years 2000-2021. The 2023 Fifth Methodology Order determined 2018 as the BLY which is 104% of the average 2000-2021 SWC entity diversions.

In terms of total SWC diversions the 06/18 average for the BLY would have resulted in 101% of the 2000-2021 average. Based on previous BLY determinations a selection closer to 100% should have been preferred. The difference between 1% and 4% of bias over the BLY selection criteria for total SWC diversions is 32,000 af and 128,000 af, respectively. For TFCC diversions 2018 as the BLY is 106% of average 2000-2021 where 6% bias is 60,000 af, this is almost the entire shortfall determination of 75,200 af determined in the Final Order Regarding April 2023 Forecast Supply. The 2010 and 2015 Orders make clear that this level of bias is not needed to define an appropriate BLY, 97-101% of the BLY selection criteria is adequate. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the particular water conditions for the irrigation season. The average for the BLY criteria ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

A copy of my January, 2023 comments to the Department in response to their recommendations following the 2022 TWG is included as ATTACHMENT B. Some values in my comment letter were estimated from graphics provided to the TWG and have been corrected based on more accurate data below.

2.1.3.4 Conclusions on BLY selection in Methodology Order

IDWR should consider a percent of average for total SWC diversions and select an average of years closer to that of the 06/08 BLY (100%) and 06/08/12 BLY (101%) selected in 2010 and 2015, respectively. The average of diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria (as shown in Table 2-4) and is 101% of total SWC diversion. The BLY of 06/18 has a better technical basis than 2018 as the BLY.

In a hindcast analysis by IDWR staff (ATTACHMENT C), the BLY 2018 causes a huge shift in the type of water year (i.e. wet, average, dry, very dry) where Demand Shortfalls and Shortfall are calculated. The hindcast showed a Demand Shortfall much more frequently in average and even wet years in addition to every dry or very dry year. When you compare the bell-shaped distribution of SWC total diversion demands for the POR 2000-2014 compared to 2000-2021 in Figure 2-8 and Figure 2-9, it is apparent that they are very similar. The average total SWC diversions for the period of record 2000-2014 and 2000-2021 are 3.15 maf and 3.20 maf, respectively. Similarly, the variability in the total SWC diversions for 2000-2014 and 2000-2021, as represented by the standard deviation, are also very close with values of 180,076 af and 178,587 af, respectively. The selection of BLY 2018 translates to a much higher level of bias and is not technically justified given the similarity between mean diversions and the standard deviation for the 2000-2021 POR versus the 2000-2014 POR.

An additional reason for targeting a specific percent of average in line with the average BLY criteria within the POR when establishing a BLY, and for using an average of years (or synthetic diversion volume), is that the process for selection of the BLY otherwise appears arbitrary and subjective. If IDWR staff are presented with multiple years within the POR that fit the criteria for a BLY, and there is no guidance or standard method for selecting a single BLY or average of years, the ultimate selection becomes purely subjective. Using an average of years (or even a synthetic diversion volume) that targets a prescribed percent of average is a more objective and technically defensible process.

Table 2-4. Baseline Year Alternatives and Baseline Year Criteria

BLY Criteria	Avg 2000-2021	BLY Avg 06/18	BLY 2018	BLY 2020
Above Avg SWC diversions	3.20 maf	3.21 maf	3.34 maf	3.54 maf
Above Avg GGD	2526 units	2579 units	2557 units	2597 units
Above Avg ET	1238 mm/d	1265 mm/d	1275 mm/d	1281 mm/d
Blw Avg Precip	4.27 in	3.88 in	2.54 in	2.79 in
Abv Avg SWC Supply	7.45 maf	8.56 maf	9.04 maf	8.22 maf

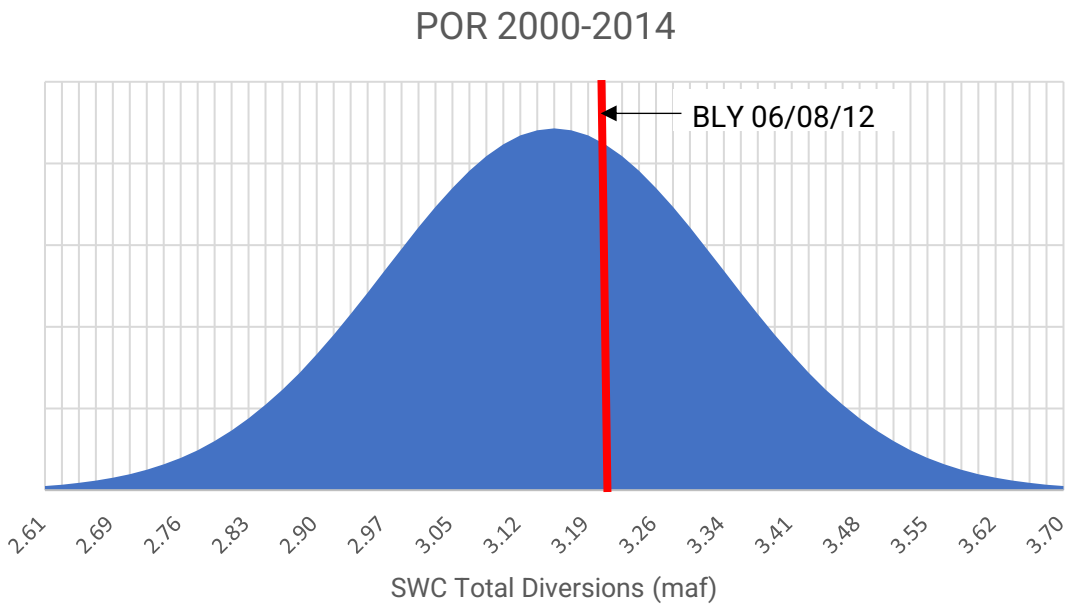

Figure 2-8: Bell Curve of SWC Total Diversion over the POR 2000-2014, the red line shows where the selected BLY 06/08/12 for the 4th Methodology Order falls within the normal distribution.

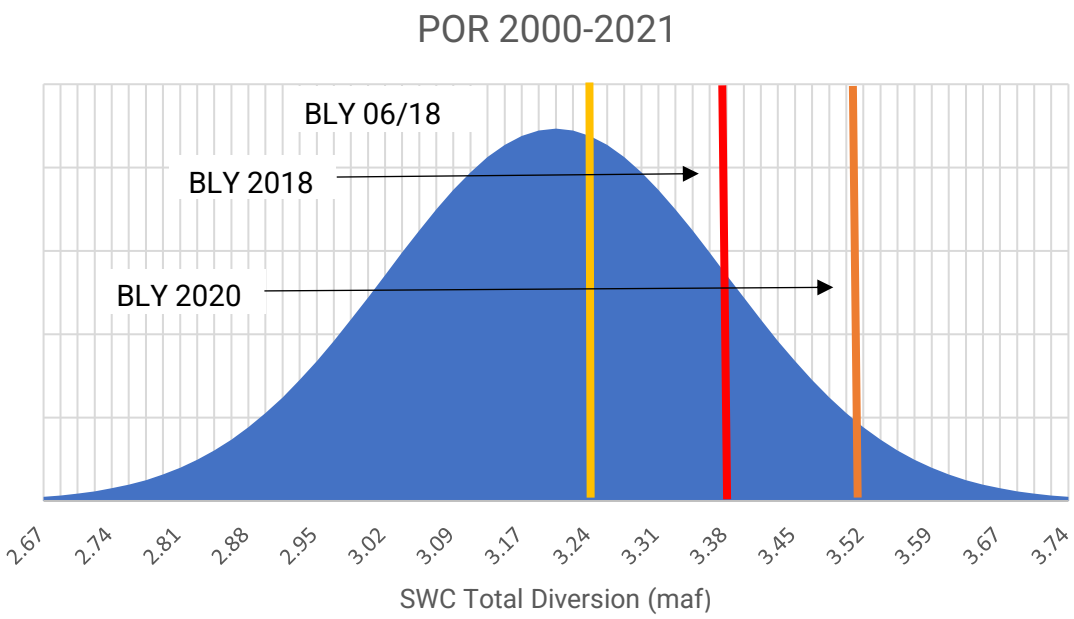

Figure 2-9: Bell Curve of SWC Total Diversion over the POR 2000-2021, the yellow line, red line, and orange line show where the proposed BLY 06/18, 2018 and 2020 falls within the normal distribution, respectively.

Another reason a better alternative would be to use diversion demands for the 06/18 irrigation seasons for the BLY is that there were unique hydrologic circumstances in 2018 that I don't believe represent the typical dry year. The 2017/2018 snowpack was very high and water year forecasts and early season streamflow led to positive water supply forecasts which resulted in a large amount of aquifer recharge in 2018. Department staff acknowledged the technical difficulties in sorting out surface water allocation adjustments like recharge in applying the Methodology Order. In the Department's RISD calculation sheet for "Demand" the table titled "SWC-Monthly Wheeled Water and In-Season Recharge Adjustment Factors (ac-ft)" show the adjustment for recharge and wheeled water. For 2018 there is a note about AFRD2 recharging between 5,000-10,000 af of recharge to MP31 for Magic Valley GWD and the calculation shows only 5,000 af of recharge was accounted for. Additionally IGWA's Settlement Performance Report shows almost 4,000 af of recharge by North Snake GWD through NSCC that is not accounted. This creates a consistent bias of potentially 9,000 af in the application of 2018 as the BLY. This unaccounted for recharge water artificially inflates the 2018 BLY Demand and would directly artificially increase the DS amount calculated in April. The positive water supply outlook in 2018 may have also resulted in less stringent surface water administration and ultimately higher diversions than the crop water need alone would predict.

The BLY criteria concerning precipitation also reveal that 2018 is an extremely low precipitation year. Twin Falls Agrimet station data show the 2018 irrigation season is the only year in the 1992-2021 POR with a zero-precipitation total for July-September and that total irrigation precipitation for 2018 is about one standard deviation below the average. The fact that almost any individual water year will have some unique circumstance is a good reason for continuing to define the BLY based on an average of years as the Methodology Order has previously applied.

2.2 Forecast Supply (FS)

As previously described the shortfall issued in the Methodology Order is the difference between the forecast supply and the forecast demand for each SWC member. The forecast supply has two components: the predicted natural flow supply and the predicted storage allocation for each SWC member. The Department undertakes an April forecast and mid-irrigation season forecast.

2.2.1.1 2015 TWG regarding Forecast Supply

On January 30, 2015 the Director issued an order to staff directing them to convene a TWG to recommend specific changes to the Second Methodology Order. One of the specific recommendations for technical changes was revising the natural flow forecast for Twin Falls Canal Company.

Department staff presented analysis where both single linear regression and multiple linear regression models were considered over the period of record 1990-2013. New multiple linear regression models were recommended to replace existing regression models for TFCC, AFRD2, BID, MID, and NSCC.

In the April forecast for these entities, the final predictor variables selected included the total April through July natural flow in the Snake River near Heise and the total November to March discharge at Box Canyon Springs. Natural flow at Heise is considered a good April predictor of supplied by snowmelt, whereas Box Canyon Springs, was considered by Department staff to be a good indicator for the natural flow supplied by reach gains the in Blackfoot to Milner reach. I disagree with the latter as will be described in a later section.

For the July forecast new forecast models were developed for each SWC member. July natural flow predictors for A&B and AFRD2 are based on Snow Water Equivalent (SWE) Two Oceans Plateau Snotel on July 1. The regressions models for BID, MID, and NSCC include natural flow in Snake River near Heise (April-June), SWE Two Oceans Plateau Snotel on June 15, and March depth to water at well 05S31E27ABA1. I disagree with the use of well 05S31E27ABA1 as will be described in a later section. The predictors in the regression model for TFCC includes Snake River near Heise natural flow (April-June), SWE at Two Oceans Plateau Snotel on June 15, and Spring Creek discharge (January-May).

Table 2-5 shows a summary of all the variables tested in for the linear regression models presented to the TWG in 2015.

Table 2-5. Variables Tested in 2015 Multiple Linear Regression Models

Variable Name	Description	Units
HeiseAprtoJulKAF	**USBR Hydromet Heise Natural Flow April - July**	**KAF**
MarWell1	USGS Well: WL-9S 25E 03CAC1 March depth to water	Feet
MarWell2	USGS Well: WL-2N 37E 02ABA1 March depth to water	Feet
MarWell3	USGS Well: WL-3N 37E 12BDB1 March depth to water	Feet
MarWell4	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
MarWell5	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
RupNovtoMar	Rupert Agrimet Total Precipitation November - March	Inches
TYHEE	USGS 13075910 PORTNEUF RIVER NR TYHEE ID Total Flow November - March	AF
LastYearNF7to9	TFCC Natural flow diversions July - September, lagged by 1 year	AF
SpringCreek11to3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow November - March	AF
SpringCr3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow March	AF
Devils11to3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S Total Flow November - March	AF
Devils3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S total Flow March	AF
Box11to3	**USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow November - March**	**AF**
Box3	USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow March	AF
Briggs11to3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow November - March	AF
Briggs3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow March	AF
TwoOceans71	**NRCS Two Oceans Plateau (837) Snow Water Equivalent on July 1**	**Inches**
HEIAprtoJune	**USBR Hydromet Heise Natural Flow April - June**	**KAF**
SpringJantoMay	**USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow January - May**	**KAF**
NA	NRCS Spring Creek Divide (779) Snow Water Equivalent on July 1	Inches
NA	NRCS Togwotee Pass (822) Snow Water Equivalent on July 1	Inches
NA	NRCS Phillips Bench (689) Snow Water Equivalent on July 1	Inches
2OcTow	Sum of Two Oceans Plateau and Togwotee Pass Snow Water Equivalent on July 1	Inches
Variables in Bold were used in the models		

2.2.1.2 2022 TWG regarding Forecast Supply

In the 2022 TWG the Department presented December 14, 2022 a presentation on an evaluation of the April and July forecast supply models. This presentation was primarily an overview of how the forecast supply models performed 2014-2022 based on their R^2 values. Unlike the 2015 TWG improving the forecast supply models did not seem to be a priority in 2022 and only a very limited analysis concerning potential model improvement was performed. Table 2-6 shows the list of predictors tested in the 2022 TWG, where the only new predictors were two individual wells and the Sentinel Well index, none of which were found to improve the models for which they were tested.

Table 2-6. Variables Tested in 2022 Multiple Linear Regression Models

Variable Name	Description	Units
HeiseAprtoJulKAF	**USBR Hydromet Heise Natural Flow April-July**	**KAF**
Box11to3	**USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow November-March**	**AF**
TwoOceans71	**NRCS Two Oceans Plateau (837) Snow Water Equivalent on July 1**	**inches**
	WELL 02N31E35DCC1 (Mar Avg)	feet
	Sentinel Wells	feet
	WELL 05S31E27ABA1 (Mar 15)	feet
Variables in Bold were used in the models		

Department staff did not make a recommendation on updating April and July regression models to improve their predictive power for natural flow supply. However, the presentation to the TWG on natural flow forecasting models did show the TFCC model is degrading in the R^2 value and has decreased from 0.86 in 2014 to 0.72 in 2022. The degradation is significant in that the R^2 values is an expression of the

explanatory power of the forecast model. The technical information presented to the TWG indicates that a revised natural flow method for TFCC should be evaluated and a recommendation for an improved method should be made. There was not sufficient time during the 2022 TWG or prior to the June hearing to perform the necessary analysis as described in section 2.2.3.

2.2.2 Concerns with Current FS Predictor Variables

The next section 2.2.3 outlines my recommendations for how the natural flow models should be developed and could be improved. Aside from those recommendations I have additional concerns about two of the predictors used in the current regression models.

The first is that Box Canyon spring flows are representative of groundwater discharge to the near Blackfoot to Minidoka reach. Box Canyon spring discharges to the Snake River along the Kimberly to King Hill reach of the Snake River. A comparison of reach gains between the near Blackfoot to Minidoka and Kimberly to King Hill reach show that spring discharge between the reaches varies in response to changes in precipitation and precipitation practices. The hydrogeologic controls on spring discharge between these reaches are also different. Aside from the fact that groundwater contributes to both spring reaches there is no logical reason that Box Canyon Springs should be a representative of gains to the near Blackfoot to Minidoka reach gains.

The second concern is related to the use of well 05S31E27ABA1 as a predictor for reach gains. This is a shallow well located near the American Falls Reservoir and located in an area irrigated using surface water. The well shows a rapid response to surface water irrigation practices (Ralston, 2008). The relationship between canal diversions and observed water levels mean that this is not a good representation of groundwater conditions and more likely correlates with near Blackfoot to Minidoka gains as related to surface water supply.

2.2.3 Recommendations on Improving the Natural Flow Models used in the Methodology

The accuracy of predicting April and July natural flow available to SWC entities is dependent on reasonable predictor variables and maintaining high R^2 values over the period of record. The process for natural flow forecast model revision should be standardized in-terms of defining how frequently a thorough re-evaluation of the predictors and models is done (i.e. 3-yrs, 5-yrs, or if R^2 value drops below a threshold). This should include re-evaluating previously tested predictors over the new POR, as well as, casting a new net of total predictors for consideration by the TWG.

The standardized process should include a multicollinearity analysis to screen out variables selected to be predicted that are correlated with one another followed by something like a stepwise regression analysis used to select the most suitable model structure for predicting natural flow.

There was not time for Lynker to perform a proper analysis to demonstrate if there are more accurate models to consider in the natural flow predictions. If time had allowed Lynker would have performed something similar to the following process.

Data collection is the first step in the process. Natural flows are largely controlled by natural hydrologic processes often starting in the sub-alpine and alpine environments. Processes include snow accumulation, evapotranspiration, runoff generation, groundwater flows, and subsurface filling/spilling of subsurface storage. Many data sets exist to describe the hydroclimatic state of water supply and demand in areas that ultimately impact the generation of natural flow.

However, it is difficult to objectively select which predictor variables should be included in a linear regression model. If too few predictor variables are selected, there is a risk of not accounting for an unforeseen control on natural inflows. On the other hand, if too many predictor variables are selected, there is a risk of over-fitting the model, which degrades a model's predictive fidelity. To circumvent this challenge, I propose using stepwise linear regression analysis to construct parsimonious models for the specific SWC entities.

A stepwise linear regression analysis is a regression technique whereby explanatory variables are selected by an automatic procedure that culminates in a parsimonious model that includes only the most important explanatory variables. Provided a list of uncorrelated candidate predictor variables, stepwise linear regression analysis starts with a "maximal" model, which includes all candidate variables. The analysis iteratively removes variables whose omission results in the most statistically insignificant deterioration of the model performance. The Akaike Information Criterion (AIC) is used to objectively quantify the significance variable omission. The variable omission process stops when all predictor variables in the model are statistically significant. Stepwise linear regression analysis is a data-driven approach to construct predictive models and test the utility of additional natural flow predictor variables.

Lynker's technical memorandum included as addendum to IDWR staff recommendations in 2015 laid out an alternative forecast model approach that I continue to think should be further investigated. A better approach would use forecasted flow at Heise or some alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC. The technical basis for this suggestion is that water rights administration creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This is likely the reason it is difficult to find a high performing regression model for TFCC.

2.3 Reasonable Carryover

Reasonable Carryover is defined as the difference between the BLY demand and projected typical dry year supply. Reasonable Carryover = BLY Demand – Projected Supply (based on a typical dry year)

The Heise natural flow for the years 2002 and 2004 are well below the long-term average (1992-2021) but not the lowest years on record as shown in Figure 2-4. The percent of average for these years rank very similarly when comparing the period of record for 1990-2014 to the period of record 1990-2022, at 75-79% and 74-78%, respectively. The Fifth Methodology Order like the First Methodology Order, the 3rd Methodology Order, the 4th Methodology Order adopted the average of these years to represent the typical dry year supply.

The Fifth Methodology Order adopts 2018 as the BLY for demand. Like in the DS calculation in April the selection of 2018 as the BLY greatly increases the prediction of carryover need for the SWC (Table 2-7). When Department staff presented the difference in the projected carryover need to the 2022 TWG there was no analysis presented to indicate whether or not this increase in carryover storage was needed based on existing conditions over the time the Methodology Order has been applied. There was not time prior to my writing of this Expert Report to analyze the need for the increased projection of reasonable carryover needs to the SWC.

Table 2-7. Maximum Projected Carryover Need Fourth Methodology Order Compared to the 5th Amended Order

SWC Member	Fourth Methodology Order Reasonable Carryover (af)	5th Amended Order Reasonable Carryover (af)
A&B	18,500	22,696
AFRD2	11,500	93,160
Burley	0	2,495
Milner	4,800	16,072
Minidoka	0	0
NSCC	65,500	113,277
TFCC	25,200	86,834

2.4 Compounding Bias

Each component of the RISD and Forecast Supply calculations in the Methodology Order has a built-in bias in favor of the SWC. These biases are meant to adequately to protect senior water users while providing a level of protection against unnecessary curtailment to juniors. However, these biases have a compounding effect as they propagate through the methodology, resulting in excessive Demand Shortfall predictions that provide essentially no protection against unnecessary curtailment of juniors.

This is apparent from the Department's "Summary of Hindcast SWC Delivery Call Demand Shortfall Calculation 2000-2022" which shows that the Methodology no longer offers any protection against unnecessary curtailment to the juniors. To the contrary, the Fifth Methodology Order leads to the curtailment of every junior groundwater right on the ESPA in most years event though TFCC diversion records (the SWC entity most often short and demanding the largest demand short fall volumes) demonstrate that it is short of water only occasionally. This section will analyze how the compounding biases in the Fifth Methodology Order concerning irrigated acres, BLY, FS, and Reasonable Carryover result in Demand Shortfalls that are unreasonable given the actual water supply and demand conditions over the period of record 2000-2022.

2.4.1 BLY 2018 in April Demand Shortfall Determination

IDWR completed a hindcast analysis 2000-2022 for the April Demand Shortfall volume with 2018 as the BLY, the results of this analysis are shown in column 2 in Table 2-8. The Department provided ESPAM files for May 1 curtailment dates of junior pumping ranging from Oct 1900 to April 1994 that included acres and cfs curtailed. I have used these for column 2-4 in Table 2-8 to estimate the curtailment date most closely associated with the DS calculated in the Department's hindcast. Note that under a transient ESPAM simulation any DS over about 97,700 af results in complete curtailment to the October 1900 date. The analysis shows that for the 23 years in the hindcast 14 years would have resulted in a complete curtailment of all the junior groundwater acres across the ESPA within the area of common groundwater. This means that 60% of the time using 2018 as BLY results in an April DS that demands

complete curtailment of junior groundwater rights and over 940,000 acres curtailed. In contrast column 6 shows TFCC diversion rates in incher per year and only 4 years show that their diversion rates are below the full diversion amount of 5/8" per acre (*emphasized in Bold*). The IDWR hindcast shows only 4 years over the 23-year period where less than 300,000 acres of junior groundwater rights would be curtailed. This demonstrates how extremely conservative the application of 2018 as a BLY in the April DS determination and that the Methodology no longer offers any protection against unnecessary curtailment to the juniors.

Table 2-8. IDWR Hindcast of April Demand Shortfall with BLY 2018 and Lynker Estimated Jr GW Curtailment based on Sukow May 1 Curtailment model files

Year	April BLY 2018 (AF)	Estimated Jr GW Curtailment Date	Estimated Jr GW Acres Curtailed	Estimated Jr cfs Curtailed	TFFC inches per acre
2000	126,125	1900	941,377	3,105	3/4
2001	***334,970***	***1900***	***941,377***	***3,105***	***3/4, 5/8, 1/2***
2002	131,308	1900	941,377	3,105	5/8
2003	93,902	1900	941,377	3,105	5/8
2004	***364,958***	***1900***	***941,377***	***3,105***	***5/8, 1/2***
2005	228,241	1900	941,377	3,105	5/8
2006	0	-	-	-	3/4
2007	152,855	1900	941,377	3,105	5/8
2008	15,138	~1981	105,041	344	3/4
2009	34,109	~1973	319,515	1,050	3/4
2010	190,898	1900	941,377	3,105	3/4
2011	0	-	-	-	3/4
2012	53,778	~1936	480,838	1,571	3/4, 5/8
2013	110,912	1900	941,377	3,105	3/4, 5/8
2014	0	-	-	-	3/4, 5/8
2015	184,901	1900	941,377	3,105	3/4
2016	111,457	1900	941,377	3,105	3/4
2017	65,382	~1956	658,364	2,157	3/4
2018	44,805	~1969	394,602	1,292	3/4
2019	88,237	1900	941,377	3,105	3/4
2020	59,101	~1961	556,146	1,820	3/4
2021	***126,102***	***1900***	***941,377***	***3,105***	***3/4, 5/8, 1/2***
2022	***313,446***	***1900***	***941,377***	***3,105***	***5/8, 1/2***

2.4.2 Erroneous Non-Irrigated Acres for TFCC included in RISD November Actual Demand Shortfall Calculation

As detailed in section 2.1.2 the Department reverted to using out-date irrigated acres for TFCC in their calculation of CWN for RISD starting in 2011. Based on the most current and accurate irrigated acres from IDWR's irrigated dataset I recalculated CWN for the November actual DS and show the difference

in Table 2-9. For the TFCC acres in my analysis I used IDWR's 2011 irrigated lands dataset for years 2011-2016, IDWR's 2017 irrigated lands dataset for years 2017-2020, and IDWR's 2021 NRT METRIC acres for years 2021-2022. This shows that the erroneous use of non-irrigated acres for TFCC results in up to 84,732 af in demand shortfall.

Table 2-9. IDWR Hindcast of November Actual Demand Shortfall based on IDWR RISD with out-dated TFCC acres applied to CWN and Lynker's Corrected RISD with most current TFCC acres

Year	Nov Actual DS (AF)- IDWR Calculation outdated acres	Nov Actual DS (AF)- Lynker Calculation updated acres	Erroneous Shortfall Volume
2011	*0*	*0*	-
2012	***139,524***	***114,248***	***25,276***
2013	22,588	22,588	-
2014	0	0	-
2015	***92,246***	***20,596***	***71,650***
2016	***7,853***	***0***	***7,853***
2017	0	0	-
2018	***10,996***	***0***	***10,996***
2019	0		-
2020	0		-
2021	***190,816***	***150,286***	***40,530***
2022	***276,551***	***191,819***	***84,732***

2.4.3 Bias in April and July Forecast Supply Models

The forecast supply models predictions are used to predict in April Snake River natural flow volumes for diversion by each SWC entity. To protect the senior SWC water rights each prediction of natural flow is reduced by one standard deviation. Where DS=FS-RISD, this decrease to the FS directly amounts to an equivalent increase in the DS calculated. There was not time prior to my writing of the Expert Report but I would have evaluated this bias in Forecast Supply with respect to the IDWR Hindcast presented in the previous sections.

Table 2-10. April Reduction to Forecast Supply Models for Natural Flow available to SWC entities

SWC Member	April Reduction to FS Prediction (af)
A&B	19,828
AFRD2	32,595
Burley	15,579
Milner	3,221

SWC Member	April Reduction to FS Prediction (af)
Minidoka	17,968
NSCC	54,217
TFCC	47,368

2.4.4 Bias in 2018 BLY for Reasonable Carryover

There was not time prior to my writing of this Expert Report to analyze the need for the increased projection of reasonable carryover needs to the SWC with the use of 2018 as the BLY. However, based on a hindcast analysis presented to the 2022 TWG comparing the Fourth and the Fifth Methodology Orders for Reasonable carryover we can see, like with the April DS determination, the use of 2018 creates a huge difference in how often and the type of water years in which the SWC are determined to have a shortfall to their carryover needs. Figure 2-10 is IDWR's hindcast analysis showing annual carryover volumes for TFCC 1995-2022 under the Fourth Methodology Order (BLY 06/08/12) and the Fifth Methodology Order (BLY 2018). The highlighted carryover volumes indicate years where a shortfall to reasonable carryover would be determined. We can see that under the Fourth Methodology Order only 3 out of the 30 years would have resulted in a carryover shortfall and that these all occurred in very dry or dry years. Under the Fifth Methodology Order 19 out of the 30 years would have resulted in a carryover shortfall and that these occur even in average and above average years.Figure 2-1

			4th Amended Methodology	5th Amended Methodology
Name (AF)	Year	Water Natural Flow April - Sept (AAF)	TFCC (AF)	TFCC (AF)
	2001	2,968	29,917	29,917
	1994	2,319	38,696	38,696
	2007	2,220	39,999	39,999
Very Dry <3000	2021	2,623	33,582	33,582
	2013	2,721	22,419	22,419
	2002	2,775	46,825	46,825
	2023 Preliminary	2,806	31,125	31,125
	2004	2,855	58,813	58,813
	2003	2,921	0	0
	Average	2,788	31,041	31,041
	2016	3,032	21,439	21,439
	2000	3,059	56,536	56,536
	2010	3,108	46,343	46,343
Dry 3000 - 4000	2005	3,195	68,352	68,352
	2011	3,208	44,957	44,957
	2012	3,380	72,167	72,167
	2019	3,930	94,191	94,191
	2017	3,942	66,609	66,609
	Average	3,357	58,882	58,882
	2006	4,070	78,562	78,562
	1997	4,138	104,424	104,424
Average 4000 - 4500	2022	4,288	70,192	70,192
	1995	4,447	68,576	68,576
	1998	4,498	116,433	116,433
	Average	4,286	95,637	95,637
	2014	4,504	130,086	130,086
	2009	4,611	95,533	95,533
	2018	4,706	94,286	94,286
>4500 AAF	1999	4,949	191,501	191,501
	1996	5,581	111,459	111,459
	2017	6,139	169,862	169,862
	2011	6,347	129,757	129,757
	1997	7,007	156,976	156,976
	Average	5,559	127,436	127,436

Figure 2-10: IDWR hindcast analysis showing annual carryover volumes for TFCC 1995-2022 under the Fourth Methodology Order (BLY 06/08/12) and the 5th Amended Order (BLY 2018). The highlighted carryover volumes indicate years where a shortfall to reasonable carryover would be determined.

2.4.5 Other sources of Bias in the Methodology

There are a few other sources of bias in the Methodology that increase the Demand Shortfall determination. One is that is appears that not all of the recharge water in 2018 diverted through the SWC systems has been removed in the calculation of Demand for 2018. Potentially 9,000 af have not been accounted for and this directly increases the Demand Shortfall calculated every year with 2018 used as the BLY.

The Department does not account for supplemental groundwater use on mixed source lands which represents an additional supply to the SWC.

A critical problem is that the BLY selection criteria method will continue to create additional bias. Under the established BLY criteria, increases in diversion by SWC result in higher BLY demands. There is no examination of acreage or efficiency. It needs to be established that any increase in diversion by SWC entities is related to beneficial use on irrigated lands and not caused by decreases in project efficiencies or diversion of water to meet other needs like hydropower production. As mentioned in

section 2.2.3, and raised in both my 2015 and 2022 TWG comments a better approach would use forecasted flow at Heise or some alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

3 Simulation of Curtailment of Junior Groundwater Rights Using the ESPAM Model

3.1 Background

The Enhanced Snake Plain Aquifer Model version 2.2 (ESPAM2.2) is the current configuration used for IDWR modeling of the Eastern Snake Plain Aquifer (ESPA). The ESPAM was created with review and input from the Eastern Snake Hydrologic Modeling Committee (ESHMC).

A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.1 provides a detailed description of background on the ESPAM and development.

From the outset of the ESPAM modeling effort, it was recognized that there would be a need for future enhancements to the model as new information and modeling approaches became available. ESPAM version 2.2 is the current version released in 2021. Discussion regarding the scope of future enhancements began shortly after the release with a preliminary release target date for the next model in 2026. With each model version release potential objectives to advance the model are made with ESHMC input, not all of which are accomplished because there is either insufficient time, insufficient data or are generally considered a low priority.

3.2 Model Structure

ESPAM is developed in MODFLOW, a groundwater modeling environment developed by the U.S. Geological Survey (McDonald and Harbaugh, 1988; 2000). A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.2 provides a detailed description of the ESPAM model structure.

ESPAM2.2 was converted to MODFLOW-USG a code developed by the USGS (Panday, et al, 2013). While the MODFLOW-USG code supports a wide variety of structured and unstructured grid types and includes the ability to have multiples layers across the whole domain or in select areas of the model. ESPAM2.2 uses the same structured grid as ESPAM2.1. ESPAM2.2 is represented as a single layer with uniform thickness. In the ESPAM the aquifer is represented within a defined model boundary by individual model cells at a one-mile by one-mile uniform grid. The MODFLOW code solves the equations of flow between these cells to determine aquifer responses to changes in inputs or outputs. MODFLOW has the capability to represent anisotropy (where flow occurs in preferential directions), but this feature has not been used in any versions of the ESPAM.

Key differences between ESPAM2.2 and its predecessors include a longer study period (2008-2018), the adoption of METRIC data to estimate ET, structural changes including American Falls Reservoir area springs and spring fed river reaches and the addition of the Portneuf River. Additional work also included adding the Menan gage to separate the Heise to Shelley river reach, additional calibration targets for river reaches, finer spatial resolution for aquifer recharge from surface water irrigation

entities, calibration methods, and structural changes to drain boundaries of the Kimberly to King Hill reach. ESPAM2.2, like its predecessor ESPAM2.1 (released 2013) uses monthly stress periods.

3.3 Model Calibration Process

The typical development of a groundwater flow model involves creating a conceptual model and water budget for the system to be represented. These form the basis for the model structure and model inputs. After formulation of the model the next step in development is calibration. Calibration is a form of "history matching" wherein initial values of model parameters (such as transmissivity) are adjusted to achieve a better correspondence between historical targets (e.g., measured water levels and spring and river flows) and model-predictions.

A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.4 provides a detailed description of the ESPAM model calibration process.

The software program used to calibrate all versions of the ESPAM has been the model-independent Parameter ESTimation program (PEST) developed by John Doherty (Watermark, 2005). While the calibration of models with large numbers of parameters (such as ESPAM2.2) allows consideration of more factors affecting aquifer conditions, it increases the risk that any given PEST solution (i.e., an "optimal" set of parameter values) is not unique (Watermark, 2005). This means that there may be many other combinations of parameter values could produce a similarly minimized value of overall model error. This non-uniqueness creates one dimension of overall model uncertainty, which is discussed in more detail in a later section.

The parameters that PEST was allowed to adjust in ESPAM2.2 included aquifer parameters such as transmissivity and specific yield. In addition, PEST was allowed to manipulate a number of terms in the aquifer water budget where precise values could not be known (like recharge on non-irrigated lands and tributary valley underflow).

3.4 Model Uncertainty

Any groundwater model is necessarily a simplification from the real world. The simplifying assumptions must be made to model complex natural systems. ESPAM2.2 inherently has limitations and uncertainty. As noted by IDWR in the 2021 ESPAM2.2 Model Calibration report, water budget parameters are adjusted during calibration simultaneously with the aquifer properties transmissivity and specific yield, resulting in a non-unique solution. The calibration results for these aquifer parameters are affected by assumptions regarding the uncertainty of water budget parameters. The ramifications of this are discussed in more detail in a later section.

The courts have recognized ESPAM as the best science available. Accepting that does mean that the inherent uncertainty in the model should be ignored in its application. As IDWR notes in their 2021 report of ESPAM2.2 model predicted uncertainty:

> Acknowledgement and a general understanding of the uncertainty associated with predictions made by the ESPAM2.2 is important to guide the use of the model as a tool for water management and administration.

3.4.1 Overview of Model Uncertainty

Model uncertainty has several dimensions, and these have been described in various submittals to the ESHMC (e.g., Brendecke, 2009a,b; 2012). Essentially, the principal dimensions of model uncertainty are those associated with model conceptualization, with model input and with model calibration. While all of these dimensions are important, conceptual uncertainty is fundamental. No amount of data improvement, re-sampling or recalibration can correct errors stemming from incorrect (or simply incomplete) model conceptualization (Bredehoeft, 2005).

A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.6 provides a detailed description of ESPAM model uncertainty.

3.4.2 Examples of ESPAM2.2 Conceptual Model Limitations Leading to Uncertainty in near Blackfoot to Minidoka Reach Gain Prediction

The predictive uncertainty analysis of ESPAM2.2 carried out by the IDWR explores only a limited aspect of model uncertainty and does not quantify overall model uncertainty.

Fundamental to overall model uncertainty is the uncertainty associated with the conceptual model reflected in ESPAM2.2. The predictive uncertainty analysis relies on a single conceptual model and does not explore uncertainty that arises from improper conceptualization of local geology and hydrologic conditions that influence discharge to the near Blackfoot to Minidoka Reach.

The ESPAM2.2 configuration with a single layer model representation is not adequate to represent the hydrogeologic controls on groundwater discharge to the near Blackfoot to Minidoka Reach. Several hydrogeologic studies were summarized by Ralston Hydrologic Services (“Ralston”) in their report *Hydrogeologic Analysis of the Near Blackfoot to Neeley Reach of the Snake River* prepared for IDWR in 2008 (ATTACHMENT E). This report characterizes the hydrogeological conceptual model for the near Blackfoot to Neeley reach of the Snake River.

The Quaternary basalt near the center of the Snake River plain is generally considered to host a single unconfined aquifer where average hydraulic conductivity of the basalt is extremely high. The inter-fingering of Quaternary basalt flows with fine-grained sediments (i.e. Raft River Formation and American Falls Lake Beds) in the vicinity of the American Falls Reservoir results in an aquifer system composed of individual aquifers and confining units (aquitards). The presences of fine-grained sediments around American Falls Reservoir likely result in lower transmissivity compared to the aquifer to northwest where these materials are absent. Northeast of the reservoir a shallow gravel unit roughly parallel to the Snake River is present.

The presence of the fine-grained sediments (Raft River Formation and American Falls Lake Beds) likely act as restriction for southwestward ground-water flow in both the basalt and the gravel along the Snake River. This results in upward hydraulic gradients and groundwater discharge in the form of springs and river gains. The inter-fingering of the basalt and fine-grained sediments in the vicinity of the American Falls Reservoir and the distribution of the gravel deposits to the northeast is illustrated in Figure 3-1 and Figure 3-2.

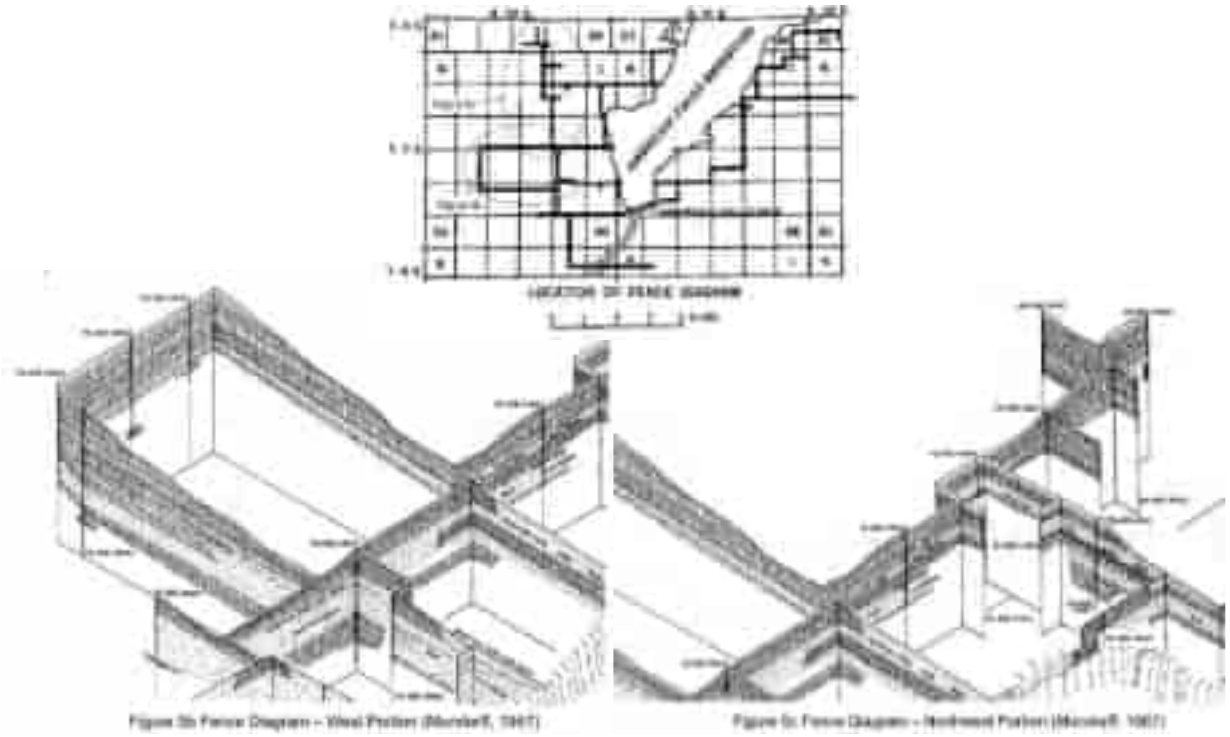

Figure 3-1: Excepts from Ralston (2008) Figures 5a,b,c showing Fence Diagrams of subsurface geology around the American Falls Reservoir from Mundorff (1967).

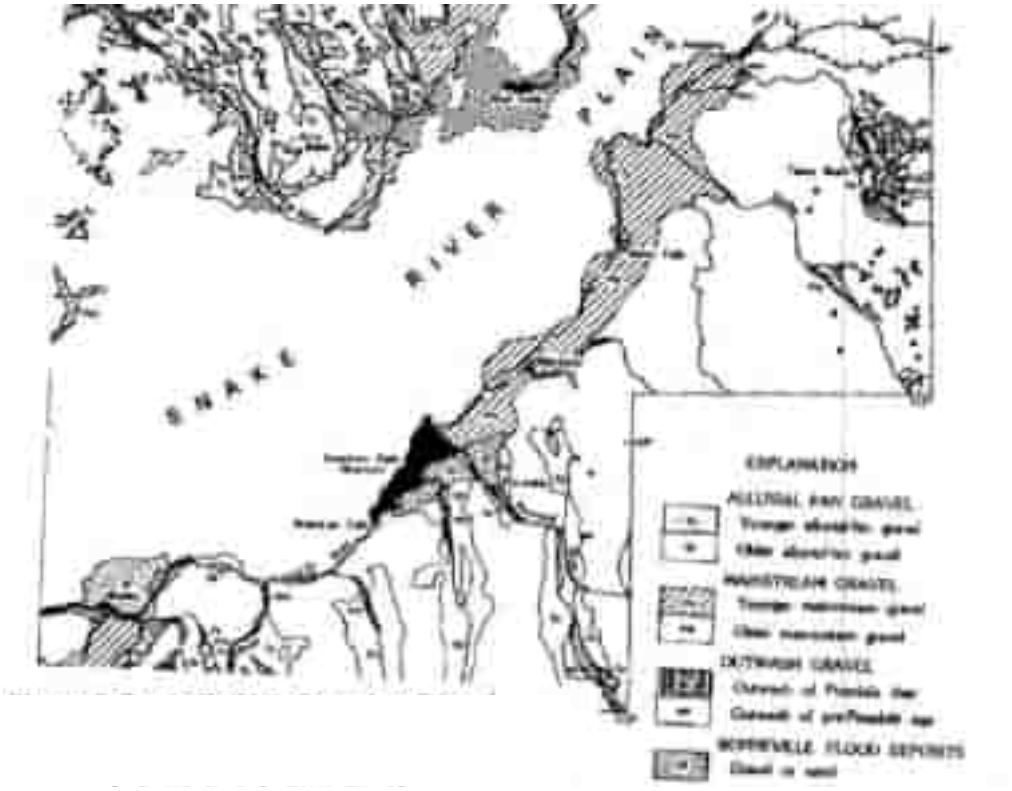

Figure 3-2: Except from Ralston (2008) Figure 8 of geologic map showing the gravel deposits along the Snake River by Piece and Scott, 1982).

These features mean that groundwater discharge to the near Blackfoot to Neeley reach is a function of the combination of water from shallow aquifers that are hydraulically connected to the basalt system of the main ESPA and vertical fluxes from the deeper aquifer units that are hydraulically connected. The magnitude of upward groundwater flow depends on the hydraulic gradient and the vertical hydraulic conductivity of the basalts and sediments in the areas. A single layer does not allow for the evaluation of vertical hydraulic conductivity or vertical flow within the aquifer or discharge characteristics of the individual springs or stream-gains areas.

The ESPAM2.2 transmissivity distribution (Figure 3-3) does not fit the know hydrogeologic characteristics of the region. Ralston (2008) describes how groundwater discharges to the Snake River in the near Blackfoot to Neeley reach because the transmissivity around and southwest of American Falls Reservoir is low compared to the upstream aquifer. The model should show high transmissivity representative of basalt and gravel dominated system north and northeast of American Falls Reservoir transitioning into low transmissivity representative fined-grained, sedimentary dominated system under the reservoir and to the southwest. Conceptual and calibration considerations should be made in the advancement of ESPAM2.2 to achieve a transmissivity array that better fits the hydrogeologic framework. In my recommendations for future improvements following the release of ESPAM2.2 I recommended an investigation to better understand groundwater gradients near the American Falls Reservoir reach.

3.4.3 Examples of ESPAM Input Parameters Leading to Uncertainty

As previously discussed, for ESPAM2.2 the water budget parameters like the ET rate for consumptive use by groundwater and components representing natural recharge to the groundwater system are adjusted during calibration simultaneously with the aquifer properties like transmissivity (T) and the aquifer storage specific yield (Sy), resulting in a non-unique solution. The calibration results for the aquifer parameters (T, Sy) are affected by assumptions regarding the uncertainty of water budget parameters.

ESPAM2.2 was adopted by the ESHMC following a vote in a September 9th, 2020 committee meeting. The Department had presented another version of the model for consideration to adopt as ESPAM2.2 in January 2020[2]. At the January, 2020 ESHMC meeting I presented an “impact analysis” of the proposed ESPAM2.2 version compared to ESPAM2.1 after my review of the model showed significant differences in model predictions, particularly for changes in water levels from simulated aquifer stresses. At the conclusion of the January ESHMC meeting it was decided that the validation run years (2015-2018) would be included in the ESPAM2.2 calibration, as well as, new irrigated lands maps (2015) to further evaluate the calibration results. At the September 2020 meeting IDWR again proposed a final ESPAM2.2 calibration with changes including updated water budget data through 2018.

3.4.3.1 ESPAM Aquifer Parameter Uncertainty ESPAM1.1 to ESPAM2.2

Figure 3-3 and Figure 3-4 below show the evolution of aquifer parameter distributions of transmissivity and specific yield, respectively, between ESPAM1.1, ESPAM2.1, ESPAM2.2 (proposed in January) and ESPAM2.2 (proposed in September and accepted as final).

[2]Based on calibration & modeling information provided to ESHMC September, 2019 and November, 2019

Compared to ESPAM2.1 the calibration results show a significant ESPA wide change of increased aquifer storage (Sy), as well as, generally lower aquifer transmissivity (T) that result in changes to pumping response functions and predicted stream depletion timing throughout the model domain.

Figure 3-5 shows the difference in simulated reach gains between ESPAM2.1 and ESPAM2.2 for the Departments 1/1/1961 curtailment scenario (Sukow, 2021). The ESPAM2.2 results in increased reach gains above Milner in response to curtailment. The near Blackfoot to Neeley reach shows one of the biggest increases overall with reach gains of 760 cfs and 931 cfs for curtailment of junior groundwater pumping to 1961priority date with ESPAM2.1 and ESPAM2.2, respectively. The percent difference is about 20%. The change in the steady state response function to the near Blackfoot to Minidoka reach between ESPAM2.1 and ESPAM2.2 is shown in Figure 3-6.

The Sentinel Wells which make-up the IGWA-SWC index for the 2015 Settlement Agreement were selected based on achieving the highest correlation (R^2~.63)[3] with the near Blackfoot to Minidoka reach gains. The aquifer level rise across the Sentinel Wells in ESPAM2.2 is about 50-60% of what was predicted with ESPAM2.1.

This changes between ESPAM2.1 and ESPAM2.2 illustrate the difference in predicted water level rise across the ESPA and modeled reach gains to the near Blackfoot to Minidoka from changes in aquifer properties transmissivity (T) and specific yield (Sy).

[3] Technique for Calculating Groundwater Level Index and Determining Compliance with Settlement Agreement Targets, August 8, 2016.

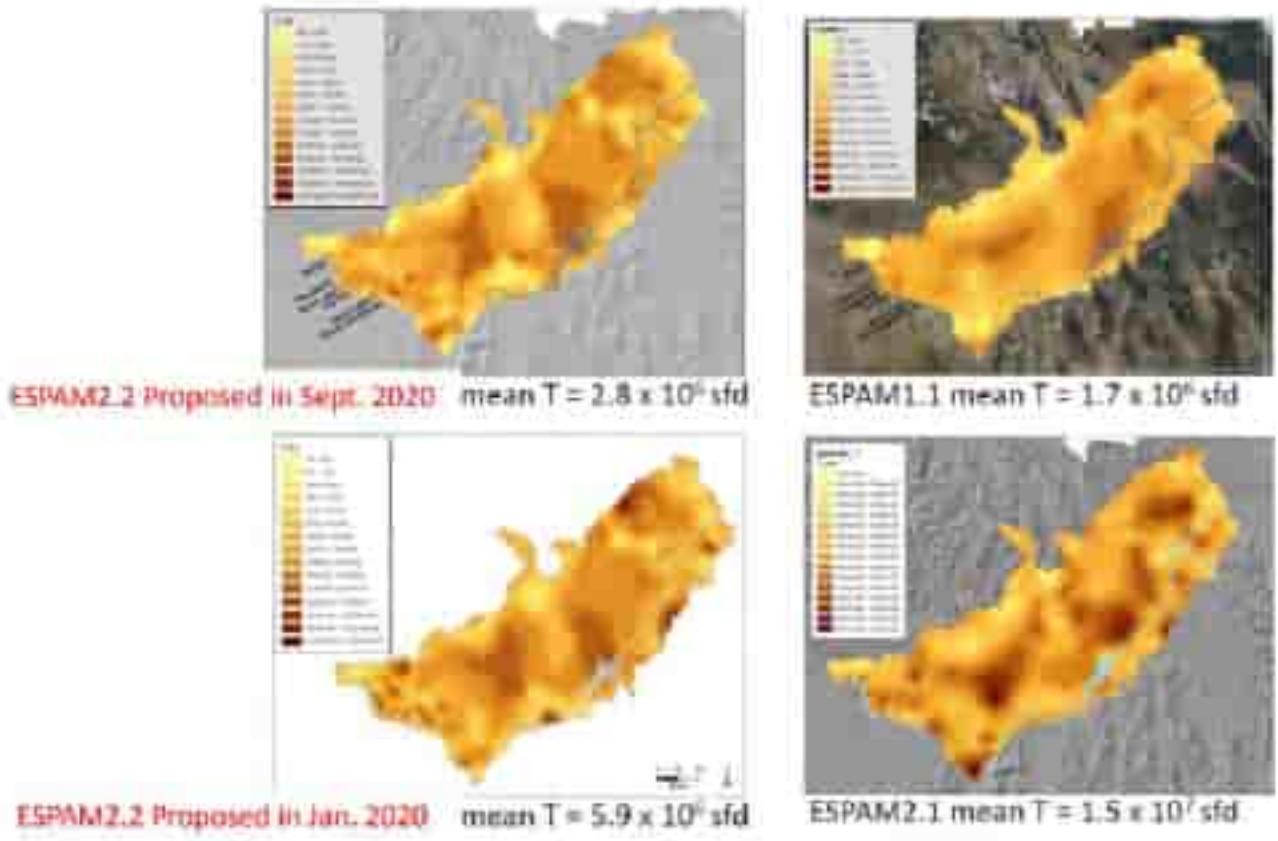

Figure 3-3: Transmissivity (T) changes ESPAM1.1 (UR), ESPAM2.1 (LR), ESPAM2.2 (proposed January 2020) (LL), ESPAM2.2 (proposed September 2020 (UL). Darker oranges indicate higher values, lighter oranges indicate lower values.

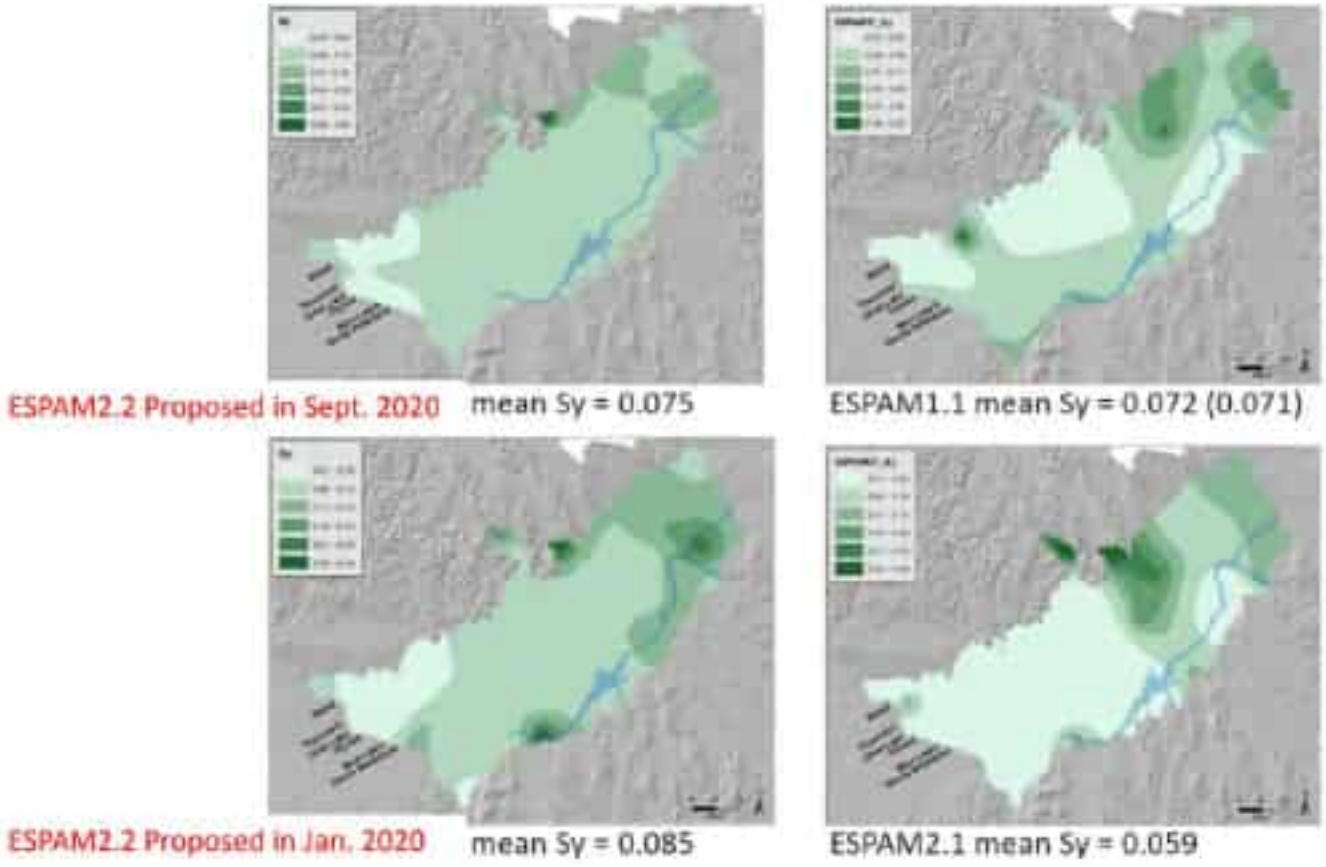

Figure 3-4: Specific Yield (Sy) changes ESPAM1.1 (UR), ESPAM2.1 (LR), ESPAM2.2 January (LL), September (UL). Darker greens indicate higher values, lighter greens indicate lower values.

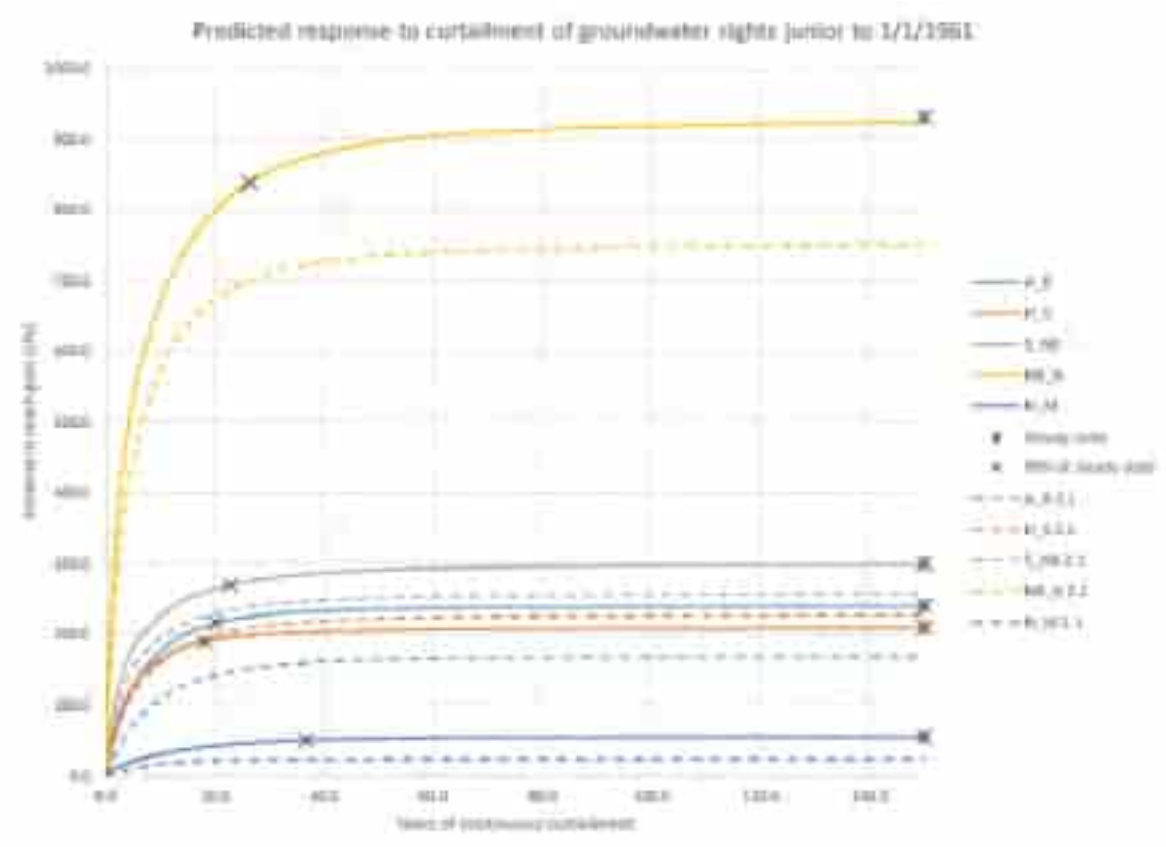

Figure 3-5: Changes in timing rate of river reach gains for ESPAM2.1 dashed line and ESPAM 2.2 solid line.

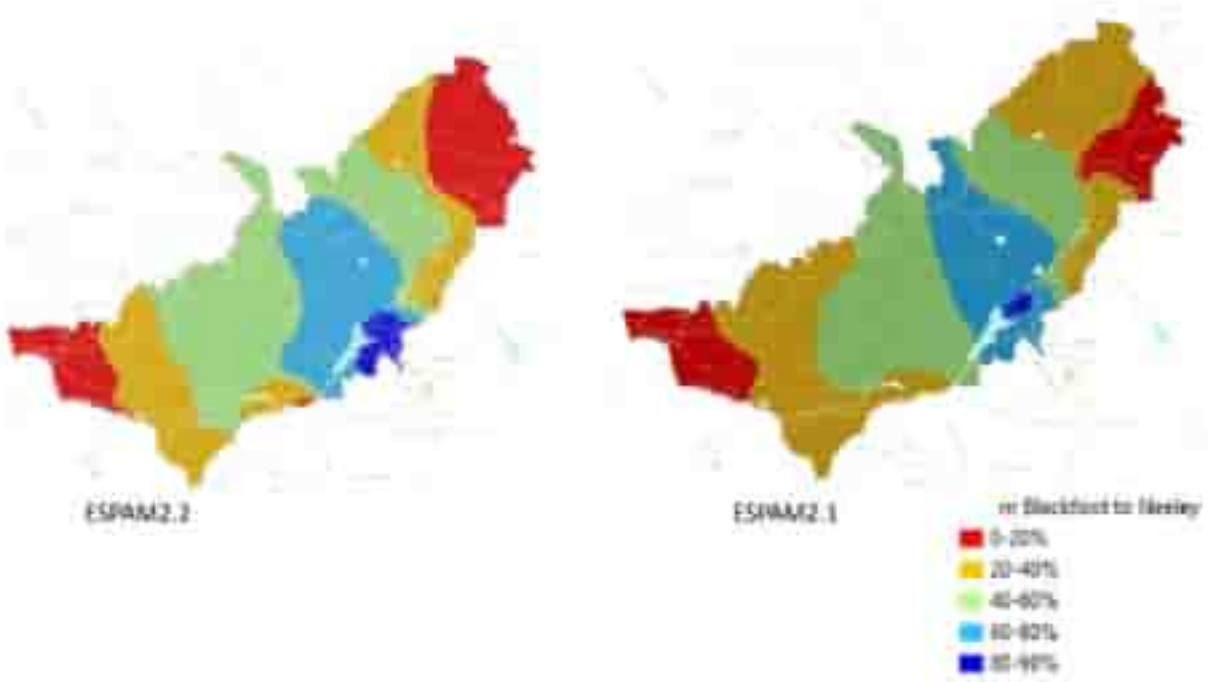

Figure 3-6: Changes in steady state response function for near Blackfoot to Minidoka river reach gains for ESPAM2.1(right) and ESPAM 2.2 (left).

3.4.3.2 ESPAM Water Budget Components Uncertainty ESPAM2.2

In ESPAM2.2 the aquifer parameters (T, Sy) and the water budget components (natural recharge, ET for consumptive groundwater use) are both adjusted during calibration. This means uncertainty in one of these components leads to uncertainty in the other. In the presentation of my impact analysis to ESHMC January, 2020 I was concerned about the change seen to aquifer storage following my review of the proposed ESPAM2.2 calibration, as shown in Figure 3-4. I did not believe the ESPA wide change in storage parameters could be explained by the localized structural model improvements and extending the period of record for the water budget components in ESPAM2.2. Because intermediary calibration results had not been presented to ESHMC it was impossible to parse out what change was leading to the new aquifer parameter distributions. I made the recommendation to the Department that ESPAM be calibrated a step-wise approach so we could understand the result of each major model change, as well as, sensitivity testing for 1) changes in the calibration approach and 2) the METRIC processing method used to calculate ET for groundwater consumptive use

It was my belief that only either a change in the calibration method (e.g. pilot point distribution, regularization, or parameter weighting) or the METRIC processing for the ET rate for groundwater consumption (one of the biggest water budget components) could be responsible for such wide spread changes in the aquifer parameter values between ESPAM2.1 and ESPAM2.2.

My only concern around changes to the calibration method was that a simple change in calibration procedures should not significantly change the entire model results or if it did we should understand why.

I had two main areas of concern regarding the METRIC processing for ESPAM inputs. First, I was part of the METRIC TWG in 2015 that developed the processing methods for the METRIC data. The Department's processing of METRIC data for ESPAM included using a 90-meter buffer around the irrigated areas that ultimately increased the rate of ET used when applied to the irrigated lands acreage. There did not appear to be a well-founded reason around the specific choice of 90-m. That is why I recommended a sensitivity test to explore the impacts of this choice on the model calibration. The second, was that when I reviewed the calibration analysis for ESPAM2.2 it was obvious that the calibration tool PEST was adjusting parameters in ways that seemed to be compensating for the rate of groundwater ET being too high. For example, the significant increase in aquifer storage (Sy). Another example is the PEST adjustments to sources of natural recharge across the ESPA. The pre- and post-calibration time-series for water budget components that make up natural recharge are shown in Figure 3-7. It is evident that post-calibration results are much higher, indicating that to match model results to observed values the calibration tool PEST is trying to get more water into the ESPA. Again possibly compensating for groundwater ET rates being too high. This is particularly evident when comparing the pre- and post-calibration results for tributary underflow and recharge on non-irrigated lands.



Figure 3-7: Annual volume of net aquifer recharge, tributary underflow and recharge on non-irrigated lands water years 1981 through 2018

When the Department ultimately accepted the September 2020 ESPAM2.2 calibration as final they sent notice to the ESHMC members asking for suggestions for areas of improvement for the next version of ESPAM. Again, I recommended (along with several other issues), that a sensitivity analysis for the METRIC ET processing be performed. This was voted as a priority by the rest of the ESHMC. January 2023 the Department gave a presentation to ESHMC on METRIC where initial findings were that when the Department processing of METRIC for ESPAM was compared to both to a field-scale investigation using groundwater diversion data and two openly available sources of METRIC ET (ssebop and eemetric) the Department's method was consistently too high. The Department consulted with METRIC experts and concluded that it was not appropriate to apply a 90-m outer buffer and that best practices would apply an inward buffer to ensure that the most accurate METRIC pixel value was applied for to the irrigated lands dataset acres. These processing alternatives were presented to ESHMC May 2023 along with the Department's preliminary recalibration of ESPAM2.2 using the no buffer processing method alternative. Based on the preliminary recalibration of ESPAM (unbuffET_mile_003) the distribution for storage (Sy) and Transmissivity (T) compared to ESPAM2.2 are shown in Figure 3-8. This shows that model storage on average is less than ESPAM2.2, as well as, transmissivity with the alternative METRIC processing.

As previously discussed, the uncertainty in the water budget components directly results in the uncertainty of the aquifer parameters because errors in the water budget can be compensated by changes in aquifer properties to ensure the best model fit for observed versus simulated results like reach gains. The comparison of water budget components pre-and post-calibration based on the preliminary recalibration of ESPAM2.2 using alternative METRIC processing are shown in Figure 3-9.

There are several water budget components where the difference between the METRIC processing method is evident. Tributary basin under flow and recharge on non-irrigated lands are both about 300K af lower compared to ESPAM2.2 and we see that these components need to be adjusted much less pre- and post-calibration. Recharge on surface water irrigated lands is increased by about 300k af. The consumptive irrigation requirement (CIR) on groundwater irrigated lands is about 500K af lower. These differences demonstrate the uncertainty in the water budget components of the ESPAM model including those directly related to curtailment of junior groundwater rights. These uncertainties in the water budget inevitably result in uncertainty in the aquifer parameters that control the timing and magnitude of near Blackfoot to Minidoka reach gains in the ESPAM2.2 simulation of curtailment of junior groundwater rights.

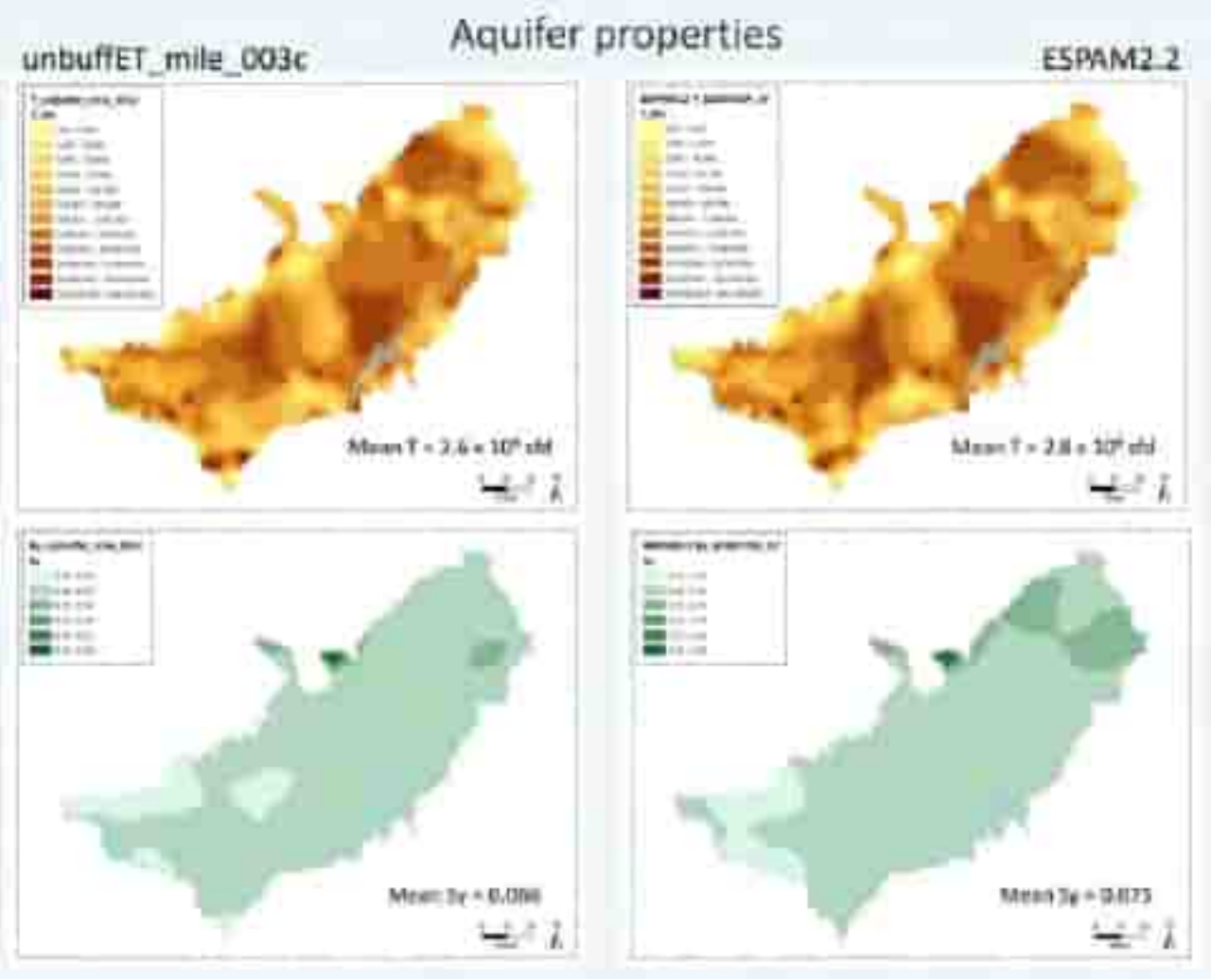

Figure 3-8: Comparison of Storage (Sy) and Transmissivity (T) distribution based on preliminary recalibration of ESPAM2.2 using alternative METRIC processing (model version "unbuffET_mile_003c"

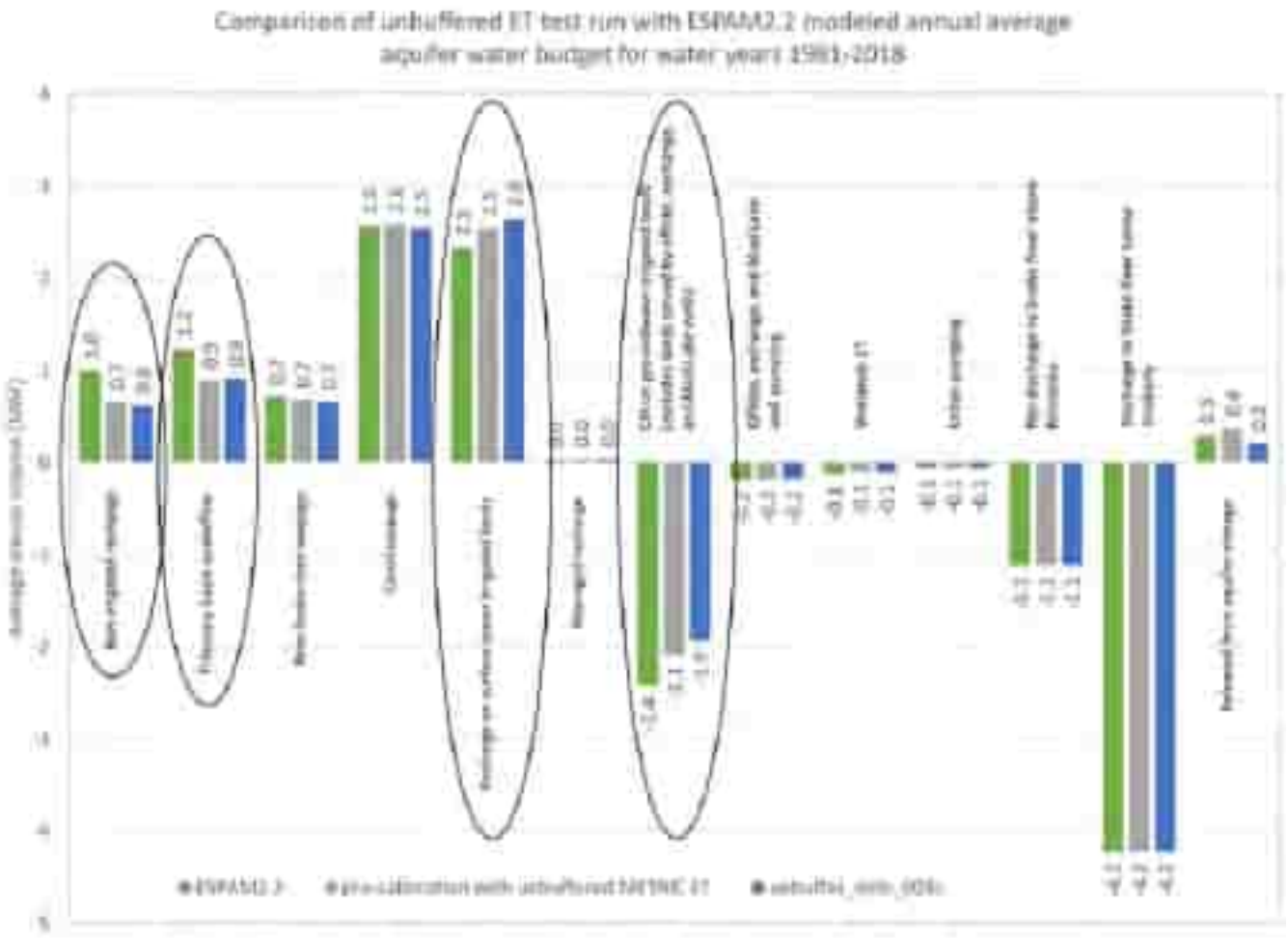

Figure 3-9: Comparison water budget components pre-and post-calibration based on preliminary recalibration of ESPAM2.2 using alternative METRIC processing (model version "unbuffET_mile_003c")

3.4.4 Conclusions on Model Uncertainty and the Application of ESPAM for Simulating Curtailment of Junior Groundwater Right for the Methodology

ESPAM2.2 is used in the Methodology to find the curtailment date of junior groundwater pumping that amounts to reach gains to the near Blackfoot to Minidoka reach of the Snake River equivalent to the Demand Shortfall calculated under the Methodology As-Applied Order. The Fifth Methodology Order transitions from a steady state to a transient ESPAM simulation to determine the amount of junior groundwater rights that must be curtailed for an in-season equivalent reach gain response to the Demand Shortfall. The April 2023 As-Applied Order determined a December 30, 1953 curtailment date and shows total proportionate share for all members of IGWA as 63,645 af.

IGWA requested that IDWR break the obligation down within IGWA by ground water district. As a response, IDWR provided the first two columns shown in Table 3-1. IGWA districts were interested in knowing the transient response given the curtailment scenario under the Fifth Methodology Order is now run using a transient ESPAM simulation. Jaxon Higgs provided the analysis but will be out of the country during the hearing and unable to testify. I reviewed the analysis and can testify to results

shown in Table 3-1. The IDWR MODFLOW wel input file was split by district based on their geographic boundaries as shown in Figure 3-10 and run with ESPAM2.2 to calculate individual district curtailment impact to the Near Blackfoot to Neeley reaches (SWC reaches) from May-September.

Table 3-1. Results of Jaxon Higgs Analysis on IGWA's Proportionate Share Related to Reach Gain Benefits and Acres Curtailed for the April 2023 As-Applied Order

GWD	IGWA % of IGWA's proportionate share	IDWR Portion of April 2023 predicted demand shortfall		Transient May - Sept Impact[1]	May - Sept Curtailed Volume[2]	Ratio of Curtailed to Benefit	Pr. to 12/1953[3]	District Total	% of Acres Curtailed	Baseline Volume[4]
	%	AF	%	AF	AF	AF	acres	acres	-	AF
American Falls Aberdeen	33.4%	21,214	35.2%	16,328	313,075	9:1	124,112	145,759	83%	285,815
Bingham	20.9%	13,184	17.8%	27,841	206,152	7:1	105,815	148,799	71%	277,011
Bonneville Jefferson	13.4%	8,469	11.3%	1,085	179,607	166:1	92,471	95,531	97%	158,133
Carey Valley	0.0%	1	0.0%	0.00	6,901	-	-	3,669	-	5,671
Henry's Fork	0.2%	90	0.1%	0.00	18,719	-	-	40,192	-	73,901
Jefferson Clark	10.8%	6,939	9.2%	69.9	247,700	3,547:1	111,792	174,099	64%	445,393
Madison	0.0%	4	0.0%	0.00	w/HF	w/HF	-	64,041	-	78,095
Magic Valley	16.1%	10,377	13.7%	23.1	227,879	9,856:1	98,110	137,469	72%	216,188
North Snake	5.1%	3,262	4.3%	0.00	217,151	3619,180:1	88,330	101,356	87%	208,795
Sub-Total	100.0%	63,645	84.6%	67,347	1,412,649	21:1	621,630	914,358	68%	1,787,002
GWD	-	-	-	0.02	153,292	7,684,585:1	-	-	-	-
No District	-	-	-	7,373.6	31,698	4:1	-	-	-	-
Grand Total				**74,720.8**	**1,597,639**	**21:1**				

1. Impact broken down by geographic boundary. Some non-members are included in each district. For example, the A&B usage is included in Magic Valley and North Snake GWDs. See accompanying map. Acre-ft rounded to 2 decimal places.
2. Total volume split geographically as described in note 1 from IDWR model input files from Jr12301953 run. Some slight conversion and rounding errors.
3. Acres provided by each district except Carey, Henry's Fork, and Madison. Based on breakdown of combined acres to provide effective acres per water right. 4. Baseline volume taken from 2022 Settlement Report submitted by IGWA to IDWR and the Surface Water Coalition. Represents average usage from 2010-2014.

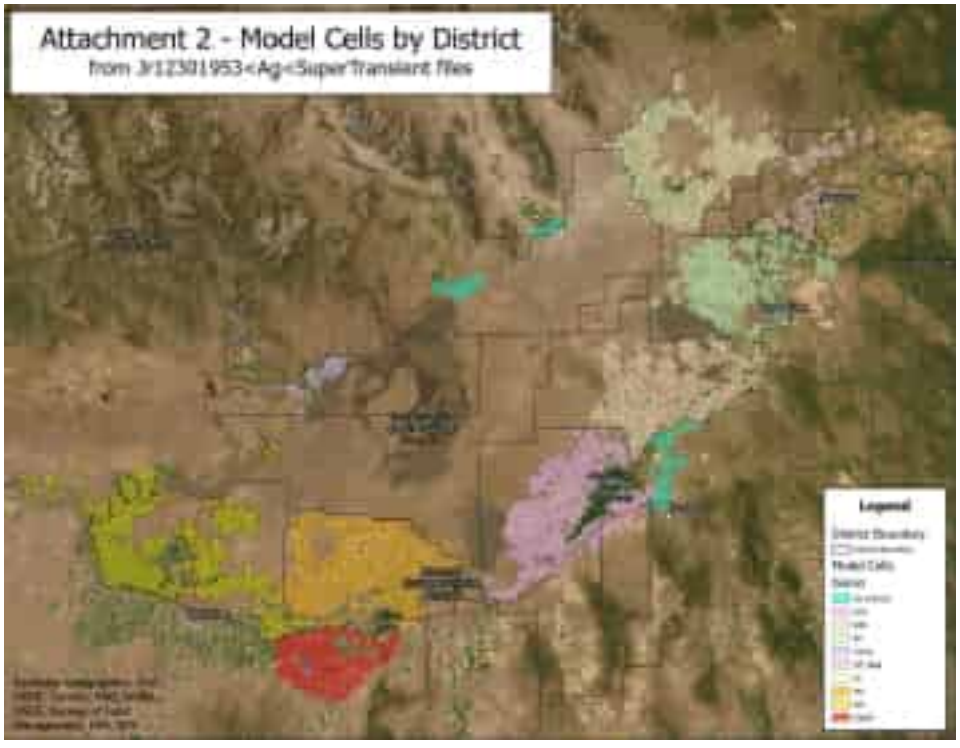

Figure 3-10: Distribution of junior groundwater pumping curtailed under 12/31/1963 priority date broken out by Groundwater District (Jaxon Higgs)

The results of Higgs' analysis show that the benefit to the SWC reach compared to the junior groundwater volume curtailed varies greatly by groundwater district. This is a result of their distance and hydrologic connection to the reach.

ESPAM2.2 is not sufficiently detailed in its representation of hydrogeologic conditions at the near Blackfoot to Minidoka reach to be used to accurately predict change in discharge due to curtailment of junior groundwater rights on the ESPA. Using ESPAM2.2 the number of junior groundwater acres that would be curtailed that do not have significant in-season benefits to the near Blackfoot to Minidoka reach is between 300,000-400,000 acres. The water from these rights will accrue to other connected river reaches, springs, without benefit to the SWC, or in years when the water is not needed. The wide-spread curtailment will, by any reasonable standard, result in waste of the resource.

ESPAM2.2 is highly simplified in the conceptual model in the near Blackfoot to Minidoka reach ignoring several critical hydrogeologic features that would make significant differences in predicted benefits of curtailment. The ESPAM water budget components related to junior groundwater use and the aquifer properties are uncertain and the variability in these components make significant differences in predicting benefits of curtailment. That ESPAM2.2 can fairly closely match observed discharge to the river is not proof that it represents the hydrogeological reality to sufficiently predict future behavior especially under aquifer wide water use conditions (e.g., curtailment of junior groundwater pumping).

If the Director uses ESPAM2.2 to quantify the benefits to the near Blackfoot to Minidoka reach from curtailment of junior groundwater uses, this quantification should reflect the substantial uncertainty in that model prediction and a trimline respective of the level of model uncertainty should be applied.

4 Summary of Conclusions

Irrigated Acreage

1. Evidence presented in prior hearings show a trend of decreasing irrigated acreage, particularly within TFCC due to urbanization of the City of Twin Falls and surrounding area. Beneficial use does not occur on acres that have been hardened or are otherwise not irrigated.
2. Every technical analysis of irrigated acres within TFCC consistently shows that TFCC is irrigating approximately 15,000 acres less than the 194,732 acre figure that TFCC reports to IDWR as being irrigated.
3. The Department is not using the best science available to determine irrigated acres in the Fifth Methodology Order, relying instead on outdated acreage figures provided by SWC entities.
4. The Department should implement a review process in Step 1 of the Methodology Order that compares the irrigated acreage figures reported by SWC entities with the irrigated acreage data in the most recent Irrigated Lands data set and/or using METRIC data. The Department should also account for supplemental groundwater use as a source of supply to SWC entities.

Baseline Year

5. The BLY demand for 2018 includes recharge water that has not been accounted for.
6. The BLY 2018 has total precipitation far below the average for the period of record.
7. Hindcast analysis show the BLY 2018 frequently predicts Demand Shortfalls for TFCC in years when TFCC is not actually short of water.

8. The BLY 2018 significantly increases the reasonable carryover demand shortfall in average and above average water supply years. No technical justification for this has been demonstrated.
9. In selecting the BLY, IDWR should consider a percent of average for SWC diversions within range of 97-101% and select an average of years closer to that of the BLY 06/08 (100%) and BLY 06/08/12 (101%) utilized in the First Methodology Order and Fourth Methodology Orders, respectively.
10. The average diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria and is 101% of total SWC diversion. This 06/18 average (or a synthetic diversion volume) should be used as the BLY as it represents 101% of average total SWC diversion.
11. A critical problem is that the BLY selection criteria utilized to date create excessive bias in favor of senior water users. Under the current BLY criteria, increases in diversion by SWC result in higher BLY demands, incentivizing SWC entities to divert more water than is needed to grow crops, and disincentivizing water conveyance efficiency. A new BLY method should be developed that accounts for non-irrigated acres , ensures that any increase in diversion by SWC entities is related to beneficial use on irrigated lands and is not caused by decreases in project efficiencies or diversion of water to meet other needs like hydropower production, and incentivizes water conveyance efficiency.

Forecast Supply

12. The forecast supply model for TFCC is degrading in its explanatory power based on regression data, resulting in inaccurate predictions for natural flow to TFCC
13. Box Canyon Springs discharge is not representative of discharge to the near Blackfoot to Neeley Reach. This should not be used in the April Forecast Supply Models.
14. Well 05S31E27ABA1 is not representative of groundwater conditions in the vicinity of the near Blackfoot to Neeley Reach. This should not be used in the July Forecast Supply Models.
15. A better alternative to the FS models could use forecasted flow at Heise or other model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

Model Uncertainty

16. . ESPAM2.2 is, like all models, a simplified representation of reality, and its predictions contain a degree of uncertainty.
17. ESPAM is a single-layer model which assumes the ESPA is homogenous and isotropic. By contrast, the hydrogeology in the vicinity of the near Blackfoot to Minidoka reach suggests the aquifer system is multi-layered with vertical gradients that result in discharge to the reach that require a multi-layered modeled with anisotropic properties. ESPAM's current inability to represent multiple hydrogeologic layers may result in substantial misrepresentation of flow conditions in some parts of the aquifer.
18. Fundamental to overall model uncertainty is the uncertainty associated with the conceptual model reflected in ESPAM2.2. The predictive uncertainty analysis relies on a single conceptual model and does not explore the uncertainty that arises from improper conceptualization of local geologic and hydraulic conditions of the near Blackfoot to Minidoka reach.
19. The large number of parameters adjusted during calibration of ESPAM2.2 increases the likelihood that the model in not unique.

20. ESPAM2.2 has demonstrable uncertainty in the aquifer parameters for transmissivity and specific yield which will impact the timing and magnitude of reach gains to the near Blackfoot to Minidoka reach simulated under the curtailment of junior groundwater rights.
21. ESPAM2.2 has demonstrable uncertainty in the water budget components, particularly consumptive use of groundwater, which impact the timing and magnitude of reach gains to the near Blackfoot to Minidoka reach simulated under the curtailment of junior groundwater rights.
22. The predictive uncertainty analysis of ESPAM2.2 carried out by IDWR explores only a limited aspect of model uncertainty and does not quantify overall model uncertainty.
23. That ESPAM2.2 can fairly closely mimic the observed past behavior of the near Blackfoot to Minidoka reach is not proof that it accurately predicts the effect of curtailment of junior groundwater pumping.
24. ESPAM2.2 is not sufficiently detailed in either its general formulation or its representation of hydrogeologic conditions in the vicinity of the near Blackfoot to Minidoka reach to be used reliably to predict changes in reach gains due to curtailment of junior groundwater rights on the ESPA.
25. ESPAM2.2 represents the surrounding geology to the near Blackfoot to Minidoka reach in highly simplified form, omitting several key features and that would make significant differences in predicted benefits of curtailment.

Transient Application of ESPAM

26. Under a transient simulation with ESPAM2.2, the benefit to the near Blackfoot to Minidoka reach in-season compared to the junior groundwater volume curtailed varies greatly by groundwater district. This is a result of their distance and hydrologic connection to the reach.
27. Using ESPAM2.2 the number of junior groundwater acres that would be curtailed that do not have significant in-season benefits to the near Blackfoot to Minidoka reach is between 300,000-400,000 acres. The water from these rights will accrue to other connected river reaches, springs, without benefit to the SWC, or in years when the water is not needed. The wide-spread curtailment will, by any reasonable standard, result in waste of the resource.

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ATTACHMENT A:

2015 TWG RECOMMENDED REVISIONS TO SURFACE WATER COALITION METHODOLOGY

State of Idaho
DEPARTMENT OF WATER RESOURCES
322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098
Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: www.idwr.idaho.gov

C.L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Director

MEMORANDUM

To: Gary Spackman, Director

From: Liz Cresto, Technical Hydrologist LC
Matt Anders, Technical Hydrologist MA

Date: March 16, 2015

Subject: Recommended revisions to the Surface Water Coalition Methodology

Introduction

On January 30, 2015, the Director of the Idaho Department of Water Resources (IDWR, Department) issued an order to staff directing them to convene a committee of experts to recommend specific technical changes to the "Second Amended Final Order Regarding Methodology For Determining Material Injury To Reasonable In-Season Demand And Reasonable Carryover" (Methodology) signed on June 23, 2010. Department staff created a committee in response to the Director's order composed of IDWR staff and experts representing parties involved in litigation of the Surface Water Coalition's (SWC) 2005 delivery call. In his January 30 order, the Director requested recommendations for technical changes to the Methodology by March 16, 2015, regarding the following specific issues:

1. Revising natural flow forecast methods for Twin Falls Canal Company.
2. Identifying more accurate and current crop data to determine crop water need.
3. Improving the mid-season reasonable in-season demand forecast.

Committee

The committee held multiple meetings and corresponded though email regarding the issues identified in the order. The committee comprises the following members:

Committee Member	Organization	Representing
Charles G. Brockway	Brockway Engineering	Surface Water Coalition
Chuck Brendecke	Lynker Technologies	Idaho Ground Water Users
Dave Shaw	ERO Resources	Surface Water Coalition
David Hoekema	IDWR	IDWR
Greg Sullivan	Spronk Water Engineers	City of Pocatello
Liz Cresto	IDWR	IDWR
Matt Anders	IDWR	IDWR
Scott King	SPF Water Engineering	Idaho Ground Water Users
Sean Vincent	IDWR	IDWR
Sophia Sigstedt	Lynker Technologies	Idaho Ground Water Users

The committee collectively decided that the most efficient method for consolidating member comments while still adhering to the March 16, 2015 deadline was to have committee members attach their comments to this memorandum. All of the committee members had an opportunity to review this memorandum and all of their comments that we received are attached in Appendix B.

Section 1 – Natural Flow Forecast

Background

The Methodology requires the Director to issue an order determining the demand shortfall of the SWC members for the irrigation season. The SWC members include A & B Irrigation District (A&B), American Falls Irrigation District #2 (AFRD2), Burley Irrigation District (BID), Milner Irrigation District (Milner), Minidoka Irrigation District (MID), North Side Canal Company (NSCC), and Twin Falls Canal Company (TFCC). The shortfall is the difference between the forecast supply and the forecast demand for each SWC member. The forecast supply is comprised of two components: the predicted natural flow supply and the predicted storage allocation for each SWC member. Pursuant to the Methodology, the Department undertakes an April forecast and mid-irrigation season forecast.

In the current Methodology, the April predicted natural flow supply is based on a regression analysis comparing the total natural flow in the Snake River near Heise between April and July to the annual natural flow diverted by each SWC member. While the Director only requested revisions to the natural flow forecast recommendations for TFCC, the committee also identified improved models for AFRD2, BID, MID, and NSCC through its work on revised natural flow forecast methods for TFCC. This memo includes recommendations for revising the April predicted natural flow supply forecasts for TFCC, AFRD2, BID, MID and NSCC.

The mid-irrigation season forecast is addressed in Step 6 of the Methodology. The forecast supply in Step 6 is the sum of the actual year-to-date natural flow diverted, plus the predicted natural flow supply for the remainder of the season, plus the actual preliminary storage allocation. The predicted natural flow supply for the remainder of the season was forecast by selecting an analogous year based on the Snake River Blackfoot to Milner reach gains. The selection of the analogous year typically occurred in August and a revised forecasted supply was issued. In working to meet the request of the Director's January 30 order, the committee reviewed a host of models that predict the natural flow supply for each SWC member from July 1 through October 31.

The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains which occur in the Snake River between the Blackfoot to Milner reach. The committee reviewed several different models for predicting both the April and mid-season natural flow supply for each SWC member. While many different predictor variables were considered, the following variables were ultimately selected: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Oceans Plateau SNOTEL site; Box Canyon Springs discharge; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The recommended model predictors vary by SWC member and by model implementation date (i.e. April 1 vs. July 1) and are summarized in the sections below.

April 1 Forecast

April forecast natural flow supply models were developed using data from 1990 through 2013. Data from 2014 was excluded from model development for two reasons: 1) the dataset for 2014 was still provisional at the time of model development and 2) record rainfall in August of 2014

resulted in significant data anomalies. For these reasons, we decided to exclude 2014 values from the dataset.

Both single linear regression and multiple linear regression models were considered. We recommend that natural flow supply forecast for A&B and Milner continue to be based on single linear regression models, in which the natural flow at the Snake River near Heise is the predictor variable. We believe the natural flow at the Snake River near Heise is a good predictor because A&B and Milner have relatively junior water rights and typically only divert natural flow during the spring runoff events. When applied, the April 1 forecast will utilize the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation joint forecast of total natural flow in the Snake River near Heise from April-July. Alternative models were evaluated, but we found they added additional complexity without significantly improving the existing A&B and Milner models.

New multiple linear regression models are recommended to replace the existing regression models for TFCC, AFRD2, BID, MID, and NSCC. For these entities, the final predictor variables selected for their respective April 1 models included the total April through July natural flow in the Snake River near Heise and the total November to March discharge at Box Canyon Springs. The predictor variable, natural flow in the Snake River near Heise, was considered a good indicator of the natural flow supplied by snowmelt runoff. The predictor variable, Box Canyon Springs, was considered a good indicator for the natural flow supplied by the reach gains in the Blackfoot to Milner reach. If applied, the April 1 forecast models will utilize the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation joint forecast of the natural flow in the Snake River near Heise from April-July.

Below is a table comparing the models used in the current Methodology to the recommended models. The recommended models for each member of the SWC have a better model fit (higher adjusted r^2) and a lower standard error than the models used in the current Methodology.

SWC Member	Models from Current Methodology[1]		Recommended Models	
	Adjusted r^2	Standard Error	Adjusted r^2	Standard Error
AFRD2	0.8317	39,700	0.8448	37,290
BID	0.7964	20,690	0.8546	17,100
MID	0.7896	29,710	0.8788	22,070
NSCC	0.8952	63,560	0.9151	55,950
TFCC	0.5416	71,990	0.8564	37,940

Appendix A contains graphs of the April models in comparison to the actual natural flow diversions for each SWC member.

July 1 Forecast

Step 6 of the Methodology requires the Department to issue a revised forecast supply "approximately halfway through the irrigation season". New natural flow predictor models have been developed for each SWC member for the specific period July 1 – October 31. We recommended that the July 1 models be implemented when revising the forecast supply in Step 6 of the Methodology.

Using data from 1990 to 2013, regression models were developed for A&B, AFRD2, and Milner by comparing snow water equivalent at the Two Oceans Plateau SNOTEL site on July 1 to the total

[1] Final Order Regarding April 2014 Forecast Supply, April 18, 2014.

natural flow diverted for the period July 1 through October 31. Data from 1997 was excluded from model development because of significant data anomalies as of a result of the high runoff year. The snow water equivalent at the Two Oceans Plateau SNOTEL site was considered a good indicator of additional natural flow diversions after July1. Years with zero (0) snow water equivalent on July 1 were excluded from the model dataset. It is recommended that in years with zero (0) snow water equivalent at the Two Oceans Plateau SNOTEL site on July 1, the predicted natural flow supply for the period July 1 – October 31 for A&B, AFRD2, and Milner will also be zero (0). For A&B, AFRD2, and Milner, the regression models would only be used in those years when the July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site is greater than zero.

Multiple linear regression models were developed for BID, MID, NSCC, and TFCC. The regressions for BID, MID, and NSCC were developed with data from 1990 to 2013 and correlations were developed between the total natural flow diversions from July 1 through October 31and three predictor variables: (1) natural flow in the Snake River near Heise (April – June), (2) snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15, and (3) March depth to water at well 05S31E27ABA1. Manual well measurements were historically taken from March 13 to March 30, with an average date of March 23. A transducer installed in May 2010 replaced the need for manual measurements. The combination of historical manual measurements and March 23 transducer readings will be utilized in the models.

The regression model to predict TFCC natural flow diversions from July 1 through October 31 relies on data from 1990 to 2013 and utilizes three predictor variables: (1) natural flow in the Snake River near Heise (April – June), (2) snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15, and (3) Spring Creek total discharge (January – May). Below are summary statistics for the recommended models.

	Regression based on Two Oceans Plateau Snow Water Equivalent		Multiple Linear Regression	
SWC Member	Adjusted R^2	Standard Error	Adjusted R^2	Standard Error
A&B	0.9294	741		
AFRD2	0.8699	7,502		
BID			0.8932	11,480
Milner	0.6382	2,939		
MID			0.9037	15,720
NSCC			0.8615	46,930
TFCC			0.8511	29,270

Appendix A contains graphs of the July predictor models in comparison to the actual natural flow diversions for each SWC member.

Section 2 – Current Crop Mix Data

Current Method

Crop mix is one of the variables used in the current Methodology to calculate the crop water need of the SWC members. Crop mix is defined as the acreage of each crop type grown by each SWC member. The current method for determining crop mix is a three step process:

1) Tabular crop acreages from 1990 to the present are downloaded by county from the USDA National Agricultural Statistics Service (NASS).

2) Based on the tabular data available from 1990 to the present, an average crop mix for each county is determined.

3) The average crop mix of the counties is applied to each SWC member based on the proportion of land the SWC member has in each county.

Shortcomings of the current cropping pattern method include: NASS tabular data is adjusted to protect farmer privacy and is becoming increasing incomplete with fewer acreage totals being reported since 2005, average acreages for a 25-year period do not reflect current crop mix patterns, and county-wide crop mix may not represent the crop mix of SWC members.

Recommended Revision

Based on testing and with consideration of input from the committee, we recommend revising the method for determining crop mix. Instead of relying on county-wide tabular data, we propose using the digital Crop Data Layer (CDL) from the USDA National Agricultural Statistics Service (NASS). Benefits of this proposed method include: (1) using the most recent data available; and (2) restricting the geographic area of the data to the service area of each SWC member. The proposed method would involve the following steps each year:

1) Downloading the digital CDL dataset from the NASS website.

2) Removing crop type classification errors (speckling) in the CDL dataset with Zonal Statics in ArcGIS. A potential source of error associated with the Zonal Statics process is the intermittent availability of an annual field boundary dataset. However, our review of field boundary datasets and historical aerial photography revealed that field boundaries change infrequently and substituting field boundary datasets from previous years introduces minimal error. An additional possible source of error associated with the Zonal Statics process is the assignment of a single crop type to fields actually planted with multiple crop types. With respect to this concern our qualitative review of historical aerial photography and CDL datasets establishes that fields with multiple crops are rare and we conclude this concern represents a minimal source of error.

3) Clipping the CDL dataset in ArcGIS with an irrigated lands dataset for each SWC member.

4) Calculating the acreage by crop type for each SWC member.

5) Computing a 3-year average by crop type for each SWC member. In our analysis we have found the seven years of CDL data that are currently available do not depict a clear relation between cropping pattern and water supply. Because of this finding, a 3-year average appears adequate to reduce the influence of a single year while still being representative of the current cropping pattern.

Our comparison of the results of the tabular and CDL methods establishes that making this revision will cause the percentage of crop types identified for each SWC member to change between 0 and 30 percent (table below). This range of adjustment appears plausible given the change from a 20-year to a 3-year average and from a county-wide geographic area to the service areas of SWC members. A preliminary comparison of the crop water need calculated using the CDL and METRIC indicates the CDL and METRIC are in general agreement.

Comparison of Crop Mix Derived From NASS Tabular and NASS CDL.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
Alfalfa	20.2%	42.5%	40.4%	27.6%	36.9%	14.0%	29.5%
	19.2%	26.5%	16.6%	20.9%	29.8%	22.4%	22.4%
Barley	11.6%	3.3%	3.7%	12.0%	11.9%	20.1%	12.7%
	31.1%	5.6%	4.3%	15.4%	13.2%	6.9%	10.8%
Corn	3.6%	5.7%	27.8%	14.9%	0.1%	2.0%	11.2%
	3.1%	28.1%	6.8%	11.2%	2.7%	31.3%	16.9%
Developed-Open Space	—	—	—	—	—	—	—
	0.9%	1.1%	3.0%	0.4%	2.0%	1.6%	2.6%
Developed-Low Intensity	—	—	—	—	—	—	—
	0.0%	1.4%	1.9%	0.0%	3.4%	0.9%	2.0%
Developed-Med Intensity	—	—	—	—	—	—	—
	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
Developed-High Intensity	—	—	—	—	—	—	—
	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Dry Beans	3.4%	4.4%	2.9%	9.2%	2.1%	3.6%	16.7%
	8.4%	2.5%	7.8%	13.0%	3.0%	3.6%	11.1%
Oats	0.2%	0.4%	0.4%	0.1%	0.8%	0.2%	0.2%
	0.1%	0.7%	0.1%	0.3%	0.2%	0.1%	1.0%
Pasture/Hay	—	—	—	—	—	—	—
	2.6%	17.1%	5.3%	1.6%	6.9%	11.9%	14.9%
Peas	—	—	—	—	—	—	—
	0.1%	0.0%	0.0%	0.4%	0.1%	0.1%	1.6%
Potatoes	12.2%	11.9%	10.2%	10.5%	7.1%	13.7%	6.3%
	6.7%	3.3%	10.7%	7.6%	11.9%	7.3%	2.7%
Spring Wheat	13.2%	5.2%	5.3%	8.3%	14.6%	15.0%	4.2%
	3.7%	3.7%	4.1%	3.7%	3.6%	1.8%	0.7%
Sugarbeets	12.6%	11.7%	4.0%	9.6%	12.0%	23.0%	6.7%
	18.7%	4.4%	20.6%	10.5%	11.9%	5.6%	3.0%
Winter Wheat	23.0%	14.9%	5.2%	7.5%	5.5%	8.4%	12.5%
	3.5%	5.5%	18.7%	15.0%	8.8%	6.5%	7.4%

—	Data not included in the NASS Tabular Data
Clear Cells	NASS Tabular Data: Average (1990-2010) % of Crop Harvested vs. Total Crops Harvested Irrigation District Wide
Shaded Cells	NASS CDL Data: 3-Year (2011-2013) Average Crop Pattern per SWC Member

Section 3- Reasonable In-Season Demand (RISD)

The committee began discussions on improving the mid-season reasonable in-season demand forecast. With the limited timeframe the committee was given, we were unable to conclude an analysis of methods to improve RISD forecasts. Because this analysis is not yet complete, we cannot currently recommend any changes to the current Methodology regarding this issue.

Section 4 – Future Committee Meetings

Committee members provided valuable technical input for revising the Methodology. We recommend continuing to convene this committee in the following manner:

1) At least one annual meeting to review implementation of the Methodology during the previous irrigation season. This would be an ongoing forum for identifying and reviewing potential technical revisions to the Methodology.

2) Multiple meetings during 2015 to finish reviewing the following subjects that were discussed by the committee, but require further discussion and analysis to develop a recommendation:

    a. Mid-season calculation of reasonable in-season demand (RISD): The current method uses average demand in 2006/2008 to predict the RISD for the remainder of the irrigation season. We are analyzing the potential for refining this predication by selecting a representative historical analogous year(s).

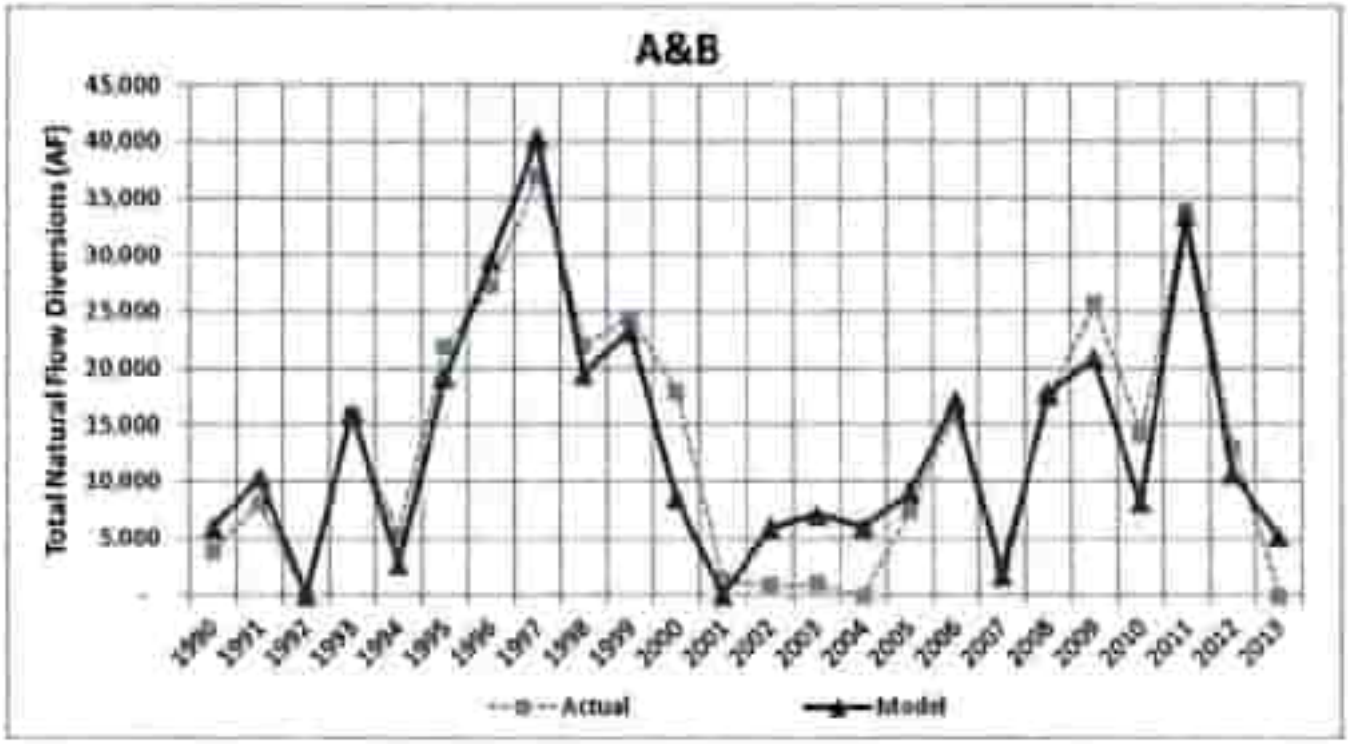
    b. Supplemental ground water use: There was insufficient time for the committee to evaluate this subject.

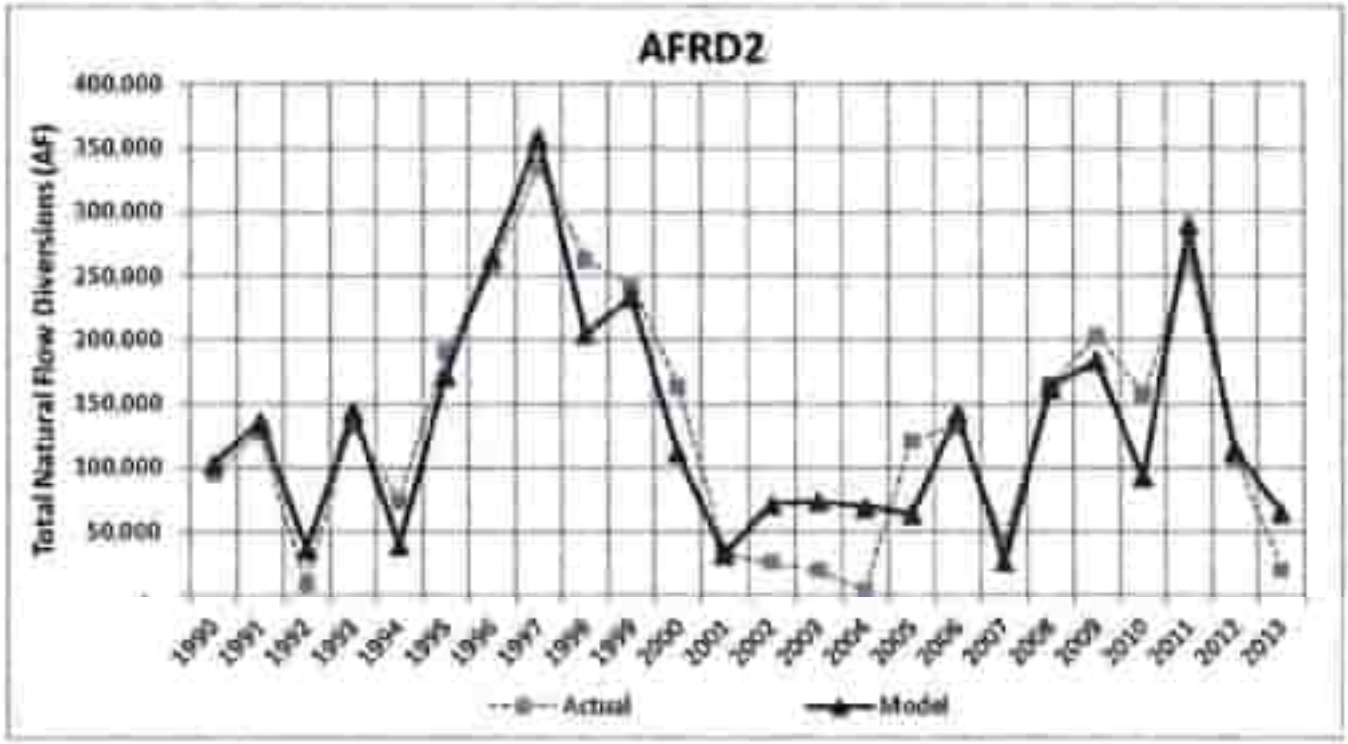
    c. Project efficiency: The project efficiency variable used in the RISD calculation has not been updated since the Methodology was originally developed. The committee had preliminary discussion about the need to update project efficiency and committee members expressed interest in providing input.

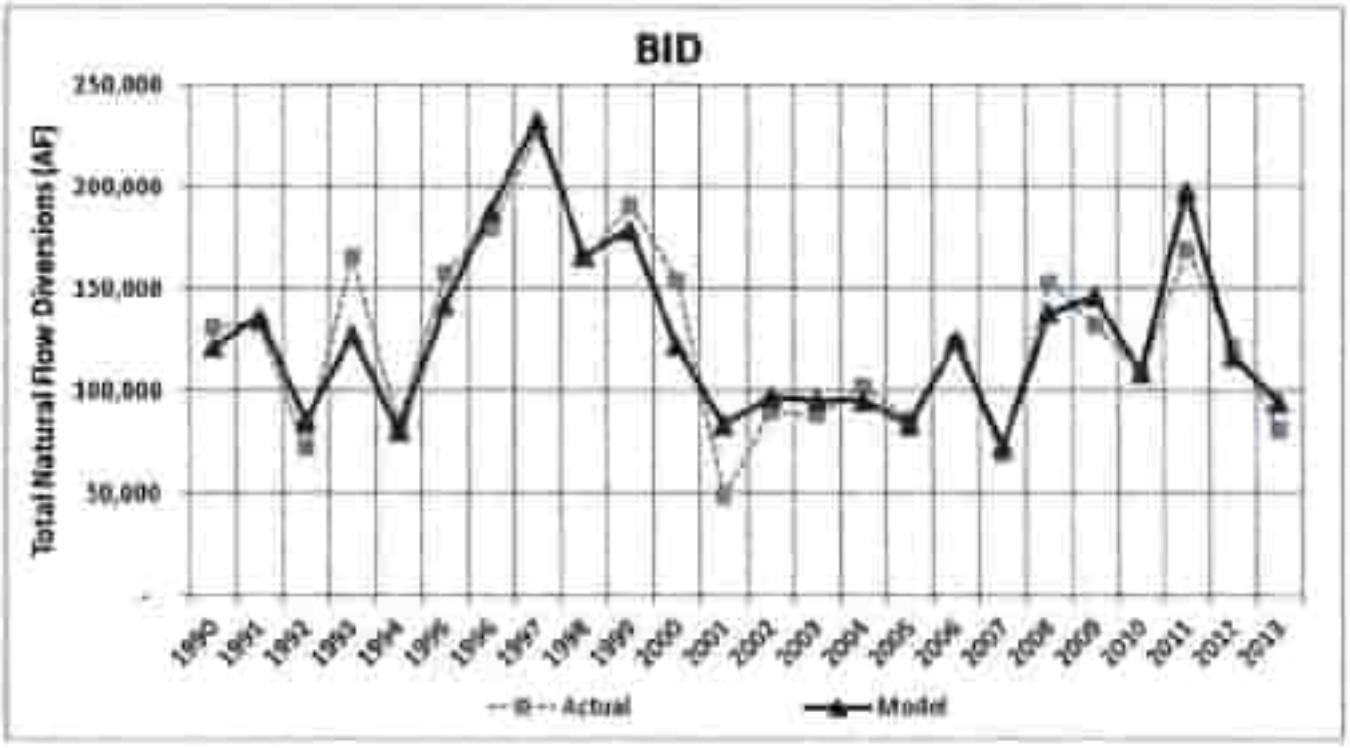
    d. Irrigated acres: Significant discussion focused on this topic and it was generally agreed that the process for determining irrigated acres for SWC members could be improved.

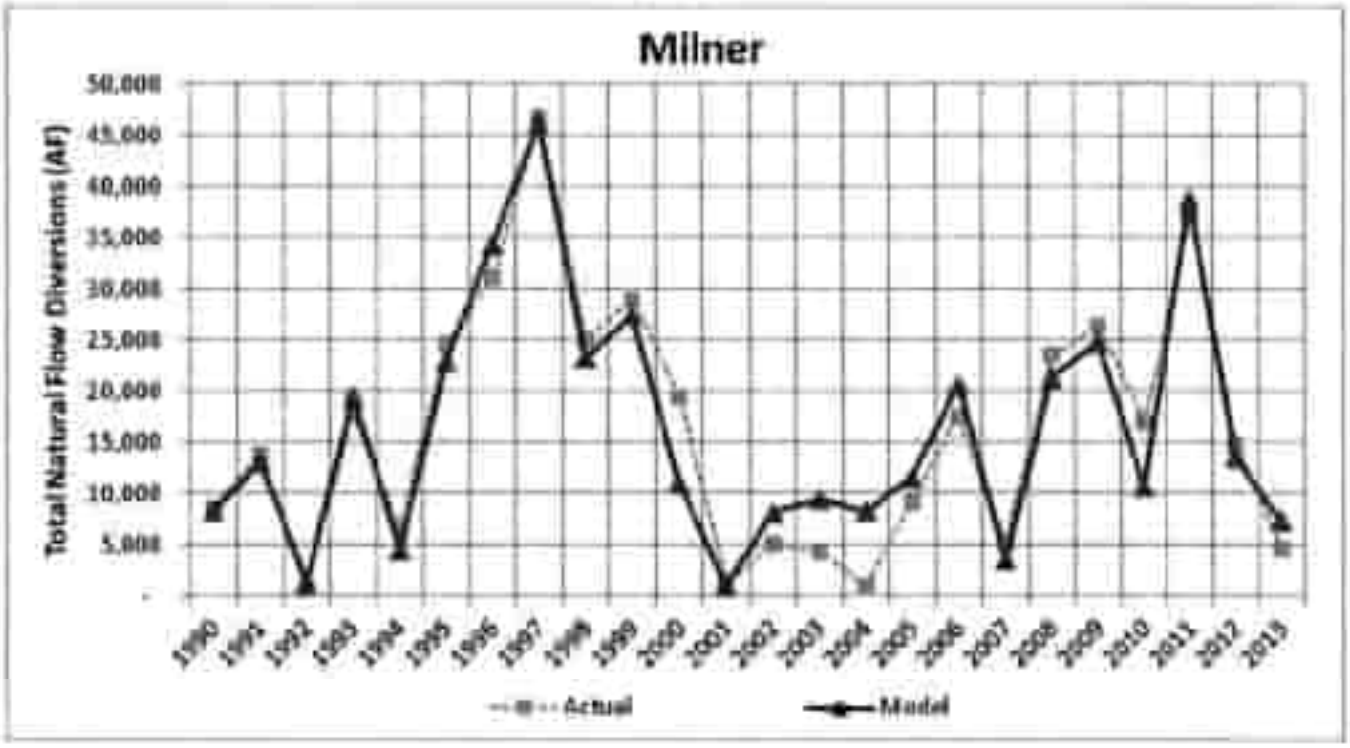
APPENDIX A

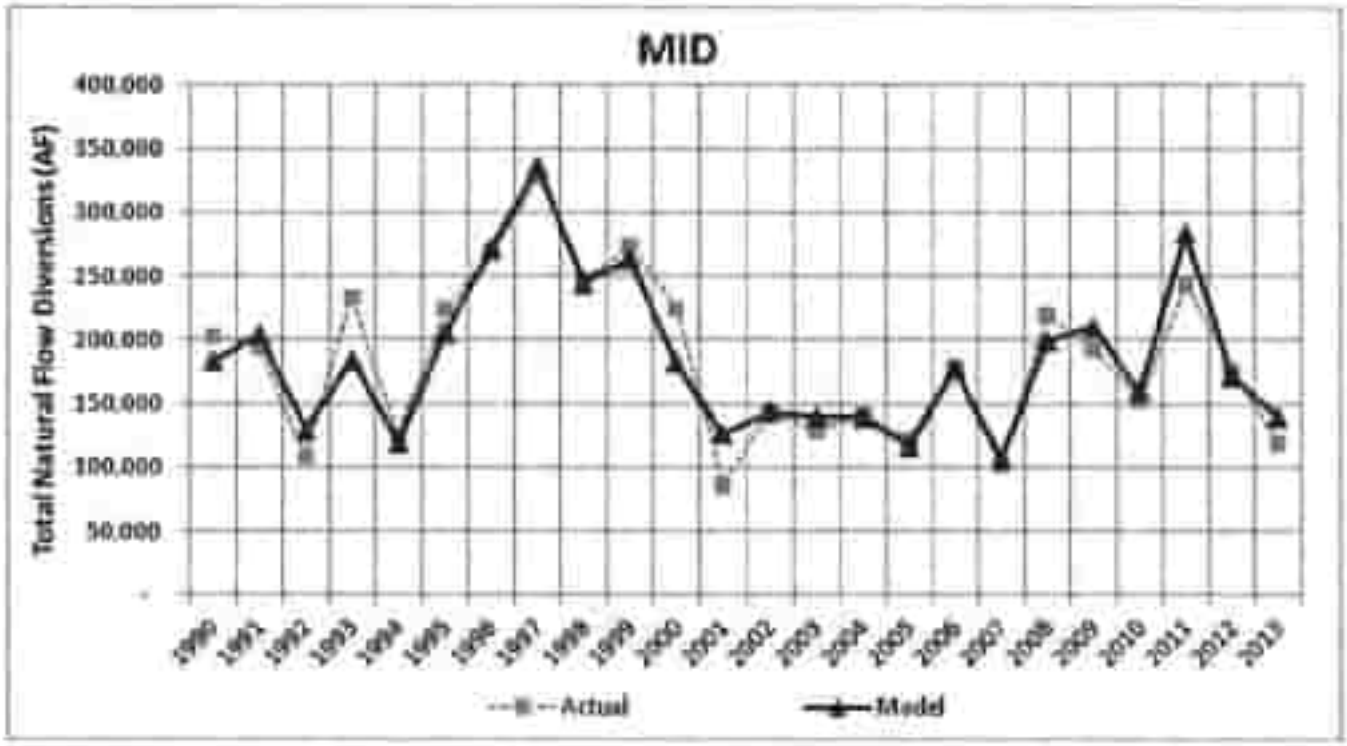
Recommended April Forecast Flow Predictor Models

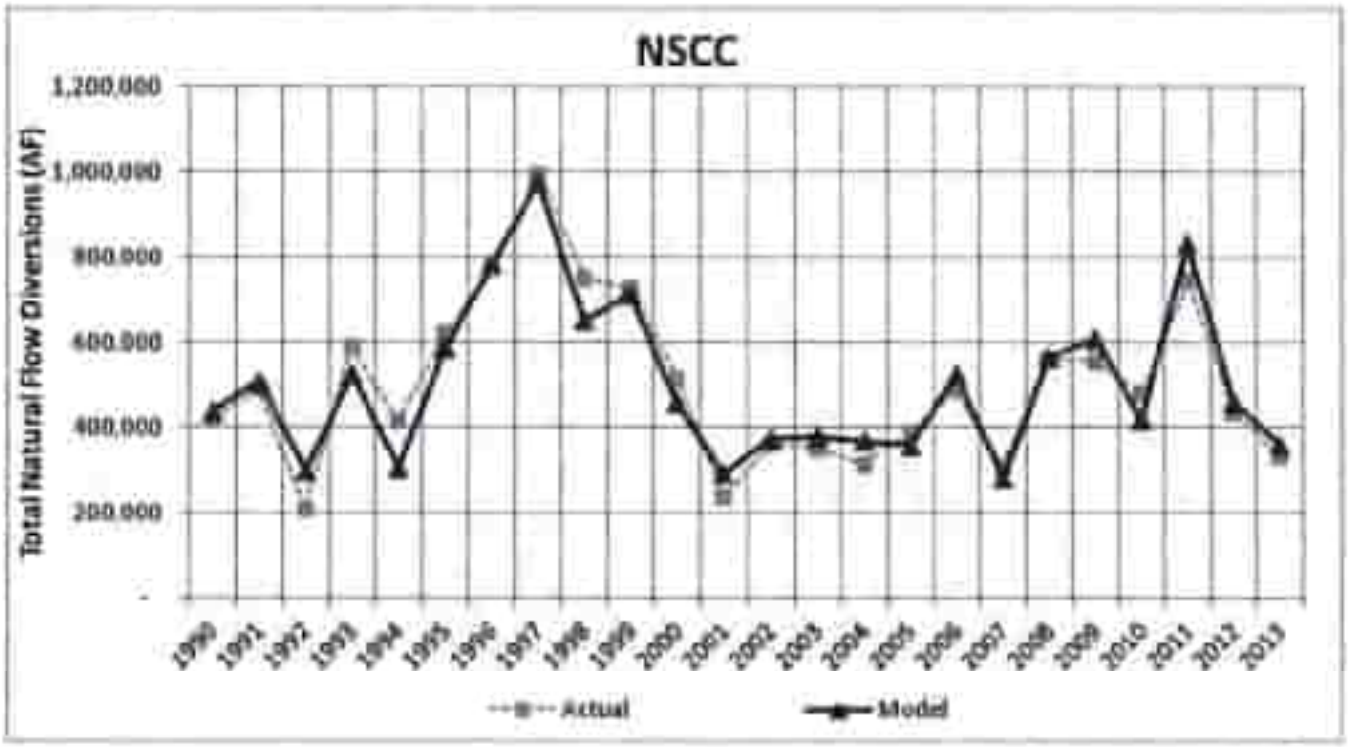


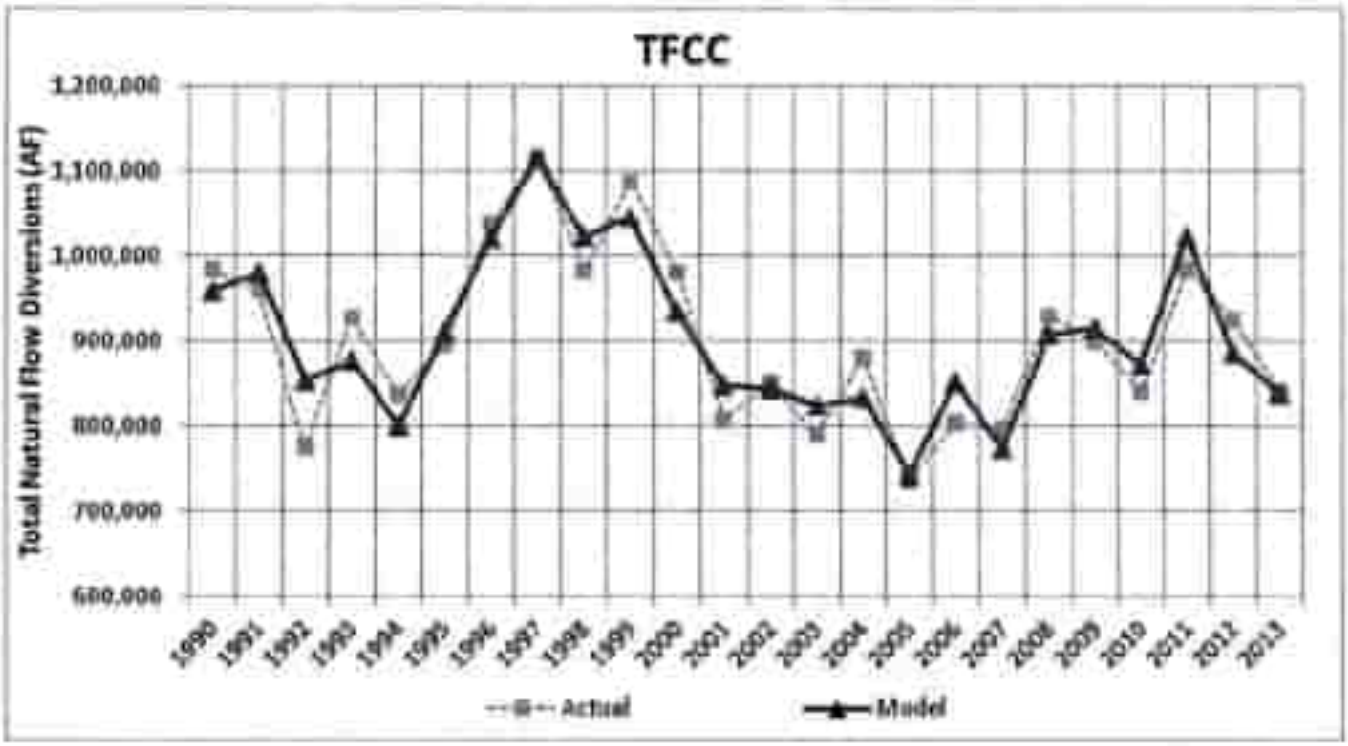



BID
Total Natural Flow Diversions (AF)
250,000
200,000
150,000
100,000
50,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

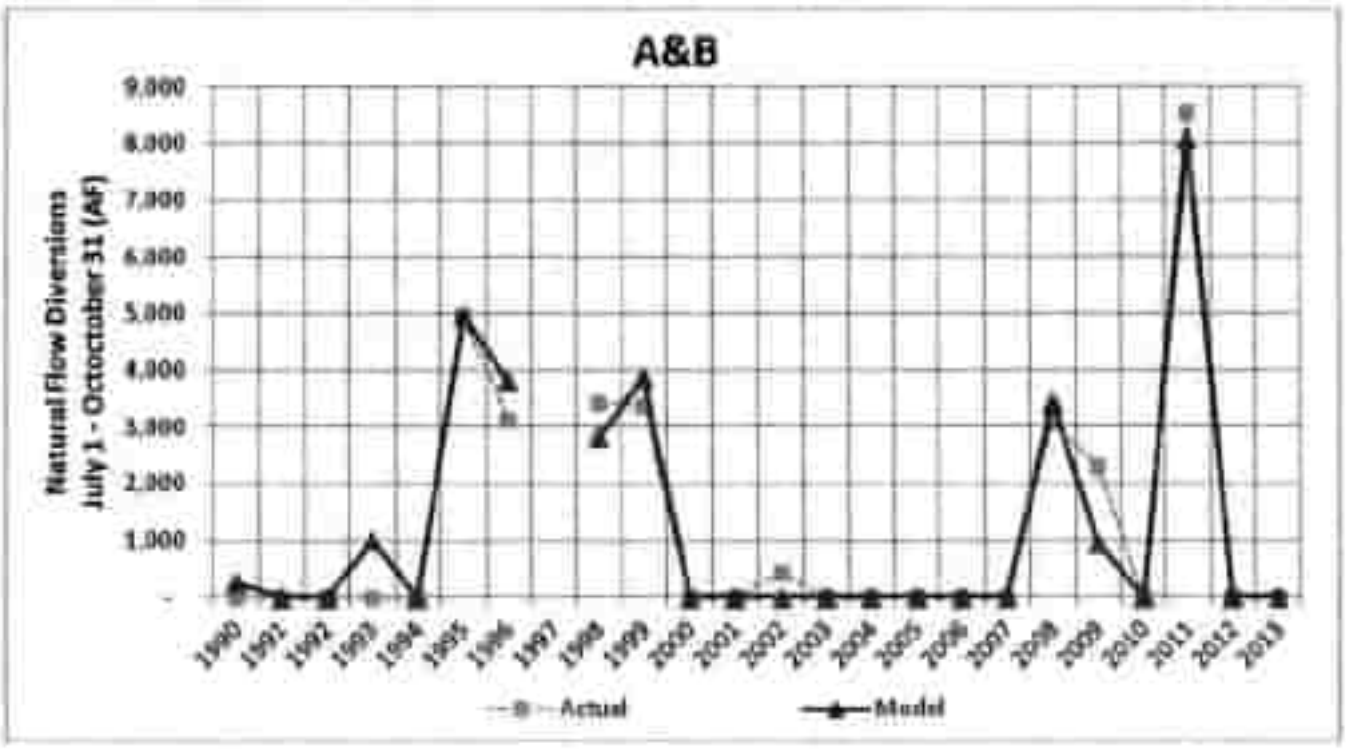

Milner
Total Natural Flow Diversions (AF)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

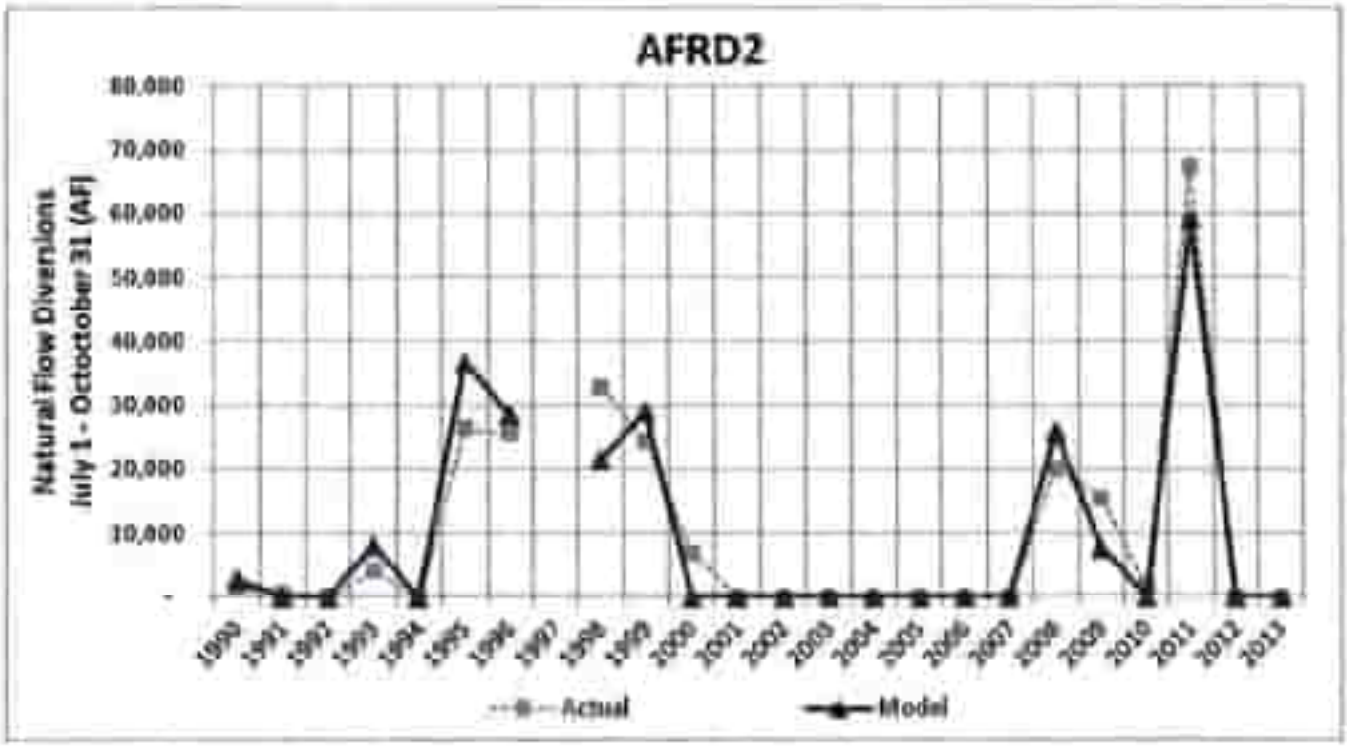

MID
Total Natural Flow Diversions (AF)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

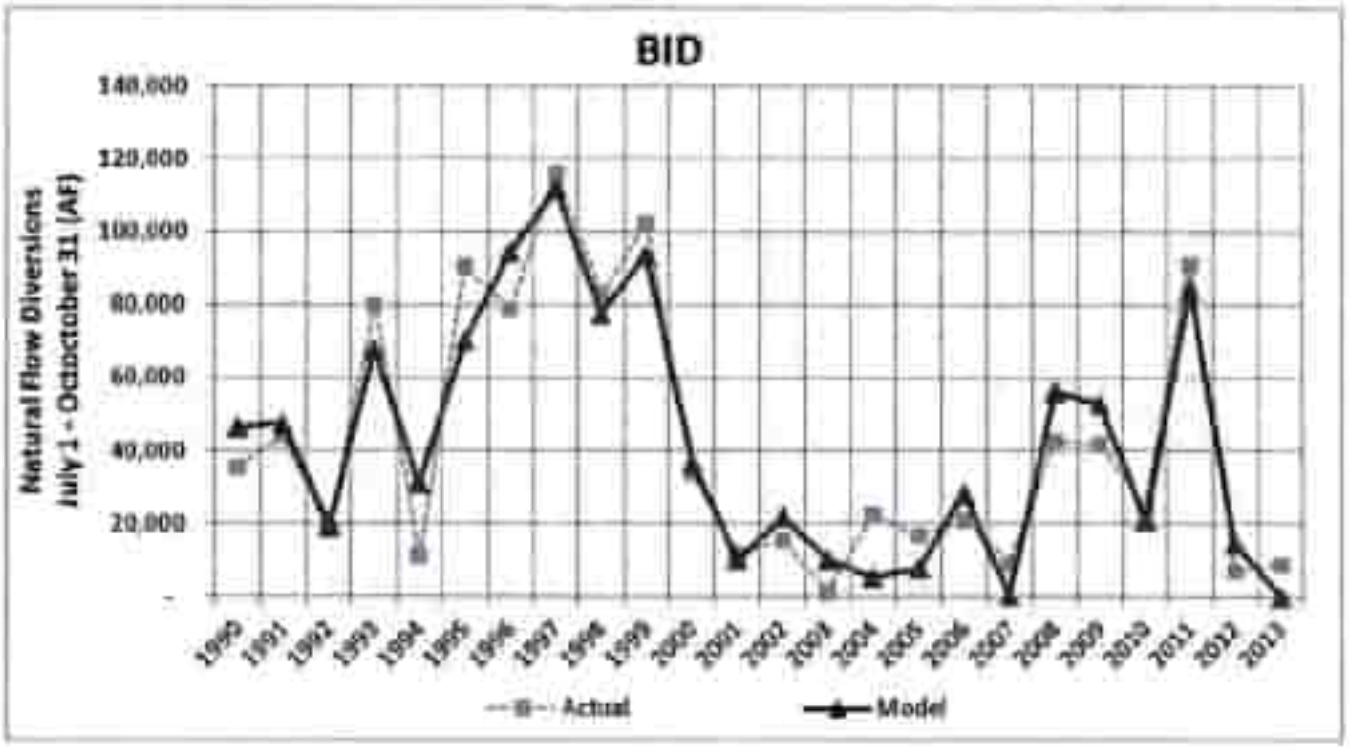

NSCC
Total Natural Flow Diversions (AF)
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

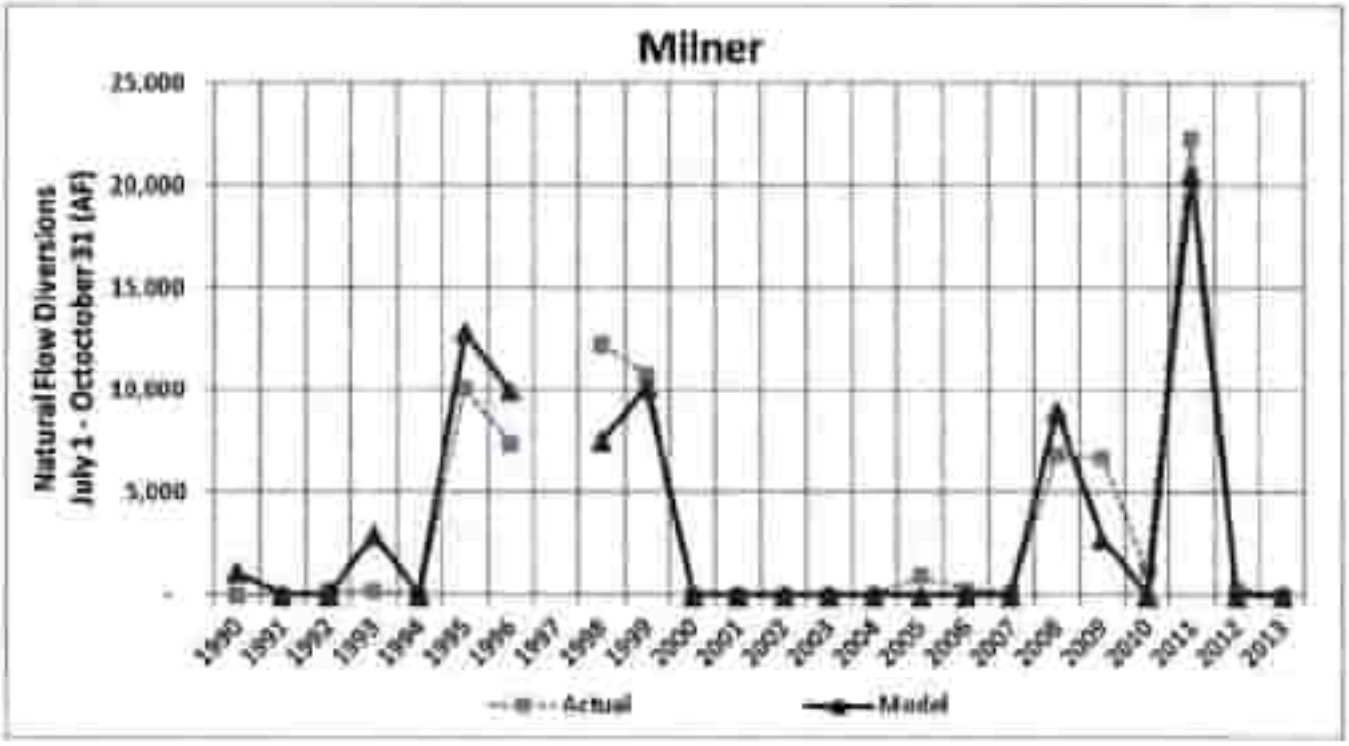

TFCC
Total Natural Flow Diversions (AF)
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model

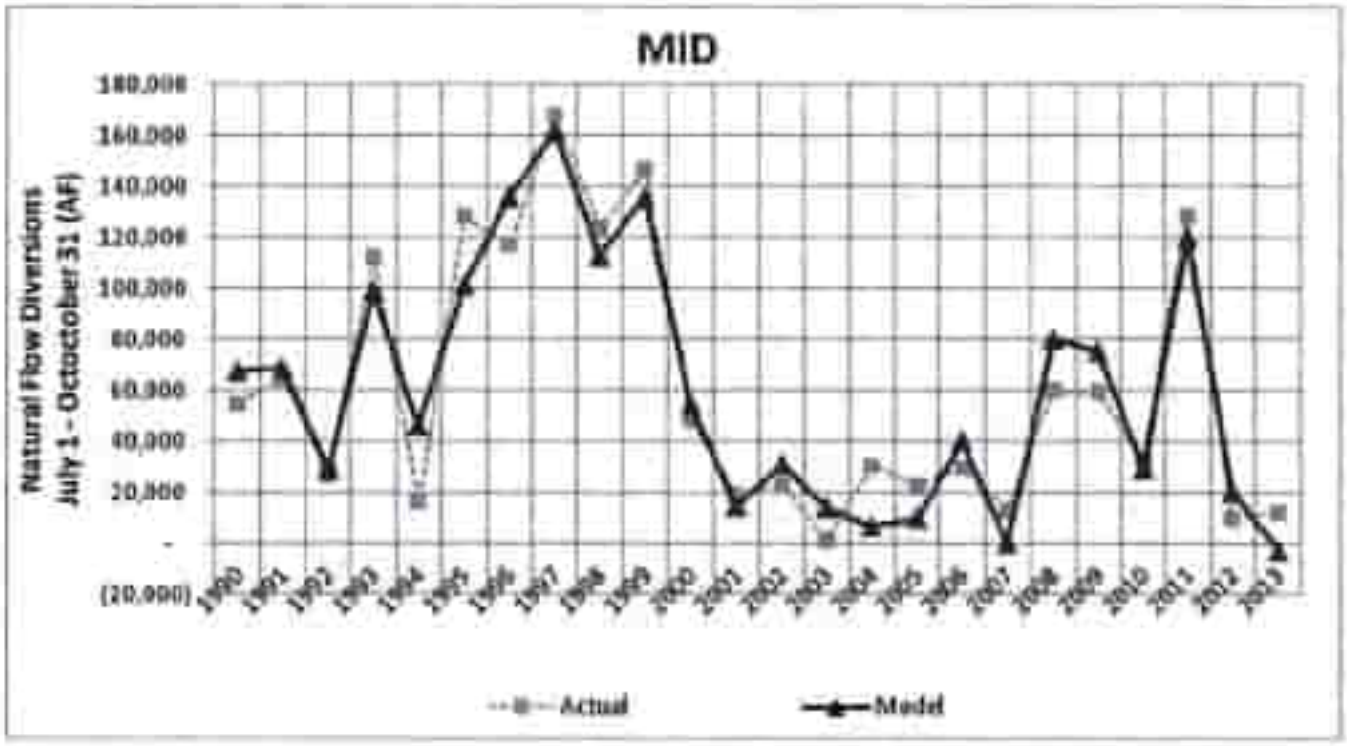
Recommended July Forecast Natural Flow Models






BID
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


Milner
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
25,000
20,000
15,000
10,000
5,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


MID
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
(20,000)
1990
1991
1992
1993
1994
1995
1996
1997
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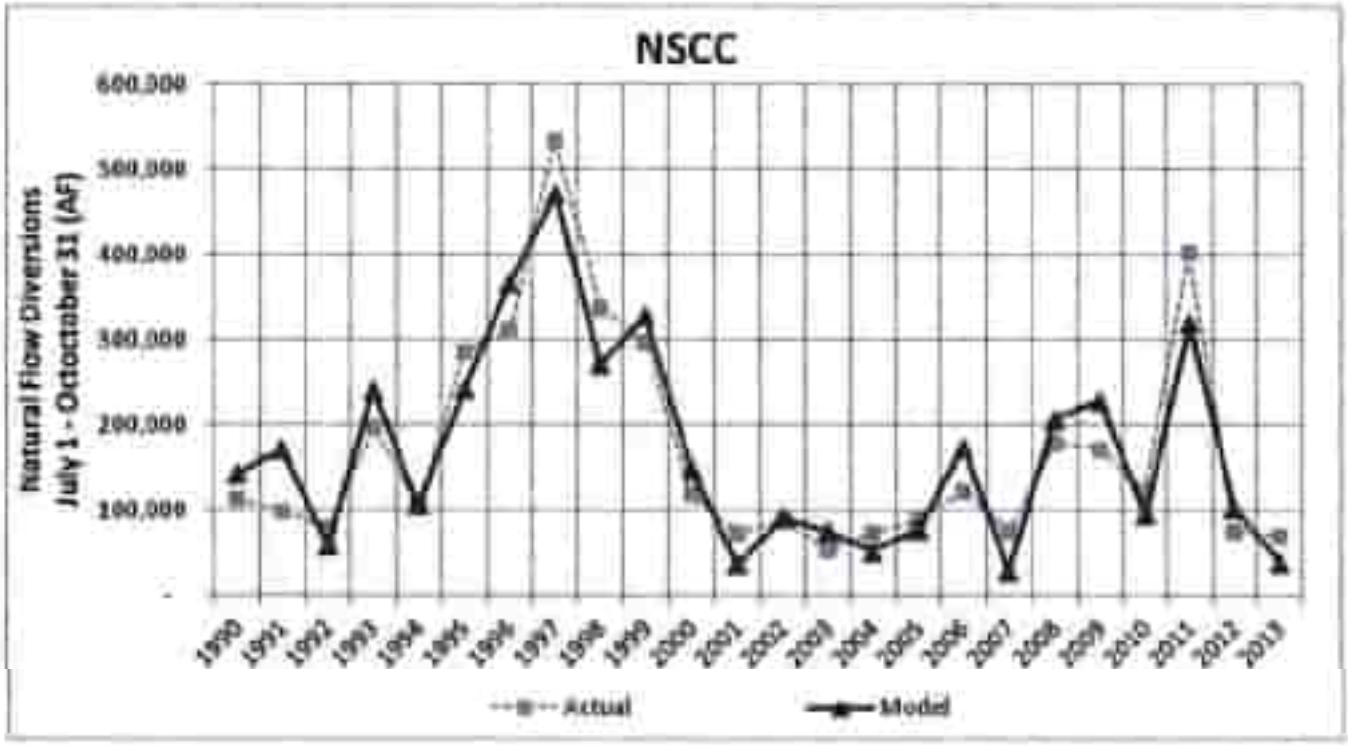
2010
2011
2012
2013
Actual
Model


NSCC
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
600,000
500,000
400,000
300,000
200,000
100,000
-
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
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2006
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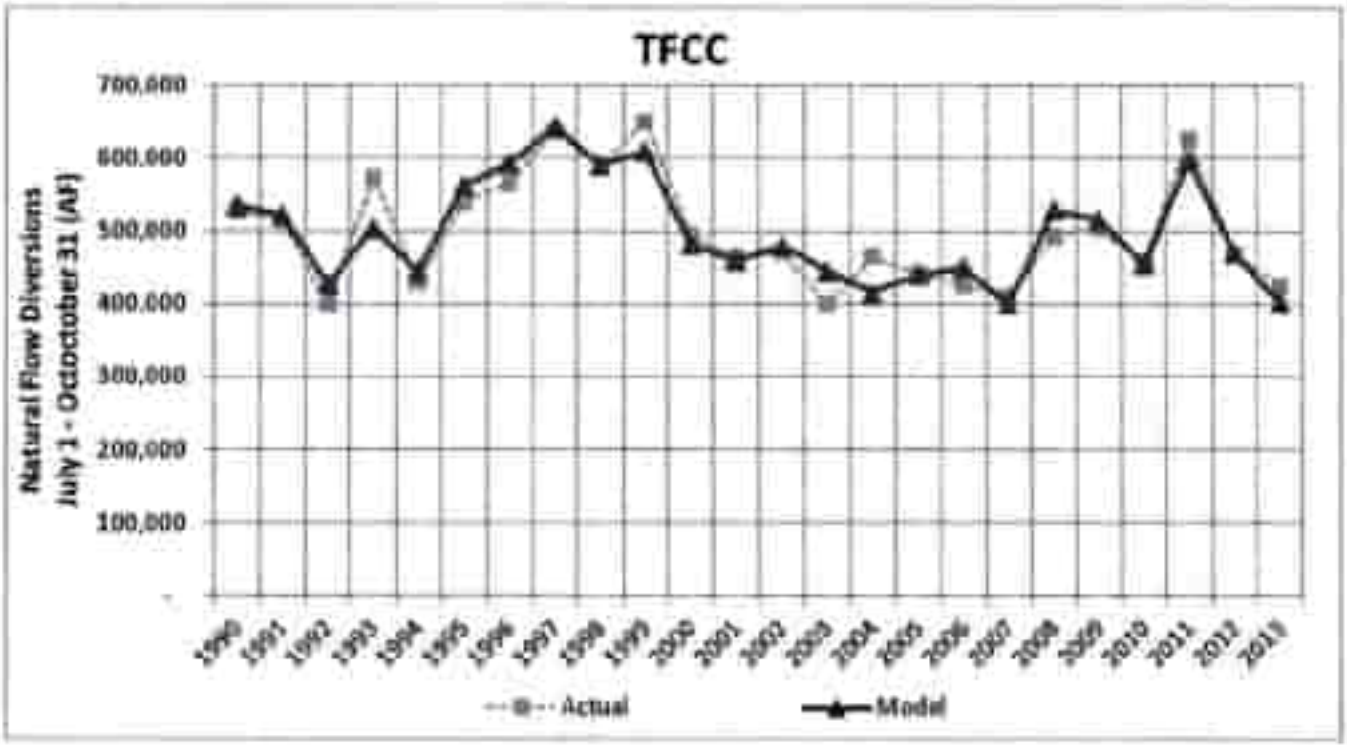
2010
2011
2012
2013
Actual
Model


TFCC
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
Actual
Model

APPENDIX B

Comments Received From Committee Members

MEMORANDUM
Settlement Document Subject to I.R.E 408

To: Liz Cresto

From: Charles Brendecke and Sophia Signodi

Subject: Comments on Staff Recommendations

Date: March 16, 2015

This memorandum addresses our comments on the analyses presented to the Technical Working Group related to revisions to the Methodology Order for determining injury to water rights held by members of the Surface Water Coalition. It serves as an addendum to the Idaho Department of Water Resources (IDWR or Department) staff memorandum regarding recommended revisions. Department staff were asked to provide recommendations to the Director on the following topics[1]:

1. Revised natural flow forecast methods for Twin Fall Canal Company (TFCC)
2. Identify more current and accurate crop data to determine crop water need.
3. Improvement of mid-season reasonable in-season demand forecast (RISD)

Topics 1 and 2 were assigned priority and due to time constraints are the only topics the Department staff make recommendations on in their memorandum.

Sections 1 and 2 below summarize our comments based on the proceedings of the committee regarding the recommendations to topics 1 and 2, respectively, in the staff memorandum. It is our understanding that Department staff recommendations on topics 1 and 2 are based on analyses that could be completed within the time constraints provided, and that while they are intended to provide guidance for administration of TFCC's water rights for the 2015 irrigation there will be opportunity for further analyses and recommendations concerning both topics for future irrigation seasons. It is also our understanding further work will be done on topic 3 prior to the need for the mid-season adjustment. Section 3 summarizes our preliminary comments regarding aspects of the mid-season RISD calculation.

The three topics identified above are not the only items in the Amended Methodology Order that were set aside or remanded by the District Court. The comments in our memorandum should not be considered a comprehensive summary of our opinion on all the technical aspects under consideration in the remand of the Amended Methodology Order.

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[1] Status Conference, January 28th 2015

Lynker Technologies
5485 Conestoga Court Suite 220
Boulder, Colorado 80301

Tel: 303.384.8627

Section 1

Part D. of the Memorandum Decision and Order on Petitions for Judicial Review of the Amended Methodology Order found that "The *Methodology Order's* reliance upon the Joint Forecast, and its use of the Heise Gage, to determine the available water supply for Twin Falls Canal Company is set aside and remanded for further proceedings as necessary." The issue was unopposed and the Department expressed that the Joint Forecast is "not the best evidence" for purposes of predicting TFCC's supply and that they would be willing to work with TFCC to improve the predictors for future application.

The Department staff's recommendations for revised natural flow forecast methods for TFCC began with the assumption that the need to predict TFCC's supply must occur prior to April 1. The comments provided here neither support nor reject that assumption. The Department staff' recommendations for revising TFCC's supply improves the current relationship used in the Methodology Order. However the analysis and committee review process was undertaken in a highly compressed timeframe and many things warrant additional consideration. We support the idea of treating the refinements to the Methodology Order as a "living document" that allows for continual improvement and to use the staff's recommendation as an interim solution for the upcoming 2015 irrigation season only.

We believe that one reason the Heise Gage forecast is not a good predictor for TFCC supply is that the predictor is physically based while the TFCC supply is considered to be the historical TFCC diversion record. TFCC diversions are not the same as the physical supply available to TFCC because the diversions reflect administrative and operational influences in addition to being a condition of the physical natural flow supply. For example, TFCC has the more senior water right relative to the other surface water diverters below Blackfoot and their diversions in early season are often capped by the water right amount rather than the physically available supply. The water right cap creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This difference is a probable reason the Heise forecast alone had such a low correlation to TFCC compared to the other entities. In light of this, an approach that we believe should be further investigated is creating a regression relationship or alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

The natural flow forecasts for TFCC and subsequently a selection of other entities were improved by moving from a single variable linear regression model to a multilinear regression. The improvement in the TFCC prediction supports the Department staff recommendation in the use of the additional Box Canyon data in April and the Snotel and Spring Creek discharge data in July. The Department Staff also recommended new models for some entities that showed improvement in the July forecast with the addition of Snotel and March groundwater level data. While these newly developed models can be tested over the upcoming irrigation season we believe they can be further improved.

Section 2

Our comments are limited on the succinct issue of the Department staff recommendation to use the digital Crop Data Layer (CDL) from the USDA National Agricultural Statistics Service (NASS) as a more current and accurate crop data source to determine crop water need. One concern here is how the data is post processed. We recommend sensitivity tests to different program settings when raster processing is applied. We also recommend further investigation into the method behind the development of the NASS dataset to determine how and to what extent the data set is field verified or if there are common misrepresentations that should be considered in the process of data quality assurance checks.

Section 3

As the Department memorandum stated there was not sufficient time for the staff to make a recommendation on the RISD forecast. There are multiple components to the RISD forecast calculation that are under review in the current Methodology Order. These include but may not be limited to:

- The mid-season calculation of RISD
- Project efficiency
- Irrigated acres
- Supplemental groundwater use

Regarding the mid-season calculation of RISD the sensitivity and appropriate use of crop coefficients and climate data behind the reference ET in the calculation should be investigated and analyzed for proper application to local conditions.

Regarding project efficiencies we recommend investigation into trends among the entities related to each of the factors the Methodology Order considers in their determination.

Regarding irrigated acres it appears there is not a standard review process for the updates by the SWC or for the critique by IDWR of the submittal of the irrigated acres. With only a check against the total acres in the decreed place of use, there is little or no incentive to keep these shapefiles up to date. Based on the discussion in the technical working group the determination of irrigated acres will likely not be addressed in this review process. Updating irrigated acres by verification of claimed irrigated polygons by satellite and/or aerial imagery is a detailed, time consuming process. But it is essential to protect the valid water rights of juniors.

If SWC members are going to be responsible for this task a first step that the Department should take is to develop a standardized method for this update. This should include pointers to the preferred irrigated polygon base layer, satellite/aerial imagery, and a comprehensive list of items that need to be clipped out (i.e. roads, homesteads, brush land, fallow acres, water features, urban areas, sub-divisions), how alignment issues could be improved and recommendations for how to streamline as many of these processes as possible. This process will only be fair if each user does the analysis in the same way. Once a more accurate representation of the irrigated acres for each entity is created and approved updates in the future can be based more on accounting of the movement of water throughout the district as some of the entities already track. The 5% change standard should also be considered in light of large districts like TFCC where a 5% error

in irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation.

Regarding supplemental groundwater use there was not sufficient time for the working group or Department staff to address this issue. However, it was one of the specific technical items cited for revision by the District Court. Accordingly, we believe that the process that has been established for identifying Methodology revisions be continued until all the technical issues presented in the remand are addressed.

SPF WATER ENGINEERING

MEMORANDUM

DATE: March 16, 2015

TO: Liz Cresto, Technical Hydrologist

FROM: Scott King, P.E., SPF Water Engineering LLC on behalf of IGWA

RE: **Comments on Staff Recommendations**

Job: **535.0190**

Liz,

This memo provides comments to be included with your March 16, 2015 Settlement Document Memorandum.

1. The committee discussed the importance of methodology guidance being a living document and that the Technical Working Group (TWG) should continue meeting occasionally to improve the methodology and address items that were neglected due to limited time. I want to express my support for this approach.

2. Supplemental ground water use was a topic of importance to the Technical Working Group's (TWG), but was not evaluated sufficiently due to time constraints. Supplemental ground water use within much of the surface water coalition's delivery area is measured and reported to IDWR. However, we expect not all ground water use is measured due to the wells being located outside of the ground water measurement program area. Unmeasured supplemental ground water use should be addressed and may need to be measured.

3. The total area of lands receiving surface water irrigation deliveries has been updated for some but not all SWC members. The TWC discussed a methodology whereby irrigated acres would be updated if that area changed more than five percent from currently used values. A five percent change is significantly different when comparing between the smaller and larger delivery entities. For example, five percent approaches ten thousand acres for Twin Falls Canal Company. The committee may consider also including an acreage threshold in this decision point. For example: "the lesser of five percent or one thousand acres." This approach is supported by high quality aerial imagery currently available, limited land use changes within the SWC areas, and prior efforts in identifying and digitizing irrigated and non-irrigated areas.

300 E. Mallard Drive, Suite 350, Boise, Idaho 83706 Tel: 208-383-4144 Fax: 208-383-4158

4. Some delivery entities have reported that irrigated acres are unchanged from decreed values. There is not an incentive for SWC entities to identify and report reductions in irrigated acres. This deficiency should be addressed.

Thank you for the opportunity to participate in the committee and provide these comments.

Memorandum Subject to I.R.E. 408

To: Gary Spackman, Director IDWR

From: Charles G. Brockway, Brockway Engineering on behalf of the SWC
David Shaw, ERO Resources Corp. on behalf of the SWC

Date: March 18, 2015

Re: Recommended Revisions to the Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

The SWC generally supports the efforts of the Director, IDWR Staff and other members of the TWG for their efforts and the recommendations proposed in the staff memorandum to the Director dated March 16, 2015. The recommended natural flow forecasting methods and crop mix determination are improvements to the original methodology procedure and we urge the Director to implement those changes. We also support the annual review of the implementation of the Methodology.

In the second paragraph under the April 1 Forecast section the statement is made that A&B and Milner irrigation districts have relatively junior priority water rights and typically only divert natural flow during spring runoff events. We believe it would be worth noting that Milner's priority is good enough to sometimes divert natural flow at other times, particularly late in the irrigation season.

The SWC supports the use of the NASS CDL data to estimate crop mix for the current year based on the 3 previous years' data. We notice in the example on page 6 of the staff memo the average used is for 2011 – 2013. We assume this is the result of a timing issue since the 2014 CDL was not released until after January 1, 2015. We assume the intent is to use the most recent 3 years' data when used to calculate RISD in the Methodology process. We also want to ensure the SWC Managers can submit crop mix data that becomes available to them if they believe any particular year is an anomaly and would not be fairly represented by the previous 3 years' CDL data.

The SWC is concerned about the topics in the final recommendation for multiple meetings for the remainder of 2015. Most of the proposed topics are not part of the Court's remand order. In particular, project efficiency was fully supported by the court in spite of the ongoing efforts by others to attack that aspect of the methodology or the efficiencies themselves. On remand the Court simply said the Director should follow the order when considering irrigated acreage submitted by members of the SWC. We understand the need to change the water supply forecasting methods to make a mid-season determination and the July 1 methods in the staff memorandum address that need but there has not been a compelling reason given to change the method of estimating demand for the remainder of the year.

Again, thank you to everyone who participated and to the Director and his staff for the opportunity to participate in this effort.

ATTACHMENT B:

LYNKER MEMORANDUM: COMMENTS ON 2022 IDWR STAFF RECOMMENDATIONS

MEMORANDUM

To: Matt Anders and Kara Ferguson, IDWR

From: Sophia C. Sigstedt, Lynker

Subject: Comments on 2022 IDWR Staff Recommendations

Date: January 16, 2023

This memorandum addresses my comments on the analyses presented to the 2022 Technical Working Group (TWG) related to revisions to the Methodology Order for determining injury to water rights held by members of the Surface Water Coalition. It serves as an addendum to Idaho Department of Water Resources (IDWR or Department) staff recommendations for the 2022 Methodology Update. IDWR staff and other members of the TWG presented analyses and recommendations regarding the following topics:

1. Baseline Year (BLY)
2. Forecasting Natural Flow Supply
3. Near-Real-Time METRIC for ET
4. Project Efficiency (PE)
5. ESPAM2.2 Steady State v. Transient

IDWR staff proposed changes related to BLY and PE, but only presented the results of internal analysis without recommending changes to the other topics investigated. TWG members were asked to consider whether the proposed recommendations provide a better technical basis than the current technique, or if there was an alternative with a better technical basis.

Sections 1-5 summarize my comments based on the proceedings for each TWG topic as listed above, respectively.

The topics identified above are not the only items in the Amended Methodology Order that should be considered regarding technical improvements. The comments in this memo are primarily in response to recommended changes made by IDWR staff in their memorandum dated December 23rd, 2022[1] and should not be considered a comprehensive summary of my opinions on all the technical aspects presented to the TWG or any other outstanding issues in the proceeding.

Section 1: Baseline Year Update

The IDWR staff recommended:

- Update the BLY irrigation demand used to determine Reasonable In-Season Demand (RISD) from the current average of diversion demands for the 2006, 2008, and 2012 (06/08/12) irrigation seasons to the diversion demand for the 2018 irrigation season.
- Update the BLY irrigation demand used to determine Reasonable Carryover for each SWC member from the current average of diversion demands for the 06/08/12 irrigation seasons to the diversion demand for the 2018 irrigation season.

[1] Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition (IDWR, December 23rd 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

In my opinion the recommendation to replace average diversions for the 06/08/12 irrigation seasons with single-year diversions in 2018 as the BLY does not have an adequate technical basis, and alternatives should be considered due to the following:

1. IDWR should consider rank within the period-of-record (POR) and select an average of years closer to the rank of the 06/08/12 BLY selected in 2015. IDWR staff presented analysis to the TWG for individual years 2018 and 2020 for consideration as the updated BLY. Either of these individual years are inadequate to represent reasonably dry baseline conditions for SWC diversions.

   When the average of diversion demands for the 06/08/12 irrigation seasons was selected as the BLY in 2015, the 06/08/12 average ranked between 7th and 8th highest for diversions, or about the 55th percentile (based on a normal distribution), for the POR 2000-2015 (**Figure 1**). IDWR staff presented analysis of Demand Shortfall calculations using 2018 and 2020 as an alternative BLY as they were both found to individually meet all the BLY criteria as shown in **Table 1**. For the POR 2000-2021 the diversion demand for 2018 and 2020 rank 3rd and 2nd, respectively, highest for diversions out of the 22 years, or about the 90th and 95th percentile (based on a normal distribution) for the POR (**Figure 2**).

   In a hindcast analysis by IDWR staff, the higher rank in BLY SWC diversions appears to cause a huge shift in the type of water year (i.e. wet, average, dry, very dry) where Demand Shortfalls are calculated. The hindcast showed a Demand Shortfall much more frequently in average and even wet years in addition to every dry or very dry year. When you compare the distribution of SWC total diversion demands for the POR 2000-2015 compared to 2000-2021 in **Figures 1** and **2**, however, it is apparent that they are very similar with mean diversions of 3.16 maf and 3.2 maf, respectively. The standard deviation is also very similar for the POR 2000-2015 compared to 2000-2021 at 178,089 af and 178,587 af, respectively. The selection of the BLY is meant to be conservative as defined by the BLY criteria. The shift to SWC diversions of a much higher rank (compared to the previous BLY) like 2018 or 2020 translates to a much higher level of conservatism and is not technically justified given the similarity between mean diversions and the standard deviation for the 2000-2021 POR versus the 2000-2015 POR.

   The Methodology Order states that the BLY can be a year or an average of years that meet the BLY criteria (**Table 1**). IDWR staff considered rank within the POR when they recommend keeping the 2002 and 2004 average Heise natural flows as the Supply in the Reasonable Carryover calculation from the 4th Amended Methodology Order for the 2022 update[2]. The average of diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria as shown in **Table 1** and is closer to the 55th percentile based on a normal distribution for diversions 2000-2021 similar to the rank of the BLY 06/08/12 (**Figures 1** and **2**) as applied in the 4th Amended Methodology Order. The BLY of 06/18 has a better technical basis than the proposed update to 2018 as the BLY.

Table 1. Baseline Year and Baseline Year Criteria

BLY Criteria	BLY Avg 06/18	BLY 2018	BLY 2020	Avg 2000-2021
Abv Avg SWC Diversions	3.22 maf	3.38 maf	3.53 maf	3.20 maf
Abv Avg GDD	2575 units	2550 units	2600 units	2495 units
Abv ET	1265 mm/d	1275 mm/d	1280 mm/d	1245 mm/d
Blw Avg Precipitation	3.9 in	2.6 in	2.7 in	4.5 in
Abv Avg SWC Supply	8.52 maf	9.00 maf	8.10 maf	7.70 maf

[2] Proposed Modification of the Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: Reasonable Carryover (IDWR, presentation slide no. 4, December 9th, 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

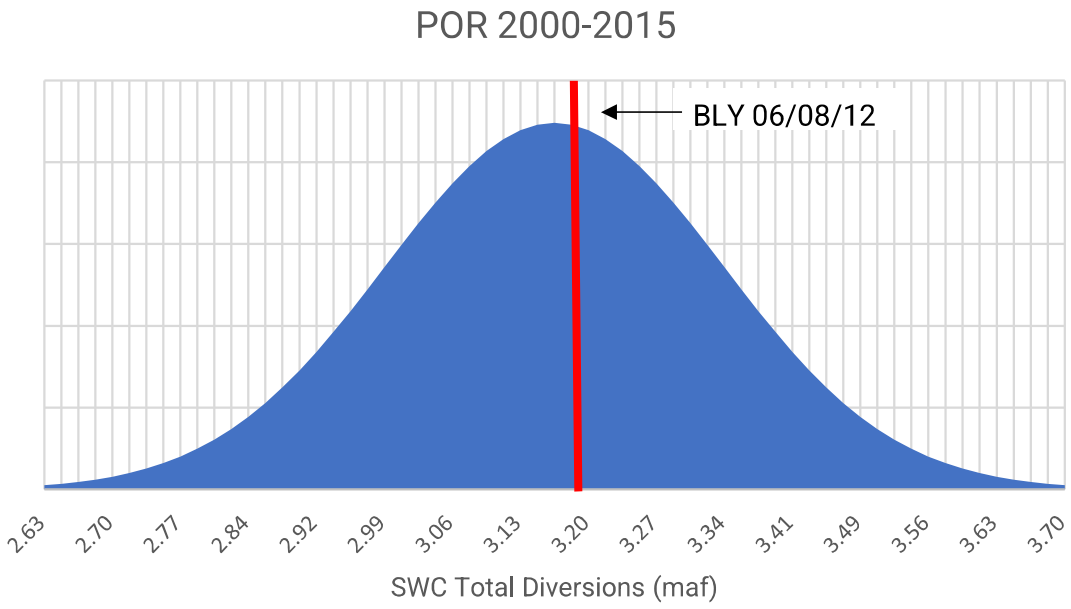

Figure 2. Normal distribution of SWC Total Diversion over the POR 2000-2015, the *red line* shows where the selected BLY 06/08/12 for the 4th Methodology Order falls within the normal distribution.

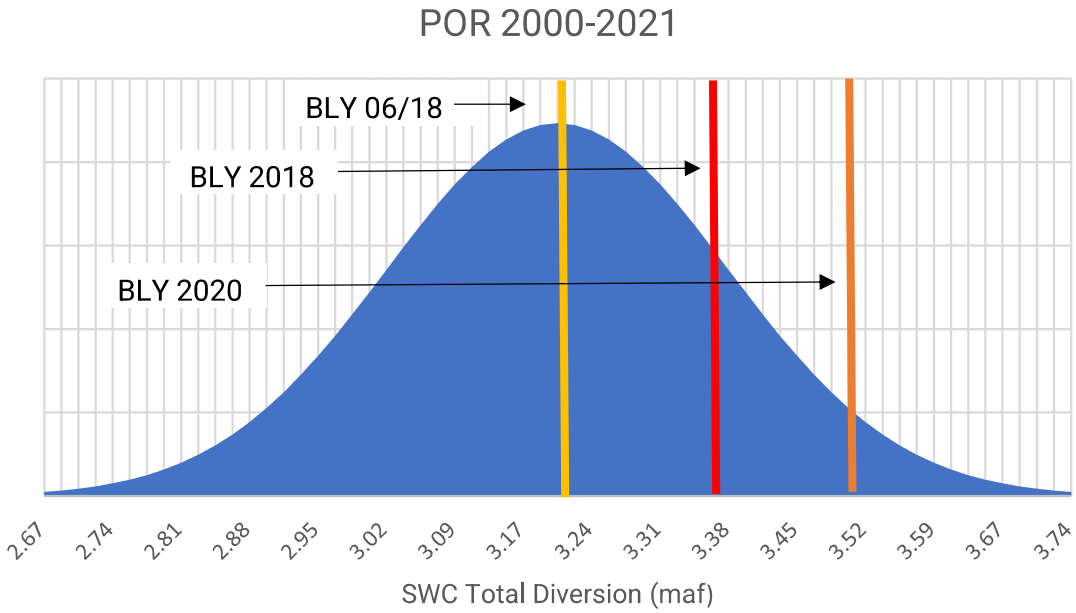

Figure 2. Normal distribution of SWC Total Diversion over the POR 2000-2021, the *yellow line*, *red line*, and *orange line* show where the proposed BLY 06/18, 2018 and 2020 falls within the normal distribution, respectively.

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

2. Another reason a better alternative would be to use diversion demands for the 06/18 irrigation seasons for the BLY is that there were unique hydrologic circumstances in 2018 that I don't believe represent the typical dry year. The 2017/2018 snowpack was very high and water year forecasts and early season streamflow led to positive water supply forecasts which resulted in a record amount of aquifer recharge in 2018. IDWR staff acknowledged the technical difficulties in sorting out surface water adjustments like recharge in applying the Methodology Order. The combination of large volumes of widely distributed canal recharge, often in relatively rarely used or new systems, may have exacerbated uncertainty in the adjustment. The positive water supply outlook may have also resulted in less stringent surface water administration and ultimately higher diversions than the crop water need alone would predict. Consequently, using gross diversions in 2018 as the BLY effectively overstates surface water irrigation demand. IDWR staff presentations and a review of Twin Falls Agrimet station data also showed the 2018 irrigation season is the only year in the 1992-2021 POR with a zero-precipitation total for July-September. The fact that almost any individual water year will have some unique circumstance is a good reason for continuing to define the BLY based on an average of years as the Methodology Order does currently.
3. An additional reason for using a specific percentile (or rank) within the POR when establishing a BLY, and for using an average of years, is that the process for selection of the BLY otherwise appears arbitrary and subjective. If IDWR staff are presented with multiple years within the POR that fit the criteria for a BLY, and there is no guidance or standard method for selecting a single BLY, the ultimate selection becomes purely subjective. Using an average of years that targets a prescribed rank is a more objective and technically defensible process.

Section 2: Forecasting Natural Flow Supply

IDWR staff did not make a recommendation on updating April and July regression models to improve their predictive power for natural flow supply. The staff did make presentations to the TWG on natural flow forecasting models that showed the Twin Fall Canal Company (TFCC) model is degrading in the R^2 value. This degradation is significant in that the R^2 values is an expression of the explanatory power of the forecast model. The TFCC natural flow forecast models also started with the lowest R^2 values based on the previously revised forecast. The technical information presented to the TWG indicated that a revised natural flow method for TFCC should be evaluated and a recommendation for an improved method should be made. However, given the extremely compressed timeframe for staff and TWG members to conduct a thorough evaluation I understand why a recommendation was not made at this point.

Lynker's technical memorandum included as addendum to IDWR staff recommendations in 2015[3] laid out an alternative forecast model approach that I continue to think should be further investigated. The approach is creating a regression relationship or alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC. The technical basis for this suggestion is that water rights administration creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This is likely the reason it is difficult to find a high performing regression model for TFCC.

The process for natural flow forecast model revision should also be standardized in-terms of defining how frequently a thorough re-evaluation of the predictors and models is done (i.e. 3-yrs, 5-yrs, if R^2 value drops below a threshold). This should include re-evaluating previously tested predictors over the new POR, as well as, casting a new net of total predictors for consideration by the TWG. While the TFCC model stands out in needing a refinement all of the models could be improved if sufficient time for the analysis were allowed. Several of the models utilize a depth to groundwater measurement as a predictor from a specific Sentinel Well flagged by a separate TWG (IGWA-SWC)[4], as likely impacted by American Falls Reservoir level.

[3] Recommended Revisions to the Surface Water Coalition Methodology (DWR, March 16th, 2015)
[4] IGWA/SWC Steering Committee TM: 2021 Sentinel Well Recommendations (IGWA/SWC TWG, August 20th, 2021)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

Section 3: Near-Real-Time METRIC for ET

The IDWR staff did not make a recommendation on utilizing near-real-time METRIC for determining Crop Water Need (CWN) in the RISD calculation. The application of METRIC in the determination of crop demands deals with a complex dataset that requires complex processing. Given the magnitude of the task to incorporate METRIC data I understand the staff not making a recommendation at this time. The IDWR staff should keep track of the calculation utilizing the METRIC data in parallel to the current CWN calculation method as way to continue to evaluate its use. The Department's Eastern Snake Plain Aquifer (ESPA) model already utilizes METRIC data for consumptive use calculations used for model input data. Given the complexity of the METRIC data I also recommend further investigation into the method behind the calibration and processing of the dataset to determine how and to what extent the METRIC data can be validated at the field-scale or if there are common misrepresentations that should be considered in the process of data quality assurance checks. This should be done in coordination with validation efforts by the Department on their ESPAM Metric calibration and processing.

The IDWR staff presentation regarding near-real-time METRIC application identified a significant shortcoming in the current method for calculating CWN as the fact that the most up-to-date crop data is from the previous year and that SWC irrigated acre datasets sometimes represent service areas, not the actual irrigated land[5]. Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members[6]. The METRIC data could first be used to create a standard review process for the Methodology Order Step 1 submittal of irrigated acres by the SWC entities. IDWR staff should use a precise determination of irrigated acreage irrespective of whether it uses METRIC in the calculation of CWN. With IDWR staff only checking against the total acres for the decreed place of use, there is little to no incentive to keep the spatial data for the irrigated acres up to date. The METRIC data would be available for the current irrigation season and can be used to assess actual irrigated land. Some of the preliminary analysis by IDWR staff using METRIC data illustrated that through processing they were able to identify about 15,000 acres within the TFCC irrigated acres dataset that should not qualify as irrigated. The mischaracterized acres were all minor areal corrections but over a large service area such as TFCC added up to a significant amount of erroneous total acres. This just highlights the importance of spending the time to get an accurate picture of irrigated acres for an accurate RISD calculation. As previously noted in Lynker's 2015 comment letter the 5% change standard for SWC submittals should be reconsidered in light of large districts like TFCC where a 5% error in the irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation. Liz Cresto an IDWR staff member on the TWG in 2015 also made a similar recommendation in her comment letter attached to the staff memorandum.

Neither the 2015 nor the 2022 TWG has provided an opportunity to address concerns regarding supplemental groundwater use. This is a critical aspect of the RISD calculation and was one of the specific technical items cited for revision by the District Court. Analysis of supplemental groundwater use is likely critical to accurately applying METRIC in the RISD calculation.

Section 4: Project Efficiency

The IDWR staff recommended:

- Update the project efficiency value used to calculate monthly reasonable in-season demand from a rolling average of the previous eight years to a rolling average of the previous fifteen years.

[5] Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time Metric (IDWR, presentation slide no. 8, November 17th 2022)

[6] Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover-pg 4

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

The technical basis for the IDWR staff recommendation was based on there being an extended POR available. TWG discussions and subsequent presentations identified other issues that should be considered in Methodology applications of project efficiency (PE) to RISD calculation.

1. There is higher uncertainty in the April and October project efficiency values. April and October represent months during the irrigation season when the method of calculating RISD strictly as a function CWN and PE is less reliable because CWN is often not the driving factor in diversions[7].
2. Project efficiency among SWC entities are almost all flat or declining (6 out of 7 entities), which is contrary to what would be expected with technology advancements and constrained water supplies[8].

Change in Project Efficiency (2001-2021) (percentage point change)	
A&B	-4.6%
AFRD2	-3.6%
BID	-1.0%
Milner	-12.6%
Minidoka	+12.2%
NSCC	-3.0%
TFCC	+1.8%

3. Scatter plots by SWC entity comparing Annual Crop Water Need to Annual Diversions show Crop Water Need is limited as a predictor given the low explanatory power indicated by the low R^2 values in the analysis[9].

Regarding the mid-season calculation of RISD, the sensitivity and appropriate use of CWN as a predictor for in-season demands for SWC entities should be evaluated. Technical analysis to the TWG showed that this is not a strong relationship[10]. This disconnect should be evaluated by the TWG so a recommendation can be made. The trends in declining PE are concerning in that they are contrary to our expectations given the direction technology advancements and constrained water supply. The declines in PE are significant in that any decline in PE will result in increased demands and subsequently increased calculated Demand Shortfalls. The IDWR staff presentation on PE illustrated how the very minor change in PE resulting from extending the POR for the average translated to tens of thousands of acre-feet differences in the Short Fall determination[11]. Sullivan (e-mail to TWG 12/21/2022) found that when analyzing monthly PE the low PE in some months cause monthly demands calculated based on CWN/PE to be very sensitive to changes in CWN. I agree with Sullivan's recommendation that given the outside influences and uncertainty in some of the monthly PE values IDWR staff should consider using a seasonal PE value in computing monthly diversion demands. I also agree with Sullivan's recommendation that consideration should be given to PE values that better reflect reasonable and efficient operations of SWC members. Given the observed declining trends in PE and the historically wide range in operational PE by entity it is hard to know when SWC supplies are short under reasonable and efficient operations. This is consistent with Lynker's 2015 recommendation for an investigation into trends among entities related to PE factors.

[7] Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover-pg 18
[8] Greg Sullivan e-mail, Updated Comparison of Adjusted Diversion and Crop Water Needs for SWC Members, to TWG December 21, 2022
[9] Analysis in Greg Sullivan datasheet "2022-12-21 SWC Diversions and CWN.xls"
[10] Analysis in Greg Sullivan datasheet "2022-12-21 SWC Diversions and CWN.xls"
[11] Proposed Modification of the Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: Project Efficiency (IDWR, presentation slide no. 15, November 28th, 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

Given the compressed timeframe around the 2022 TWG meeting there was not sufficient time for the TWG members to analyze or address these outstanding issues. Additional time should be set aside for the TWG to conduct an analysis and make a recommendation.

Section 5: Steady State v. Transient

The Department staff did not make a recommendation on using transient model simulation for determining curtailment priority dates in the Methodology. The IDWR staff presented to the TWG the following:

1. Technically the steady state application is not consistent with the variable curtailment dates and mitigation volumes under the Methodology.
2. Transient analysis shows that in-season shortfalls can generally not be met at Time of Need by in-season curtailment.
3. There is a huge difference in resulting determination of the curtailment priority date if a steady state v. transient model is applied.
4. Under a transient model application any Demand Shortfall above ~100K af would result in aquifer wide curtailment

It is not clear what additional analysis the Department staff need to conduct to make a recommendation on steady state v. transient model application. What is clear is that this represents a huge uncertainty to the water users and how they make planning and management decisions moving forward.

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

ATTACHMENT C:

SUMMARY OF HINDCAST SWC DELIVERY CALL DEMAND SHORTFALL CALCULATIONS 2000-2022

Table 1 - Summary of Hindcast SWC Delivery Call Demand Shortfall Calculations 2000-2022

Year	April BLY 06-08-12 (AF)	April BLY 2018 (AF)	July BLY 06-08-12 (AF)	July BLY 2018 (AF)	November Actual Demand Shortfall (AF)
2000	30,183	126,125	0	0	0
2001	179,947	334,970	160,472	200,546	243,565
2002	42,800	131,308	17,381	45,136	31,217
2003	10,124	93,902	43,808	80,241	0
2004	199,101	364,958	223,032	264,426	264,340
2005	114,916	228,241	0	0	0
2006	0	0	365,880	388,939	23,792
2007	56,914	152,855	201,036	253,185	289,065
2008	0	15,138	46,525	55,334	0
2009	0	34,109	0	0	0
2010	94,957	190,898	0	0	0
2011	0	0	0	0	0
2012	0	53,778	69,066	92,125	139,524
2013	28,802	110,912	114,058	154,132	22,588
2014	0	0	0	0	0
2015	88,959	184,901	107,418	138,684	92,246
2016	44,163	111,457	21,271	44,330	7,853
2017	0	65,382	0	0	0
2018	0	44,805	0	0	10,996
2019	20,943	88,237	0	0	0
2020	0	59,101	0	0	0
2021	40,491	126,102	162,873	194,139	190,816
2022	162,613	313,446	52,771	84,036	276,551
Average:	48,474	123,071	68,939	86,750	69,241
Median:	28,802	110,912	21,271	45,136	7,853
75th Percentile	72,937	168,878	110,738	146,408	115,885
80th Percentile:	92,558	188,499	141,906	178,136	170,299
85th Percentile:	108,928	217,038	162,153	198,624	227,740
86th Percentile:	113,319	225,254	162,681	200,033	239,345
87th Percentile:	121,594	240,170	168,216	207,915	246,474
88th Percentile:	132,087	258,915	176,612	219,496	251,044
89th Percentile:	142,580	277,660	185,008	231,077	255,615
90th Percentile:	153,074	296,405	193,403	242,657	260,185
95th Percentile:	178,214	332,818	220,832	263,302	275,330
Max:	199,101	364,958	365,880	388,939	289,065

Hindcasting and spreadsheet summary developed by IDWR (Matt Anders, Kara Furgason) as part of the Nov-Dec 2022 SWC Delivery Call TWG meetings.

ATTACHMENT D:

HYDROLOGY, WATER RIGHT AND GROUNDWATER MODELING EVALUATION OF RANGEN DELIVERY CALL (Brendecke, 2012)

Hydrology, Water Right and Groundwater Modeling Evaluation
Of
Rangen Delivery Call

By

Charles M. Brendecke, PhD, PE

AMEC Environment & Infrastructure



For

Racine, Olson, Nye, Budge and Bailey, Chartered
Boise Idaho

December 21, 2012

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1.0 INTRODUCTION

1.1 Objectives

The objective of this report is to review the hydrology, water rights and groundwater modeling of the Eastern Snake Plain Aquifer (ESPA) in the vicinity of the Rangen, Inc., (Rangen) aquaculture facility, as they relate to the delivery call placed by Rangen on December 13, 2011. That delivery call requests the curtailment of all groundwater rights within the domain of the Enhanced Snake Plain Aquifer Model (ESPAM) that are junior to July 13, 1962. The primary study area of focus of this report is shown on Figure 1.1.

1.2 Organization of Report

This report is organized into 6 sections, beginning with this Introduction and Summary of Conclusions. Section 2 presents an overview of hydrology and water development in the area of the Rangen facility. Section 3 provides a detailed description of the Rangen facility itself and the water rights pertinent to it. Section 4 describes development and calibration of the ESPAM Version 2.1 (ESPAM2.1) by the Idaho Department of Water Resources (IDWR). Section 5 describes analysis of the effects of curtailment of junior groundwater rights using ESPAM2.1 and its predecessor, ESPAM2.0. Section 6 presents an analysis of curtailment effects using a modified version of ESPAM2.1 that more closely reflects hydrogeologic conditions near Rangen.

A related discussion of hydrogeology of the Rangen area is presented in Hinckley (2012).

1.3 Summary of Conclusions

Based on the analyses and evaluations I carried out in preparing this report, I conclude that:

1. The Martin-Curren Tunnel is a distinct source of water separate from natural springs that also supply Rangen.
2. The July 13, 1962, Rangen water right that is the basis of the delivery call (36-2551) is sourced at the Martin-Curren Tunnel.
3. The April 12, 1977, water right (36-7694) held by Rangen is sourced at the Martin-Curren Tunnel.
4. The Martin-Curren Tunnel is an artificial excavation that was constructed to access groundwater for irrigation purposes.
5. The Martin-Curren Tunnel meets the physical definition of a well contained in Idaho Code 42-230(b).
6. Neither observed nor estimated flows from the Martin-Curren Tunnel have ever been high enough to provide water in-priority to the 1977 water right (36-7694) held by Rangen.
7. Observed flows of Billingsley Creek reported by Rangen have not been high enough to provide any water to Rangen's 1977 water right (36-7694) since October of 1976, a date which precedes the priority of the water right.
8. Inspection of Rangen facilities and diversions by the Department of Water Resources concluded, among other things, that water right 36-7694 "should not have been issued."

9. Water right 36-7694 has never been able to divert and beneficially use water in priority.
10. Neither observed nor estimated flows from the Martin-Curren Tunnel have ever been high enough to deliver the maximum rate of diversion authorized under water right 36-2551.
11. Rangen's measurement of water flows through its property underestimates actual flows by 10-12%
12. It is feasible for Rangen to make more efficient use of available flows by delivering water from Billingsley Creek to its small raceways.
13. As a result of incidental recharge from surface water irrigation, spring flows in the Milner to King Hill reach are currently 25 percent greater than natural, pre-development flows.
14. Much of the change in spring discharge in the Milner to King Hill reach since 1960 can be attributed to reduction in incidental recharge from surface water irrigation due to changes intended to reduce waste.
15. Neither ESPAM 2.1 nor its predecessors is capable of separating the effects of groundwater pumping on flows from the Martin-Curren Tunnel from the effects of groundwater pumping on flows from other springs in the Rangen complex. .
16. The predictive uncertainty analysis of ESPAM2 and ESPAM2.1 carried out by the IDWR explores only a limited aspect of model uncertainty and does not quantify overall model uncertainty.
17. Fundamental to overall model uncertainty is the uncertainty associated with the conceptual model reflected in ESPAM2.1. The predictive uncertainty analysis relies on a single conceptual model and does not explore the uncertainty that arises from improper conceptualization of local geologic and hydraulic conditions that influence discharge of specific spring complexes, such as those at Rangen.
18. Alternative conceptual models can be developed that better reflect hydro-geologic conditions near Rangen and which produce substantially different effects of curtailment than does ESPAM2.1.
19. That ESPAM2.1 can fairly closely mimic the observed past behavior of a spring complex is not proof that it represents hydrogeologic reality sufficiently to predict accurately future behaviour of that complex, especially under aquifer water use conditions (e.g., curtailment of junior groundwater pumping) that are radically different from those extant in the model calibration period.
20. The ESPAM2.1 is not sufficiently detailed in either its general formulation or its representation of hydrogeologic conditions at Rangen, to be used reliably to predict changes in flow available to water right 36-2551 due to curtailment of junior groundwater rights on the ESPA.
21. ESPAM2.1 represents the details of the Rangen spring complex and the surrounding geology in highly simplified form, omitting several key features and that would make significant differences in predicted benefits of curtailment.
22. Using ESPAM2 and ESPAM2.1, less than 3 % of the curtailed groundwater rights junior to Rangen's 1962 priority, under the 10% trimline, would accrue to the Rangen complex; the rest would accrue to other connected river reaches, springs and baseflows, including those on which there are no water rights or diversions, those on which there are no delivery calls, those on which

approved mitigation plans are already in place, and those on which diversions occur under water rights junior to those of the curtailed rights.

23. An even smaller amount of the curtailed water use described in conclusion (23) above would accrue to the Martin-Curren Tunnel.

24. Using ESPAM2, less than 1% of the curtailed groundwater rights junior to Rangen's 1962 priority over the entire model domain, such as requested by Rangen, would accrue to the Rangen complex, the rest accruing to other connected river reaches, springs and baseflows, including those on which there are no water rights or diversions, those on which there are no delivery calls, those on which approved mitigation plans are already in place, and those on which diversions occur under water rights junior to those of the curtailed rights.

25. Because the model domain, irrigated lands and water rights are the same in ESPAM2.1 as in ESPAM2, conclusion (25) above would also apply to results from ESPAM2.1.

26. An even smaller amount of the curtailed water rights described in conclusion (25) above would accrue to the Martin-Curren Tunnel.

27. Alternative calibrated models that better reflect hydro-geologic conditions near Rangen show that curtailment of groundwater rights, within the 10% trimline and junior to Rangen's 1962 right, would produce only half, and possibly as little as 5%, of the benefit to Rangen predicted by ESPAM2.1.

28. Analysis using ESPAM2.1 shows that implementation of Rangen's request for widespread curtailment will, by any reasonable standard, result in waste of the water resource.

29. If the Director uses ESPAM2.1 to quantify the benefits to water right 36-2551 from curtailment of junior groundwater uses, this quantification should reflect the substantial uncertainty of that benefit that derives from use of a regional model to predict discharge from a particular spring outlet at the edge of the aquifer system. Due to this uncertainty, any curtailment based on ESPAM2.1 should be limited to junior-priority rights for which ESPAM2.1 predicts a significant benefit to Rangen. In my opinion, to recognize uncertainty and prevent unreasonable waste, application of ESPAM2.1 should at a minimum restrict curtailment to junior rights for which ESPAM2.1 predicts at least 10% of the curtailed water will accrue to Rangen.

30. Even use of a 10% trimline results in waste of the water resource because the vast majority of that foregone use would not accrue to the benefit of Rangen.

31. Use of trimlines smaller than 10% increases the relative waste of the water resource.

Hydrology and Water Development

32. Spring discharge is closely related to incidental recharge from surface water irrigation within the service area of the North Side Canal Company.

33. The sensitivity of spring discharge to incidental recharge is likely increased near the edges of the aquifer system near the Hagerman Rim and Rangen.

34. The Winter Water Savings Program of the North Side Canal Company alone may have reduced incidental discharge to the ESPA above the Thousand Springs reach by roughly 150,000 acre-feet per year beginning in 1961.

35. Conversion of irrigated lands from flood and furrow irrigation to sprinkler irrigation has significantly reduced incidental recharge.

36. Sprinkler usage under the North Side Canal Company grew from zero percent of the service area in 1982 to 100% of the service area by 2008.

37. Approximately 24,000 linear feet of lateral off the W-canal in the area west of Wendell, in proximity to Rangen, have been lined or placed in pipe since the 1990s, primarily to reduce excessive seepage losses, which are incidental recharge.

38. All of the foregoing reductions in incidental discharge are reductions in waste of water.

39. Prior to development of irrigation under the North Side Canal Company natural flow from springs in the Milner to King Hill reach was estimated to be about 4,000 cfs. Spring flows reached a peak at about 7,000 cfs in the early 1950s and have declined since that time. The average annual discharge for the 10-year period ending in 2011 is about 5,000 cfs, which is still above the natural (predevelopment) levels

40. When significant surface water irrigation began in the NSCC area the seasonal variability of spring discharges increased in addition to the magnitude of average annual flows. Prior to development, the pronounced seasonal pattern of spring flows that currently exists did not appear to exist.

41. Reductions in total annual spring discharge are also related to drought episodes.

Rangen Water Use

42. Discharges from the Curren Tunnel are divided between Rangen pipelines, three irrigation diversions, and spills to Billingsley Creek from the Rangen Box.

43. The North Snake Groundwater District has been providing mitigation supplies to the irrigation water users through the Sandy Pipeline since 2003. This pipeline is believed to have nearly eliminated irrigation diversions from the Curren Tunnel outlet.

44. Flows in Billingsley Creek are divertible by gravity to Rangen's large raceways but not to the hatch house, upper (small) raceways, or culinary use, all of which are presently supplied only by pipelines from the Tunnel.

45. Spills from the Rangen Box may remain in Billingsley Creek and bypass the Rangen facilities under some circumstances.

46. It is feasible to pump water from Billingsley Creek to Rangen's small raceways from the same point where Rangen diverts water into the large raceways. This would increase the efficiency of use of Rangen's existing physical supplies by making the total discharge of the Rangen complex available to all of Rangen's raceways.

ESPAM2.1 Model

47. Observations of ESPA geology suggest it is highly complex, comprised of overlapping fractured basalts interspersed with sedimentary formations, with hydraulic characteristics that can vary substantially over short distances.

48. ESPAM2.1 is, like all models, a simplified representation of reality, and this leads to model uncertainty.

49. ESPAM2.1 is comprised of cells that are one mile square.

50. Within each ESPAM2.1 grid cell, aquifer characteristics are assumed to be homogenous and isotropic.

51. This assumption of homogeneity means that hydrologic and geologic details of a scale smaller than the cell cannot be explicitly represented in the model.

52. Considerable amounts of pertinent input data are not known at even the one-square mile level of spatial resolution of the ESPAM2.1 grid.

53. ESPAM2.1 is comprised of a single layer of cells of uniform thickness.

54. ESPAM2.1 assumes constant thickness throughout the model domain and constant transmissivity within each cell. These assumptions may result in substantial misrepresentation of flow conditions in some parts of the aquifer, such as the Hagerman rim, where thinning occurs and preferential flow pathways become more restricted.

55. The discharges at Rangen are represented in ESPAM2.1 as a single drain.

56. This single-drain representation does not allow ESPAM2.1 to distinguish flows emanating from the Curren Tunnel from flows emanating from natural springs in the Rangen complex.

57. The generalizations and simplifications in ESPAM2.1 can introduce significant error into model results, particularly for highly localized conditions such as those governing discharge from specific outlets of a specific spring complex.

58. ESPAM2.1 has a large number of cells and each cell has a large number of adjustable parameters, so the total number of adjustable parameters in the ESPAM2.1 model is large.

59. The large number of parameters reflected in ESPAM2.1 increases the likelihood that the model is not unique.

60. ESPAM2.1 simulates conditions that are not physically possible and conditions that are in direct opposition to observed conditions in the real system. These discrepancies reveal serious model misrepresentation of detailed aquifer behaviour in the Rangen area, and raise doubt as to the accuracy of model predictions there.

61. Many of the conceptual aspects of ESPAM2.1 fail to reflect observed characteristics of the aquifer system in the Rangen area. These failures lead to conceptual uncertainty in the ESPAM2.1.

62. Each of the input data types used in ESPAM2.1 carries its own uncertainties that can stem from, among other things, the inability to measure a condition accurately (or at all) and from the spatial or temporal resolution of measurements.

ESPAM2.1 Calibration

63. Calibration uncertainty reflects the fact that many combinations of model parameter values may lead to equally well-calibrated models.

64. The ESPAM2.1 was calibrated under the assumption that aquifer transmissivity in any given cell is constant over the calibration period. This assumption has not been validated, and there are many locations and situations in the model domain and over the model calibration period where it is probably not true.

65. ESPAM2.1 was calibrated using an automated approach implemented in a computer program called PEST.

66. ESPAM2.1 systematically under-estimates discharge at the Rangen spring in the early years of the calibration period while over-estimating it in the later years.

67. ESPAM2.1 systematically under-predicts the water level at the closest well to Rangen that was used for calibration by 20 feet. ESPAM2.1 also consistently under-predicts the water level in another nearby well.

68. The under-prediction of water levels near Rangen is partly a result of the fact that discharge targets were weighted more heavily than water level targets in the calibration process.

69. Because predicted water levels are too low, PEST increased the drain conductance to values higher than are suggested by observation, thereby embodying in ESPAM2.1 a mischaracterization of the real physical relationship between water levels and flows at Rangen.

70. This mischaracterization results in over-sensitivity of the change in drain flow to a simulated change in water level due to curtailment. This over-sensitivity is carried into the superposition model used for curtailment, with the result that changes in spring flows are over-predicted by nearly a factor of 4.

71. The calibrated drain conductances in ESPAM2.1 range over 4 orders of magnitude. This extremely large variation suggests that the set of calibrated parameters is quite fragile and that PEST can readily find alternative parameter sets that provide acceptable calibrations.

72. ESPAM2.1 differs from ESPAM2 in the correction of an error that arose in the calculation of the water budget in the Mud Lake area and overestimated aquifer recharge by approximately 89,000 acre-feet/year in that area of the model domain. This represents a change of less than one percent in the overall water balance for the ESPA.

73. Correction of this error required re-calibration of the model, so a new set of model parameters, including drain conductances were developed. These are the parameters used in ESPAM2.1.

74. The drain conductances in ESPAM2.1 differ from those used in ESPAM2 by more than the 1% change in water budget associated with the correction. The conductance for the Rangen drain decreased by about 4%, but some drain conductances in the area changed by nearly 1000%. Some cell transmissivities in the area near Rangen changed by more than 100%.

75. These changes in conductance and transmissivity are carried directly into the superposition models used to calculate the flow changes resulting from curtailment.

76. The area encompassed by the 5% trimline is substantially larger with ESPAM2.1 compared to ESPAM2, and this expansion is mainly in areas on the opposite side of the Malad Gorge from Rangen, which are hydrogeologically disconnected from the Rangen spring.

77. Large changes in calibrated parameter values and model results suggest that ESPAM2 and ESPAM2.1 may be over-parameterized, and that other comparable calibration solutions easily can be reached with only minor perturbations in model assumptions.

Estimation of Benefits from Curtailment

78. ESPAM2.1 represents the Rangen spring as a drain and the flow in that drain as a linear function of water level in the cell that contains the drain.

79. Application of ESPAM2.1 to estimate changes in spring flow due to curtailment employs the method of superposition.

80. The principle of superposition relies on the assumption that the system being modeled and the model behaves in a completely linear way.

81. If the system being simulated or the model exhibits important non-linear behaviours, a superposition model can introduce significant error into the analysis of effects of stress changes.

82. Analysis of observed water levels and Range spring flows by Hinckley demonstrates that the relationship of Rangen flow to water levels in nearby wells is not linear.

83. The structure of the aquifer and conditions in the aquifer along the Hagerman Rim in the region of Rangen indicate that the behaviour of the aquifer in that region is not linear.

84. The large number of parameters reflected in ESPAM2.1 increases the likelihood that the model is not linear.

85. There are a total of 406 groundwater irrigated acres relying on rights junior to Rangen's 1962 priority within the 10% trimline, using 1,445 acre-feet of groundwater. At steady state, curtailment of pumping on these lands would cause total modeled flow at the Rangen springs to increase by 0.19 cfs (141 af/y assuming year around flow). Not all of this increase would accrue to the Martin-Curren Tunnel, but the ESPAM2.1 model does not represent flows in the tunnel. It would take somewhat less than a year for discharge to reach 90% of this modeled steady state increase.

86. There are a total of 565,023 groundwater irrigated acres within the model domain relying on rights junior to Rangen's1962 priority, using 1.46 million acre-feet (MAF) of groundwater. At steady state, ESPAM2 predicts that curtailment of pumping on these lands would cause modeled discharge at Rangen to increase by 18.07 cfs. It would take approximately 16 years for modeled discharge to reach 90% of this steady state increase.

87. Because the model domain, irrigated lands and water rights are the same in ESPAM2.1 as in ESPAM2, conclusion (86) above would also be expected to apply to results from ESPAM2.1.

2.0 WATER DEVELOPMENT AND USE ON THE EASTERN SNAKE PLAIN

2.1 Hydrology

The Snake River flows along the southern edge of the Eastern Snake River Plain (ESRP), a broad arcuate plain that covers an area of approximately 10,000 square miles in southeastern Idaho. As shown on Figure 2.1, the two main branches of the Snake River are the South Fork, which primarily drains the eastern side of the Teton mountain range, and the Henry's Fork, which primarily drains the western side of the Teton Range and joins the South Fork near Idaho Falls. Several smaller tributaries enter the Snake River from the south, the largest being Willow Creek and the Blackfoot, Portneuf and Raft rivers. With few exceptions, tributaries from the mountains to the north of the plain flow out onto the plain and recharge the underlying aquifer. Because of its porous surface, there are no significant surface water features on the plain itself.

At Milner Dam, northeast of Twin Falls, the Snake River drops into a canyon making gravity diversion of river flows impossible; large irrigation canals at Milner seasonally divert all but a small amount of the river flow. The canals diverting from the Snake River at Milner Dam, as well as others diverting from the lower Big and Little Wood Rivers, deliver large amounts of irrigation water to lands in Jerome, Gooding and Lincoln Counties above the north rim of the river canyon. The Snake River itself is largely restored by the time it reaches King Hill due to spring discharges from the north wall of the Snake River canyon and tributary streams such as Rock Creek, Salmon Falls Creek and the Malad River.

The ESRP is underlain by a vast basalt aquifer system, the Eastern Snake Plain Aquifer (ESPA), formed when intermittent lava flows filled ancestral valleys and canyons of the Snake River (Stearns and Crandall, 1938). In the central part of the ESPA, these and other formations extend to a depth of more than 3,000 feet (Whitehead, 1992). The total volume of water stored in the ESPA has been estimated to be as high as 1 billion acre-feet (IDEQ, 2006).

The agriculturally productive areas of the Plain occur in sedimentary and aeolian deposits overlying the most recent (Quaternary) basalts, which outcrop in numerous places. The porous and fractured basalt formations in the upper part of the ESPA can store and transmit large amounts of water and have been developed as a groundwater resource. Lindholm (1996) estimated that the upper 500 feet of the aquifer may contain 200-300 million acre-feet, an amount approximately 50 times greater than the combined surface water storage above King Hill.

Between Milner Dam and King Hill are numerous springs that emerge from the north side of the canyon and flow to the river. In some cases there are very well-defined outlets for these springs while in other cases they discharge through talus slopes and the actual outlets in the canyon wall can't be seen. There are also some springs that emerge in the river itself. This reach of the river is often referred to as the Thousand Springs Reach, though there is also an individual spring complex named Thousand Springs. A few of the larger spring complexes along the north wall of the canyon are at Crystal Springs, Clear Lakes, Box Canyon, Thousand Springs, Billingsley Creek and the Malad Gorge.

Figure 2.2 shows the annual average water budget for the period 1981-2008 used in development of the ESPAM2.1. Note that this is not a water budget for the ESPA, as it includes surface water supplies that are consumed directly without entering the aquifer. Based on Figure 2.1, average recharge to the aquifer system from precipitation on non-irrigated lands, from tributary underflow, and from non-Snake River seepage is 2.46 million acre-feet (MAF). This relatively small component of overall aquifer recharge is still greater than the total groundwater consumption simulated in curtailment to 1870 (Sukow, 2012) indicating that groundwater use remains less than the reasonably anticipated rate of future natural recharge.

2.2 North Side Canal Company

Early irrigation development on the ESRP was concentrated in the upper portions of the basin, above Blackfoot. Irrigation development in the lower portion of the plain began in 1877 with appropriations from the lower Big and Little Wood Rivers north of Wendell and Shoshone. By 1900, surface water rights totalling more than 900 cfs had begun operating to irrigate lands above the Malad Gorge (at their confluence, the Big and Little Wood Rivers become the Malad River).

Diversions from the Snake River onto the western ESPA began in 1905 with the development of the Twin Falls Project. Small diversions by the Twin Falls North Side Land & Water Company (predecessor to the North Side Canal Company) began in 1908. Diversions quickly grew from 250 thousand acre-feet (KAF) in 1909 to 1.2 million acre-feet (MAF) in 1912 (USGS, 1956). Considerable water was diverted in the first decade of canal operation to fill the Jerome Reservoir, but that project was abandoned in 1918 after it became clear that seepage losses from the reservoir would prevent it ever being filled (Crandall, 1923; USGS, 1956). North Side Canal Company (NSCC) diversions at Milner Dam have averaged about 986,000 af/y over the last 10 years. Present acreage served by the NSCC is reported to be 154,067 acres. Figure 2.3 shows the present service area and main canals and laterals of the NSCC.

For the first half of the 20th century, the NSCC diverted water in the winter as well as during the irrigation season. This was done primarily to provide domestic and stock water to small towns and farms. There is no significant crop water demand in the winter, so considerable amounts of the winter diversions undoubtedly recharged the ESPA in Jerome and Gooding Counties or were spilled over the canyon rim at the ends of laterals.

As part of its Regional Aquifer System Analysis (RASA) study, the USGS estimated that by 1952 more than 24 MAF of water had been added to the aquifer by incidental recharge from surface water irrigation (Kjelstrom, 1995). The importance of incidental recharge resulting from seepage losses from surface irrigation systems is evident in Figure 2.4a, b which is reproduced from the RASA study. Figure 2.4a shows the close correlation between incidental recharge and spring discharges in the Milner to King Hill reach of the river. The pattern of incidental recharge is clearly superimposed on a longer term increasing trend of spring discharge from 1912 to the mid-1950s, and is very closely related to the declining trend in spring discharge since the mid-1950s. Figure 2.4b shows the estimated change in ground water storage from this incidental recharge.

Figures 2.5 and 2.6 are from another RASA report (Goodell, 1988). Figure 2.5 shows the early 20th century increase in water levels in three observation wells, the locations of which are shown on Figure 2.6. Water levels in observation well 8S-17E-19BBB1 reflect water levels in the aquifer beneath the area irrigated by the North Side Canal Company. It can be seen that the aquifer water level in this area rose by approximately 45 feet between 1900 and 1950 as the result of incidental recharge from surface water irrigation.

Winter diversions all but ended in about 1960 as the Company participated in the Winter Water Savings Program, which sought to stop 435,000 af of "wasteful non-irrigation season diversions" and redirect this water to storage in Palisades and American Falls Reservoirs (USBR, 1946). The Palisades Winter Water Savings agreements went into operation in 1961 and generally required participating canal companies to cease diversions in the months of November through March. Figure 2.7 is derived from records of the USGS and the IDWR and shows the historical November through March diversions of the NSCC. The onset of the Winter Water Savings Program is clearly evident in this diversion record. Based on Figure 2.7, the Winter Water Savings of the North Side Canal Company alone may have reduced incidental recharge to the ESPA above the Thousand Springs reach by roughly 150,000 acre-feet per year (207 cfs).

Prior to the 1950s, flood and furrow irrigation was the primary method of water application on the ESRP. Kjelstrom (1995) notes that by the 1970s about 20 percent of surface water irrigation distribution systems had converted from gravity application methods to sprinkler application methods and that this conversion had reduced deep percolation to the aquifer. In 1981 the University of Idaho published (Hamilton, et al., 1981) the results of a survey of the responses of irrigators to the severe drought of 1977. Table 2.1 is reproduced from the Hamilton report. It shows that many irrigators on the ESRP had installed sprinkler systems, had added gated pipe, and had lined ditches as a result of the 1977 drought.

Information provided to the IDWR by the North Side Canal Company in connection with the 2005 delivery call of the Surface Water Coalition shows that in 2004 sprinklers were the primary method of water application on 88 percent of the North Side service area. Documentation for the current groundwater model of the Eastern Snake Plain Aquifer (ESPAM2.1) reflect a growth in sprinkler usage under the NSCC from 0% of the service area in 1982 to 100% by 2008. This has undoubtedly further reduced aquifer recharge in the area of the springs.

Figure 2.8 shows the portion of the NSCC service area generally between the town of Wendell and the head of Billingsley Creek. The irrigation laterals shown in this area are part of the W-lateral system. Lateral W-40 extends nearly to the head of Billingsley Creek, ultimately reaching a spill point on the canyon rim immediately to the north of the Rangen aquaculture facility. Recent data (Sullivan, 2012) show that flows into the lower portion of the W-lateral system, have declined about 20,000 af/y since the late 1980s. Interviews of NSCC personnel (Wertz, pers. comm., 2012) revealed that approximately 24,000 linear feet of laterals off the W-Canal in the area west of Wendell have been lined or placed in pipe since the 1990s, primarily to reduce excessive seepage losses.

The spill point at the end of W-40 was visited in June, 2012, and did not show evidence of current use. As with other canal companies in the area, the NSCC has been attempting in recent years to consolidate and reduce spills to the river for water quality management purposes. The primary spill point for the W-Canal system is now into the Malad Gorge just downstream of the State Park.

2.3 Springs in the Milner to King Hill Reach

As mentioned previously, between Milner Dam and King Hill the Snake River flows in a deep canyon. There are numerous springs discharging from the walls of this canyon, the majority of them being on the north side in an area known as the Thousand Springs reach, including an individual spring complex named Thousand Springs. In some cases there are very well-defined outlets for these springs while in other cases they discharge through talus slopes and the actual outlets in the canyon wall can't be seen. There are also some springs that emerge in the river itself. Figure 2.9 shows the locations of major spring complexes in the Milner to King Hill reach.

The earliest records of spring discharge measurements in this reach of the river date back to 1902. In the spring of that year the U.S. Department of Agriculture and the U.S. Geological Survey (USGS) separately made measurements on several of the springs in this reach of the river. These and other early measurements are summarized in Nace, et al., (1958). J.D. Stannard, the investigator for the Department of Agriculture estimated the total discharge of springs on both sides of the river between a point 3 miles above Twin Falls and a point 10 miles below the Malad River (roughly the entire Milner to King Hill reach) to be 3,833 cfs. These 1902 measurements were made before irrigation development under the North Side Canal system, though not before irrigation diversions began from the lower Wood River to supply lands north of Wendell and Shoshone. Kjelstrom (1995) estimated that the pre-irrigation (pre-1880) discharge of springs between Milner and King Hill averaged about 3.0 maf, or 4,140 cfs. Mundorff, et.al. (1964) estimated the natural discharge from the aquifer in the Thousand Springs Reach to be 4,000 cfs, and possibly less.

When significant surface water irrigation began in the North Side Canal area spring discharges changed, increasing in seasonal variability and in overall magnitude. Meinzer (1927) prepared an inventory and description of large springs in the United States, including the springs in the reach of the Snake River between Milner Dam and King Hill. Figure 2.10, reproduced from the Meinzer report, illustrates the close relationship he found between the combined spring discharges at the Blue Lakes and Clear Lakes spring complexes and the quantity of irrigation water applied to the Eastern Snake River Plain above the springs via the North Side Canal Company. Figure 2.10 shows that the monthly rise and fall pattern of North Side Canal diversion is followed, in a slightly delayed fashion, by a similar monthly pattern in spring discharge. Canal diversions were substantially smaller in 1919 (shortly after the Jerome Reservoir project was abandoned) than they were in the preceding two years, and the subsequent rise in spring discharge is also substantially smaller. A comparison of the two 1902 observations of flow at Blue Lakes given in Nace, one in April and one in August, showed almost equal flow rates. So the seasonal spring discharge pattern evident in the period 1917-1920 didn't appear to exist in 1902 at Blue Lakes and Clear Lakes, prior to major irrigation development above the springs. This emphasizes the importance of localized patterns of incidental recharge to flows of specific springs.

The IDWR prepares estimates of the annual spring discharge to the Thousand Springs Reach based on a method originally developed by Kjelstrom (1995b) and documented in USGS Water-Resources Investigation Report 95-4055. Figure 2.11 is a plot of the discharge estimates prepared by the IDWR for the period 1902-2011. The average of the annual discharge values for the 10-year period from 1902-1911 is 4,207 cfs. The average annual discharge for the 10-year period ending in 2011 is 5,019 cfs.

Also shown on Figure 2.11 is the annual value of the Palmer Drought Severity Index (PDSI) for NOAA Climate Zone 7 (NOAA Earth System Research Laboratory Physical Sciences Division 2012). The PDSI is a commonly used water supply index that incorporates precipitation, temperature, runoff and soil moisture conditions. Greater positive values of the PDSI reflect increasingly cooler and wetter conditions; greater negative values reflect increasingly warmer and drier conditions. A relationship can be seen in Figure 2.11 between drought episodes and reductions in total estimated spring discharge to the Milner to King Hill reach.

From the foregoing, it can be concluded that pre-development springs flows in the Thousand Springs Reach were probably not greater than 4100 cfs; that flows peaked in the early 1950s at approximately 6900 cfs primarily as a result of surface water irrigation development; and that flows have declined to current levels as a result of changes in surface water irrigation practices, drought and groundwater development. However, spring discharge between Milner and King Hill remains above natural (predevelopment) levels.

2.4 Groundwater Development

With the exception of shallow wells constructed in the Mud Lake area in the 1920s, ground water development of the ESPA did not begin in earnest until the late 1940s. The first project relying heavily on ground water supplies was the Minidoka North Side Pumping Division of the Minidoka Project (now the A&B Irrigation District) which began operation in 1948. While the majority of the subsequent permits were for irrigation of new lands, many were for supplemental irrigation of lands already irrigated with surface water supplies. In addition, the benefits of sprinkler irrigation have led to the conversion of some formerly surface-water irrigated lands to ground water use. Ground water development began to level off in the 1980s and a moratorium on new irrigation well development has been in place since 1992.

Farms in the Wendell area were initially supplied with irrigation water by the NSCC (Sullivan, 2012). Conversion of irrigated lands from surface to groundwater sources and development of new groundwater-supplied lands in the area began in the 1950s. Figure 2.12 shows the growth in groundwater permits in the area from 1948 until 1992, when a moratorium on further groundwater irrigation permitting went into effect. Notable increases in permitting occurred in 1960-61, just prior to Rangen's application for water right 36-2551, and in 1973-76, just prior to Rangen's application for water right 36-7469. Figure 2.13 shows the current Points of Diversion for groundwater rights in the area between Wendell and the head of Billingsley Creek; these points are color-coded to show their priorities relative to July 13, 1962.

Sullivan estimates that there were approximately 25,000 acres of irrigated land under the W Canal in 1953 and about 30,500 acres in 2009. In 1953 there was little or no groundwater irrigation under the W Canal. By 2009 roughly 10,000 of the formerly surface-water irrigated acres were supplied in whole or in part with groundwater and about 9,300 acres of new acreage was being served by groundwater (about 3,500 acres of surface water irrigation had been retired). Given the 1992 moratorium on new groundwater irrigation, it is reasonable to assume that nearly all of this groundwater use was actually in place by 1992.

Figure 2.14 shows observed groundwater levels in two wells in the area between Wendell and Rangen. Records of groundwater levels are less complete as one goes back in time, so the wells shown in Figure 2.14 do not illuminate aquifer conditions in earlier periods. It can be seen from Figure 2.14 that that seasonal fluctuations in water levels are about 5 feet in this area, with lows generally occurring in the months of March (well 992) and July (well 989). Annually, water levels have declined somewhat since 1985, with levels appearing more stable in the last 10 years. These declines are likely due to changes in surface water irrigation practices, including spill management, lining or piping of laterals, and conversions from surface to groundwater use, to drought, and to that increment of groundwater pumping brought online since 1985.

3.0 RANGEN SPRINGS DEVELOPMENT AND USE

3.1 Billingsley Creek Overview

Billingsley Creek enters the Snake River northwest of the town of Hagerman, just upstream from Lower Salmon Falls Dam. The creek is fed by a series of springs emanating from the Quaternary basalts forming the canyon rim in western Gooding County. Figure 3.1 is an aerial photo of the area showing the creek and the locations of selected spring discharge points. Figure 3.2 shows the measured flows of Billingsley Creek at the USGS gaging station (13134600) at the Highway 30 bridge just north of Hagerman. Records at this station are not continuous, and spring and creek flows are diverted both above and below the station for aquaculture, irrigation and other uses.

The Martin-Curren (aka Curran, Kearn) Tunnel and Rangen aquaculture facility are located at the upper end of Billingsley Creek. Figure 3.3 is an aerial photo of the Rangen facility showing key features of the area that will be referred to later in this section. Flows from the Tunnel and from other spring outlets and seeps in the Rangen area form the headwaters of Billingsley Creek.

The Rangen facility was constructed in 1962, apparently expanding on an earlier, smaller aquaculture operation purchased by Rangen in May of that year (Twin Falls Times-News, December 30, 1962). The facility was launched as a research center focused on trout diseases and diet, and on hatchery management problems.

The primary physical sources of water used at the Rangen facility are the Martin-Curren Tunnel and natural springs, most of which emerge from the talus slope about 45 feet in elevation below the tunnel portal (Farmer, 2009). Water from the Tunnel is divided between Rangen pipelines and three irrigation diversions. The natural springs all discharge to Billingsley Creek. Flows in Billingsley Creek are divertible by gravity to Rangen's large raceways but not to the hatch house, upper raceways, or culinary use, all of which are presently supplied only by pipelines from the Tunnel. Inspection of the Rangen facilities by IDWR personnel in 2003 concluded that some spring inflow to Billingsley Creek also occurs below the diversion for the large raceways (Berkey, 2003a).

3.2 Water Rights

Water rights for flows in the headwaters of Billingsley Creek in the area of the Rangen facility are listed in Table 3.1. The earliest rights date to 1884 and are for irrigation and domestic use.

The earliest right for fish propagation is Rangen's 1957 priority for 1.46 cubic feet per second (cfs). This may have been the primary water right for Rangen's predecessor. The present delivery call seeks administration of groundwater rights junior to Rangen's 1962 priority (36-2551), which is sourced by the Snake River Basin Adjudication (SRBA) Court at the Martin-Curren Tunnel.

The irrigation rights of Candy, Morris and Musser are also sourced at the Martin-Curren Tunnel. These diversions provide water to irrigate parcels south of Billingsley Creek. The water rights for these diversions are senior to the Rangen rights, dating to as early as 1884. Because the irrigation diversions are consumptive with respect to Billingsley Creek, they reduce the water supply available to Rangen from the Tunnel.

In 2003, anticipating that groundwater users might in the future be required to mitigate declines in Tunnel and spring flows, the North Snake Groundwater District (NSGWD) voluntarily constructed a pipeline (the "Sandy Pipeline") from ponds in Section 5 of T8S, R14E (the "Sandy Ponds") to the Curren Ditch. The pipeline was constructed so that it could also supply irrigation water to Candy, Morris and Musser, thereby reducing or eliminating those irrigation diversions at the Tunnel and increasing the Tunnel supply available for Rangen. This pipeline is in operation and is believed to have nearly eliminated irrigation diversions from the Tunnel outlet.

The Curren Ditch diverts from the creek below the Rangen facility under irrigation rights that are also senior to the Rangen aquaculture rights. However, since Rangen's aquaculture use is non-consumptive, the Curren Ditch does not call for bypass of Rangen's more junior aquaculture rights.

Groundwater development on the plain above the Curren Tunnel began in the early 1950's. Figure 2.12 showed the evolution of groundwater rights in the area east of Billingsley Creek. The earliest groundwater rights in the immediate area date to 1952. Notable increases in permitted acreage occurred in 1959-61 and in 1973-76, just prior to Rangen's applications for water rights 36-2551 and 36-7694. By the time of Rangen's 1962 water right, about 3900 acres had been permitted. At the time of Rangen's 1977 water right, about 8300 acres had been permitted. By 1992, when the moratorium on new groundwater irrigation went into effect, permits for about 10,000 acres had been issued.

3.3 Curren Tunnel Development

The Curren Tunnel is excavated into the canyon rim above the Rangen facility. It extends roughly 100-300 ft into the basalt forming the rim (Tate deposition testimony, 2012), at a depth roughly 70 feet below the ground surface above the rim (Hinckley, 2012). The tunnel is bifurcated some distance into the cliff into north and east forks. Water flows out of the Tunnel by gravity.

It appears that the Tunnel excavation had at least commenced by October of 1884 (New International Mortgage, 1932) with the aim to deliver irrigation water via a ditch (i.e., by gravity) to lands on the bench area south of Rangen. A feature article in the December 30, 1962, Twin Falls Times-News describes the source of Rangen's supply as "man-made springs on the north side of the canyon" where "early pioneers in search of irrigation water drilled a hole into the cliff and struck water." USGS Water Supply Paper 1463 (Nace, et.al., 1958) contains a Billingsley Creek flow observation made in April, 1902, with remarks that "Water emerges from a tunnel dug into brecciated, highly permeable basalt, and from the talus slope below the tunnel…" The 1932 decree from New International Mortgage Bank v Idaho Power Company, et.al., an adjudication of

water rights in Billingsley and Riley Creeks, grants 1884 priority rights to water "…developed and diverted…by means of a tunnel commonly known as the Curran Tunnel…".

According to Idaho Code 42-230(b) a "well" is defined as "an artificial excavation or opening in the ground more than eighteen (18) feet in vertical depth below land surface by which groundwater of any temperature is sought or obtained." Based on the foregoing descriptions of its development, the Curren Tunnel appears to meet this definition.

About the first 50 feet of the Tunnel is lined with large diameter corrugated steel pipe; beyond this the tunnel is unlined. It is not known when the corrugated steel lining was installed. A 6" diameter PVC pipe is laid along the bottom of the steel pipe, extending beyond it into the unlined portion to the bifurcation. This PVC pipe carries water for laboratory, culinary and landscape irrigation use at the Rangen facility. Based on a diagram produced by Rangen (RANGEN001907), it is believed that this PVC pipe was installed in 1976.

The PVC pipe does not carry all the water emerging from the Tunnel. The remainder of tunnel discharge is collected in a concrete division box (the "Farmers box") at the mouth of the tunnel, shown in Figure 3.4. The Candy, Morris and Musser pipelines deliver water from this division box to parcels south of the Rangen facility; the elevation of the Tunnel outlet allows this irrigation delivery to operate by gravity.

Two Rangen pipelines also take water from the Farmers box and water can spill from the box. The two Rangen pipelines flow into another concrete box, the "Rangen box" shown in Figure 3.5, which is further down the slope toward the Rangen facility. There they enter the pipeline serving the hatch house and research facility. Spills from the Rangen box, as well as flows from other spring outlets, flow into Billingsley Creek and can be diverted into Rangen's large raceways.

There are other spring outlets in the vicinity that also supply water to the Rangen facility. The largest of these emerges about 45 ft below the Curren Tunnel and flows to Billingsley Creek. Based on recent discharge records, discussed in more detail below, these "lower" springs produce roughly twice the flow of the Tunnel.

3.4 Discharge Records

The earliest record of discharge from springs in the Rangen area is contained in Nace (1958). Table 27 in that report shows a Billingsley Creek flow of 54.3 cfs in April, 1902, at a location where Road E2900S (aka Hagerman Highway) crosses Billingsley Creek. This observation post-dates the excavation of the Tunnel, and potentially includes discharges from other springs in the area. Other than a few subsequent measurements in the general vicinity, systematic recording of spring discharge in the area did not begin until the Rangen facility was operating.

The only measurement of discharge specifically from the Curren Tunnel was in the period between 1993 and 2009 when the IDWR operated a sonic measuring device inside the tunnel. This measured the portion of tunnel flow not conveyed in the 6" PVC pipe installed in the tunnel

by Rangen. All other historical measurements of spring discharge are derived from measurements made by Rangen at locations within the hatchery or on Billingsley Creek.

Flow measurement within the Rangen facility relies primarily on recording the depth of water flowing over the check dams in the "large" and "CTR" raceways, and depth of water flowing over the "lodge dam" in Billingsley Creek shown in Figure 3.6. Flow depth is apparently measured by a metal ruler placed on the crest of the dams as shown in Figure 3.7 (Exhibit 7a from Rangen 1st Request; Yenter, 2003). It appears that the flow from the CTR raceways reflects flow through the Rangen hatchery and, when combined with discharge over the lodge dam and diversions for irrigation, gives the total discharge of the spring complex.

Along with most other spring users, Rangen began submitting diversion records to the IDWR in 1995. In late 2003, responding to a request from IDWR Director Karl Dreher, Rangen submitted monthly flow records covering the period 1966-2003. These data, and the measurement methods used by Rangen, were subsequently reviewed by IDWR technical staff (Yenter, 2003; Berkey, 2003, 2003a). This review included field inspection of measurement sites and methods, and verification of various estimates used by Rangen in its flow summarization. The inspection concluded, among other things, that the flow record reflected total spring complex discharge rather than Rangen diversions and found that Rangen's flow measurement methods could underestimate the total discharge by 10-12%.

Figure 3.8 shows the IDWR records of total discharge from the Rangen complex, as well as observed flows from the Curren Tunnel and IDWR records for flow in the 6" PVC pipe from the Tunnel. Seasonal variability of flow is plainly evident as are longer term wet and dry spells. In the period of overlap between total flow and Tunnel flow records, it appears the Tunnel flow is the greater source of this seasonal variability. This is to be expected as the Tunnel penetrates the aquifer at a higher elevation than that of the natural springs. In his May 19, 2005, Order, former Director Dreher found decreases in the springs supplying the Rangen hatchery facilities to be correlated with repairs made to the facilities of the North Side Canal Company to reduce losses of surface water to ground water from the canal company's facilities above those springs in 1987, 1998, and 2000 (Order, FF 23). The 1992 moratorium on new irrigation wells suggests that decreases in discharge after the mid-1990's are not the result of groundwater pumping.

Figure 3.9 shows a regression analysis of total Rangen flow against observed Curren Tunnel flow. It can be seen that the relative contribution of the Tunnel is somewhat greater at higher total flow; this is to be expected from the relative elevations of the Tunnel and the natural springs that contribute to the total flow. At lower flow levels, the Tunnel may represent as little as 20% of the total Rangen flow. Over the last 10 years, the Tunnel discharge has represented roughly one-third of the total Rangen flow.

The regression shown in Figure 3.9 was used to generate estimates of Curren Tunnel flow for the entire period of record for Rangen total flow. The results of this procedure are shown on Figure 3.10, which plots both the monthly total Rangen flow and the monthly Curren Tunnel flow for the period 1966 through 2012. Also shown on Figure 3.10 are the cumulative water rights sourced at the Martin-Curren Tunnel by the Snake River Basin Adjudication (SRBA). The cumulative rights

at the Tunnel were 61.29 cfs prior to Rangen's April, 1977, appropriation. With that appropriation, cumulative rights at the Tunnel rose to 87.29 cfs.

It can be seen from Figure 3.10 that the flows from the Martin-Curren Tunnel have never been high enough to fully satisfy Rangen's 1962 priority (36-2551) and have never been high enough to provide any water to Rangen's 1977 priority (36-7694). Accordingly, it can be concluded that water was not available to water right 36-7694 at the time of its appropriation nor at any later time.

In his May 19, 2005, Order former Director Dreher found that the Department of Water Resources erred in licensing water right 36-7694 and should not have recommended it in the SRBA, because water was not available to it either at the time of its appropriation or subsequently (Order, FF 62, 63, 72). The foregoing analysis of Rangen discharge records shown in Figure 3.10 supports this conclusion.

Director Dreher also found that curtailment of water rights junior to July 13, 1962 (Rangen water right 36-2551) would "not at any time result in a meaningful increase in the quantity of water discharging from springs in the Thousand Springs to Malad Gorge reach of the Snake River, which includes the Curran Springs from which Rangen diverts surface water." (Order, FF 84). In its disclosure of June 12, 2012, the Department produced modeling results, apparently related to this finding, showing an analysis by Allan Wylie with a conclusion that Rangen could "at best expect" an increase of 0.22 cfs from curtailment.

A decomposition and back-casting of the historical monthly total discharge of the Rangen spring complex was also undertaken by Brannon (2009) apparently in anticipation of its use as a target for groundwater model calibration. This decomposition relied on Rangen measurements dating back to 1966. Figure 3.11 shows the results of this effort. Documentation of this work has not been provided by Rangen, though notes in the spreadsheet file submitted by Brannon to the IDWR allude to such documentation (Rangen Water History for IDWR.xls). Inspection of this decomposition supports the preceding conclusions that there has never been water available to water right 36-7694 since its time of appropriation.

While flows diverted from the Martin-Curren Tunnel can be delivered through the small raceways and reused in the large raceways, spring flows emerging below the Tunnel cannot. Based on a reconnaissance-level analysis (Coleman, 2012), it is feasible to pump water from Billingsley Creek to the small raceways from the same point where the diversion to the large raceways is made. This would increase the efficiency of use of Rangen's existing physical supplies by making the total discharge of the Rangen complex available to all of Rangen's raceways.

4.0 MODEL DEVELOPMENT

4.1 Background

The Enhanced Snake Plain Aquifer Model (ESPAM) is the current incarnation of numerical modeling of the Eastern Snake Plain Aquifer (ESPA) that began in 1974 (deSonneville, 1974). The ESPAM was created with review and input from the Eastern Snake Hydrologic Modeling Committee (ESHMC). The ESHMC is comprised of professionals working on water issues on the eastern Snake River Plain. Regular members include agency representatives (Idaho Department of Water Resources, U.S. Bureau of Reclamation, U.S. Geological Survey, U.S. Fish and Wildlife Service), industry representatives (Idaho Power), researchers (University of Idaho, Idaho Water Resources Research Institute) and private consultants representing various water user interests. While a diversity of interests are represented on the ESHMC, the committee is constituted by request and invitation and not through election or appointment on the basis of population, water right amounts, irrigated acreage, or other such factors. Committee decisions are generally reached by consensus, though this is not always possible to achieve.

Actual development of ESPAM was carried out by the IDWR and the Idaho Water Resources Research Institute (IWRRI). Model design, construction and calibration were reviewed and in some instances redirected by the ESHMC.

From the outset of the ESPAM modeling effort, it was recognized that there would be a need for future enhancements to the model as new information and modeling approaches became available. ESPAM Version 1.0 (ESPAM1.0) was released in 2004, followed shortly by ESPAM1.1 which corrected an input data error. Discussions regarding the scope of future enhancements to ESPAM1.1 began shortly after its release (e.g., Brendecke, 2009a). ESPAM2.0 was released in the summer of 2012; correction of an input data error has recently resulted in the distribution of ESPAM2.1.

4.2 Model Structure

4.2.1 Overview

Like its predecessors, the ESPAM2.1 is developed in MODFLOW, a groundwater modeling environment developed by the U.S. Geological Survey (McDonald and Harbaugh, 1988; 2000). In MODFLOW, aquifers are represented as a collection of rectilinear elements or “cells”. The MODFLOW code solves the equations of flow between these cells to determine how the aquifer will respond to changes in inputs or outputs. Figure 4.1 shows the grid of model cells used for ESPAM2.1.

Within each cell, aquifer characteristics (e.g., porosity, hydraulic conductivity) are assumed to be homogenous (the same throughout the cell) and isotropic (allowing flow to occur in all directions with equal ease) as would be the case if the cell were filled with clean sand of uniform grain size. This assumption of homogeneity means that hydrologic and geologic details of a scale smaller

than the cell cannot be explicitly represented in the model. MODFLOW has the capability to represent anisotropy (where flow occurs in preferential directions), but this feature has not been used in any versions of the ESPAM.

A MODFLOW model may be comprised of one or more vertical layers of cells. Multiple layers are typically used when there is more than one geologic layer that is meaningful to groundwater flow patterns. The thickness of cells in model layers can vary to reflect changes in thickness of subsurface formations, such as the thinning of water bearing formations that often occurs at the edges of aquifers.

Boundary conditions must be defined to characterize the patterns of flow into and out of the model domain, and MODFLOW provides a variety of special cell types for this purpose. River cells are used to represent subsurface flow between river reaches and the aquifer. Drain cells are used to represent aquifer discharge through springs. Constant flux cells are used to represent fixed amounts and patterns of subsurface flow into the aquifer from tributary valleys. Other special-purpose cells serve other functions.

Most of the cells in a MODFLOW model are general purpose cells. It is in these model cells that aquifer recharge from precipitation and irrigation, and aquifer withdrawals by pumping and evapotranspiration, among other things, are represented. To carry out a groundwater flow simulation, it is first necessary to develop a water budget of aquifer inflows and outflows at each model cell and to develop, through calibration, estimates of parameters representing the aquifer characteristics at each cell.

4.2.2 General Structure of ESPAM2.1

Like its predecessors, the ESPAM2.1 is comprised of cells that are one mile square. This means that features having dimensions smaller than one mile cannot be explicitly represented in the model. However, considerable amounts of pertinent input data are not known at even this one-square mile level of spatial resolution. For example, subsurface geology on the ESPA is known with certainty only at outcrops or at locations where drilling logs are available. Crop distribution information on the ESPA is available only at a county level from annual agricultural statistics based on self-reported data. Detailed water distribution to lands within canal companies can be quite variable as shares are transferred between users; even if this information were readily available it is difficult to embody in model inputs. As a result of these latter data limitations, crop distributions in ESPAM2.1 are assumed to be uniform county-wide, and surface water distribution is assumed to be uniform across every parcel of served land within groups of canal companies.

The resolution of input data may not present a problem when doing a regional-scale analysis because local errors, if random, may effectively cancel each other in the larger context. However, the questions presented in the present delivery call are quite localized in nature and this “error cancelling” cannot simply be assumed to occur. Hinckley (2012) has illustrated some of the discrepancies that exist between the coarse simplifications of ESPAM2.1 and the details of Rangen-area hydrogeology.

Like its predecessors, ESPAM2.1 is comprised of a single layer of cells of uniform thickness. This means that substantial aquifer thinning, such as occurs in the Hagerman-Wendell, Burley-Pocatello, and Rigby Fan-Mud Lake areas (Whitehead, 1992), is not represented in the model. This is important because aquifer transmissivity (T) is a linear function of the hydraulic conductivity of the aquifer material (K) and the aquifer saturated thickness (b), as shown in the following equation:

$T = Kb$

As the aquifer material (in this case the Quaternary basalt) thins, the transmissivity is reduced and resistance to groundwater flow increases. Saturated thickness is also reduced by drawdown of the water table, e.g., by pumping or by spring discharge, resulting in a non-linear relationship between water level and flow. The ESPAM2.1 assumes constant transmissivity throughout the model domain. This assumption is made largely for reasons of computational convenience, as will be discussed later in this report, but may result in substantial misrepresentation of flow conditions in some parts of the aquifer, such as the Hagerman rim, where thinning occurs and preferential flow pathways become more restricted.

Like its predecessors, the ESPAM2.1 represents springs using special-purpose drain cells. As shown in Figure 4.2, discharge from a drain cell is a function of the difference in head (Δh) between the computed water level in the cell and the assumed elevation of the drain outlet, and a conductance parameter (C) that effectively acts as a throttle on the rate of discharge. The conductance parameter can be expressed in units of cubic feet per second (cfs) per foot of head difference. While it is a calibrated value in ESPAM2.1 (calibration is discussed in a later section), under certain conditions it can be estimated from field observations.

Like its predecessors, the ESPAM2.1 uses data from a variety of sources to represent the water budgets of the aquifer and of individual model cells. These data include precipitation, surface water diversions, subsurface inflows from tributary basins, stream gage records, county surveys of crop distributions, estimates of evapo-transpiration (ET), methods of irrigation water application, and assumptions about irrigation canal seepage, among others. With few exceptions, the data sources used in the ESPAM2.1 are the same as those used in its predecessors.

From the foregoing, it can be seen that the ESPAM2.1 should not be viewed as a new model of the ESPA but as a relatively modest refinement of earlier versions of ESPAM. It has the same conceptual formulation as its predecessors and relies on the same data sources as its predecessors. Its spatial resolution is the same as that of its predecessors. Like its predecessors it "…is a regional-scale model … best applied for regional-scale predictions." (IDWR, 2012).

4.2.3 Key Differences between ESPAM2.1 and Its Predecessors

The ESPAM2.1 utilizes a longer study period (1980-2008) than did ESPAM1.1 (1980-2002). The addition of six years to the study period means that more input data are used in the ESPAM2.1,

though the basic data sources used remain the same in both models. The ESPAM2.1 utilizes monthly stress periods where ESPAM1.1 used semi-annual stress periods; the increased number of stress periods also increased the amount of input data used in ESPAM2.1, since each formerly semi-annual data value was replaced with 6 monthly values. In some cases (e.g., precipitation, canal diversions) this allowed more accurate temporal representation of water budget terms, while in others (e.g., tributary underflow) it required further disaggregation of data for which only annual estimates are available.

Surface water conveyance and application efficiency are represented in more detail in the ESPAM2.1 than in ESPAM1.1. A greater number of leaky canals were explicitly represented in ESPAM2.1 (primarily in eastern portions of the plain), though canal seepage losses are still considered to be constant throughout the model study period. Farm irrigation efficiency is assumed to increase somewhat in water-short years in ESPAM2.1 through an "On-Farm Algorithm" that operates on model input data. Irrigated acreage is slightly higher in ESPAM2.1 due primarily to the use of better image processing methods than were used for ESPAM1.1 (Sukow, 2012).

The ESPAM2.1 is calibrated to a larger number of spring complexes in the Milner-King Hill reach of the Snake River than was ESPAM1.1. This stems largely from efforts to develop more complete data sets of spring discharges than were available for ESPAM1.1. In large part, these data sets are based on diversion and flow measurements reported by spring users, with extrapolation to fill missing data. The data sets were then used as targets for calibration of drain cells representing those spring complexes. Some spring complexes in ESPAM2.1 are represented by using two drains within the same model cell; in general, this was done to encompass the range of observed outlet elevations of springs falling within the cell, but in some cases the springs so represented may have little hydro-geologic relation to one another. Figure 4.3 shows the distribution of drain cells used to represent springs in the ESPAM2.1.

The more comprehensive representation of spring complexes in ESPAM2.1 necessitated the use of General Head Boundary (GHB) cells to represent observed river gains that were not accounted for in spring discharge data (Wylie, 2012 memo). These unaccounted for flows were implicit in ESPAM1.1 spring discharges. GHB cells work in a fashion similar to drain cells in that their discharge is a function of head difference and a calibrated conductance parameter. Figure 4.3 also shows the distribution of these GHB cells, some of which occur in cells already containing drains representing springs.

4.3 Rangen Area Representation in ESPAM2.1

While all the refinements made in ESPAM2.1 have some effect on simulated flows and impacts at the Rangen springs, two refinements bear directly on them. The first of these is the use of the Rangen springs as a specific calibration target in ESPAM2.1. Figure 4.4 shows a close-up of the ESPAM2.1 model grid in the area of the Rangen complex. In ESPAM1.1, flows at the Rangen springs were estimated as a percentage of overall spring discharge to the Thousand Springs - Malad subreach (the cells that comprised this reach are highlighted on Figure 4.4). In ESPAM2.1, historical diversions and Billingsley Creek flow measurements reported to the IDWR

by Rangen were used to derive estimates of monthly total discharge that were used as a calibration target. The discharges at Rangen are represented in ESPAM2.1 as a single drain, though discharges actually occur at multiple outlets. This single drain representation does not allow ESPAM2.1 to distinguish flows emanating from the Curren Tunnel from flows emanating from natural springs in the Rangen complex.

The second ESPAM2.1 refinement of particular consequence in the Rangen area is the elimination of the Hagerman Valley from the model domain. This was done at the recommendation of geologist Dennis Ralston, who studied the area and reported to the ESHMC that the Tertiary formations underlying the Valley were not connected to the ESPA (Ralston, 2008)[1]. As a result, the canyon rim became the westernmost extent of the model domain in the Hagerman area in ESPAM2.1. Figure 4.5 shows the changes in the model domain made with ESPAM2.1, highlighting the change in the Rangen area.

Later, after comparing the historical discharges of springs used for calibration targets with reach gains computed from river gages, it was discovered that the observed reach gains substantially exceeded, by roughly 25%, the sum of spring discharges used as calibration targets (Wylie, 2011; 2012 memo). To remedy this discrepancy, GHBs were defined through several reaches to account for the undocumented gains, or "baseflows." This at least partially undid the change in model domain, as the baseflows from the ESPA are now assumed to pass through Ralston's "unconnected formations" to reach the Snake River. As will be discussed later, this results in simulation of unrealistic groundwater flow patterns in the Rangen area.

4.4 Model Calibration Process

4.4.1 General Approach

After conceptual formulation and data development, the next step in groundwater model development is calibration. Calibration is a form of "history matching" wherein initial values of model parameters (such as transmissivity) are adjusted to achieve a better correspondence between historical targets (e.g., measured water levels and spring flows) and model-predictions. Ordinary least-squares regression may be the most familiar example of this process; in it, the parameters of the regression equation (slope, intercept) are adjusted to minimize the sum of the squared differences between the regression line and the data observations. In this context, the groundwater model can be viewed conceptually as a regression equation.

Because of the many parameters that must be adjusted (several for each model cell), groundwater model calibration is often done using special software programs that solve this "inverse problem", so called because its aim is to use observed behaviors to specify the model rather than to use the model to describe the behaviors. The software program used to calibrate

[1] In his mapping of the geohydrologic framework of the Eastern Snake River Plain, Whitehead (1992) also excluded the Hagerman Valley from the Quaternary basalt aquifer system.

all versions of ESPAM has been the model-independent Parameter ESTimation program (PEST) developed by John Doherty (Watermark, 2005).

To find the "best" solution to the inverse problem, PEST seeks to minimize an objective function that reflects the overall sum of squared differences (or "residuals") between historical aquifer observations, or "calibration targets", and model predictions. The ultimate goal of calibration is to determine the set of parameter values that produce the smallest overall value of this objective function. Historical calibration targets included observed aquifer water levels, reach gains and spring discharges over the period 1980-2008, though not all targets had continuous data over this period. While PEST produces quantitative measures of calibration success, it is ultimately a matter of judgement for the modeller to decide that a given calibration is "good enough" for the purpose at hand.

The objective function used in model calibration effectively aggregates, using weighting and indexing assumptions, all the residuals in the model calibration data set down to a single number. The weighting assumptions used in ESPAM2.1 calibration were based on judgement. Because the objective function is a single number, it is normal for PEST to identify a parameter set that provides a closer calibration to some targets than to others. As the desired use of the model focuses on ever more detailed locations and time periods, it becomes more and more important to examine calibration success in specific areas of the model.

While the calibration of models with large numbers of parameters (such as ESPAM2.1) allows consideration of more factors affecting aquifer conditions, it increases the risk that any given PEST solution (i.e., an "optimal" set of parameter values) is not unique (Watermark, 2005). This means that there may be many other combinations of parameter values could produce a similarly minimized value of overall model error. This non-uniqueness creates one dimension of overall model uncertainty, which is discussed in more detail in a later section.

4.4.2 Calibration of ESPAM2.1

The parameters that PEST was allowed to adjust in ESPAM2.1 included conventional aquifer parameters such as transmissivity, specific yield, and streambed, drain and GHB conductances. In addition, PEST was allowed to manipulate a number of terms in the aquifer water budget where precise values could not be known. For example, PEST was allowed to adjust tributary inflow estimates and surface water irrigation efficiency assumptions, among other things. Given the large number of active cells in the model and the many aquifer water budget terms considered at each cell, the number of adjustable parameters in ESPAM2.1 calibration is large.

Doherty (Watermark, 2005) cautions that "…increased parameterisation normally results in increased parameter non-uniqueness at the same time as any semblance of model linearity rapidly fades from view." As will be discussed later in this report, the assumption of linearity is fundamental to both IDWR and Rangen efforts to quantify the flow changes resulting from curtailment. The large number of parameters reflected in ESPAM2.1 increases the likelihood that the model is not linear.

Reach gain and spring discharge targets were given greater weight in the calibration of ESPAM2.1 due to the fact that there were a far greater number of calibration target values for aquifer water levels than there were for these discharges. Without preferential weighting, PEST would try to match all targets with similar accuracy, by default placing more emphasis on aquifer water level targets. The weighting applied to targets essentially determines the degree to which PEST "focuses" its effort on minimizing error in certain types of model behavior. PEST provides guidelines for such weighting, but it ultimately becomes a decision made by the modeller.

The ESPAM2.1 was calibrated under the assumption that aquifer transmissivity in any given cell is constant over the calibration period. This assumption is computationally convenient in part because it avoids iterative recalculation of transmissivity as simulated water levels change, but it can lead to overestimation of transmissivity in some areas of the model domain (Johnson, et.al., 2010). A common rule of thumb in determining whether this assumption is justified is that simulated changes in water level should not be greater than 10% of overall saturated thickness (Reilly, et al, 1987). Areas where this condition is most likely not to be met are those where the aquifer is thinnest, such as at its edges, as is the case in the present delivery call. Hinckley (2012) estimates that the saturated thickness of the ESPA in the vicinity of Rangen is on the order of 50 feet. Water level changes in wells near Rangen are on the order of 5 feet, making the assumption of constant transmissivity (and the convenient assumption of linearity that it allows) questionable. Compounding this is the fact that fractures and heterogeneities of a scale much smaller than one mile likely dominate flow hydraulics at the thin edges of the aquifer.

4.5 Calibration Results

Calibration success can be assessed in several ways besides the final objective function value produced by PEST, which is not by itself informative. The most commonly used methods for assessing calibration are visual and mathematical comparisons of simulated values and their corresponding targets. It is also useful to examine simulated and observed flow regimes to assess whether model performance reflects general observations and geological constraints that might not be represented explicitly.

4.5.1 Comparison with Calibration Targets in Rangen Area

Figure 4.6 shows the calibrated and target discharge for the Rangen spring complex from the ESPAM2.1 final calibration, along with other representations of calibration fit. In general, the broader patterns of observed discharge are reflected in the modeled values; multi-year cycles and trends are apparent in both, as are seasonal variations. However, the ESPAM2.1 systematically under-estimates discharge in the early years of the calibration period while over-estimating it in the later years.

This systematic error is more apparent by the analysis of residuals that is also shown in Figure 4.6. This analysis shows the error in monthly simulation relative to mean discharge. If simulation errors are random, this plot of residuals should vary randomly about the zero line over time. In fact, Figure 4.6 shows that that ESPAM2.1 consistently under-predicts (by as much as 15 cfs) the total flows from the Rangen complex in the early part of the calibration period and consistently

over-predicts (by as much as 15 cfs) these flows in the more recent part of the period. Since similar patterns are evident at other target springs in the area it raises the prospect of a more general problem with ESPAM2.1 representation of springs in the Hagerman area and suggests that curtailment analyses, which look forward from present conditions, may over-predict increases in spring discharge from curtailment.

Figure 4.7 shows a comparison between simulated and target water levels in calibration well #989 (7S14E29CDC1). There is no calibration well in the Rangen cell, but well #989 is in the model cell immediately northeast from the Rangen cell and is the closest well used in calibration. The simulated water level in this well is systematically more than 20 feet lower than observed level. Also shown on Figure 4.7 is a comparison between simulated and observed water levels in well 7S14E33BBB1. This well was identified as calibration well #992, but for unknown reasons was not included in the target calibration data set. Figure 4.7 shows that ESPAM2.1 also underpredicts the water level in this well.

In 2008 the IDWR completed a monitoring well (7S14E32SENW, aka the "Rangen Monitor Well") on the plain just above the Curren Tunnel (Farmer, 2009). Observations from this well could not be used in ESPAM2.1 calibration because measurements did not begin until the very end of the model calibration period. Nevertheless, the range of observed values reasonably can be compared to simulated water levels in the Rangen cell for the last few years of the calibration period. This comparison is shown in Figure 4.8. It can be seen that ESPAM2.1 predicts recent water levels in the Rangen cell that are substantially lower than what has been observed in the Rangen Monitor Well.

The underprediction of water levels near Rangen is partly a result of the fact that discharge targets were weighted more heavily than water level targets in the calibration process. If predicted water levels were too low, PEST could still meet the more important discharge target by increasing the drain conductance. This is problematic because it embodies, in the drain conductance parameter, a mischaracterization of the real physical relationship between water levels and flows at Rangen. This, in turn, results in mischaracterization of change in drain flow as a result of simulated change in water level due to curtailment. If the calibrated drain conductance parameter is too high, the benefits to Rangen from curtailment will be over-stated.

That the Rangen discharge calibration is as good as it is despite the underprediction of surrounding water levels illustrates another important modeling concept…that good calibration is not necessarily evidence of correct physical representation (Bredehoeft, 2005).

Table 4.1 lists the ESPAM2.1 drain parameters determined by PEST for target springs in the Billingsley Creek area. Drain elevation assumptions were generally chosen to reflect actual elevations, or a range of actual elevations where multiple drains were used. PEST was allowed to adjust drain conductances as needed to match spring discharge targets using simulated water levels. As can be seen in Table 4.1, the calibrated conductances range over 4 orders of magnitude. This extremely large variation suggests that the set of calibrated parameters is quite fragile and that PEST can readily find alternative parameter sets that provide acceptable calibrations.

4.5.2 Comparison to Observed Conditions in Rangen Area

The ESPAM2.1 posits a strictly linear relationship between water level in the Rangen cell and discharge from the Rangen drain. The ESPAM2.1 drain conductance has a calibrated value of 4.85 cfs/foot, meaning that a one foot increase in water level in the Rangen cell will result in a 4.85 cfs increase in drain discharge. The only water level observations close enough to Rangen to be considered within the Rangen cell are those from the Rangen Monitor Well. Hinckley (2012) demonstrates that Curren Tunnel discharge is not the simple linear function of nearby water level represented in ESPAM2.1, a fact that appears also to be acknowledged by Rangen experts (Brannon, 2009). If this relationship is in fact non-linear, the principle of superposition cannot be used to reliably determine the effects of curtailment on Rangen flows.

Even if a linear relationship were to be derived from Hinckley fig 19, it suggests that a one foot increase in nearby water level would cause a discharge increase of 1.37 cfs rather than the 4.85 cfs embodied in ESPAM2.1. In this case the ESPAM2.1 overstates the benefit from curtailment by nearly a factor of 4.

Observed water level in the Rangen monitor well varies over a range from about elevation 3151 ft to 3166 ft (msl). Farmer (2009) estimated the elevation of the outlet of the Curren Tunnel to be 3145 ft (msl) and the elevation of the lower springs to be about 3100 ft (msl). This suggests that the saturated thickness of the aquifer above the Tunnel outlet is not greater than 6-21 feet and that the saturated thickness of the aquifer above the lower springs is in the range of 50-65 feet. Water levels in the monitor well vary seasonally by about 5 feet, and predicted (by ESPAM2.1) water level change in the Rangen cell from curtailment is about 4 feet. These changes are nearly 100% of the saturated thickness above the Tunnel and about 10% of the thickness above the lower springs, further indicating that the requirements for superposition are not met at Rangen.

Hinckley (2012) has shown that for a given water level in the Rangen Monitor well, the discharge from the Curren Tunnel can vary by 4 cfs. In other words, with *no difference* in observed water level, observed discharge varies by 100% of its average value over the observation period. Similarly, Hinckley has shown that a given level of Rangen discharge can be associated with water levels that vary over a 2.5-foot range. This casts further doubt on the accuracy with which ESPAM2.1 can predict the benefit to Rangen from curtailment.

Figure 4.9 shows the ESPAM2.1 change in calibrated values of aquifer transmissivity in the vicinity of Rangen. Notable on this figure is the fact that transmissivities increase in magnitude closer to the canyon rim above Rangen. This is the opposite of what would be expected as the aquifer thins out and saturated thickness decreases. Some of this is undoubtedly a result of the higher weighting placed on discharge targets than on water level targets, but Johnson (2011) suggests it may be a result of calibration using the assumption of constant transmissivity. It is likely that fracture or conduit flow, more than porous media flow, dominates hydraulic behavior near springs in the rim area. These other flow paradigms are not reflected in any of the MODFLOW constructs used in ESPAM2.1.

Farmer (2009) describes a geological discontinuity in the vicinity of Rangen where the Quaternary basalt forming the main aquifer effectively ends at the canyon rim. The Quaternary basalt below the rim immediately west of Rangen is postulated to have flowed down a "ramp" from the southeast. Because of this discontinuity, groundwater entering this lower basalt flow has to come from the southeast rather than directly through the Rangen area. However, in ESPAM2.1 there is a simulated groundwater flow of 320 cfs across this discontinuity from the Rangen cell into the cell containing Tucker and Stewart Springs. As a result of this high flux, simulated water level in the Tucker/Stewart cell is very high (above actual ground surface) and causes a simulated groundwater gradient sloping to the south. Hinckley (2012) points out that the observed groundwater gradient in this area is in the opposite direction from that simulated by ESPAM2.1. These discrepancies reveal serious model misrepresentation of detailed aquifer behaviour in the Rangen area, and raise doubt as to the accuracy of model predictions there.

4.5.3 Comparison of ESPAM2.1 with Previous Versions of ESPAM

ESPAM1.1 and ESPAM2.0

The IDWR carried out a comparison of ESPAM1.1 and ESPAM2.0 performance (Sukow, 2012a) using the paradigm of the generic curtailment scenarios originally run by IWRRI for ESPAM1.1 (Contor, et al, 2004). This comparison utilized a steady-state version of the primary input file (the .wel file) in both the ESPAM1.1 and ESPAM2.0 and simulated the curtailment to 5 generic dates. Table 4.2 reproduces the results of this comparison for the generic curtailment date of January 1, 1961.

Table 4.2 makes two different comparisons. The first compares results from using the ESPAM1.1 input file in both the ESPAM1.1 and ESPAM2.0; this comparison illuminates the change in model results that can be attributed mainly to changes in model structure and parameters (which have been described above). The second compares results between the two models each using their own input file; this comparison illuminates the change in model results that can be attributed mainly to changes in input data. With respect to spring flows below Milner, the IDWR analysis found that flows due to 1961 curtailment increased from 352 cfs to 454 cfs using the ESPAM2. The analysis also concluded that roughly 75% of this change was the result of changes in model input data, primarily the use of more recent years for estimation of irrigated acreage and irrigation water requirements. This highlights the sensitivity of ESPAM2 results to conditions in particular years. Review of updated comparisons using ESPAM2.1 (Sukow, 2012b) leads to the same conclusion.

ESPAM2.0 and ESPAM2.1

Shortly after its release, an error was discovered in the input data for ESPAM2.0. The error arose in the calculation of the water budget in the Mud Lake area and caused an overestimate of aquifer recharge of approximately 89,000 acre-feet/year in that area of the model domain. The error was corrected and the model was recalibrated creating ESPAM2.1, which was made available on November 16th of this year.

The water budget error at Mud Lake was on the order of 1% of the overall ESPAM water budget. It was expected that the relatively small size of this error and its location at the far northeastern part of the model domain would not result in significant changes to the model at its western end.

Table 4.3 shows the change in calibrated values of drain conductance parameters in the Thousand Springs reach and Rangen area, between ESPAM2.0 and ESPAM2.1. As can be seen in Table 4.3, many of the conductances in the western end of the model domain changed by amounts substantially greater than the 1% change in water budget associated with the correction. The conductance for the Rangen drain decreased by about 4%, but some drain conductances in the area changed by nearly 1000%. Figure 4.9 shows how transmissivity values changed as a result of the error correction. Some cell transmissivities in the area near Rangen changed by as much as 500%. As will be discussed in a later section, these changes in conductance and transmissivity are carried directly into the superposition models used to calculate the flow changes resulting from curtailment. Large changes in calibrated parameter values suggest that ESPAM2.0 and ESPAM2.1 may be over-parameterized, and that other comparable calibration solutions easily can be reached with only minor perturbations in model assumptions. This substantially raises the level of uncertainty in model predictions, since other models can readily be found (by PEST) that are as well-calibrated but have very different parameter values in specific locations.

Further evidence of unexpectedly large changes in ESPAM2.1 is seen in Figure 4.10, which depicts the boundary of the 5% and 10% trimlines for Rangen using ESPAM2.0 and ESPAM2.1. Figure 4.10 shows that the area encompassed by the 5% trimline is substantially larger with ESPAM2.1, but that this expansion is mainly in areas on the opposite side of the Malad Gorge from Rangen. Given the fact that the Gorge severs the Quaternary basalts that form the aquifer (Hinckley, 2012), it is difficult to see why wells west of Bliss should now be viewed as having increased effect on Rangen flows simply because of a small data error at Mud Lake.

4.6 Model Uncertainty

The ESPAM2 is, like all models, a simplified representation of reality, and this leads to model uncertainty. When viewed from a distance, the generalizations and simplifications made to construct the model may be sufficient to support regional scale analyses. However, when called upon to represent highly localized conditions such as those governing discharge from specific outlets of a specific spring complex, the generalizations and simplifications can introduce significant error into model results. Actual subsurface conditions within the ESPA are understood only in specific locations where lithology has been observed (e.g., boreholes and outcrops) and where hydraulic characteristics have been measured (e.g., pump tests). Observations of ESPA geology suggest it is highly complex, comprised of overlapping fractured basalts interspersed with sedimentary formations, with hydraulic characteristics that can vary substantially over short distances (Lindholm, 1996; Hinckley, 2012).

4.6.1 Overview - General Dimensions of Model Uncertainty

Model uncertainty has several dimensions, and these have been described in various submittals to the ESHMC (e.g., Brendecke, 2009a,b; 2012). In a nutshell, the principal dimensions of model uncertainty are those associated with model conceptualization, with model input and with model calibration. While all of these dimensions are important, conceptual uncertainty is fundamental. No amount of data improvement, re-sampling or recalibration can correct errors stemming from incorrect (or simply incomplete) model conceptualization (Bredehoeft, 2005).

Model conceptualization involves the identification and adoption of a model framework that the modeller believes can properly represent the behavior of the underlying real system. At a practical level it is the selection of a modeling code (in the present case MODFLOW) and the formulation of the model structure (e.g., defining the domain, deciding whether to operate it as a confined or unconfined system, adopting cell sizes, layering, boundary conditions, etc.). Previously in this chapter we have examined how many of these conceptual aspects of ESPAM2.1 fail to reflect observed characteristics of the aquifer system in the Rangen area. These failures lead to conceptual uncertainty in the ESPAM2.1.

Rigorous evaluation of conceptual uncertainty is difficult. There may be a large number of plausible conceptual models of an aquifer system and these models can't be rigorously evaluated until they are built. As a result, this critical dimension of model uncertainty is often "swept under the rug" in favor of more constrained and tractable evaluations that focus on input data and calibration. In the case of ESPAM2.1, this conceptual uncertainty bears directly on its suitability in the present matter.

Once a conceptual model has been identified and formulated, it must be populated with input data reflective of the important aspects of the aquifer water budget. In the case of ESPAM2.1, these data include precipitation, tributary underflows, irrigated acreage, crop distributions, surface water supplies, water application methods and efficiencies, etc. Each of these input data types carries its own uncertainties that can stem from, among other things, the inability to measure a condition accurately (or at all) and from the spatial or temporal resolution of measurements. Sometimes these uncertainties can be reduced by further data collection efforts, though these may be time-consuming and expensive. The effects of input data uncertainty can sometimes be explored through sensitivity analysis or through Monte Carlo analysis, which seeks to translate probabilistic descriptions of model input data to probabilistic descriptions of model output.

Once the conceptual model has been populated with input data, it must be calibrated. The calibration process has been addressed previously in this section. Calibration uncertainty essentially reflects the fact that many combinations of model parameter values (which in the case of ESPAM2.1 include aspects of the aquifer water budget) may lead to equally well-calibrated models. The uncertainty arises because the predictions made by these equally well-calibrated models may be significantly different.

4.6.2 IDWR Uncertainty Analysis

The uncertainty of ESPAM2.0, and selected aspects of ESPAM2.1, have been explored by the IDWR using a technique called "Predictive Analysis" that is available as part of the PEST software (Watermark, 2005). Predictive Analysis is described in the PEST documentation as

> "… the task of calculating the effect of parameter uncertainty, as estimated through the calibration process, on predictive uncertainty."

Predictive analysis essentially answers the question "If I use slightly different values for selected model parameters, do I get different values for key model results?" The analysis requires assumptions about the meaning of "slightly different" and whether such differences are small enough that the model can still be considered calibrated. The analysis does not explore alternative conceptual representations of aquifer hydrogeology, although it can be used in a limited way to explore input data uncertainty.

Table 4.3 summarizes the predictive analysis carried out by the Department (Wylie, 2012c,d) for ESPAM2.0, showing updates for selected portions using ESPAM2.1. The analysis made several simplifying assumptions to make the work computationally more efficient; for example, it assumed that pumping stress for entire Water Districts could be applied at the centroid of each District without loss of accuracy. The predictive analysis was designed to be generic, and did not examine parameter sensitivity of predictions of Rangen discharge. The conclusion that can be drawn from Table 4.3 is that parameter uncertainty variable of the model domain (e.g., the relationship between pumping in Water District 34 and reach gains between Blackfoot and Minidoka is apparently larger than that between pumping in Water District 130). The important thing to remember with this analysis is that it relies on a single conceptual model and does not explore the uncertainty that arises from improper conceptualization of local geologic and hydraulic conditions that influence discharge of specific spring complexes, such as those at Rangen.

4.6.3 Rationale for alternative models

In the uncertainty evaluation carried out for the ESPAM2.1, the model and parameter structure are assumed fixed, as are many data inputs. This approach is valuable in illuminating those parameters for which further investigation might reduce the uncertainty of the chosen model (James, et. al., 2009), but does not address larger questions of model uncertainty described above. More exhaustive evaluation approaches, such as Monte Carlo simulation, may shed greater light on the probability distributions of model errors. However, unless such approaches address all the dimensions of model uncertainty, including conceptual uncertainty, they too will be incomplete.

Conceptual uncertainty can only be addressed by considering alternative models. The poor correspondence between ESPAM2.1 assumptions about hydrogeology and aquifer behavior in the Rangen area indicate that at the very least a refined version of ESPAM2.1 is required. One very preliminary set of refinements are discussed in a later section of this report.

4.7 Limitations of ESPAM2

While it is clearly an improvement over its predecessor, several important features are the same in ESPAM1.1 and ESPAM2.1. The two are still conceptually the same regional model. Differences between them are largely the result of differences in input data and in values of calibration parameters resulting from the use of that input data. Both models represent the details of the Rangen spring complex and the surrounding geology in highly simplified form, omitting several key features and that would make significant differences in predicted benefits of curtailment.

Particularly important to the present case is the fact that ESPAM2.1 systematically underestimates water levels in the Rangen area. Because simulated heads are too low in the cells above Rangen, the calibrated drain conductances have to be made higher in order to meet the discharge calibration targets. This means that the drains are overly-sensitive to small changes in head. This over-sensitivity is carried into the superposition model used for curtailment, with the result that changes in spring flows are substantially over-predicted.

For these reasons, the ESPAM2.1 is subject to the same general limitations as ESPAM1.1, despite the increased attention given to the use of springs as calibration targets. That ESPAM2.1 can fairly closely mimic the observed past behavior of a spring complex is not proof that it sufficiently represent hydrogeologic reality to accurately predict future behaviour of that complex, especially under aquifer water use conditions (e.g., curtailment of large amounts of junior groundwater pumping) that are radically different from those extant in the model calibration period.

The ESPAM2.1 documentation describes limitations on model usage, highlighting the facts that a number of simplifying assumptions had to be made and that many components of the model water budget were uncertain. The documentation cautioned that ESPAM2.1 is a regional ground-water model best used for broad-scale predictions.

5.0 SIMULATION OF CURTAILMENT OF JUNIOR GROUNDWATER RIGHTS

5.1 Background

IDWR practice has been to create superposition versions of the ESPA groundwater model for use in evaluating curtailment (and other) scenarios. Superposition models are used primarily for reasons of convenience; it is faster and easier to perform analyses with superposition models than it is with "fully populated" models. A fully populated model contains all the water budget (input) data and parameters used in model calibration; outputs from a fully populated model can reflect simulated values of characteristics that may be directly observable in the aquifer. However, to examine effects of changes in input data, such as reduced pumping withdrawals, it is necessary to make two runs of a fully populated model and then determine effects by differencing the results of the two runs. The use of a superposition model allows this differencing to be accomplished in a single model run.

A superposition model preserves the parameters of the flow relationships between model cells but sets the initial condition of the groundwater flow regime to one of zero flux. Existing fluxes are eliminated by setting all aquifer heads and elevation differences to zero. The aquifer is converted, conceptually, into a still pool but one in which all the water molecules preserve fixed, predetermined relationships to one another. The relationships that are preserved in a superposition model are embodied in the calibrated parameters governing flow rates and responses: transmissivity, specific yield, conductance (of drains, riverbeds, and general head boundaries) and seepage rates from canals. The effect of a selected model stress, such as a reduction in groundwater withdrawal, can then be evaluated with the superposition model simply by applying that incremental stress and examining how heads and fluxes (including reach gains and drain flows) have changed from their zero condition.

The principle of superposition relies on the assumption that the system being modeled behaves in a completely linear way…that is, that flow relationships are independent of flow magnitude. In a linear model, the rate of flow caused by a half-foot difference in water level between two cells will be the same whether the cells contain water 1 ft or 1000 ft deep. Superposition models perform identically at all levels of assumed stress change, even those outside their range of calibration. If the system being simulated exhibits important non-linear behaviors, such as those that have been described in preceding sections of this report, a superposition model can introduce significant error into the analysis of effects of stress changes.

The practice of the IDWR has been to define three superposition versions of the ESPAM, a steady state version (dubbed "SuperSS"), and two transient versions (dubbed "SuperTransient10yr_monthly" and "SuperTransient150yr"). The transient versions allow simulation of how assumed stress changes evolve over time, the former reflecting a repeated seasonal pattern of conditions and the latter reflecting a constant annual pattern. The constant annual pattern is used to assess the speed at which the aquifer reaches equilibrium (steady state) conditions after introduction of a change.

Simulation of curtailment of groundwater irrigation rights junior to Rangen's 1962 Curren Tunnel water right has been carried out with ESPAM2.0 by both the IDWR and by Rangen experts. Simulation of curtailment using ESPAM2.1 has been carried out in a generic sense by the IDWR (Sukow, 2012b) and for the Rangen water rights by AMEC. These simulations are briefly described and evaluated below.

5.2 IDWR Curtailment Analyses

5.2.1 Generic Curtailment Analysis

As part of the development of ESPAM2.1, the IDWR carried out a comparative analysis of the effects of curtailment as simulated by ESPAM1.1, ESPAM2.0 and ESPAM2.1. The simulated curtailments were those described by Contor, et.al. (2005) for ESPAM1.1. The curtailments did not reflect priority dates of any specific water rights nor were they limited spatially to the the Area of Common Groundwater defined in Rule 50 of the Conjunctive Management Rules. The curtailment dates used in the analyses were January 1 of the years 1870, 1949, 1961, 1973 and 1986. The January 1, 1870, curtailment date reflected curtailment of all groundwater use in the model domain except that occurring under tribal water right settlement agreements.

The January 1, 1961, curtailment is roughly comparable to that which would occur under the present delivery call for Rangen's July 13, 1962, water right. Table 4.2 in the preceding section showed the results of the hypothetical 1961 curtailment using ESPAM1.1 and ESPAM2.1.

5.2.2 Rangen Curtailment Analyses

In its document production of June 12, 2012, the IDWR produced model files containing results of curtailment analyses for the present Rangen delivery call. These files indicate that the Department evaluated the effects of July 13, 1962, curtailment with ESPAM2.0 using various "trimline" assumptions.

The "trimline" defines a zone of exclusion outside of which the benefits of curtailing a well are less than a threshold percentage of the amount of water use curtailed, as determined by the groundwater model. The trimline concept was originally adopted by former Director Karl Dreher in his 2005 Orders stemming from the delivery calls of Blue Lakes Trout, Clear Springs Foods, the Surface Water Coalition, Rangen, Inc., and others. Director Dreher adopted a 10% trimline and stated in hearing testimony that he viewed this as a minimum level of model uncertainty, noting that model uncertainty had not been quantified. He went on to say that:

> *"…I made the determination it was not appropriate to curtail such junior priority ground water use if, in fact, we didn't know whether curtailment would result in a meaningful amount of water reaching the calling senior right."* (Transcript at 1167: 4-80)

Table 5.1 summarizes the results of the IDWR curtailment analyses using ESPAM2.0. The analyses considered trimline thresholds between 0.2% and 10%, as well as trimlines limited only by the Rule 50 Area of Common Groundwater Supply and by the ESPAM2.0 model domain. As

the trimline threshold decreases the area encompassed by curtailment increases. As shown in Table 5.1, there are a total of 406 groundwater irrigated acres relying on rights junior to Rangen's 1962 priority within the 10% trimline; there are a total of 565,023 groundwater irrigated acres within the model domain relying on rights junior to Rangen's1962 priority.

Table 5.1 shows that curtailment of the junior groundwater rights within the 10% trimline would immediately eliminate 1,445 acre-feet of groundwater pumping and, at steady state, would cause total modeled flow at the Rangen springs to increase by 0.19 cfs (141 af/y assuming year around flow). This increase in modeled spring discharge represents 9.5% of the pumping foregone by the curtailed wells and, assuming a permitted groundwater diversion rate of 1 miners inch (1") per acre, 0.66% of the curtailed water rights. It would take somewhat less than a year for discharge to reach 90% of this modeled steady state increase.

Curtailment of the junior groundwater rights within the entire model domain would immediately eliminate 1.46 million acre-feet (MAF) of groundwater pumping and, at steady state, would cause modeled discharge from the Rangen spring complex to increase by 18.07 cfs. This increase represents 0.9% of the pumping foregone by the curtailed wells, and 0.06% of the curtailed water rights. It would take approximately 16 years for modeled discharge to reach 90% of this steady state increase.

Foregone groundwater use that is not simulated to accrue to Rangen would accrue to other connected river reaches, springs and baseflows, including those on which there are no water rights or diversions, those on which there are no delivery calls, those on which approved mitigation plans are already in place, and those on which diversions occur under water rights junior to those of the curtailed rights.

5.3 Rangen Analysis

In its December 13, 2011, delivery call Rangen included a curtailment analysis (Exhibit 11 to the petition) carried out by its experts (McGrane et.al., 2011). The details of this analysis were requested at the outset of discovery for this case, but were not produced by Rangen until November 28th of this year. Accordingly, the conclusions below are based primarily on a facial interpretation of Exhibit 11 and may be supplemented when time permits a more careful examination of Rangen's late production.

The Rangen analysis appears to be a transient analysis using average monthly stresses. The use of a transient, average monthly analysis permits the display of simulated seasonal effects of curtailment. It does not appear that the version of ESPAM2.0 used for the analysis is the final calibrated version. The analysis recommends against the use of the trimline concept and concludes with a recommendation that Rangen seek curtailment of all junior (to July 13, 1962) groundwater irrigation rights within the ESPAM2.0 domain. As noted above, this would immediately dry up 565,023 acres of groundwater irrigated land.

Figure 5.1 is reproduced from Exhibit 11 of the Rangen petition. It shows that curtailment would achieve a simulated annual average increase in total Rangen discharge of 17 cfs after 20-plus

years of curtailment. After twenty five (25) years of continuous curtailment, simulated minimum seasonal flows from the Rangen complex would increase by about 9 cfs.

Presumably the curtailed groundwater acreage and water use amounts implicit in the Rangen analysis are similar to those of the IDWR analysis with no trimline, and that similar conclusions could be drawn regarding the portion of curtailed use and water rights that would accrue to Rangen's benefit.

5.4 Rangen Curtailment Using ESPAM2.1

AMEC has carried out analyses of curtailment for Rangen's 1962 water right using ESPAM2.1. These analyses were carried out using the assumption of a 10% trimline. A 10% trimline assumption was adopted based on precedent; previous curtailment analyses and orders by the IDWR have used this assumption, which stems from Director Dreher's Orders in 2005.

AMEC compared the spatial extent of the 5% and 10% trimlines for ESPAM2.1 as defined based on steady-state response functions published by the IDWR (http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/model_files/Version_2.1_Current). Figure 4.10 shows the 10% and 5% trimlines for ESPAM2.0 and ESPAM2.1. The 10% trimline is the same for both models, but the 5% trimline for ESPAM2.1 encompasses a larger area than that for ESPAM2.0. This is presumably the result of recalibration due to correction of the Mud Lake data error described previously, though it is difficult to see why a small change in input data in the opposite end of the model domain would cause such a large change in the trimline. It is noteworthy that the extension of the trimline occurs in the area west of Bliss, which is separated from the Rangen area by the Malad Gorge.

Table 5.2 summarizes the steady state results of the 10% trimline curtailment using ESPAM2.1. Curtailment to the 10% trimline has results nearly identical to the ESPAM2.0 analysis done by the IDWR. This curtailment would immediately dry up 406 acres of groundwater irrigated land and eliminate 1,446 acre-feet of groundwater use. Total simulated flow at Rangen would increase 0.21 cfs, which is slightly higher than the 0.19 cfs predicted by the IDWR analysis. This small difference may be attributable to changes in the transmissivity distribution that occurred in recalibration of ESPAM2.1.

6.0 Alternative Conceptual Models

This section describes the development of two alternative conceptual models (labelled #1 and #2 below) of the ESPA in the immediate area of the Rangen complex. The aim of this effort is not to present a definitive reformulation of ESPAM2.1, but to illustrate how a few relatively minor changes to its conceptual structure, suggested by detailed hydro-geologic review, could result in significantly different conclusions from a curtailment analysis. In order for either of these alternative conceptual models to be fully developed, it would be necessary to perform similar analyses at other spring complexes as were presented in the foregoing sections of this report and to extend the reach of calibration from that used herein. Nevertheless, the results of these

preliminary steps at more realistic representation of local hydrogeology illustrate the potential for significant conceptual uncertainty in the application of ESPAM2.1 to localized problems.

6.1 Description of Modifications to ESPAM2.1

The alternative modeling effort focused on making small changes to the construction of ESPAM2.1 to explore what effect these changes have on simulated Rangen discharge and simulated water levels in the vicinity of Rangen. Concepts for these changes are based primarily in hydrogeologic analyses and interpretations presented in Ralston (2008), Farmer (2009) and Hinckley (2012) and on discussions with Neal Farmer on August 22, 2012.

6.1.1 Horizontal Flow Barrier

The main geologic formations that influence the groundwater flow and spring discharge near the Hagerman area are the Quaternary basalts that form the ESPA and the less permeable Tertiary formations (e.g., Glenns Ferry) that underlie it. Current geologic understanding of the Hagerman area is that the ESPA effectively terminates along the Hagerman rim and that the underlying formations restrict subsurface flow from it into the Hagerman Valley. At the south end of the rim, however, Quaternary basalt flows form a "ramp" (Farmer, 2009) creating a pathway to feed lower-elevation springs such as Tucker and Stewart as shown in Figure 6.1. Between this ramp and the rim is a geologic discontinuity, possibly faulting, that restricts groundwater movement directly from the rim to the lower elevation springs. Observed gradients indicate that groundwater flows into this lower area from the southeast rather than the northeast.

To reflect this geological feature, a horizontal flow barrier (Hsieh, 1993) was inserted between columns 12 and 13 for the cells in rows 42 and 43 of the model domain. For model #2, this barrier was shortened to only row 42, as shown in Figure 6.2. A horizontal flow barrier restricts groundwater flow between the cells for which the HFB is defined. With this barrier in place, the preponderance of flow moving southwest through the ESPA must go around the discontinuity to reach the lower springs.

6.1.2 Multiple Drains

Groundwater flows from the Rangen complex emerge at several locations. Farmer (2009) and personal observation note at least two discharge areas, the Curren Tunnel and a set of springs emerging from the slope below it. Farmer estimated the Tunnel to be at elevation 3145 ft (msl) and the lower springs to be at elevation 3100 ft. Koreny (2011) presented spring survey data indicating a Tunnel elevation of 3150 ft "plus or minus two feet." Covington and Weaver (1991) note an elevation of 3138 ft for the "Rangen spring." Elsewhere in the Thousand Springs reach, complexes with discharge points having a range of elevations have been represented using two drains. Given the range and uncertainty in elevations of discharges at Rangen, it seems appropriate to use the same multiple drain construct to represent Rangen as was used in other nearby locations.

Accordingly, another modification made to the alternative models was to represent the Rangen complex using two drains. A new upper drain (DRN218) was added to the Rangen cell, and to the CRIV group. In both models the lower drain was given an elevation of 3100 ft. In alternative model #1 the upper drain was given an elevation of 3152 ft, while in model #2 it was given an elevation of 3148 ft, thus bracketing the upper elevation estimates for the Tunnel presented by Koreny (2011).

6.1.3 Removal of GHB Cells

As noted in Section 4, the use of General Head Boundaries (GHBs) to reflect unmeasured flows from the ESPA to the Snake River effectively undid the removal of the Hagerman Valley from the model domain. Present geologic understanding is that the Hagerman Valley is not part of the ESPA, yet the use of GHBs along the Hagerman rim implies that the ESPA continues through the valley to the river.

It is conceivable that ESPA discharges could be made to the river at the northern and southern edges of the Hagerman Valley. Covington and Weaver note the presence of springs at river level downstream of Lower Salmon Falls dam. Low elevation springs and seeps also exist in the area of the Hagerman Fish Hatchery operated by the State of Idaho.

The third modification made in the alternative models was to remove four GHB cells immediately north of Rangen to prevent simulation of ESPA flows through the Hagerman Valley. This reconfiguration is shown on Figure 6.3. This removal forces baseflows in the Buhl to Lower Salmon Falls reach to move through the remaining GHB cells defined in ESPAM2.1.

6.1.4 Increased Weighting on Recent Rangen Flows

A notable feature of the ESPAM2.1 calibration and validation is the over-prediction of Rangen flows in recent years. Given that any management action would look forward from the present, it seems appropriate that greater emphasis should be placed on simulation of current aquifer behavior. Accordingly, a further modification undertaken in Alternate Model #2 was to assign increased calibration weight to Rangen flow observations after the year 2000. The aim of this modification was to improve the model simulation of Rangen discharge in recent years.

6.2 Calibration of Alternative Models

6.2.1 General Approach

The alternative models were calibrated using the PEST software. Calibration adjustments were limited to parameters in the CRIV group; no recalibration of model transmissivity or specific yield was done, nor were any water budget terms adjusted in the calibration.

Calibration targets for the alternative models were the same as those used in ESPAM2.1, except for the addition of water level targets for PEST well #992. This well, which lies immediately northeast of the Rangen cell, was listed as a target for ESPAM2.1 but was apparently never

used. This inclusion of well #992 added 166 additional target values to the calibration data set. These were given calibration weights the same as those used in ESPAM2.1 for other transient water level targets.

6.2.2 Calibration Results Model #1

Figure 6.4a shows the results of calibration of model #1 for the Rangen discharge and Figure 6.5a shows the results for water levels in wells 989 and 992.

In ESPAM2.1, modeled groundwater levels in calibration well 989 are 20 ft lower than observed levels, and in well 992 the modeled levels are around 2 to 8 ft lower than observed levels (well 992 was apparently not used in the ESPAM2.1 calibration).

In alternative model #1, simulated water levels are higher in both wells, matching observations better than in ESPAM2.1. The most marked improvement is in well 989, which was underpredicted by approximately 20 feet in ESPAM2.1; with model #1 the underprediction is about 10 feet. ESPAM2.1 underpredicted water levels in well 992 by about 5 feet, though somewhat less in more recent years; with model #1 there is good match to water levels in well 992, though there is a slight overprediction in recent years.

The simulated Rangen discharge in model #1 is nearly identical to ESPAM2.1. From the foregoing I would conclude that the calibration of model #1 in the Rangen area is at least as good as that of ESPAM2.1.

6.2.3 Calibration Results Model #2

Figure 6.4b shows the results of calibration of model #1 for the Rangen discharge and Figure 6.5b shows the results for water levels in wells 989 and 992.

In alternative model #2, simulated water levels are not as high as with model #1, but correspondence with well 989 is still improved over ESPAM 2.1. Calibration to flow at Rangen is somewhat poorer in the early years of the calibration than is ESPAM2.1, but calibration in recent years is much better. Model #2 appears to resolve the overprediction problem noted for ESPAM 2 ? in recent years.

6.3 Curtailment Analysis with Alternative Models

Both alternative models were run to simulate curtailment of junior groundwater uses within a 10% trimline. This trimline is consistent with past practice and with IDWR water rights transfer policy. The results of these runs are shown in Table 6.1. Also shown in this table are the results of the same curtailment analysis using ESPAM2.1.

It can be seen by this comparison that the relatively minor modifications made to ESPAM2.1 to better reflect local hydrogeology have substantial effect on simulated benefits to Rangen from curtailment. In the case of alternative model #1, the benefit from curtailment is roughly half that

predicted by ESPAM2.1. In the case of alternative model #2, the benefit is about 5% of that predicted by ESPAM2.1.

6.4 Conclusion

The foregoing alternative model simulations demonstrate how sensitive the predictions from ESPAM2.1 can be to the model representation of local hydro-geologic conditions. Relatively minor changes in ESPAM2.1 conceptualization, made to more closely reflect the local conditions at Rangen, result in model predictions that differ substantially from those of ESPAM2.1. The substantial differences in model predictions highlight the potential magnitude of conceptual uncertainty in ESPAM2.1, a dimension of uncertainty not addressed in the IDWR's predictive analysis.

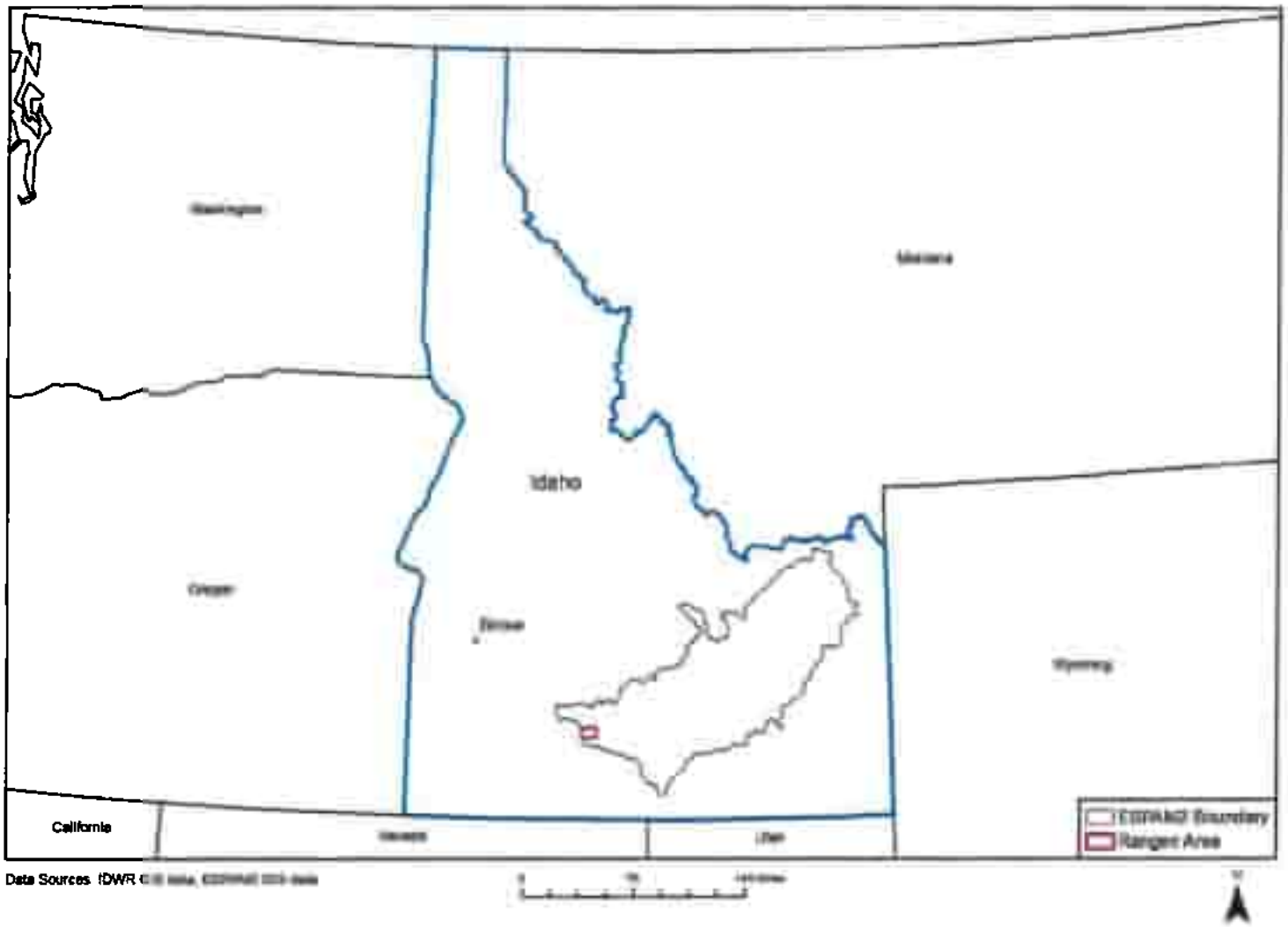


Figure 1.1: Location Map

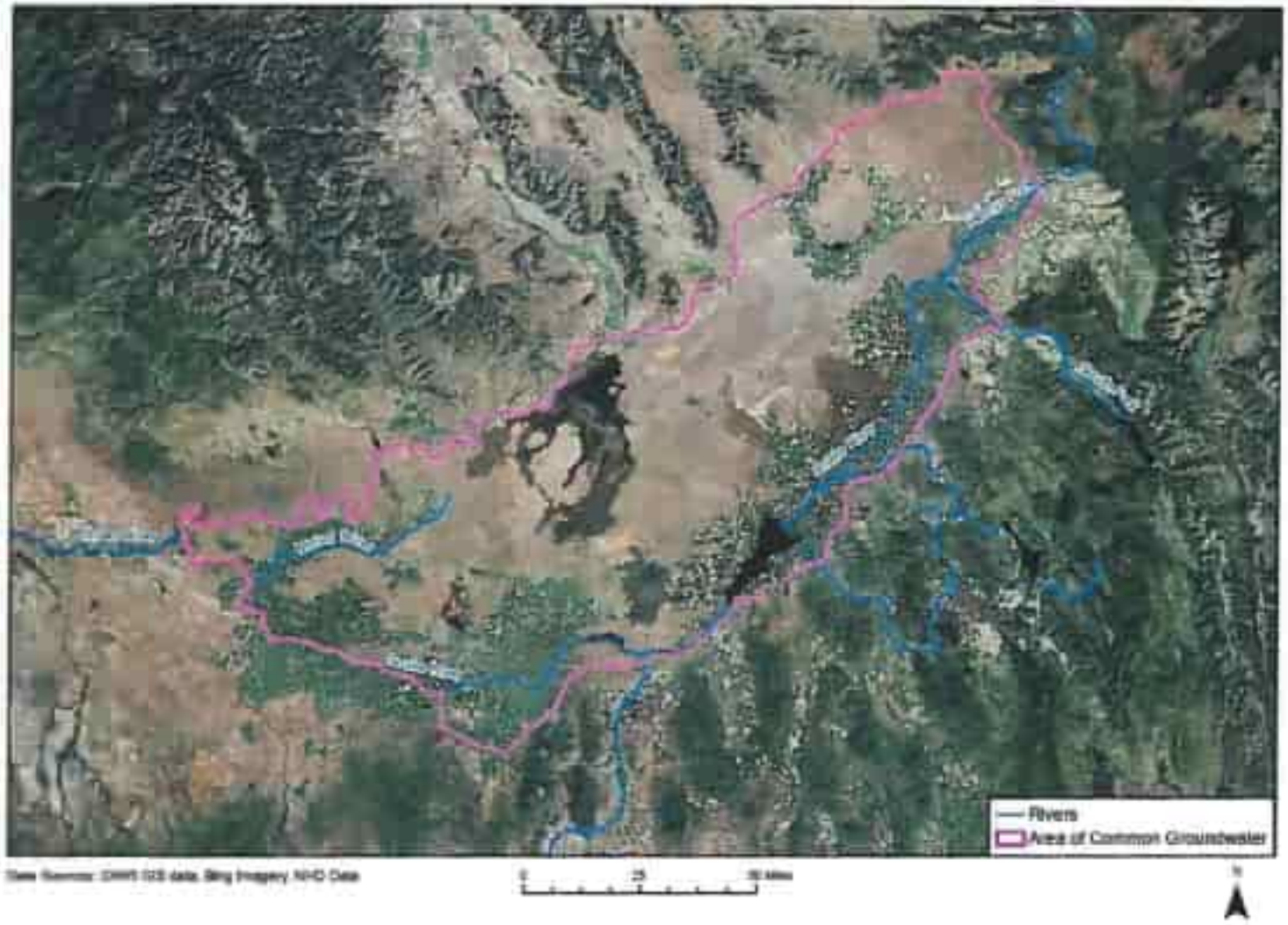


Figure 2.1: Eastern Snake Plain Aquifer

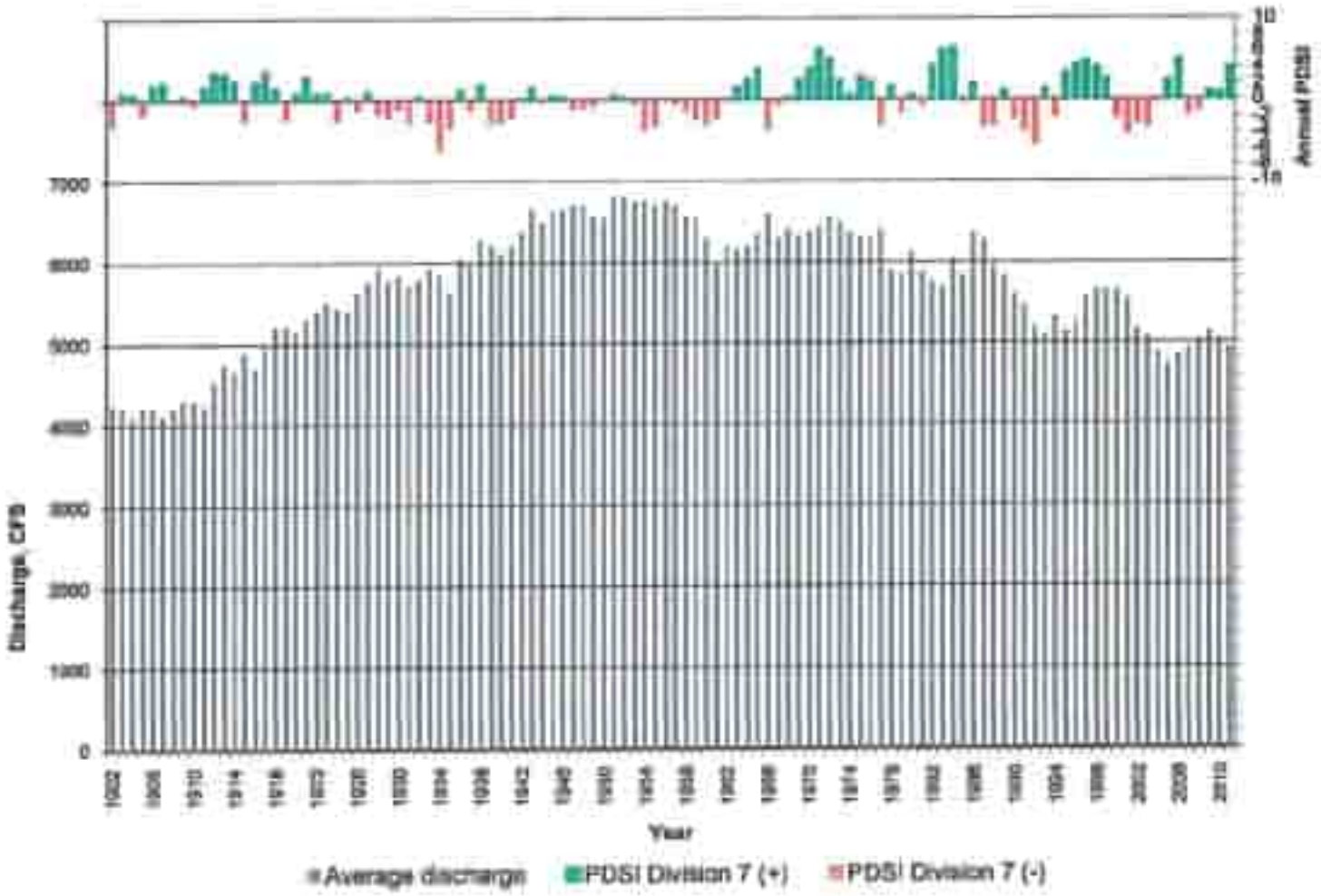


Figure 2.11: Average Annual Spring Discharge to Snake River between Milner and King Hill, 1902 to 2011

Source: IDWR, NOAA Earth System Research Laboratory Physical Sciences Division

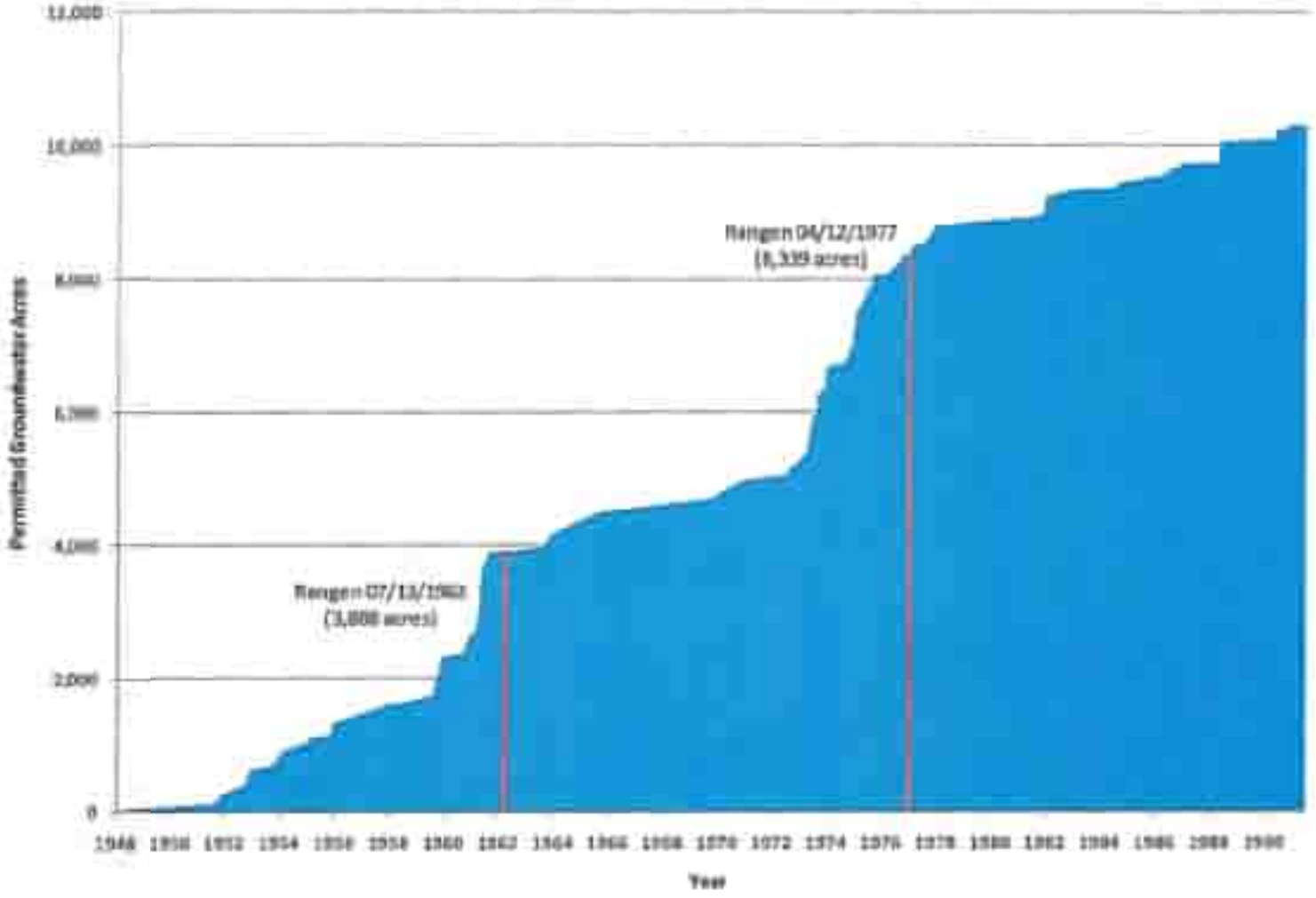


Figure 2.12: Cumulative Permitted Groundwater Acres in the Wendell Area

Source: IDWR GIS Data

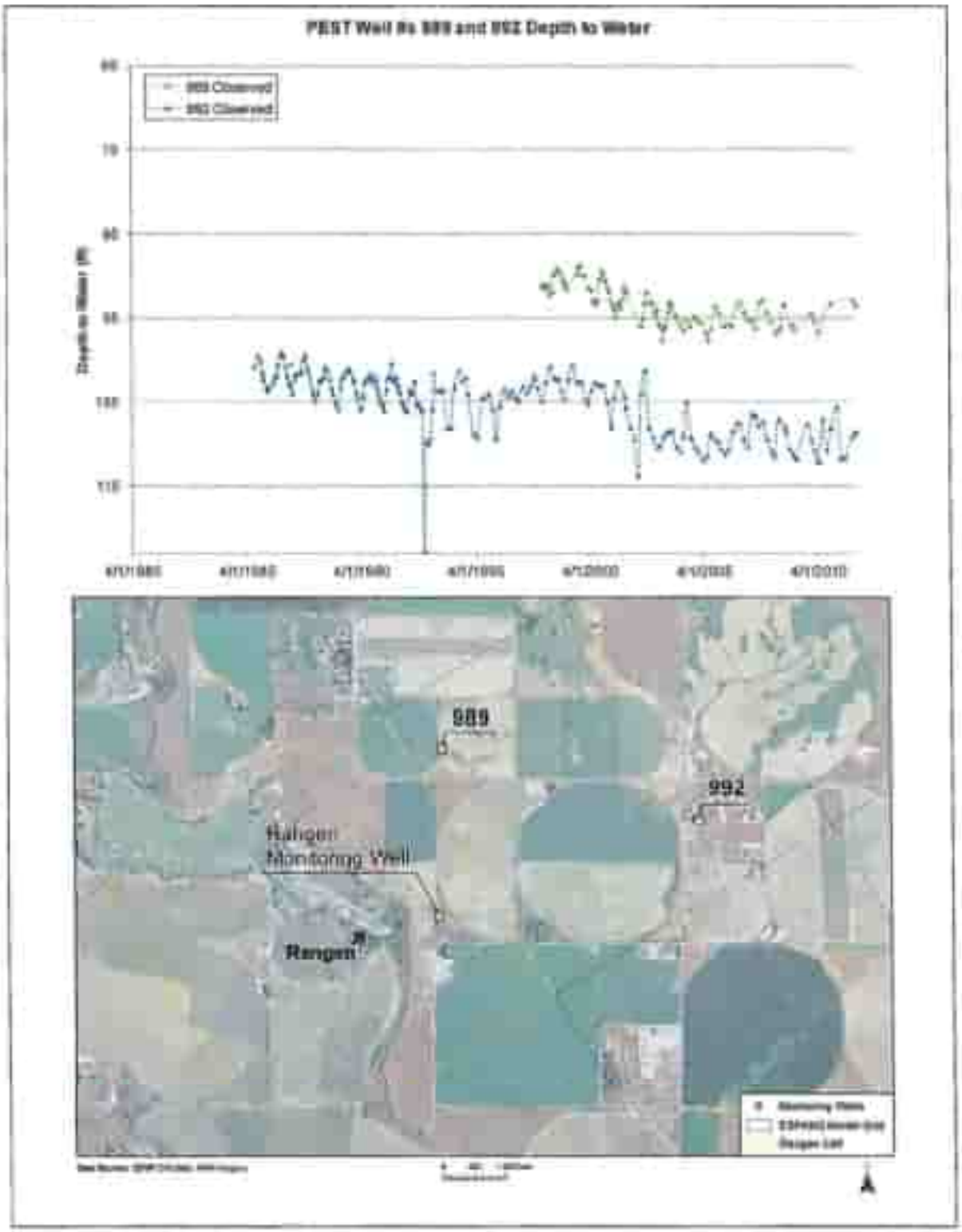
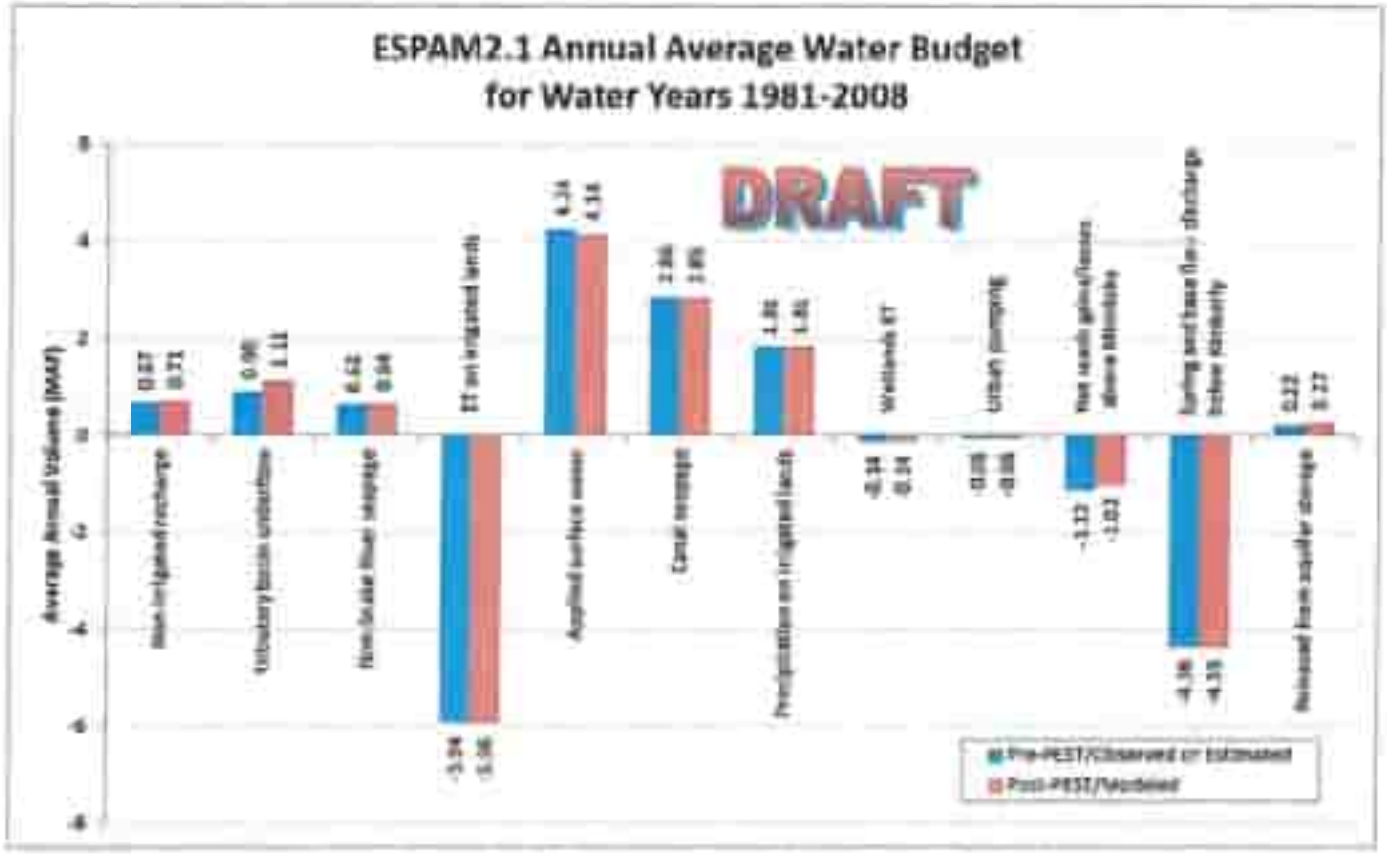


Figure 2.14: Observed Groundwater Levels in Select Wells



Notes: Positive values of aquifer storage represent water released from storage into the aquifer flow system. Negative values of aquifer storage represent water placed into storage. Applied surface water is defined as (Agricultural diversions – canal seepage – returns – offsite, exchange, and Mud Lake pumping). Precipitation on agricultural lands and urban pumping were not adjustable during model calibration.

Figure 2.2: Eastern Snake Plain Model Water Budget

Source: ESPAM2.1 Documentation

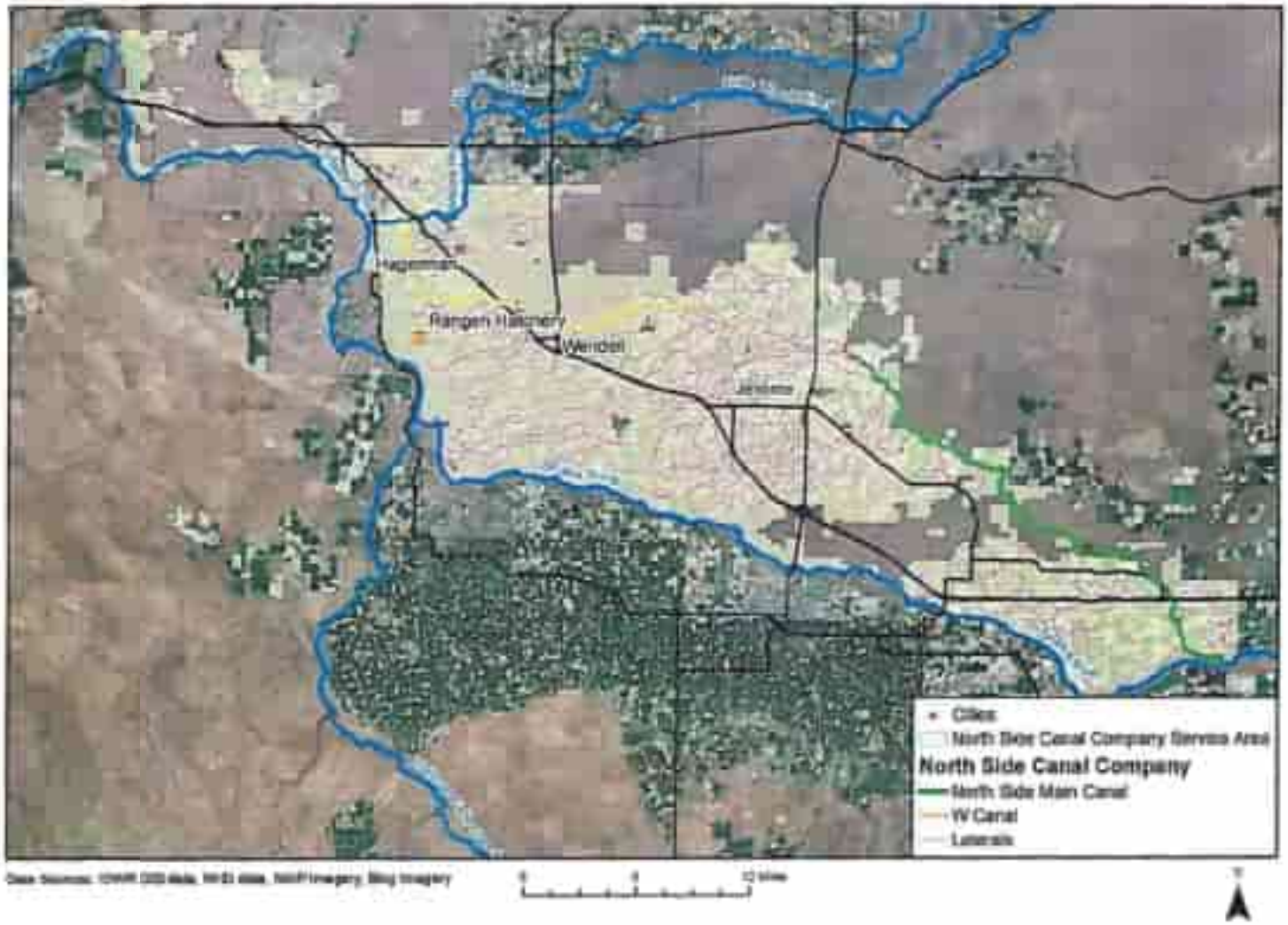
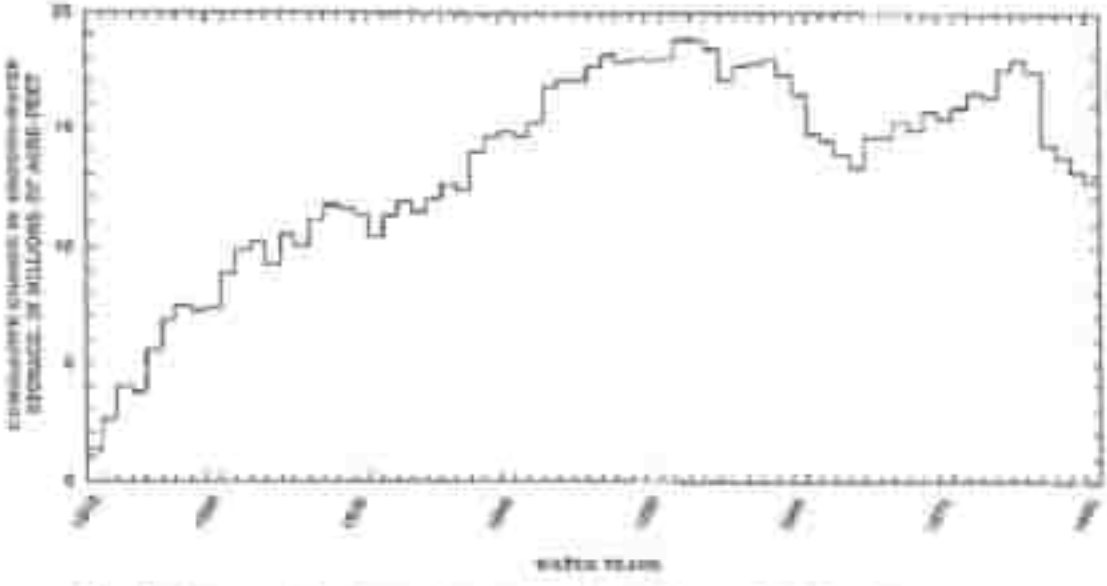


Figure 2.3: North Side Canal Company Service Area



(a)—



(b)—

Source:

Figure 2.4: Changes in Groundwater Storage on Spring Discharge, 1912 - 1980

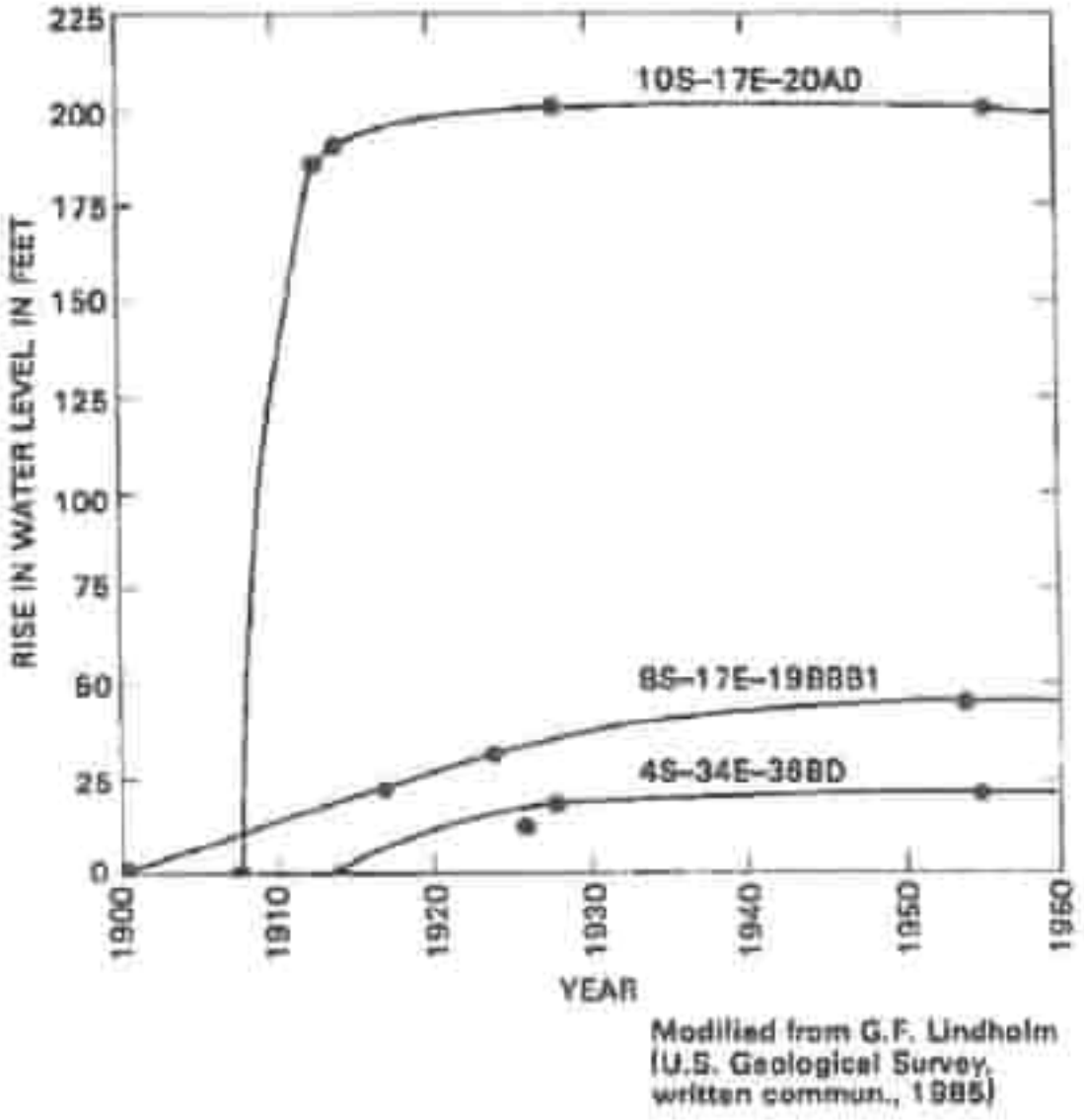


Figure 2.5: Water Level Rises in Three Observation Wells, 1900 – 1960

Source: Goodell, 1988



Figure 2.6: Locations of Three Observation Wells

Source: Goodell, 1988

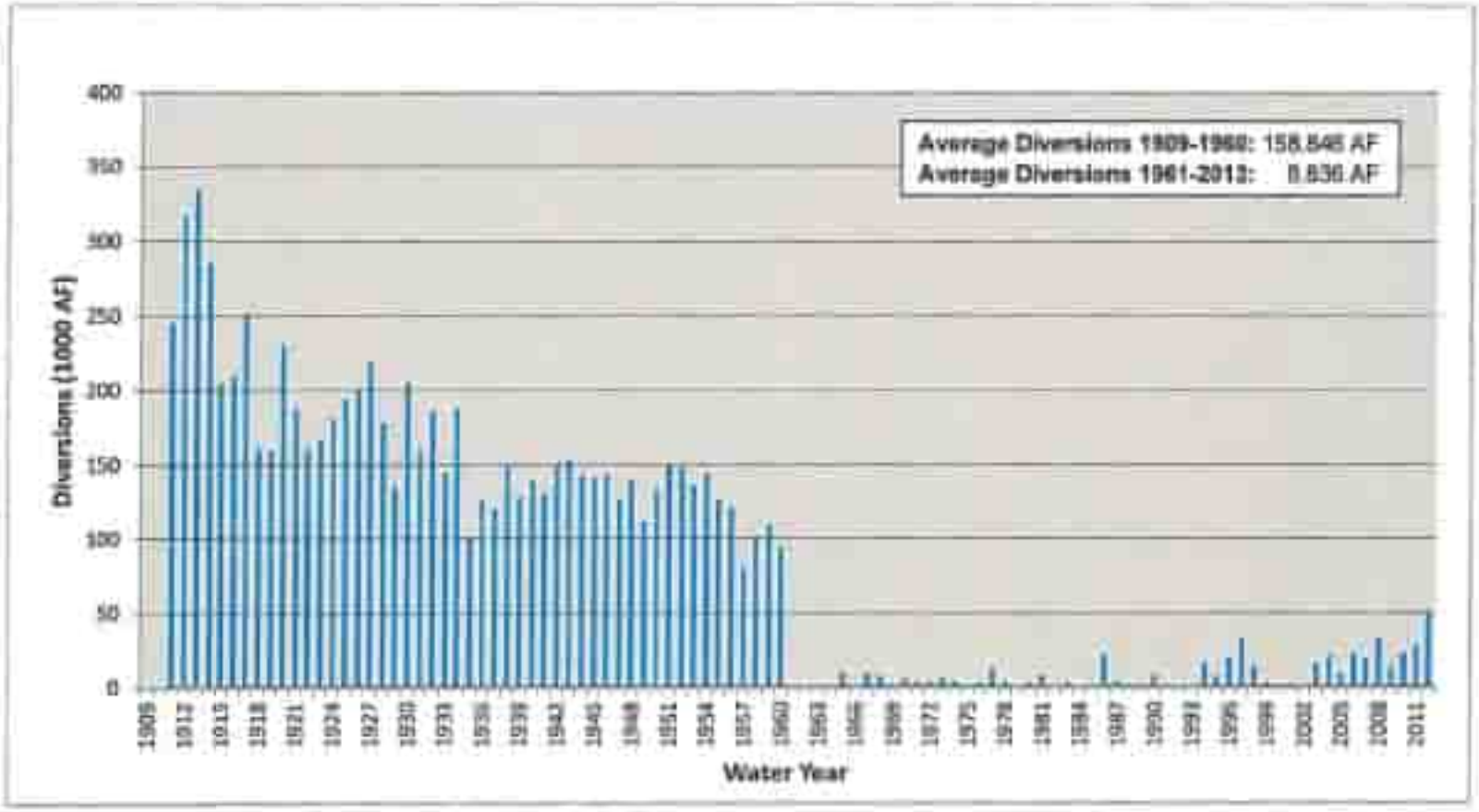
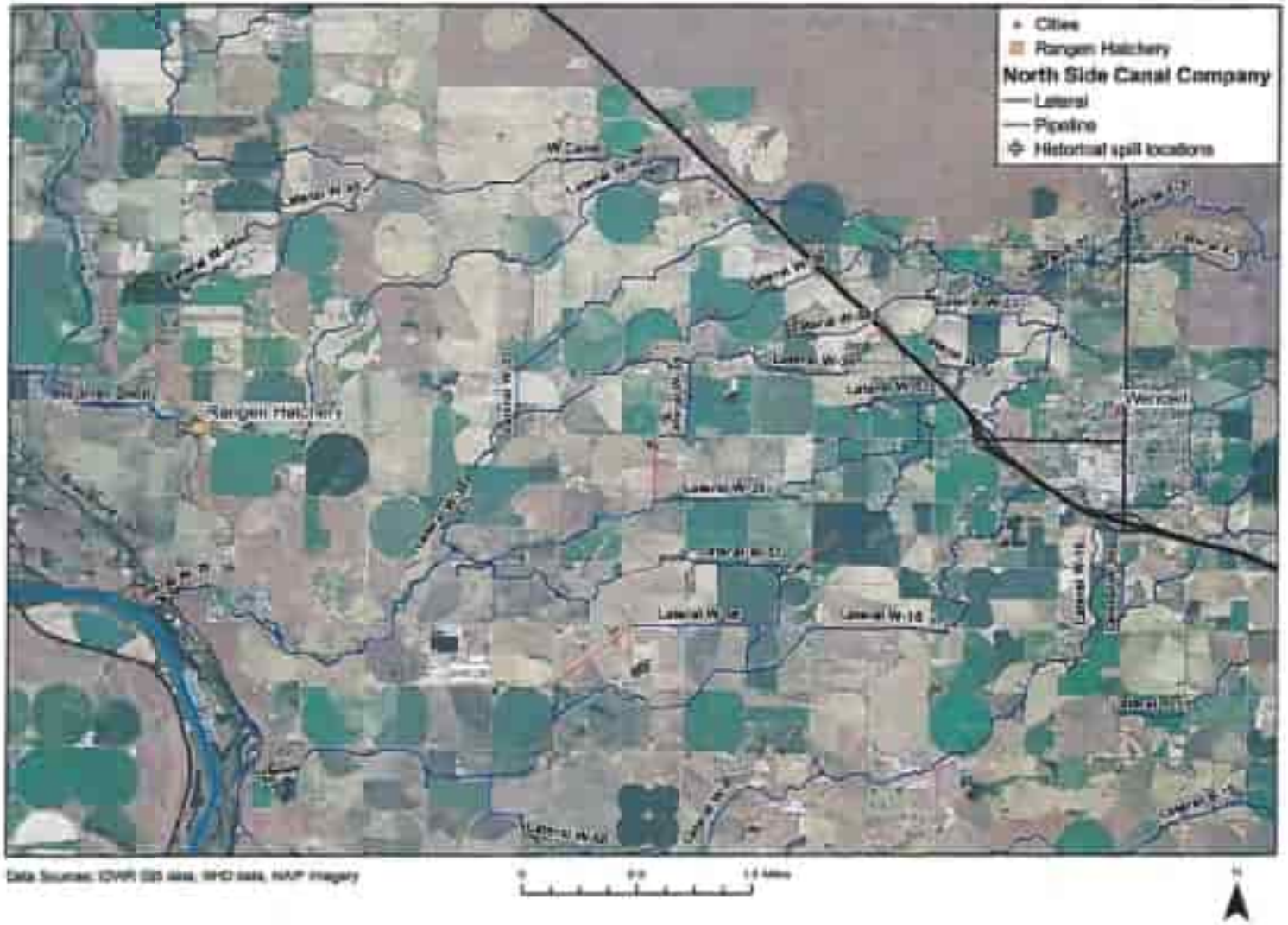


Figure 2.7: Historical Winter (Nov – Mar) Diversions, North Side Canal Company

Source: IDWR Water Rights Accounting, USGS


Cities
Rangen Hatchery
North Side Canal Company
Lateral
Pipeline
Historical spill locations
Rangen Hatchery
Wendell
Lateral W-18
Lateral W-22
Lateral W-23
Lateral W-24
Lateral W-25
Lateral W-26
Lateral W-27
Lateral W-28
Lateral W-29
Lateral W-30
Lateral W-31
Lateral W-32
Lateral W-33
Lateral W-34
Lateral W-35
Lateral W-36
Lateral W-37
Lateral W-38
Lateral W-39
Lateral W-40
Lateral W-41
Lateral

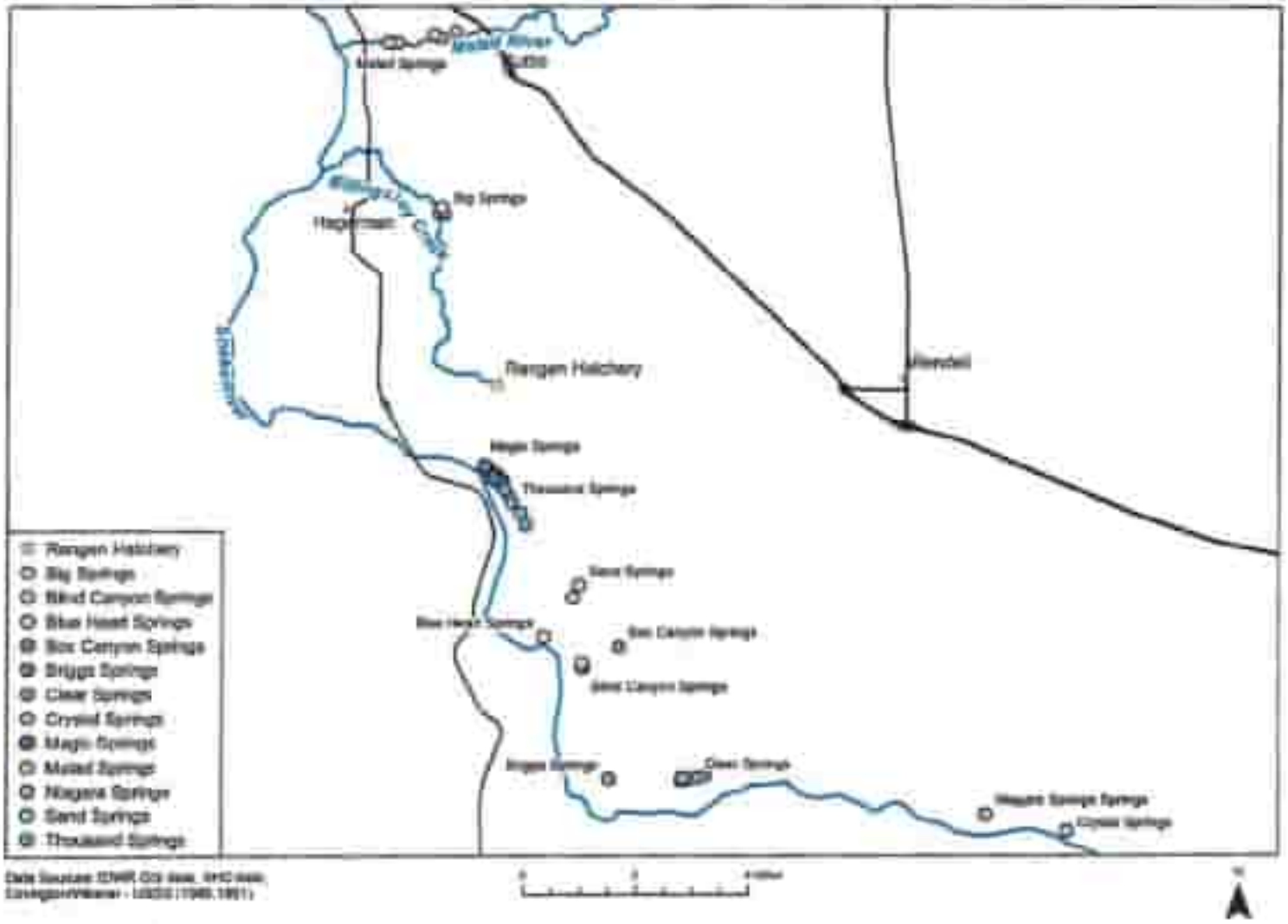


Figure 2.9 Major Spring Outlets in the Milner to King Hill Reach

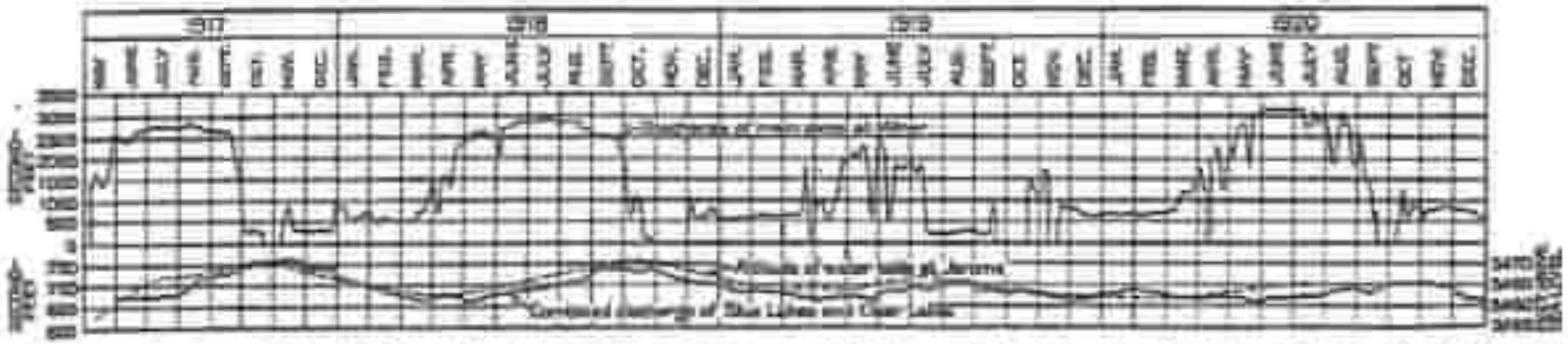


Figure 2.10: Fluctuations in the Discharge of Two Large Springs on Snake River, Idaho (Blue and Clear Lakes)

Source: Meinzer, 1927

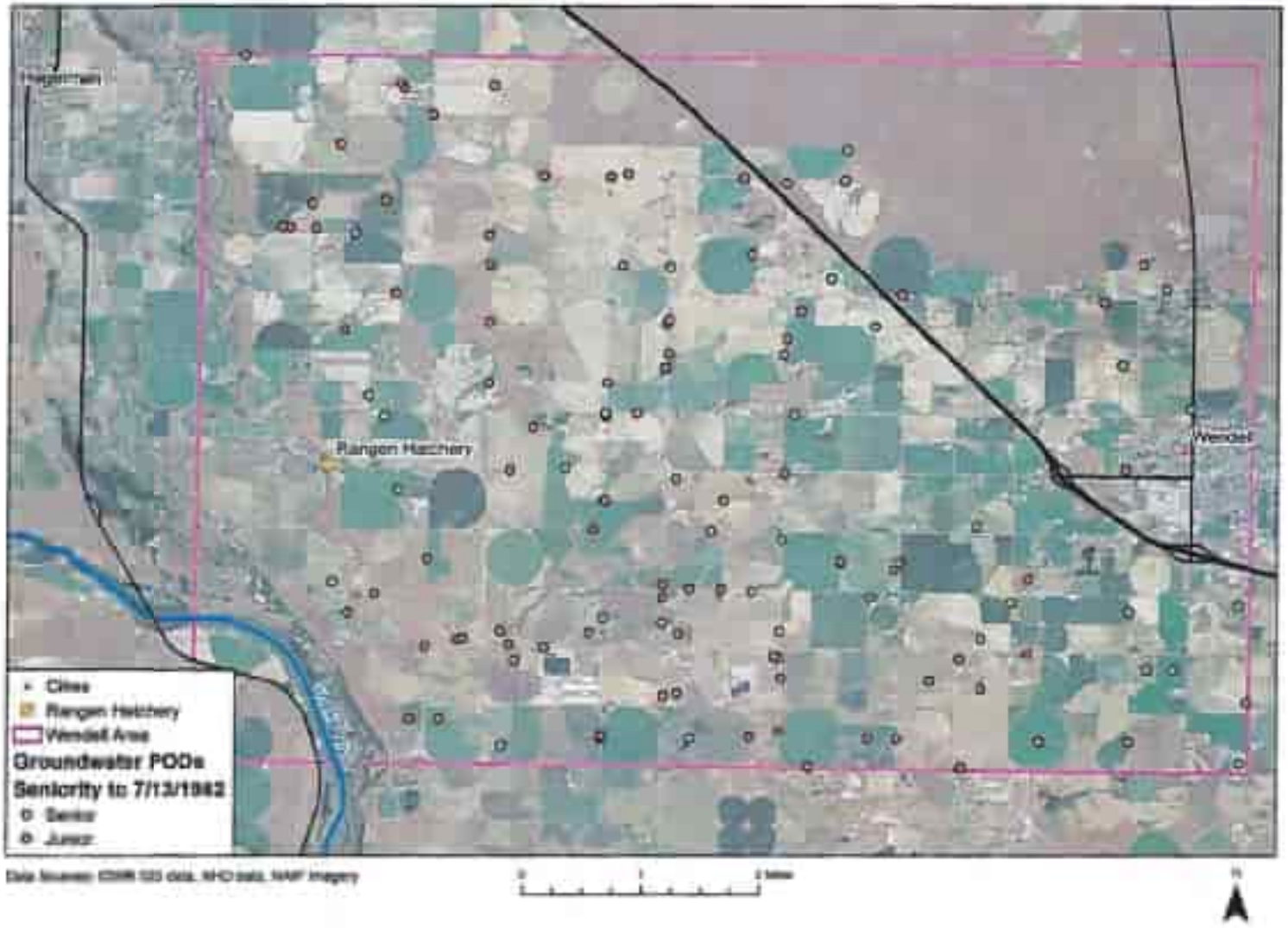


Figure 2.13: Wendell area Groundwater PODs

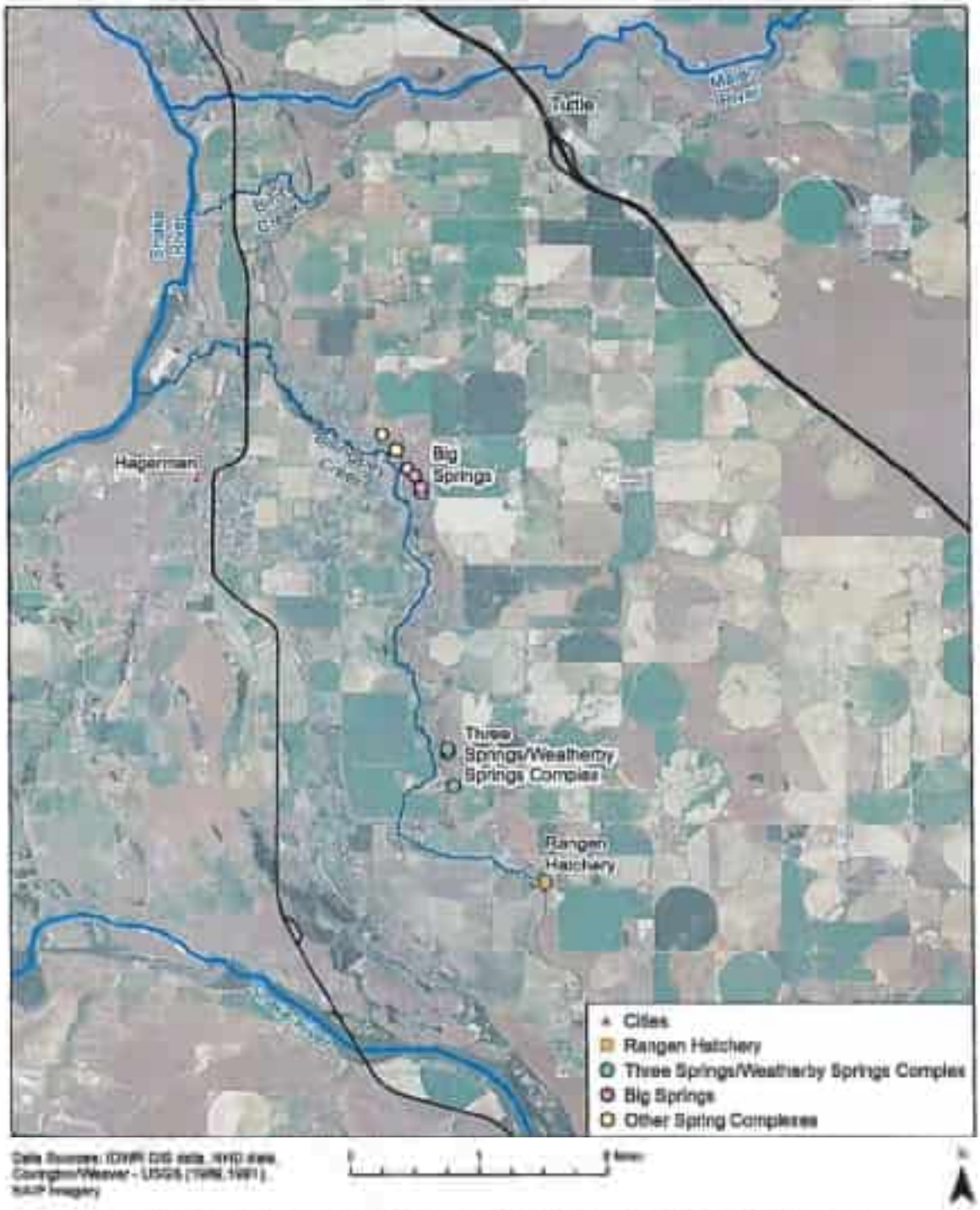


Figure 3.1: Billingsley Creek Area Selected Spring Discharge Points

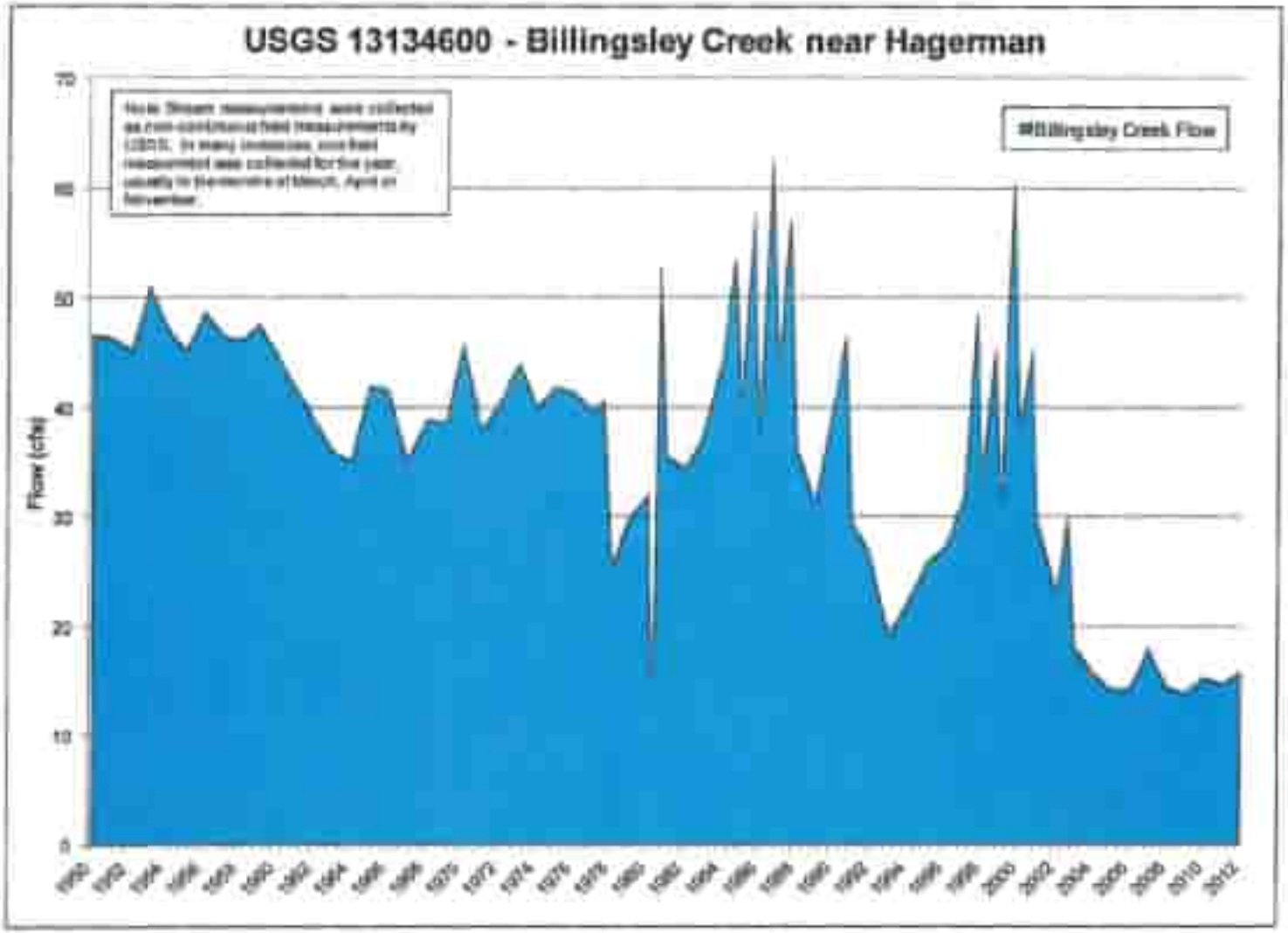


Figure 3.2: Billingsley Creek Flow

Source: USGS Gage Data



Figure 3.3: Rangen Site Map





Top photo: Water can be seen discharging from the Curran Tunnel to the Farmers Box. The Rangen 6-inch domestic pipeline can be seen exiting Curran Tunnel.
Bottom photo: Water discharges from the right side of the Farmers box to the Rangen box (not shown).

Figure 3.4: Farmers Box





Top photo: Water from the Curren Tunnel is diverted into the hatch house pipeline at the Rangen box.
Bottom photo: Water can spill from the Rangen box down the hillside to Billingsley Creek.

Figure 3.5: Rangen Box





Top photo: A view from upstream of the lodge dam on Billingsley Creek.
Bottom photo: A view from downstream of the lodge dam on Billingsley Creek.

Figure 3.8: Lodge Dam



Figure 3.7: Weir Measurement at Rangen Raceway 6

Source: "20120730 Rangen's First Discovery Request.pdf", Plaintiff's Exhibit 7a

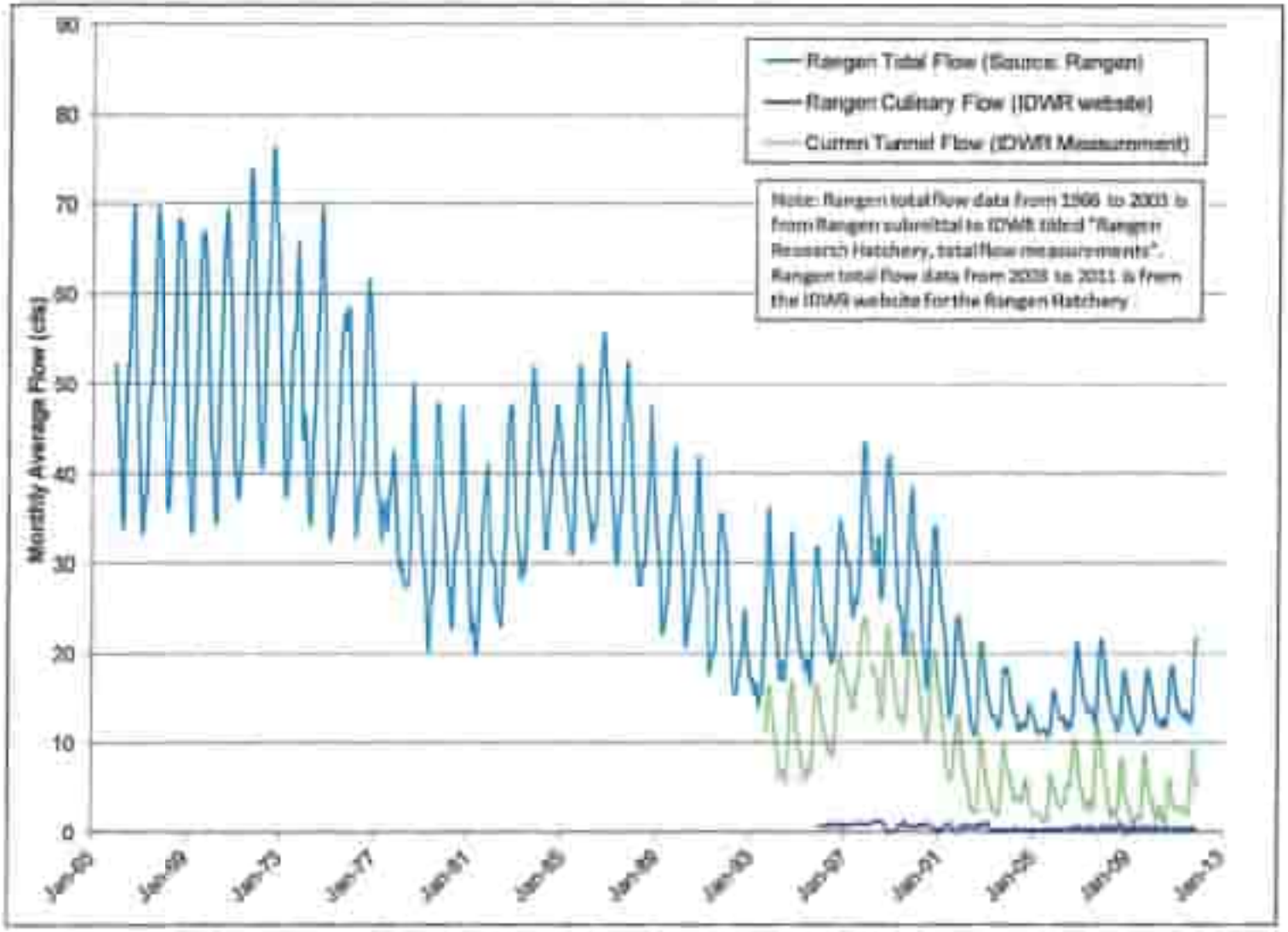


Figure 3.8: Historical Flows at Rangen Facility

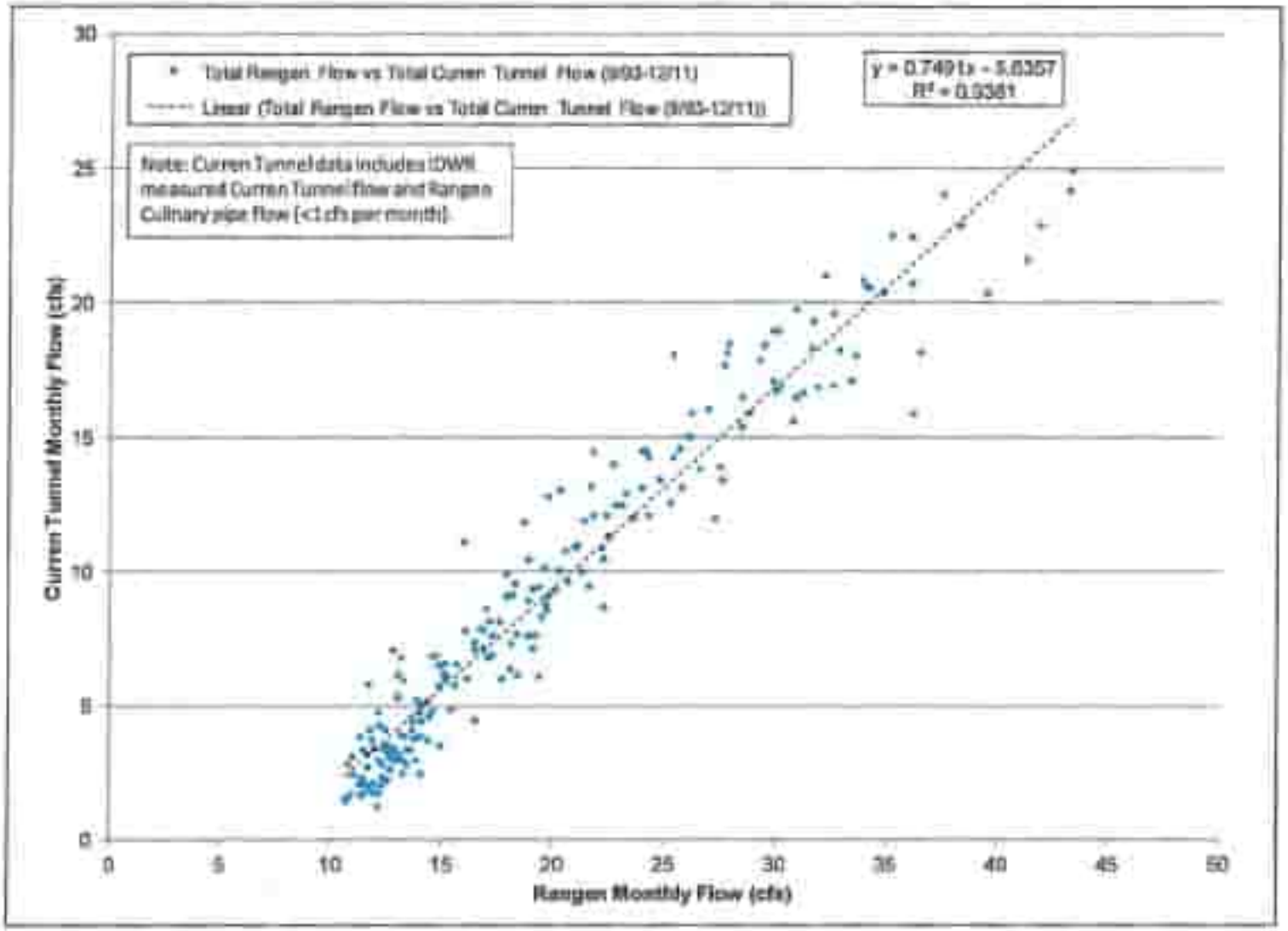


Figure 3.9: Linear Regression of Total Curren Tunnel Flow versus Total Rangen Flow

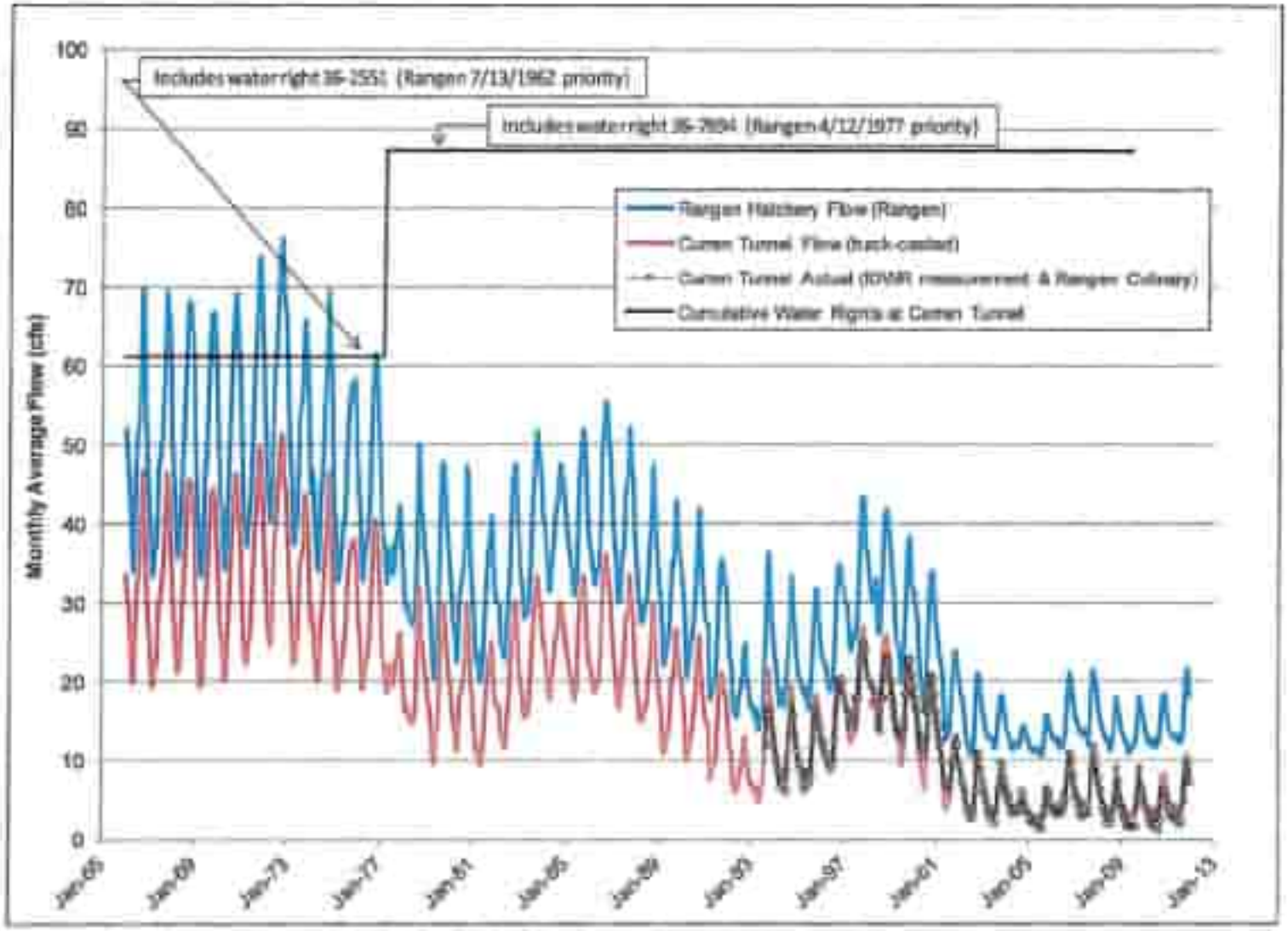


Figure 3.10: Back-casted Curren Tunnel Flow versus Total Rangen Flow

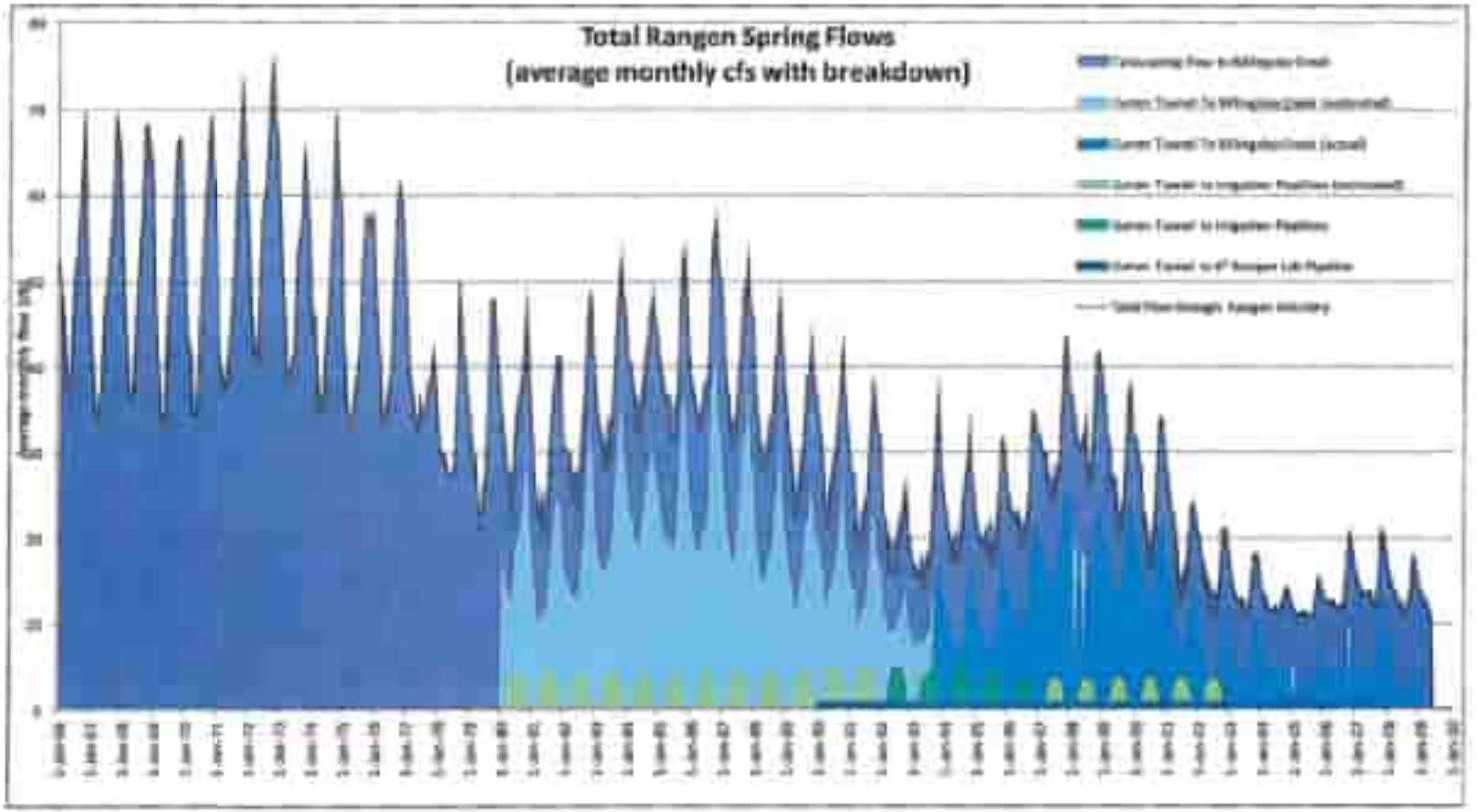


Figure 3.11: Brannon Decomposition and Back-cast of Rangen Flows

Source: Brannon, 2009. Reproduced from "Rangen Water History for IDWR.xlsx"

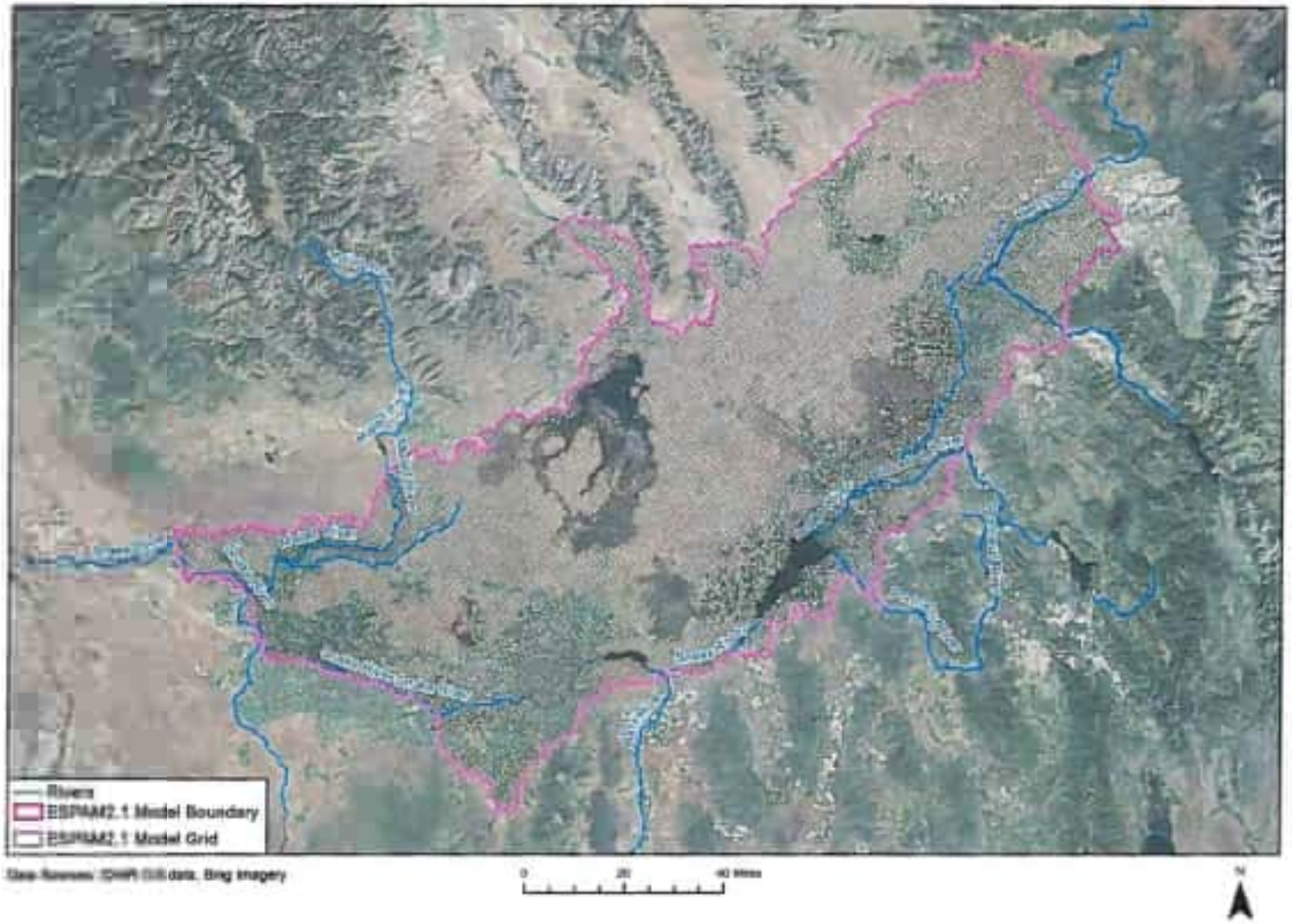


Figure 4.1: ESPAM2.1 Model Domain

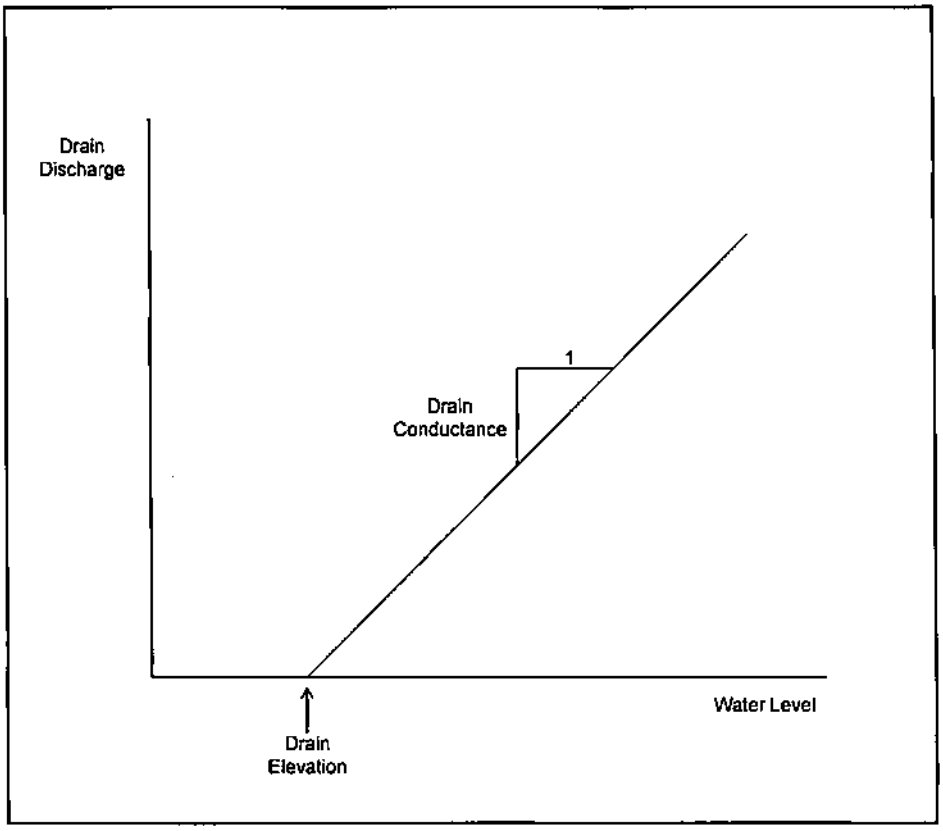


Figure 4.2: Drain Schematic

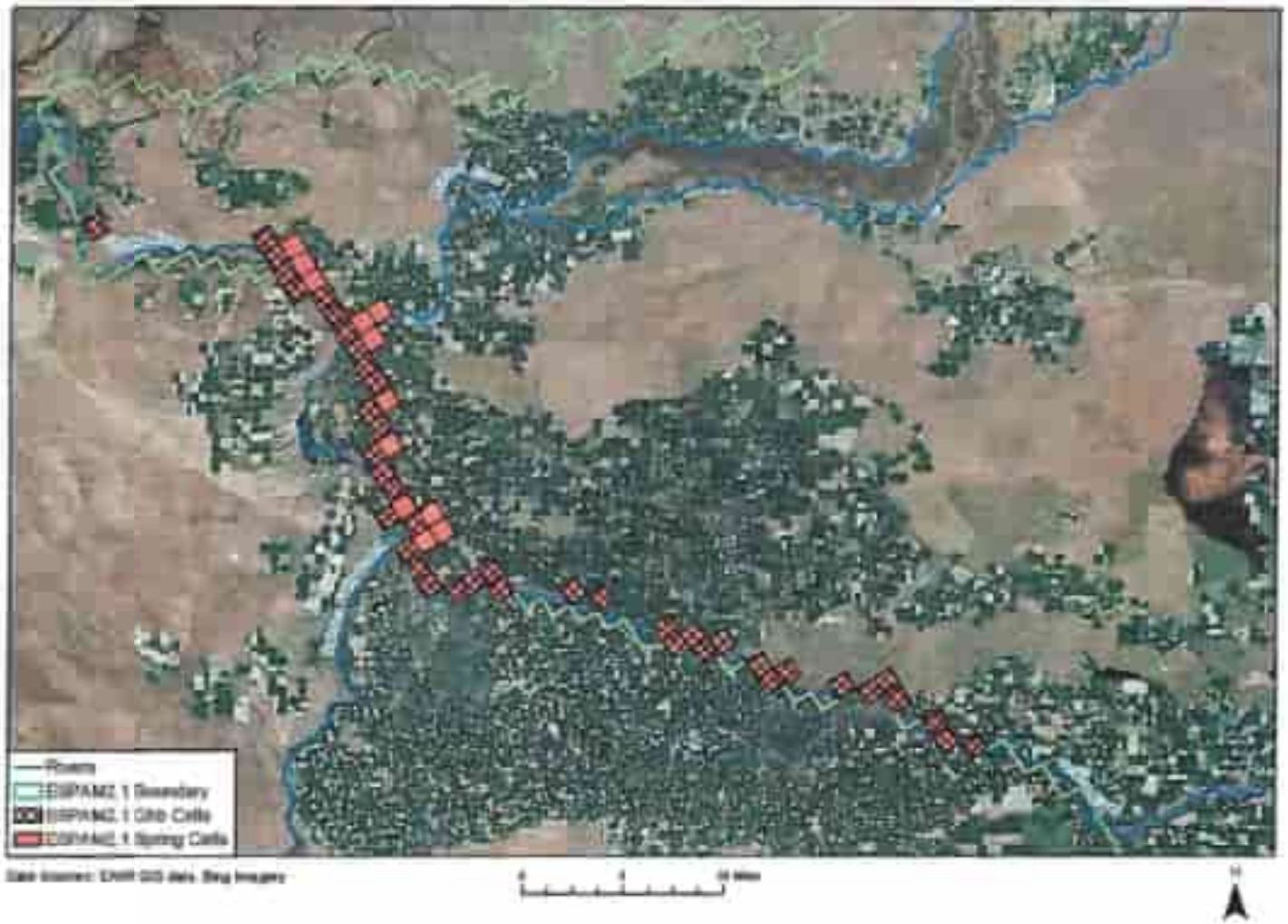


Figure 4.3: ESPAM2.1 Drain and GHB Cells

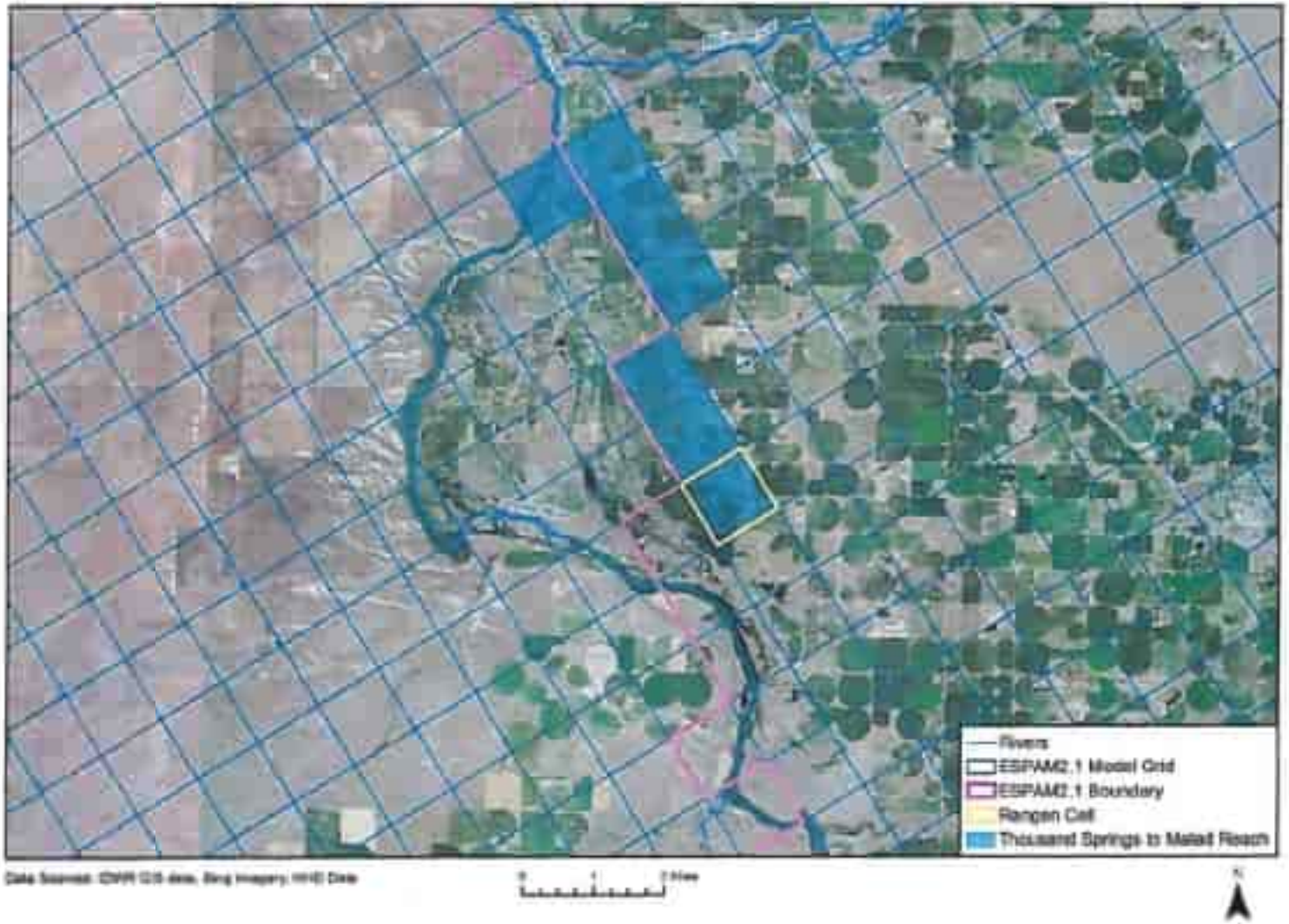


Figure 4.4: ESPAM2.1 Grid in Rangen Area

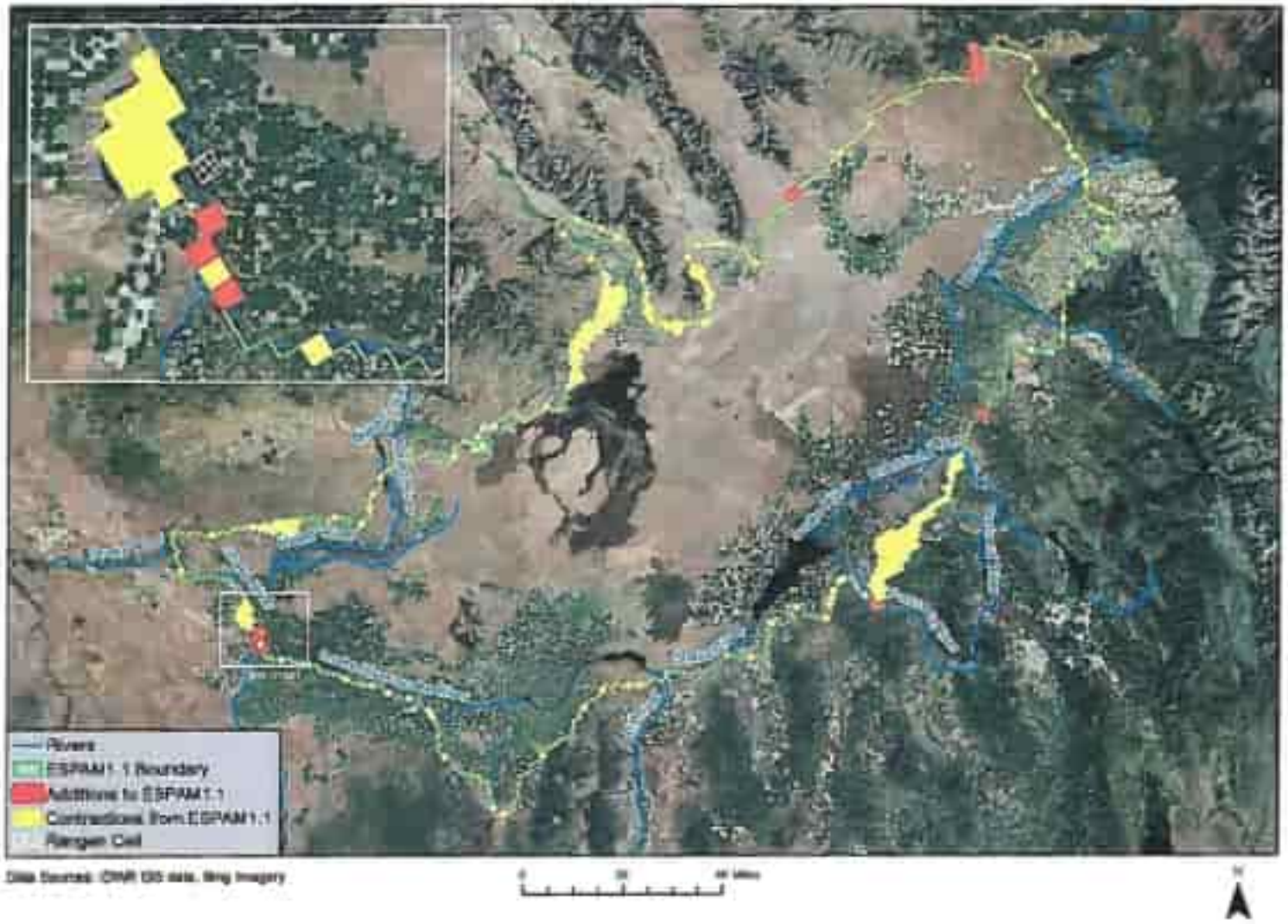


Figure 4.5: ESPAM1.1 and ESPAM2.1 Model Domain Comparison

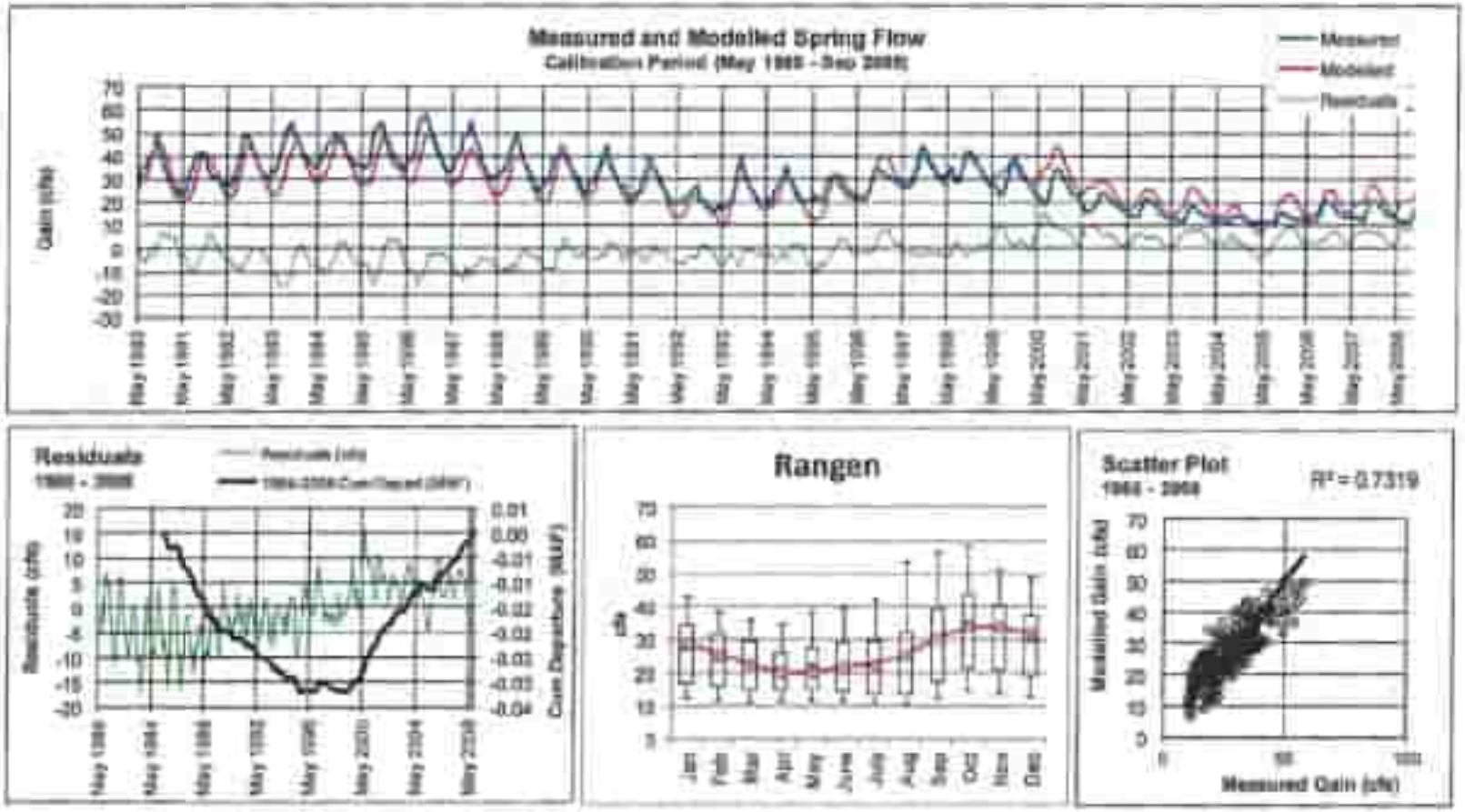


Figure 4.6: Calibrated and Target Discharge and Residuals for the Rangen Spring Complex from ESPAM2.1 Calibration

Source: ESPAM2.1 Documentation

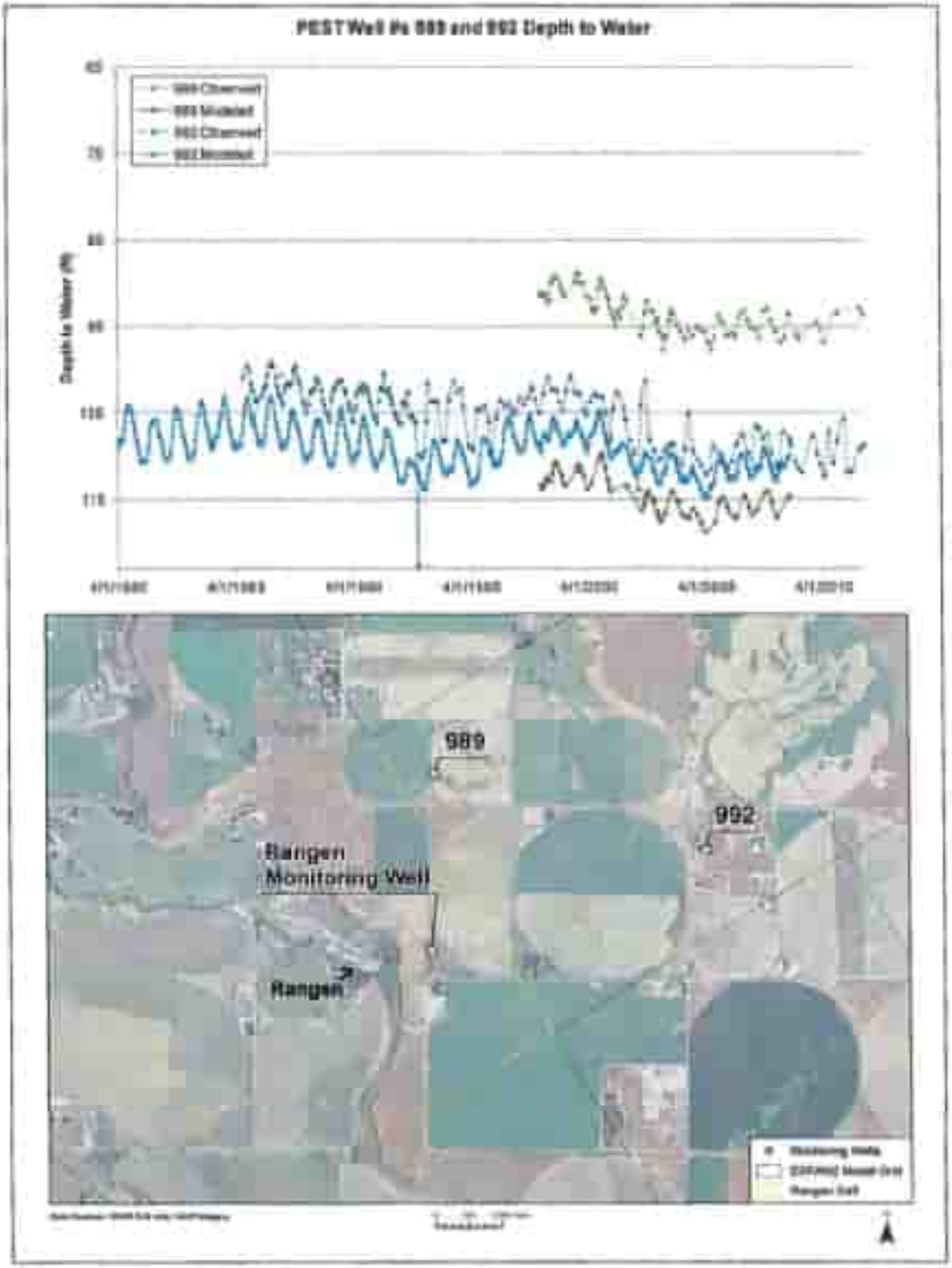


Figure 4.7: Simulated and Target Water Levels in Calibration Well #989 and #992

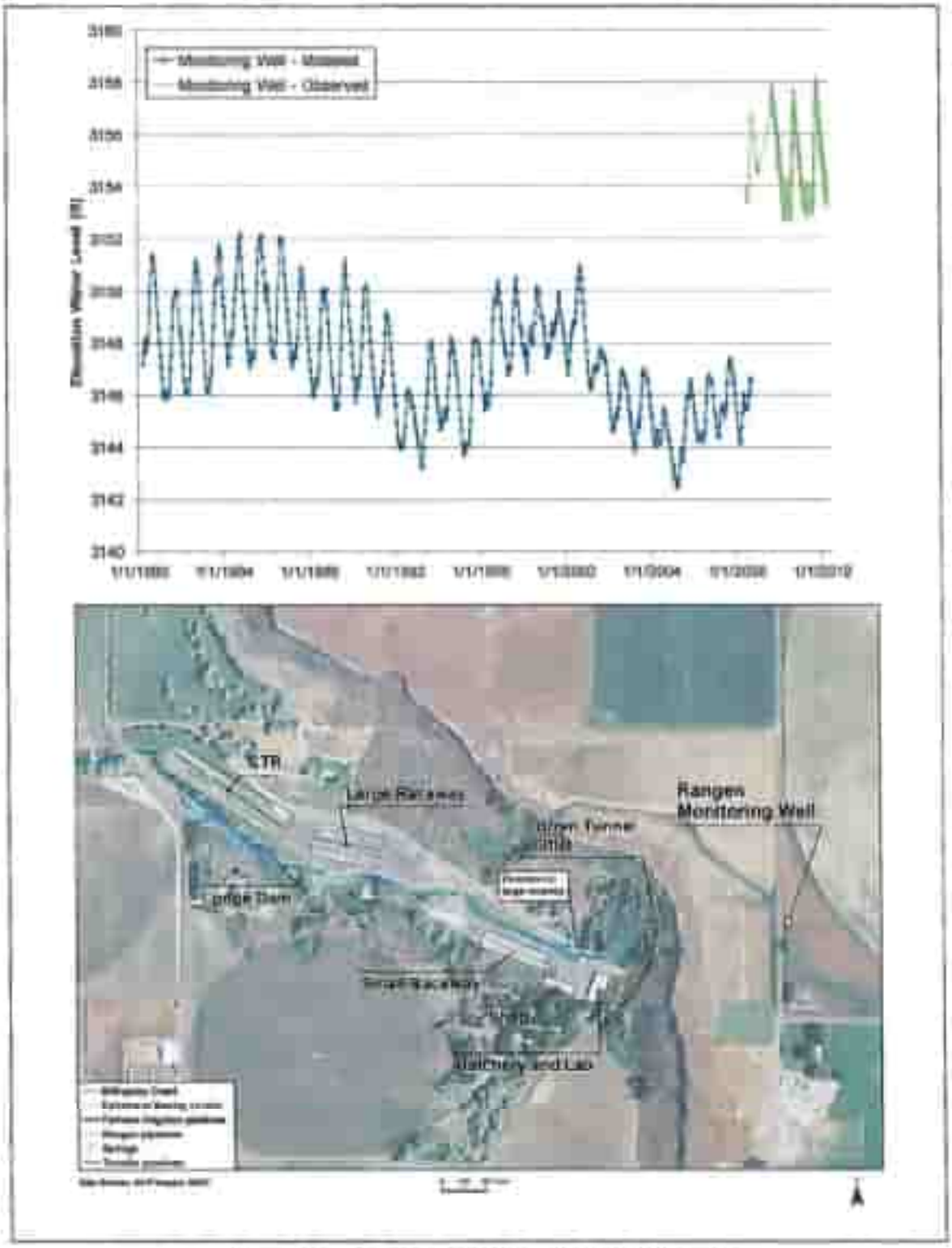


Figure 4.8: Rangen Monitoring Well Water Levels

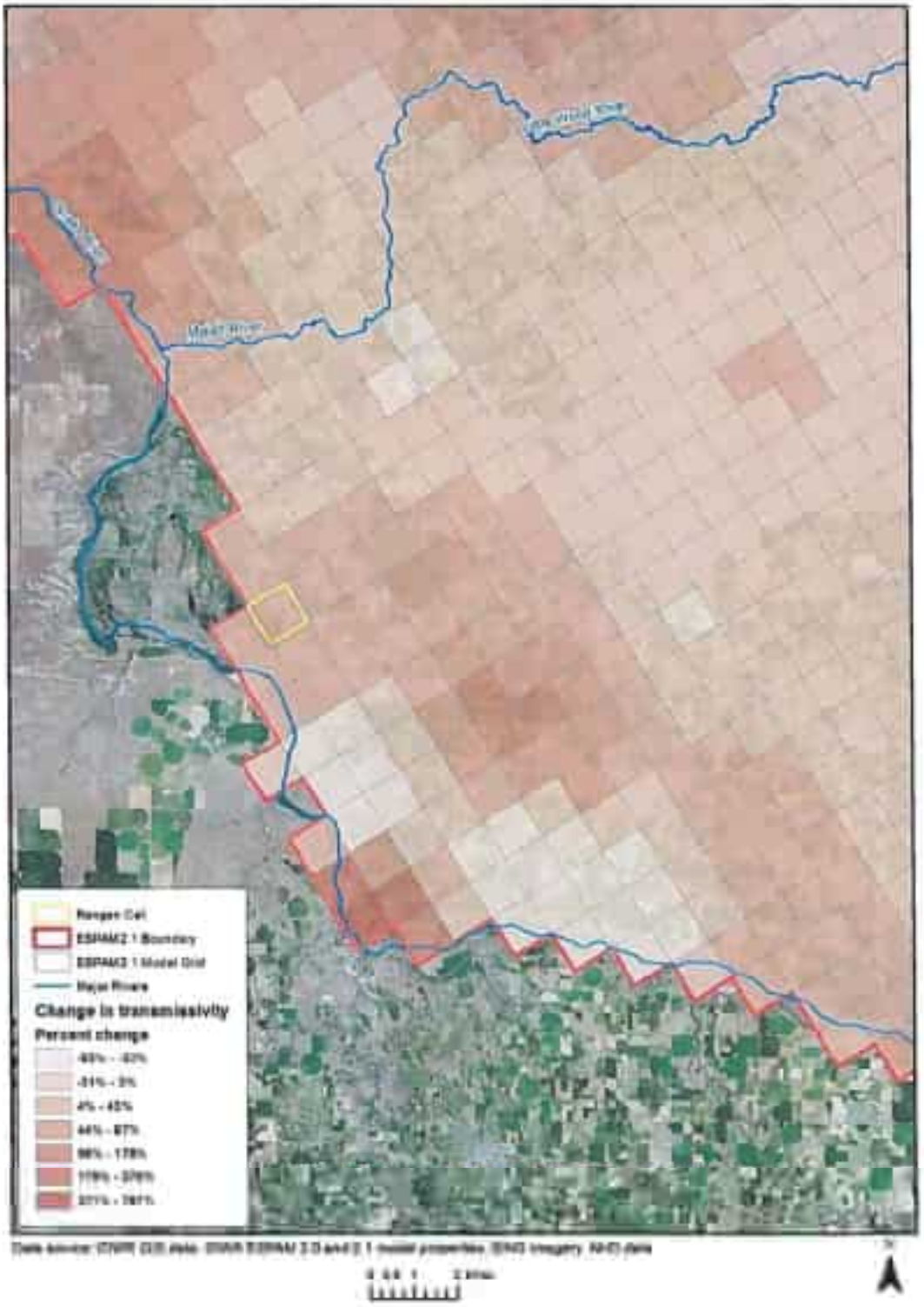


Figure 4.9: Changes in Transmissivity values in Rangen Area between ESPAM2 and 2.1
(positive % change indicates 2.1 transmissivity is greater)

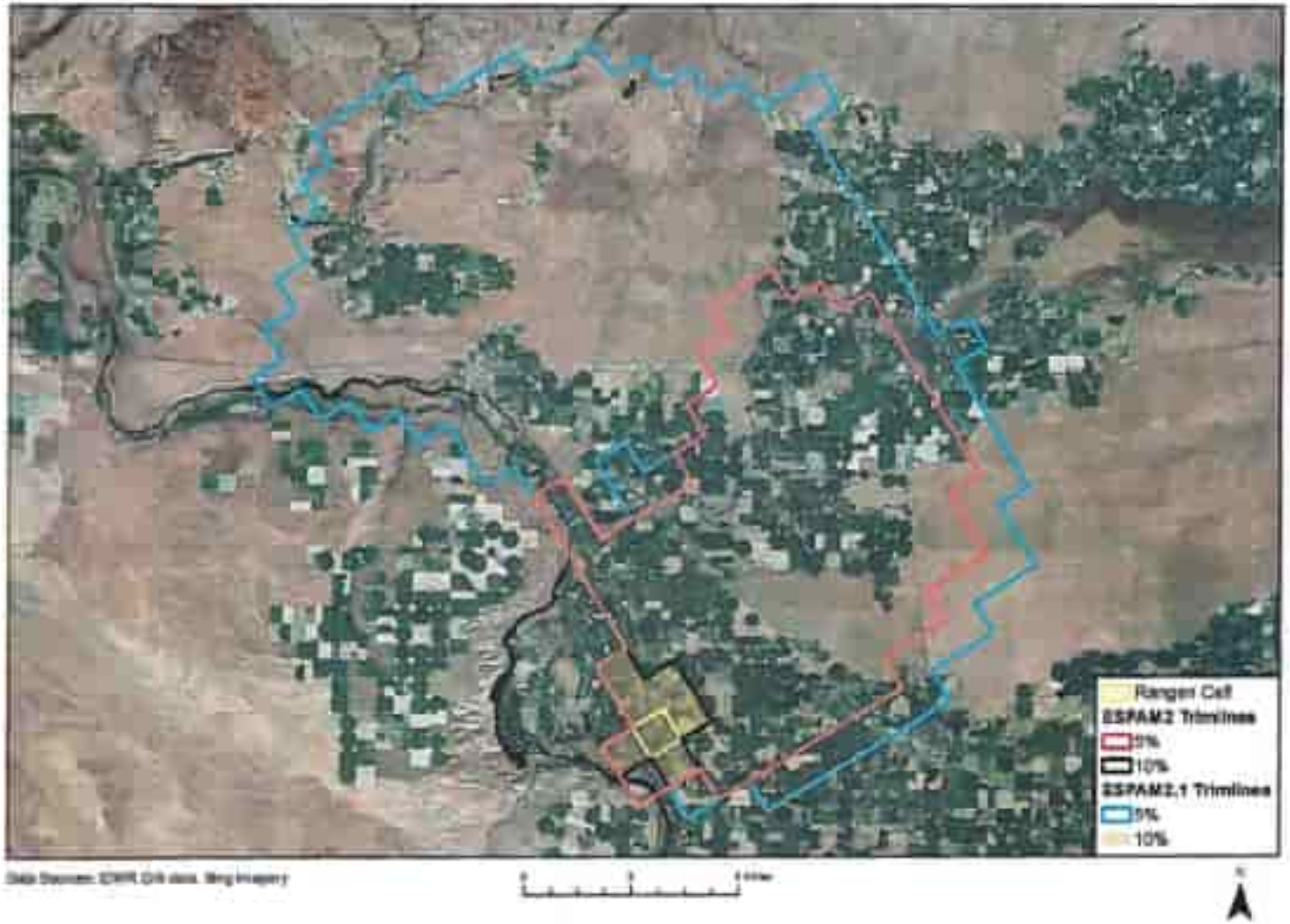


Figure 4.10: Trimline Comparisons ESPAM2.0 and 2.1

Table 6.1: Results of IDWR Curtailment Analysis using ESPAM2

Assumed Trimline Threshold	Change in Flow at Rangen Complex (cfs)	Groundwater Acres Curtailed	Curtailed Groundwater Use (afy)	Flow Increase as % of Curtailed Water Right*	Years to Reach 90% of Steady State Increase
(1)	(2)	(3)	(4)	(5)	(6)
None	18.07	565,023	1,460,653	0.96%	16
Rule 50 Boundary	17.13	479,199	1,293,018	0.87%	15
0.20%	16.3	258,000	732,419	0.11%	15
1.00%	14.8	159,564	477,823	0.15%	13
1.50%	14.51	152,682	458,530	0.16%	13
1.70%	12.2	109,594	332,754	0.18%	11
2.00%	9.55	66,913	214,962	0.22%	9
3.50%	5.74	25,429	87,799	0.33%	5
5.00%	3.35	11,385	39,329	0.43%	3
10.00%	0.19	400	1,445	0.60%	1

Notes:
Columns (1) through (4) from IDWR production of June 12, 2012. Columns (5) and (6) by AMEC.
*Assuming 1" per acre permit amount.

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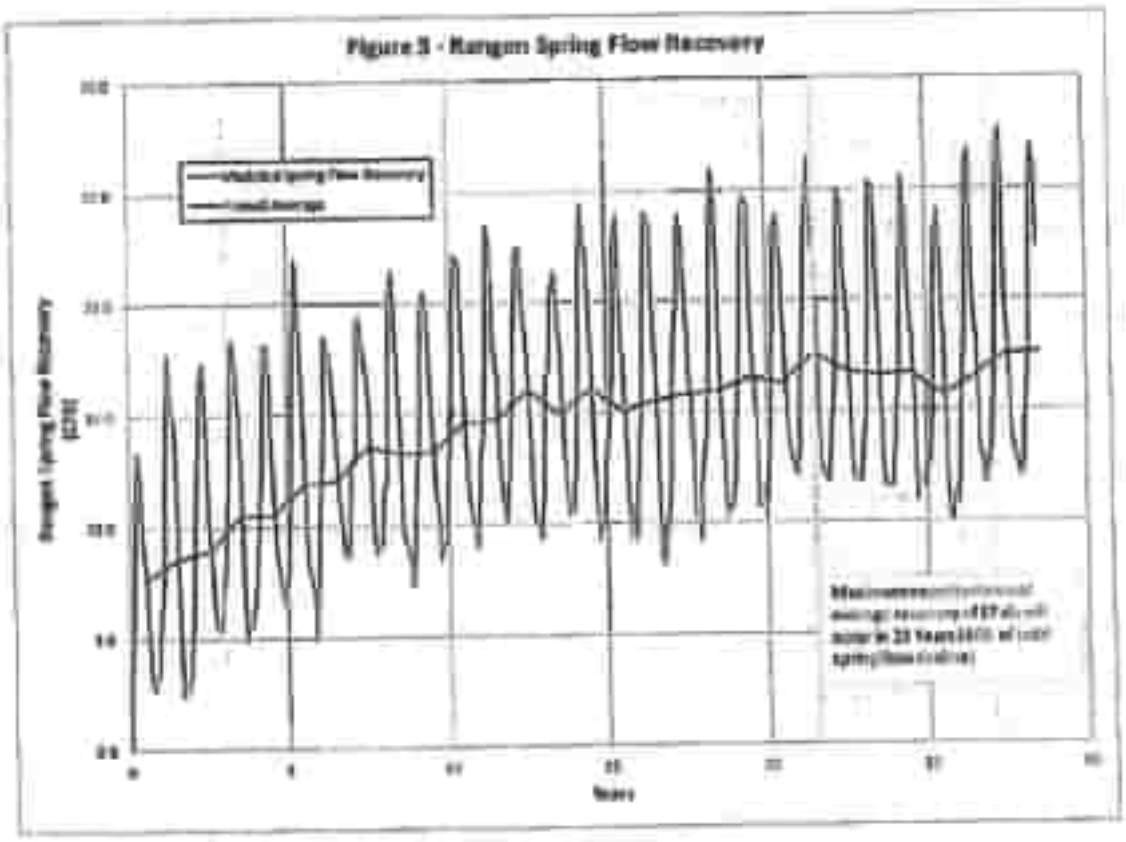

Figure 5.1: Reproduced Graph from Exhibit 11 of Rangen Petition
Source: Exhibit 11 from Rangen petition, Memorandum from Leonard Rice Engineers, Inc. to Rangen Inc., dated December 9, 2011.

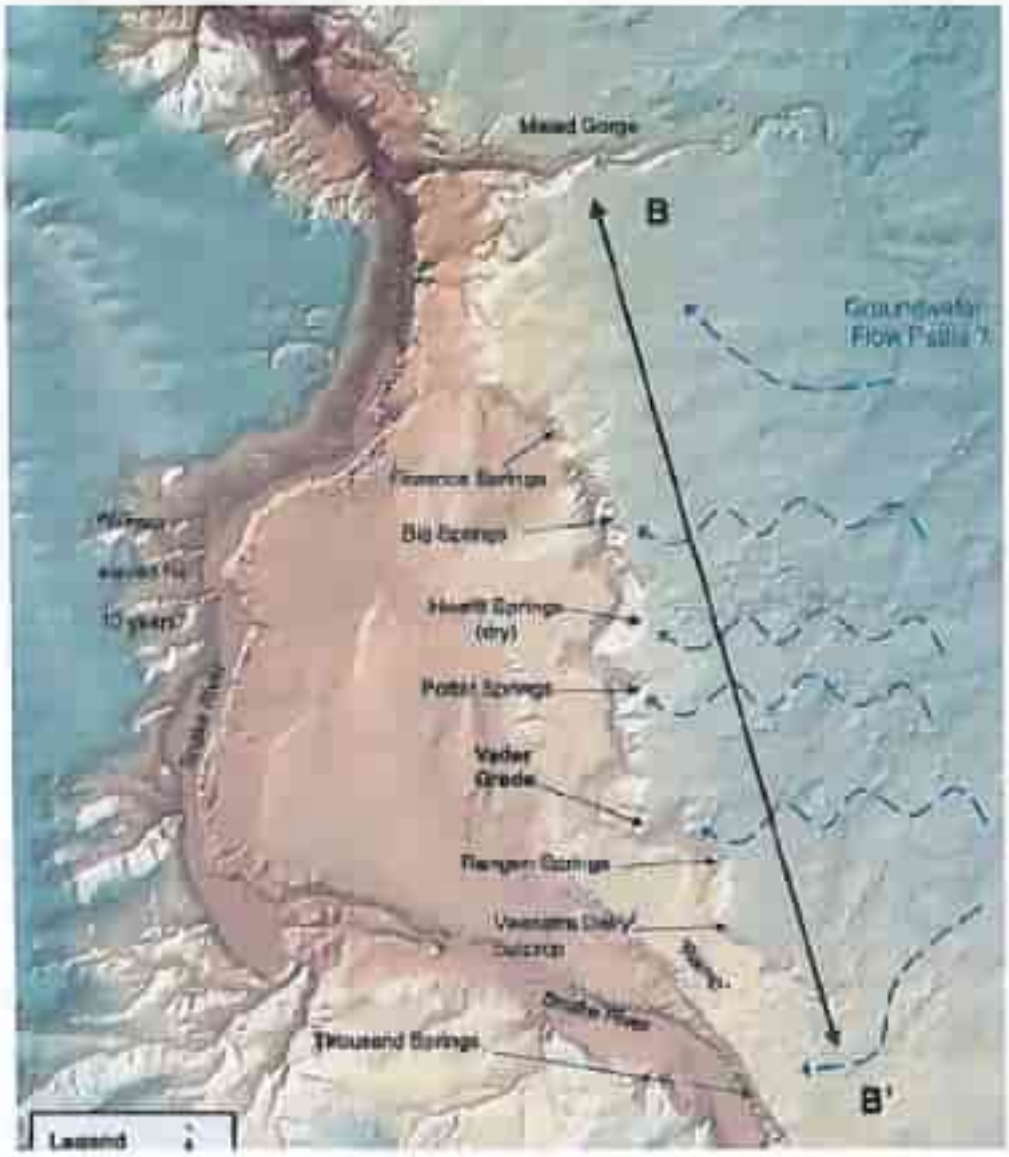

Figure 6.1: "Ramp" Formation near Hagerman

Source: Farmer pdf, no pagination, part of IDWR production dated 6/12/2012.



Figure 6.2: HFB Added to Alternative Model



Figure 6.3: GBH Modification for Alternative Model

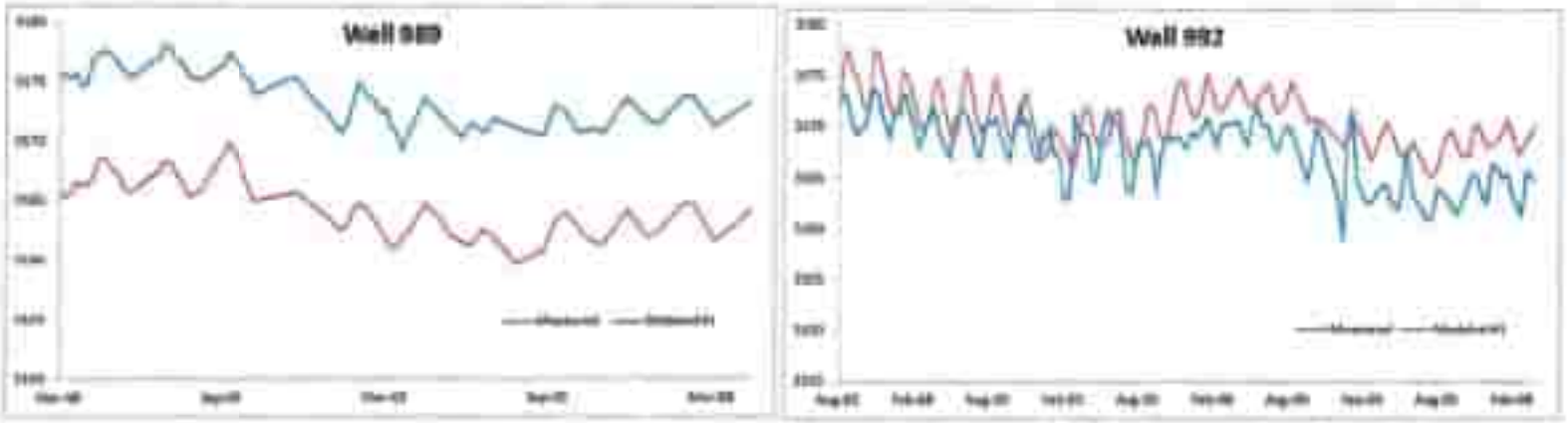

Figure 6.5a: Head Match in Wells 989 and 992 for Alternative Model #1

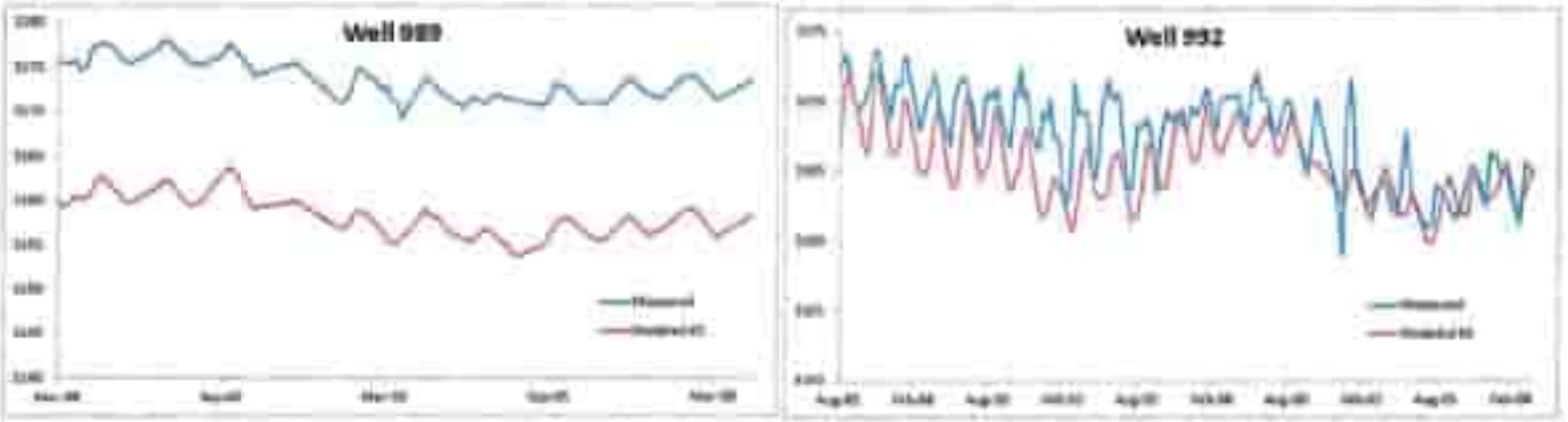

Figure 6.5b: Head Match in Wells 989 and 992 for Alternative Model #2

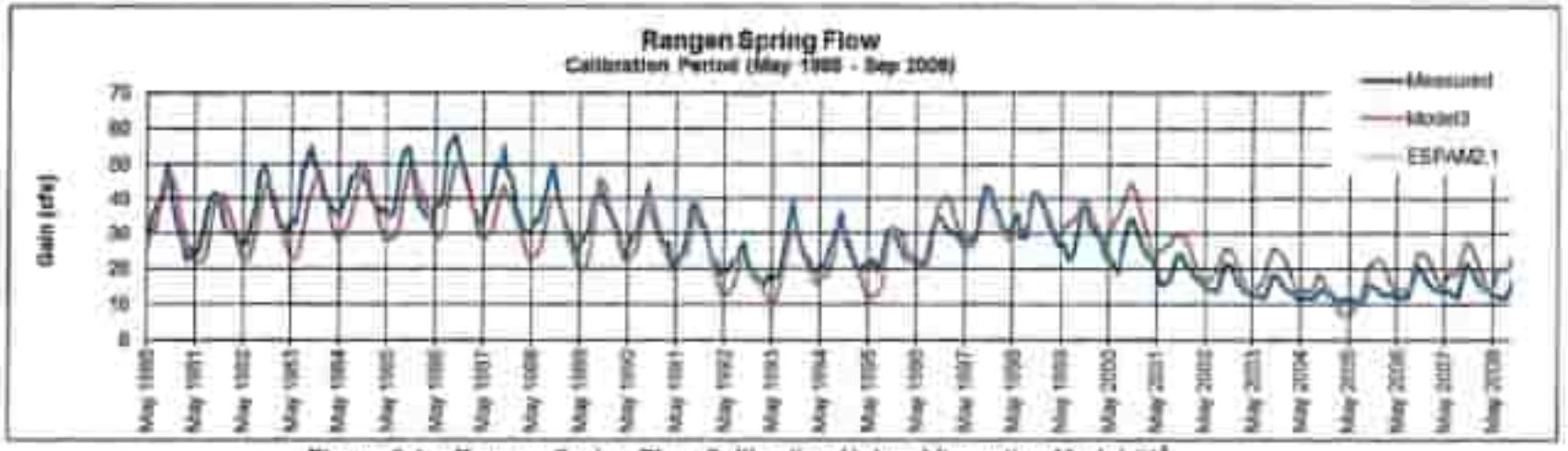

Figure 6.4a: Rangen Spring Flow Calibration Using Alternative Model #1[1]

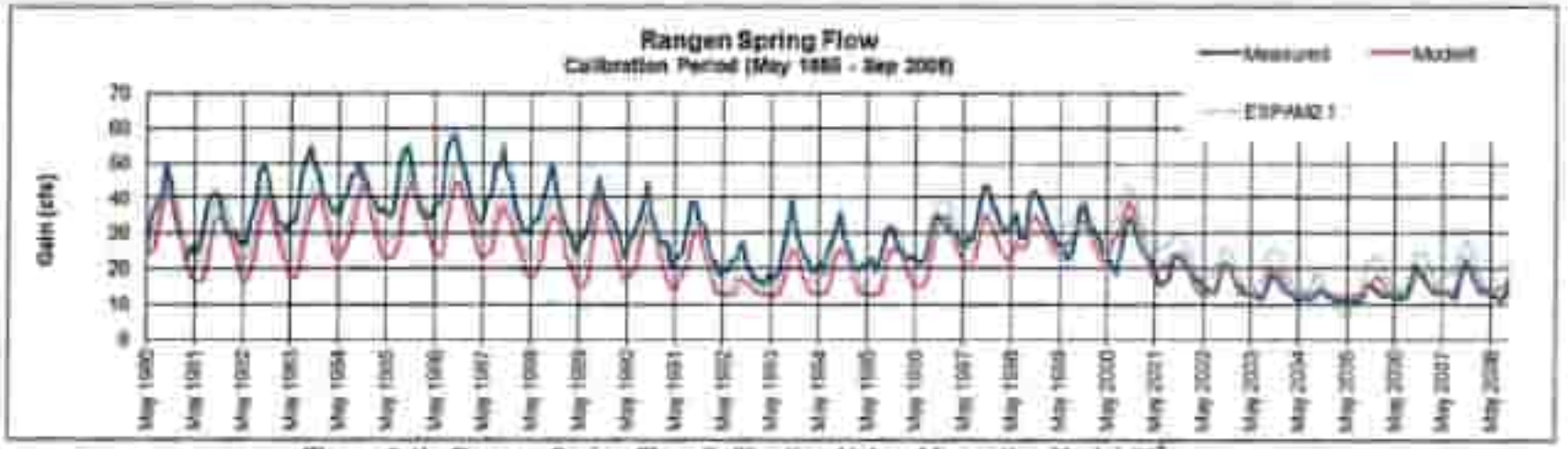

Figure 6.4b: Rangen Spring Flow Calibration Using Alternative Model #2[2]

[1] Referred to as "model #3" in supporting documentation
[2] Referred to as "model #6" in supporting documentation

Table 2.1: Irrigation Improvements in Response to 1977 Drought

Table 3.41. Have You Done Anything since 1977 that Would Help Deal with Future Droughts?

	Ada-Canyon Counties		Blaine-Lincoln Counties		Bingham-Bannock Counties		All Three Areas	
	#	%[1]	#	%	#	%	#	%
No Changes	37	52.9	12	27.9	17	44.7	66	43.7
Put In Wells	7	10.0	5	11.6	3	7.9	15	9.9
Put In Sprinklers	4	5.7	11	25.6	7	18.4	22	14.6
Added Gated Pipe	6	8.6	4	9.3	0	-	10	6.6
Lined Ditches	7	10.0	6	14.0	2	5.3	15	9.9
Land/Layout Improvements	5	7.1	3	7.0	8	21.1	16	10.6
Other	17	24.3	8	18.6	10	26.3	35	23.2
Total Reported Changes	83	-	50	-	40	-	173	-
Farmers Reporting Changes	33	47.1	31	72.1	21	55.3	85	56.3

[1]/Percent of questionnaires.

Source: Hamilton, et al. 1981

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Table 3.1: Water Rights at Head of Billingsley Creek

User Name	Water Right Number	Priority Date	Amount (cfs)	Source*	Use
Candy	36-134A	10/9/1884	0.49	Martin-Curren Tunnel	Domestic, Irrigation
Rangen, Inc.	36-134B	10/9/1884	0.09	Martin-Curren Tunnel	Irrigation and domestic use
Morris	36-134D	10/9/1884	1.58	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-134E	10/9/1884	0.82	Martin-Curren Tunnel	Irrigation, Stockwater
Musser	36-102	4/1/1892	4.1	Martin-Curren Tunnel	Domestic, Irrigation, Stockwater
Rangen, Inc.	36-135A	4/1/1908	0.05	Martin-Curren Tunnel	Irrigation and domestic use
Candy	36-135B	4/1/1908	0.91	Martin-Curren Tunnel	Irrigation
Morris	36-135D	4/1/1908	1.58	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-135E	4/1/1908	0.82	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-10141A	12/1/1908	0.82	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-10141B	12/1/1908	0.43	Martin-Curren Tunnel	Irrigation, Stockwater
Rangen, Inc.	36-15501	7/1/1957	1.46	Martin-Curren Tunnel	Fish propagation use at the hatchery and research facility on Billingsley Creek.
Rangen, Inc.	36-2551	7/13/1962	46.54	Martin-Curren Tunnel	Fish propagation use at the hatchery and research facility on Billingsley Creek. (Includes 0.1 cfs for domestic use.)
Rangen, Inc.	36-7694**	4/12/1977	25.00	Martin-Curren Tunnel	Fish propagation use at the hatchery and research facility on Billingsley Creek.

* SRBA Partial Decree.

** According to a memorandum from Cindy Yenter to Karl Dreher dated December 15, 2003, Rangen's submitted historical flow numbers show that flows have not been available to support water right number 36-7694 since October 1972, which predates the priority year of the right by nearly 5 years. Additionally, during the water right development period flows did not exceed 50 cfs, which is the total of water rights 36-15501 and 36-2551.

Table 4.1: Changes in Drain Conductance

Name	Row	Column	ESPAM2.1 Drain Conductance	ESPAM2.0 Drain Conductance	Change in Drain Conductance	Percent Change in Drain Conductance (%)
White	37	14	1132.92	886.87	246.05	28%
White	37	14	1823.45	1825.01	-201.56	-11%
Birch	37	15	1259.36	1246.64	12.73	1%
	38	14	16341.51	13743.10	1598.41	12%
	38	14	1682.55	3982.91	-2300.36	-58%
Big Spg	39	14	102977.90	95434.60	7543.30	8%
Big Spg	39	14	19790.43	19441.73	348.70	2%
	40	13	1398.28	1356.85	41.43	3%
	40	13	120.39	64.08	56.31	88%
	40	14	848.53	581.12	-32.59	-6%
	40	14	13572.02	11443.99	2128.03	19%
3 Spgs	41	13	13886.21	1299.29	12586.92	969%
3 Spgs	41	13	232246.80	239273.20	-7026.40	-3%
Tucker	42	12	33531.50	34300.84	-768.34	-2%
Tucker	42	12	1219.80	1001.69	218.10	22%
Reagen	42	13	419030.20	437500.40	-18470.20	-4%
NFH	43	12	75006.64	99063.36	-24053.72	-24%
NFH	43	12	476786.10	577165.40	-100379.30	-17%
Thousand	44	12	920.37	902.42	17.95	2%
Thousand	44	12	3000000000.00	3000000000.00	0.00	0%
	45	11	70.22	94.58	-24.36	-26%
	45	12	816.74	840.81	-24.07	-3%
	45	12	1282.55	1114.83	167.73	15%
Sand	46	12	4.05	2.78	1.27	46%
Sand	46	13	855834.30	842687.80	13146.50	2%
	47	11	10848.44	7990.13	2858.31	36%
	47	12	8846.26	10054.27	-1208.01	-12%
Box	47	12	10447001.00	3331809.00	7115192.00	214%
Box	47	13	12761.19	17330.28	-4569.09	-26%
Banbury	48	11	257005.20	229321.50	27683.70	12%
Briggs	49	11	85472.96	86088.12	-615.16	-1%
Cir Lks	50	12	828.05	545.41	282.64	52%
Cir Lks	50	12	69851178.00	37714284.00	30346894.00	80%
Cir Lks	50	13	4551.97	1135.22	3416.75	301%
Cir Lks	50	13	362620.60	137821.40	224799.10	163%
	50	14	6.98	4.62	2.36	51%
	50	14	3.07	1.58	1.49	94%
	51	14	10.86	11.65	-0.79	-7%
	51	14	28.54	9.04	19.51	183%

Table 4.2: ESPAM1.1 versus ESPAM2.1 Simulated Curtailment Date of January 1, 1961

Reach Name	Curtailment junior to 1/1/1961					
	ESPAM2.1	ESPAM2.0	ESPAM1.1	Net change (ESPAM2.1 from ESPAM1.1)	Change ESPAM2.0 from ESPAM1.1	Change ESPAM2.1 from ESPAM2.0
Ashton to Kelsey	168	167	222	-54	-55	1
Kelsey to Shelley	228	234	141	87	93	-6
Sum above Shelley	396	401	363	33	38	-4
Shelley to near Blackfoot	229	233	260	-31	-27	4
near Blackfoot to Neeley	760	755	593	167	161	5
Neeley to Minidoka	24	40	84	-60	-44	-16
Sum Shelley to Milner	1083	1052	917	136	139	-7
Devil's Washbowl to Bulit	131	135	506	-29	-25	-4
Bulit to Thousand Springs	156	150	81	75	69	6
Thousand springs	72	68	54	18	14	4
Thousand Springs to Malad	40	47	6.4	40	40	0
Sum Bulit to Lower Salmon Falls	279	285	181	139	121	19
Malad	50	51	47	3	4	-1
Malad to Bancroft	4	4	4	0	0	0
Sum Lower Salmon Falls to King Hill	54	55	51	3	4	-1
Sum of Springs Below Milner	469	453	251	107	101	6
Kimberly to Bulit baseflow	11	10	--	--	--	1
Bulit to LSF baseflow	7	7	--	--	--	0
LSF to King Hill baseflow	5	5	--	--	--	0
Sum of baseflow below Milner	23	22	--	--	--	0
Total (cfs)	1821	1827	1533	288	294	-6
Acres curtailed	635,927	635,927	584,819	51,108	51,108	0
Curtailed consumptive use (af/yr)	1,391,090	1,396,229	1,182,086	209,003	214,140	-5,139
Average consumptive use (ft/yr)	2.19	2.20	2.02	0.17	0.17	-0.01

Source: "Comparison ESPAM21 Appendix A River and Spring Reach Location Maps"

Table 4.3: Predictive Analysis by IDWR

GW Use Area	Target Reach	Calibrated Impact	Maximized Impact	Minimized Impact	Range	Model Version
WD110	Clear Lakes	0.17%	0.17%	0.16%	0.000	E110712A001
WD110	nr Blackfoot-Minidoka	26.28%	26.68%	26.09%	0.006	E120116A008
WD120	Clear Lakes	0.45%	0.93%	0.39%	0.005	E110712A001
WD120	nr Blackfoot-Minidoka	86.52%	91.33%	56.02%	0.353	E120116A008
WD130	Clear Lakes	7.56%	7.84%	6.62%	0.012	E121025A001
WD130	nr Blackfoot-Minidoka	21.56%	21.67%	14.93%	0.067	E120116A008
WD130	Ashton-Rexburg	0.94%	0.98%	0.94%	0.000	E120116A008
WD34	Clear Lakes	2.73%	3.39%	0.44%	0.030	E110712A001
WD34	nr Blackfoot-Minidoka	49.19%	76.21%	43.09%	0.331	E121025A001
WD140	nr Blackfoot-Minidoka	34.86%	35.07%	34.74%	0.003	E120116A008
WD140	Clear Lakes	4.51%	4.65%	4.44%	0.002	E120116A008
WD33	Clear Lakes	0.55%	0.58%	0.53%	0.001	E120116A008
WD33	nr Blackfoot-Minidoka	61.19%	61.52%	60.60%	0.009	E120116A008
WD100	nr Blackfoot-Minidoka	19.81%	19.81%	19.78%	0.000	E120116A008
WD100	Clear Lakes	0.11%	0.12%	0.11%	0.000	E120116A008
WD99	Clear Lakes	0.11%	0.13%	0.06%	0.001	E120116A008
WD99	nr Blackfoot-Minidoka	16.44%	29.70%	3.02%	0.267	E120116A008

Source: EBTAM2 Uncertainty Analysis, IDWR

Table 5.2 - Curtailment Results Using ESPAM2.1

Assumed Trimline Threshold	Change in Flow at Rangen Complex (cfs)	Groundwater Acres Curtailed	Curtailed Groundwater Use (af/y)	Rangen Increase as % of Curtailed Water Right*	Months to Reach 90% of Steady State Increase
(1)	(2)	(3)	(4)	(5)	(6)
10.0%	0.21	400	1,440	2.58%	3

Notes:
* Calculated as (2)/[(3)*0.02], assuming 1" per acre of irrigation

Source: AMEC analysis using ESPAM 2.1 Superposition Steady State version.

Table 6.1: Curtailment Results Using Alternative Model

Alternative Model ID	Assumed Trimline Threshold	Change in Flow at Total Complex (cfs)	Groundwater Acres Curtailed	Curtailed Groundwater Use (af/y)	Increase as % of Curtailed Water Right**	Months to Reach 90% of Steady State Increase
	(1)	(2)	(3)	(4)	(5)	(6)
#1	10.0%	0.11	208	740	2.69%	5
#2	10.0%	0.01	24	85	2.52%	2
ESPAM2.1	10.0%	0.21	406	1,446	2.56%	3

Notes:
* Calculated as (2)/[(3)*0.02], assuming 1" per acre of irrigation

Source: AMEC analysis using Alternative Model #1 and #2, IDWR's ESPAM2.1.

002579

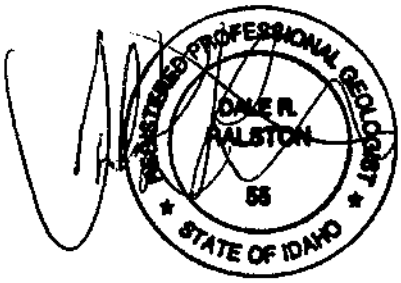
ATTACHMENT E:

HYDROGEOLOGICAL ANALYSIS OF THE NEAR BLACKFOOT TO NEELEY REACH OF THE SNAKE RIVER (Ralston, 2008)

RHS Ralston Hydrologic Services, Inc.
GROUND WATER CONSULTING AND EDUCATION
1122 East B Street, Moscow, ID USA 83843
Voice and FAX 208-883-0533, E-mail ralston@moscow.com

HYDROGEOLOGIC ANALYSIS OF THE NEAR BLACKFOOT TO NEELEY REACH OF THE SNAKE RIVER





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INTRODUCTION

The Enhanced Snake Plain Aquifer Model (ESPAM) is an important tool used by the Idaho Department of Water Resources (IDWR) in estimating impacts between ground water use and surface water resources to support water management decisions (Cosgrove and others, 2006). A significant portion of the water that discharges from the aquifer is from springs that are located along the Snake River. The Near Blackfoot to Neeley reach of the Snake River (defined by two stream gauging stations) includes large springs that discharge into the Snake River and the Portneuf River (Figure 1).

The objectives of this report are as follows: 1) describe the hydrogeology in the general vicinity of the Near Blackfoot to Neeley reach of the Snake River, 2) describe how the model represents the hydrogeology of this area and 3) provide recommendations relative to model changes to better represent the field conditions. The report is based on a review of available reports (citations provided in the text), discussions with individuals who work for the IDWR, the University of Idaho (UI) and have worked with the U.S. Geological Survey (USGS) and field site visits in March and October of 2007.

OVERVIEW OF THE AREA

The Near Blackfoot to Neeley reach of the Snake River includes the American Falls Reservoir and is located adjacent to the south margin of the of the Snake River Plain of eastern Idaho. Mundorff (1967, page 7) describes the geologic setting of the area as follows.

> "The Snake River Plain is underlain by a thick sequence of basaltic lava flows, interbedded pyroclastics and sedimentary deposits. The sequence accumulated in a structural trough between much older rocks of the mountain ranges that flank the trough along the northwest and southeast. The total thickness of the fill in the trough is not known, but it is believed, on the basis of geophysical evidence, to exceed 10,000 feet in some places.…
>
> The central part of the plain is generally higher than the margins and contains many lava domes and cones, indicating that at least in the late stages of volcanism, the basalt spread from the central part of the plain towards the northwest and southeast flanks. In the process, the Snake River was crowded against the southeast flank of the plain. Sedimentary interbeds, deposited in stream channels, flood plains and lakes, are thick and extensive along and adjacent to the present course of the Snake River, whereas they are thin or absent toward the central part of the plain."

Mundorff (1967, pages 7-8) provides the following description of the ground-water system.

> "The uppermost few thousand feet of basalt flows, pyroclastics and sedimentary interbeds compose the Snake River Group. These rocks form a great aquifer system – the Snake Plain aquifer – that stores and transmits large amounts of water … Chief sources of recharge to the aquifer are percolation from the channels of the Snake River, Henrys Fork and other streams; percolation from canals and irrigated tracts; and underflow from peripheral valleys and highlands…. The margin of the Snake Plain aquifer is the contact between the

basalt and the consolidated rocks or the sedimentary deposits of lower permeability….The aquifer discharges to the Snake River chiefly in two reaches: between the mouth of the Blackfoot River and American Falls (American Falls Reservoir reach), and between Milner Dam and Bliss (Hagerman Valley reach). Discharge in these two reaches is caused by the specific spatial relationships of the aquifer to aquitards (geologic units of low permeability) in the reach. In the Hagerman Valley reach, the contact between the aquifer and the underlying aquitard intersects the canyon of the Snake River at an altitude generally 100-200 feet above river level, and springs issue at or above that contact. In the American Falls Reservoir reach the contact is generally 20-45 feet above maximum reservoir level."

GEOLOGIC SETTING

Regional Geologic Setting

The Near Blackfoot to Neeley reach of the Snake River including the American Falls Reservoir is underlain mostly by sediments with a large mass of basalt located to the north and northwest. Figure 2 is a geologic map of the area taken from Whitehead (1992) that shows the sediments as alluvium (Qa), wind blown deposits (Qw) and older alluvium (Qts). The basalt shown northwest of the river is identified as younger basalt (Qb) or basalt (Qtb). The general relationship between basalt and sediment is shown on two figures taken from Whitehead (1992). Figure 3 shows the thickness of Quaternary basalt whereas Figure 4 shows the thickness of sedimentary rocks. The two figures show the transition from a basalt-dominated subsurface in the center of the Snake Plain to a sedimentary-dominated subsurface in the vicinity of American Falls Reservoir. In addition, Figure 3 shows that the thickness of Quaternary basalt is greater northeast of the American Falls Reservoir than in the immediate vicinity of the reservoir.

Local Geologic Setting

The local geologic setting includes Tertiary and Quaternary basalt, mostly fine-grained sediments associated with deposition in a lacustrine environment (Raft Formation and American Falls lake beds) and gravel deposits associated with the Snake and Portneuf Rivers. Information on the local geologic setting is provided from four primary papers. Trimble and Carr (1961) describe the geology of the southern portion of the American Falls Reservoir and the surrounding area. Mundorff (1967) provides geologic cross sections and a description of ground water conditions within an area that includes the southern portion of the reservoir. Pierce and Scott (1982) describe alluvial-gravel deposition along the Snake River northeast of the reservoir. Houser (1992) describes the Quaternary stratigraphy of the area northeast of the reservoir and includes a plan map and cross sections.

The geologic history provided by Trimble and Carr (1961) provides an understanding of the relationship of geologic units in the vicinity of the American Falls Reservoir.

"Rocks exposed along the Snake River include rhyolitic and welded tuff of Pliocene age; basalt and basaltic tuff of probable early Pleistocene age; clay silt, sand and gravel of middle to late Pleistocene age, mostly lucustrine and fluvial;

basalt of middle to late Pleistocene age; and alluvium and dune sand of Recent age" (page 1741).

"The oldest rocks prominently exposed in the Snake River canyon are the Pliocene Neeley Lake Beds … and the Walcott Tuff… These two conformable formations crop out mainly along the south side of the Snake River from American Falls southwestward to Rock Creek" (page 1741).

"The next youngest formation… is named the Raft Formation…. The Raft is mainly light-colored poorly bedded to nearly massive silt in the upper part and tan and gray clay, silt and fine sand in the lower part" (page 1742).

"Above the Raft, but possibly intertonguing with it, is a widespread group of nearly contemporaneous basalt flows from several vents northwest of the Snake River. These flows are restricted to the northwest side of the Snake River valley… These basalts are part of what has been mapped as Snake River Basalt… Cedar Butte Basalt..., which is younger than most of the Snake River Basalt, … occurs in an area about 8 or 10 miles long by 4 or 5 miles wide, almost entirely west of the present Snake River Canyon" (page 1742).

"The American Falls Lake Beds, which were deposited immediately after emplacement of the Cedar Butte Basalt, overlie the Snake River Basalt or the Raft Formation … where the basalt is absent… Above the American Falls Lake Beds are deltaic sand and gravel deposits, and several terrace deposits of silt, sand and gravel, all mainly north and east of American Falls" (pages 1742 - 1743).

Mundorff (1967) depicts the subsurface geology of the southwestern portion of the American Falls area, based on information from water wells, in a series of cross-sections that he combined into a fence diagram. A location map and selected portions of the fence diagram are presented in Figures 5a, 5b and 5c. The following points can be drawn from the Mundorff (1967) cross sections.

- The wells in Township 7 South Range 30 East (T7S R30E 29aa1, 20da1 and 20ab1) penetrate a considerable thickness of basalt overlying sediments, shown as the Raft Formation (Figure 5b). The basalt thins considerably to the southeast as is shown by wells 7S 30E 23cc1. The American Falls Lake Beds directly overlie the Raft Formation in this area.
- The basalt penetrated in wells along the northwest side of the reservoir is thinner with basalt flows interlayered with the American Falls Lake Beds and the Raft Formation as shown by well 7S 30E 11aa1 (Figure 5c). Only limited basalt was penetrated by well 6S 31E 32cd1 near the shore of the reservoir.
- Only thin basalt layers are penetrated by wells on the southeast side of American Falls Reservoir (not shown on Figure 5).
- The Mundorff (1967) fence diagram shows that the basalt, which is thick to the northwest in the center of the plain, thins and interfingered with mostly fine-grained sediments (Raft Formation and American Falls Lake Beds) near and likely under at least the southern portion of the reservoir.

Houser (1992) provides the most complete understanding of the subsurface geologic setting of the northeast portion of the American Falls area. Lithologic logs from 240 water wells were analyzed as part of the study and used to prepare a plan map and a number of cross sections. The geologic map prepared by Houser (Figure 6) shows the mapped surface geology and the well locations. The geologic notation used by Houser (1992) is as follows: 1) the American Falls Lake beds is noted as Ql with the Raft Formation as Qr; 2) Pleistocene basalt is noted as Qby or Qb with Snake River Gravel units identified as Qb; and 3) Tertiary basalt is shown as Tb The geologic map (Figure 6) shows the locations of ten cross sections (A-A' through J-J') The geologic cross sections are based on lithologic information from well logs. Selected cross sections are reproduced as Figures 7a, 7b, 7c and 7d. The following points can be drawn from the Houser (1992) map and cross sections.

- The geologic map (Figure 6) shows that the American Falls Lake Beds (Ql) outcrops in a discontinuous pattern over a large area northeast of the reservoir and north of the Snake River.
- The northeast maximum extent of the Raft Formation in the subsurface (subcrop) is shown on Figure 6. This line trends mostly west-northeast across the Fort Hall Bottoms past the town of Springfield. Houser (1992) did not identify the Raft Formation in the subsurface any further to the northeast.
- Geologic cross sections A-A' and B-B' are oriented approximately north-south and extend into the reservoir. The cross sections show that the American Falls Lake Beds (Ql) are present near land surface over much of the area (Figure 7a). The Raft Formation sediments (Qr) underlie the American Fall Lake beds, separated in places by a basalt layer. Either gravel (Qg) or basalt (Qb) underlies the Raft Formation (Qr). The low hydraulic conductivity units, particularly the Raft Formation, are important because they likely limit the hydraulic connection between deeper ground-water flow systems and shallow ground water and the reservoir.
- Cross-sections D-D' and E-E' are oriented northwest-southeast and are located northeast of the reservoir. In cross section D-D' (Figure 7b), the Raft Formation is depicted as extending continuously under the northeast end of the reservoir, the Snake River and the southwest portion of the Fort Hall bottoms. Cross section E-E' shows the Raft Formation as laterally continuous over the area but thinner. Either gravel (Qg) or basalt (Qb) is shown as both underlying and overlying the Raft Formation in sections D-D' and E-E'. The American Falls Lake Beds is a thin, near-surface unit in both of these sections
- Cross sections F-F' and G-G' are parallel to sections D-D' and E-E' but are located up river to the northeast. The American Falls Lake beds are still present as a near-surface unit but the Raft Formation unit is missing (Figure 7c). In section F-F', the Snake River and Fort Hall Bottoms are shown to be underlain by Snake River Gravel deposits (Qg).
- Cross section I-I' trends in a southwest-northeast direction from the northeastern corner of the reservoir to north of Ferry Butte. Cross section J-J' trends from

south-southwest to north-northeast on the east side of Ferry Butte (Figure 6). Cross section I-I' shows that a thick section of the Raft Formation is present under American Falls Reservoir but missing to the northeast (Figure 7d). Houser (1992) shows that a thin clay layer is present between the Quaternary basalt (Qb) and the gravel over about half of the section. Cross section J-J' shows a thinner section of the Raft Formation in the southwest with a considerable thickness of gravel (Qb) overlying Tertiary basalt in much of the area.

- Houser (1992) shows the presence of Tertiary basalt (Tb) under the Snake River Gravel (Qb) at the southwestern (right) end of the four east-west cross sections (D-D', E-E', F-F' and G-G'). The Tertiary basalt is also shown over most of the length of cross section J-J'.
- The Houser (1992) study shows that the fine-grained sedimentary units (American Falls Lake Beds and the Raft Formation) likely are present under the northeast end of the American Falls Reservoir. The Raft Formation is not present in the surbsurface northeast of a line roughly half way between the reservoir and Ferry Butte. The gravel and basalt units likely act as unconfined aquifers northeast of the subcrop line for the Raft Formation and as confined aquifers where they are overlain by the Raft Formation.

Pierce and Scott (1982) provide a description of gravel deposits along the Snake River northeast of the American Falls Reservoir. Their plan view map is reproduced as Figure 8.

> "An extensive gravel deposit of late Pleistocene age, about 15 kilometers wide and at least 10 meters thick, occurs along the Snake River from St. Anthony to American Falls Reservoir (see Figure 8)… Two complimentary effects fostered its accumulation. First, American Falls Lake was dammed by the Cedar Butte Basalt 72,000 +/- 14,000 years ago, resulting in elevated base levels upstream until about 14,000 to 15,000 years ago when the Bonneville Flood drained the lake… Second, conditions that favored deposition in other areas of nonglacial and glacial gravels at this time also existed along the Snake River… Following the drainage of American Falls Lake and the change in stream regimen between late Pleistocene and Holocene time, this gravel fill was incised by the Snake River and its tributaries" (page 695).

The shallow gravel zones shown in the Houser (1992) cross sections near the Snake River and underlying the Fort Hall Bottoms likely are the gravel deposits described by Pierce and Scott (1982). Figure 8 shows that gravel deposits are present northeast of the American Falls Reservoir for a considerable distance beyond Blackfoot.

Summary of Geologic Setting

Four aspects of the geologic setting of the Near Blackfoot to Neely Reach of the Snake River are of particular importance with respect to ground-water flow and the hydraulic interconnection of ground water and surface water.

- The general area of the American Falls Reservoir is underlain by basalt layered with fine-grained sediments. The deposition of fine-grained sediments in this area resulted from damming of the ancestral Snake River by basalt in Quaternary time.

The spatial distribution of the fine-grained sediments, particularly the Raft Formation, provides important control on ground-water flow. The Raft Formation thins generally to the east and northeast and can be identified in the subsurface only to a line approximately half way between the upper end of the reservoir and Ferry Butte. Upward ground-water flow from basalt aquifers into the American Falls Reservoir is likely limited by the presence of the fine-grained sediments of the Raft Formation and the American Falls Lake Beds.

- Gravel associated with the Snake River is present in the subsurface approximately along the present alignment of the river starting above Idaho Falls and continuing down river to thin and terminate against fine-grained sediments near the upper end of the American Falls Reservoir. The fine-grained sediments (Raft Formation and American Falls Lake Beds) in this area effectively block southwestward movement of ground water in the shallow sediments and result in ground-water discharge in the form of springs and river gains, generally northeast of the subcrop of the Raft Formation.
- The presence of the fine-grained sediments at depth in the vicinity of the American Falls Reservoir likely also limits southwestward flow of ground water in the deeper basalt units. This results in upward ground-water flow and discharge of water in the form of springs and river gains.
- The presence of Tertiary basalt at shallow depths in the vicinity of Ferry Butte may also be important relative to controlling ground-water flow. The Tertiary basalt, if less permeable than Quaternary basalt or Quaternary gravel, would be an additional impediment to ground-water flow. Knowledge of the hydraulic properties of the Tertiary basalt is limited.

HYDROGEOLOGIC CONCEPTUAL MODEL

The Quaternary basalt near the center of the Snake Plain generally is considered to host a single, unconfined aquifer. Water producing zones within the Quaternary basalt occur mostly at flow contacts which are present at depth intervals of about 15 to 20 feet. The average hydraulic conductivity of the basalt is extremely high.

The inter-fingering of Quaternary basalt flows with fine-grained sediments in the general vicinity of the American Falls Reservoir likely creates a subsurface environment composed of individual aquifers and confining units (aquitards). The transmissivity of the subsurface in the vicinity of the American Falls Reservoir is postulated to be much lower than the transmissivity of the aquifer to the northwest where fine-grained sediments generally are absent. The hydrogeologic environment in the area northeast of the reservoir is complicated by the presence of a shallow gravel unit roughly parallel to the Snake River. An additional complication is the presence of what is mapped as Tertiary basalt underlying the Quaternary gravel in the vicinity of Ferry Butte. The role that the Tertiary basalt plays in controlling ground-water flow patterns is unknown.

The presence of the fine-grained sediments in the subsurface (Raft Formation and American Falls Lake Beds) likely acts as a restriction for southwestward ground-water flow in both the basalt and the gravel along the Snake River. This results in upward hydraulic gradients and ground-water discharge in the form of springs and river gains.

As noted by previous investigators, most of the ground-water discharge occurs in areas northeast of the reservoir above maximum reservoir level. The sedimentary units likely are present under all but the southwestern end of the American Falls Reservoir. The amount of ground water moving vertically upward through the fine-grained sediments to discharge into the reservoir is believed to be small. The southwestern end of the reservoir is believed to act as a recharge source for ground water. Leakage likely is occurring through basalt that is present in this area.

Two major sources of information are available to combine with the hydrogeologic conceptual model to develop an improved understanding of the ground-water surface water interconnection in the Near Blackfoot to Neeley reach of the Snake River: 1) the locations and temporal variations of ground water discharges (i.e. springs, reach gains) to the river; and 2) the spatial and temporal variations in ground-water levels. Information on ground-water discharges and ground-water levels is described in the following sections.

GROUND-WATER DISCHARGE CHARACTERISTICS

Ground water discharge to the Snake River in the Near Blackfoot to Neeley reach occurs both in the form of identified springs and in the form of river gains that have not been attributed to specific springs. Information on ground-water discharge in the Near Blackfoot to Neeley reach is available from a number of different sources. The following sections provide a summary of information from each specific source.

Stearns and Others (1938)

The springs in the Fort Hall bottoms are described by Stearns and others (1938, pages 137-139) as follows.

> "Springs rise at intervals for a distance of 10 miles or more along the Fort Hall bottoms and adjacent to the Portneuf River near its mouth. Most of these springs rise on the valley floor at heights of 10 to 15 feet above the river. They have a fairly uniform aggregate discharge of about 1,400 second-feet (cfs), and most of them issue from basalt which underlies the alluvium in this area. The flow and the names of 30 of the larger springs in vicinity of the American Falls Reservoir are given below (given in this report in Table 1). The locations of the stations where the flow from these springs were measured are shown in figure … (given in this report as Figure 9)."

> "The ground-water contours … indicate that the springs bordering the Fort Hall bottoms should be divided into two groups. Batise Spring, Fish Hatchery Spring, and Wide Creek, in the Portneuf Valley form one group, and Big Spring Creek, Clear Creek, and Kinney Creek, the waters of which come from the valley of the Snake River north and east of Fort Hall, form the other group."

> "In addition to these springs, 230 second-feet (cfs) of water is discharged by 13 springs in the Aberdeen-Springfield area. These springs issue from the basalt of Gibson Butte, which collects the water from under the irrigated areas to the northeast and from seepage from the Snake River. At most of the spring vents this basalt is overlain by the American Falls lake beds or by alluvium…"

"The Portneuf and Snake Rivers are also augmented by smaller springs and by inflow rising in the stream channels themselves.…. The Snake River between the mouth of the Blackfoot River and American Falls, a distance of about 30 miles, has a total gain, exclusive of surface run-off from the upper Portneuf of about 2,500 second-feet (cfs), nearly all of which is supplied by springs."

Table 1 Spring Discharge Values Reported by Stearns and others (1938)

Number	Name	Discharge		Number	Name	Discharge
1	Rich	18.6		16	Artesian	5.5
2	Johannes	7.2		17	Sterling	6.2
3	Thorn	20.2		18	Colburn	3.2
4	Log Cabin	34.9		19	Ruger	23.9
5	Indian No. 1	47.4		20	Davis	
6	Indian No. 2	21.9		21	Franklin	
7	Indian No. 3	163.5		22	Big Jimmy	37.6
8	Indian No. 4	3.8		23	Big Spring	448.0
9	Indian No. 5	19.3		24	Kinney	29.3
10	Pyle	14.0		25	Clear	130.0
11	McTucker	26.4		26	Ford	7.4
12	Hull	7.1		27	Pocatello City	
13	Tanner	2.2		28	Batise	50.0
14	Crystal	32.8		29	Fish Hatchery	75.0
15	Danielson	51.1		30	Wide	60.0

Stearns and others (1938) discuss the possible sources of inflow to the Snake River in the reach in question. Approximate water balances are prepared for the three identified sources: 1) ground-water flow down the valley of the Portneuf, 2) precipitation on the lava beds north of the Snake River and 3) underflow along the Snake River. Stearns and others (1938, pages 141 and 142) note the following.

"Thus it appears evident that the springs in the Fort Hall bottoms are mainly supplied by this great underflow of the Snake River Valley. Coarse clean gravel deposits and basalt suitable for the accumulation of ground water underlie the river and the irrigated tracts upstream from the springs, but near Blackfoot the gravel deposits grade into relatively impermeable lake-bed silts and clays of the American Falls Basin. As a consequence the ground water that is carried by the gravel deposits tends to be forced into the basalt, which is the only available material of sufficient permeability, and practically all the springs issue from basalt."

Mundorff (1967)

Mundorff (1967) spends a number of pages dealing with a water-budget analysis of the American Falls reservoir reach. He reports the following relative to early flow measurements of the inflow (page 24).

> "Continuous records of flow in the Snake river at the two gaging stations used in the analysis are available only since 1911. Spring inflow at earlier dates can be obtained only by analysis of earlier miscellaneous records. Discharge measurements were made at different places along the Snake River in the vicinity of the American Falls Reservoir reach between 1902 and 1910. By estimating inflow from some tributaries, gains and losses in several reaches, and evapotranspiration losses from the reservoir reach, rough estimates of spring discharge were made for a period in August in three different years. These estimates are 2,000 cfs …in 1902; 1,840 cfs … in 1905 and 1,830 cfs in 1908. Although the records are incomplete and the quantities determined may be considerably in error, the records do indicate that spring inflow in the reach was considerably less before 1908 than in the years since 1911."

Mundorff (1967) presents calculated ground-water inflow to the American Falls reach of the Snake River on an annual basis from 1911 through 1960. The variability in his calculated inflow rates is small with a maximum of 2,055 cfs in 1952 and a minimum of 1,654 in 1916. The range in values from 1940 to 1960 is smaller with a minimum of 1,830 in 1956. Mundorff (1967, page 28) shows that a positive correlation exists between the calculated ground-water inflow to the American Falls reach and the 5-year progressive average of irrigation diversions to the area above American Falls Dam. Mundorff (1967, page 45) states the following in his conclusions.

> "Ground-water inflow in the American Falls Reservoir reach was probably about 1.2-1.4 million acre-feet a year (1,700-1,900 cfs) before irrigation began in eastern Idaho. Inflow increased with the increasing diversions of surface water to land adjoining the Snake River and in the late forties and early fifties averaged about 1.95 million acre-feet annually (2,600 cfs). About 1952 increased withdrawals of ground water apparently became large enough to prevent further increases of ground-water inflow. Between 1922 and 1952 the ground water inflow increased roughly 2.5 acre-feet for every 10 acre-feet of surface water diverted to lands on the Snake River Plain upstream from American Falls Dam."

Mundorff (1967) shows that his calculated monthly ground-water inflow to the American Falls reach correlates reasonably well in the period of 1952 to 1960 with water levels in a shallow well (46-feet deep) located in section 27 of township 5 south and range 31 east. A well driller's report for this well is not available on the IDWR website but other wells in this section penetrate basalt in the depth range of about 20 to about 60 feet.

Balmer and Noble (1979)

Balmer and Noble (1979) present an analysis of the water resources of the Fort Hall Indian Reservation. The study included measurement of water levels in wells and discharge from springs in the Fort Hall Bottoms. The mean flow of major springs on the

Fort Hall Bottoms, as compiled by Balmer and Noble (1979, page 17) is presented in Table 2. Some of the springs identified in Table 2 are the same as included in Table 1 from Stearns and others (1938). It is impossible to know whether flow measurements were taken at the same locations.

Table 2 Discharge of Major Springs on the Fort Hall Bottoms (Balmer and Noble, 1979)

Station	Mean flow in cfs
Hatchery Springs	103
Diggie Creek	263
Jeff Cabin Creek	21.1
Spring Creek	466
Big Jimmy Creek	30.5
Clear Creek	134
Kinney Creek	28.1
Wide Creek	57.4
Jimmy Drinks - East	103
Jimmy Drinks - West	35.4
Ross Fork	58.4

The Balmer and Noble (1979) study includes development of a water budget for the Fort Hall Bottoms. The graphical depictions of their water budget are reproduced as Figures 10A and 10B, a Snake River portion and a Portneuf River portion.

- The Snake River discharge of 4,800 cfs below the Blackfoot River (Near Blackfoot gage) increases to 5,450 cfs where it discharges into the American Falls Reservoir (Figure 10A). About 184 cfs of the total gain of about 650 cfs is noted as “groundwater to channel”. The remaining gain is from identified sources with the largest being Diggie Creek at 263 cfs.
- The Portneuf River flow increased from 270 cfs at the USGS Pocatello gage to 1,744 cfs where it discharges into the American Falls Reservoir (Figure 10B). Specific springs and creeks make up much of the gain. The combined flow of Spring Creek and Jimmie Creek (496 cfs), Clear Creek (134 cfs), Ross Fork (55 cfs), Jimmie Drinks (103 and 35 cfs) plus Wide Creek (57 cfs) is 880 cfs. Unmeasured ground-water inflow makes up an additional 428 cfs.
- Balmer and Noble (1979, page 18) note that the total identified gain to the rivers is about 2,100 cfs. Almost 70 percent of this gain is discharge to the Portneuf River with slightly less than 30 percent of the gain discharging into the Snake River.

Balmer and Noble (1979, page 156) established several temporary gaging stations to quantify inflow to the lower Portneuf River. One station was established at the Michaud Pumping Station near Siphon Road with a second station about one-half mile below Jimmy Drinks East Branch. The approximate locations of these stations are shown on Figure 10B. Six sets of measurements were obtained (dates not given). The river gain was about 619 cfs in this reach with 398 cfs accountable by individual spring inflows. Several measurements near the mouth of the Portneuf River were made during the low water period of 1977 (September 29 and November 1). The measurements indicated river gains of 671 and 637 cfs in the reach below Jimmy Drinks East Branch and the mouth. Discounting the flows in the three measured springs, the unaccounted for gain was 156 and 120 cfs for the two dates.

Kjelstrom (1995)

Kjelstrom (1995, page C17) provides the following summary of information on the gain between the Near Blackfoot and Neeley gages.

> "The Snake River gained about 1.9 million acre-ft of ground-water, largely from springs, between the gaging stations near Blackfoot and Neeley … in water year 1980. Annual streamflow gains in the reach varied little during water years 1912-80… The mean gain from ground water from 1912 to 1980 was 1.8 million acre-ft, or 2,540 ft^3/s; the standard deviation was 80,000 acre-ft, or 110 ft^3/s."

The reservoir was drawn down for dam reconstruction in 1977, providing an opportunity for measurement of the Snake and Portneuf Rivers upstream and downstream from major springs. Kjelstrom (1995, page C18) reports that the total streamflow gain from ground water in the Blackfoot to Neeley reach was estimated to be 2,560 cfs and 2,570 cfs on September 8 and 28, 1977 respectively.

Kjelstrom (1995, page C18) notes that ground-water discharge to the natural channel of the Portneuf River is about 65 percent of the total ground-water discharge to the Blackfoot to Neeley reach. He describes field measurements as follows.

> "Streamflow measurements of the Portneuf River at Pocatello and upstream from Bannock Creek were made on September 9 and 17, 1977. After these measurements adjusted for a measured diversion and estimated surface-water inflow, the average difference between outflow (measured at the downstream gage) and inflow was 1,650 ft^3/s (assumed to be ground-water discharge)".

Kjelstrom (1995), page C21) says that springs issuing from basalt north of the Snake River and American Falls Reservoir discharge about 200 cfs. The largest of these springs is tributary to Danielson Creek. Kjelstrom (1995, page C23) shows that temporal variations in discharge in Danielson Creek correlate well with water-level elevations in well 5S 31E 27aba1 (using data from 1980-81). This is the same well that Mundorff (1967) used to correlate with his calculated ground-water discharge to the American Falls Reservoir reach.

Hortness and Vidmar (2003)

Hortness and Vidmar (2003) present the results of seepage studies that were conducted jointly by the U.S. Geological Survey and the Idaho Power Company for three reaches of the Snake River: 1) lower reach from Minidoka to King Hill, 2) middle reach

from Shelley to Minidoka and 3) upper reach from Ashton to the mouth of the Henrys Fork and Snake River from Heise to Shelley. The seepage studies were conducted in 2001 and 2002. The approach used by Hortness and Vidmar (2003) is described below.

> "Data collected in each reach included discharge values from the USGS and/or IPCo (Idaho Power Company) gaging stations, discharge values at several intermediate locations obtained using acoustic Doppler instrumentation … and measured and/or inspected discharge values for several miscellaneous inflows (mostly tributaries) along the entire length of each reach obtained by field personnel" (page 1).

The Near Blackfoot to Neeley portion of the middle reach of the Snake River was divided into three subreaches using four gaging sites (Figure 11). Station M9 at the upper end of the reach is the USGS stream gaging station entitled Snake River near Blackfoot. Station M12 at the lower end of the reach is the USGS stream gaging station entitled Snake River at Neeley. Acoustic Doppler discharge measurement data were taken at two intermediate stations: M10 – Snake River near Pingree; and M11 – Snake River above McTucker Creek near Pingree. Additionally, measurements or observations were taken at a number of tributaries within the reach. The seepage studies were done twice in 2001 and three times in 2002.

Appendix B of the Hortness and Vidmar (2003) report include tables of discharge data for each of the four stations (discharge readings were not obtained from stations M10 and M11 for all of the seepage runs) plus estimates of selected inflows between the stations and changes in storage in American Falls Reservoir. Table 3 provides a summary of the seepage run results in cfs. Figure 11 shows the seepage run results for the April 9-10, 2002 data collection effort.

Figure 11 show a gain of 460 cfs from station M9 (Near Blackfoot gage) to M11 (head of the reservoir) with a 1,232 cfs gain over the length of the reservoir (station M12 minus station M11). The Hortness and Vidmar (2003) data in Table 3 show a range of stream flow gains of 1,390 to 2,186 cfs from the Near Blackfoot gage (M9) and Neeley gage (M12). The largest calculated gain was in November 2002 with the smallest in July 2002.

The study results shown on Table 3 are different from the results provided in the Hortness and Vidmar (2003) because two errors were discovered in the original document. The first error is in the calculated inflow between stations M11 and M12 for the July 23-24, 2002 seepage run. Two sites are included in estimated inflow for the July 2002 calculations that are not included in analysis of the other four seepage runs. The inflow for the other four seepage runs between stations M11 and M12 is the sum of discharge at the following sites (Hortness and Vidmar 2003, Table B20).

- Portneuf River near Tyhee
- Bannock Creek near Michaud
- Aberdeen Waste Drain near Aberdeen
- Tarter Waster near American Falls
- Seagull Bay near American Falls
- Falls Irrigation Pump near American Falls

Table 3 Summary of Seepage Run Results (cfs) (Hortness and Vidmar, 2003)

Station	April 3-6, 2001	Oct 31-Nov 1, 2001	April 9-10, 2002	July23-24, 2002	Nov 5-6, 2002
M9	2,190	1,810	1,750	3,960	2,060
Est. Inflow	0	0	0	0	0
Est. Outflow	0	0	0	0	0
M10	2,520	2,410			2,430
Est. Inflow	0	0	0	0	0
Est. Outflow	0	0	0	0	0
M11	2,820		2,190		2,550
Est. Inflow	588	481	538	246	421
Est. Outflow	0	0	0	96	0
Res. Storage	800	4,000	2,300	-4,900	4,300
M12	3,920	354	1,660	10,400	367
M10-M9	**330**	**600**			**370**
M11-M10	**300**				**120**
M12-M11	**1,312**		**1,232**		**1,696**
M12-M10	**1,612**	**1,463**			**1,816**
M12-M9	**1,942**	**2,063**	**1,672**	**1,390**	**2,186**

The following two additional sites are included by Hortness and Vidmar (2003) in the calculated inflow between stations M11 and M12 for the July 23-24, 2002 seepage run.

- McTucker Creek Springfield
- Danielson Creek near Springfield

The calculated inflow for the July 23-24, 2002 seepage run is reported in Table B13 of Hortness and Vidmar (2003) is 246 cfs rather than 506 cfs if the two additional stations are not included (see Table 3). Table B13 and Figure B5 in Hortness and Vidmar (2003) show a streamflow gain of 1,131 cfs from the Near Blackfoot gage to the Neeley Gage (M9 to M12). This number is not comparable to the other reach gains presented in the

report because of the inclusion of the two additional sites in the calculated inflow between stations M11 and M12. The corrected calculated gain is 1,390 cfs.

The second error is in the calculated reach gain from M11 to M12 for the November 5-6, 2002 seepage run. As is shown on Table 3, the gain between the Near Blackfoot and the Neeley gaging stations (M9 and M12) was 2,186 cfs. Table B17 and Figure B5 of the Hortness and Vidmar (2003) report show this gain as occurring between M11 and M12 rather than M9 and M12. The correct gain across the American Falls Reservoir (M12-M11) for the November 2002 seepage run is 1,696 cfs.

Hortness and Vidmar (2003) obtained flow measurements at 18 surface water sites that discharge directly into the American Falls Reservoir. Seven of the sites, including the Portneuf River and Bannock Creek, are included in their inflows in the M11 to M12 reach (Table 3). The total discharge of these seven sites ranges from a low of 246 cfs in July 2002 to a high of 588 cfs in April 2001. The eleven remaining surface water sites are: 1) Ross Fork, 2) Clear Creek, 3) Spring Creek, 4) McTucker Creek, 5) Danielson Creek, 6) Sterling Waste, 7) Spring #1 Sterling, 8) Crystal Spring, 9) Spring #2 Sterling, 10) Spring #3 Sterling and 11) Spring Hallow. The combined discharge of these sites was 541.5 cfs in October-November 2001, 634 cfs in July 2002 and 604 cfs in November 2002. Not all of the sites were measured in April 2001 and April 2002. Table 3 shows that the calculated gain across the American Falls Reservoir (M12-M11) was 1,696 cfs in November 2002. Thus, the eleven additional measured inflows to the reservoir (604 cfs) account for about 36 percent of the calculated gain in the American Falls Reservoir reach in November 2002. Most of the remainder of the calculated gain likely is discharge from the spring-fed creeks described by Balmer and Noble (1979) and Kjelstrom (1995) that discharge to the lower Portneuf River. The presence of the sedimentary formations (American Falls Lake Bed and Raft Formation) makes it difficult for large quantities of water to discharge directly into the bottom of the reservoir.

IDWR Reach Gain/Loss Program (2006)

The IDWR Reach Gain/Loss Program is used to develop estimates of historical river gains and losses for various reaches. Cosgrove and others (2006) describe the program as follows.

> "The Reach Gain/Loss Program uses gaged reach inflows and outflows, measured diversions and estimated irrigation returns and reservoir storage and evaporation to calculate a (monthly) water balance for the reach. The residual of the water balance is the estimated river reach gain from or loss to the aquifer" (page 92).

Most of the ground-water discharge to the Snake River occurs in two reaches: 1) Milner to King Hill and 2) Near Blackfoot to Neeley. Cosgrove and others (2006) present calculated average annual river gains in these reaches starting in the early 1900's. A plot of these data is presented in Figure 12. Their description of the temporal pattern of discharge in these two locations is presented below.

> "Natural discharge from the Snake River Plain aquifer is primarily to the Snake River along two reaches: Kimberly to King Hill and Near Blackfoot to Neeley … Spring discharge has varied in response to changes in precipitation, irrigated acreage, and irrigation practices. Overall, discharge in the Kimberly to King Hill

reach appears to have been impacted more than in the Near Blackfoot to Neeley reach…Historically, aquifer water levels and corresponding discharges to the Snake River rose significantly at the onset of surface water irrigation. This is particularly apparent in the historic discharge in the Milner to King Hill reach… Aquifer water levels peaked about 1950 and have been declining since that time. The declines are attributed to the onset of ground-water irrigation, more efficient surface water irrigation practices such as conversion to sprinkler irrigation and canal lining, and the recent seven years of drought. Historic discharge in the Near Blackfoot to Neeley reach shows a less dramatic response to historic changes in irrigation practices, however the reach does exhibit more dramatic seasonal variation since the 1950s" (pages 15-16).

Monthly average river gains, calculated using the IDWR Reach Gain/Loss Program, were obtained from Wylie (2007). The calculated monthly river gains from Near Blackfoot to Neeley results (Figure 13) show a greater data scatter than the annual gains shown on Figure 12. There are some longer-term trends in the river gain with a high in about 1987, a low in about 1995, a high in about 2000 and a low in 2006 that continues into 2007. The average calculated river gain for the reach decreases with time as follows: 2,559 cfs for the period of January 1970 through August 2007, 2,341 cfs for the period of January 2000 through August 2007 and 2,104 cfs for the period of January 2001 through August 2007.

TEMPORAL WATER-LEVEL PATTERNS IN WELLS

The comparison of temporal water-level data from wells from within the basalt-dominated portion of the Snake Plain aquifer to wells near the Near Blackfoot to Neeley reach of the river provides information of hydraulic connection of the ground-water systems. The water-level data were obtained from the U.S. Geological Survey web site.

Hydrographs for selected single completion wells (Figure 14) are presented in Figures 15 through 19. The order of presentation starts with wells completed in basalt north of American Falls Reservoir followed by wells located nearer the reservoir.

- Wells 2N 31E 35dcc1 and 1S 30E 15bca1 (Figure 15) have similar hydrographs and represent the temporal water-level pattern that is typical of the basalt portion of the Snake Plain aquifer northwest of the Near Blackfoot to Neeley reach. Both wells are deep (636 and 751 feet) and the static depth to water is considerably below land surface (594 and 721 feet in 2007). Both wells show a downward overall water-level trend with recent highs in November 1984 and January 1999 and recent lows in August 1981 and August 1994. The water-level rise between August 1981 and November 1984 was about six feet. The seasonal water-level changes in both wells were generally less than two feet with seasonal lows in late spring or summer and seasonal highs in late fall or winter.
- Wells 2S 32E 23bbb1 and 4S 31E 20bbb1 (Figure 16) show a similar water-level pattern as the previous pair of wells. These two wells are 194 and 201 feet deep and have water levels about 171 and 127 feet below land surface. The water-level rise between August 1981 and November 1984 was about five feet in both wells. There is more seasonal scatter in the data points in these wells as compared to wells to the north, probably related to pumping and irrigation application. The

seasonal water-level changes in both wells were generally less than two feet with seasonal lows in spring and seasonal highs in fall.

- Wells 4S 31E 36aba1 and 5S 31E 27aba1 (Figure 17) are both shallow (17 and 51 feet) located in areas irrigated using surface water. The wells show a rapid response to surface water irrigation practices. There is considerable scatter to water-level in both wells with lower water levels in the spring and higher water levels in the fall. The water-level rise from 1981 to 1984, noted in the wells to the north, is not evident in the data from these two shallow wells. The water-level elevation in both wells was lowest in the period of record in 2004-2005.
    - For well 4S 31E 36aba1, the annual water level fluctuation was five to seven feet with no long-term pattern of water-level change from the start of records through the mid 1970's. There is a significant change in the water-level pattern in well 36aba1 starting in about 1978 with lower water level highs and less annual water-level change. Care must be taken to differentiate changes in water-level patterns from apparent changes caused by decreases in frequency of measurement or changes in dates when measurements were taken. The data show a pattern of water-level decline with several multi-year trends (low in 1993 and high in 1999). The water level pattern seen in well 36aba1 is a reflection of change in surface water irrigation practices in the area (such as change from gravity to sprinkler irrigation or lining of canals) and possibly the impacts from ground-water pumping.
    - The overall pattern of the hydrograph for well 5S 31E 27aba1 is similar to well 4S 31E 36aba1 except for larger annual water-level fluctuations. The annual water-level fluctuation was up to 15 feet in the 1950's and 1960's. The range in annual water-level changes lessened (less than nine feet) in the mid 1970's and 1980's with both lower highs and higher lows. Again, some of the change in water-level pattern is from changes in the frequency and/or timing of measurements. An overall downward trend in water levels is evident in the record starting in the early 1980's. The water-level pattern in this shallow well likely is a combination of impacts from changes in surface water irrigation practices and possible impacts from ground-water pumping.
- Well 6S 31E 16bab1 (Figure 18) is located near the northwest shore of American Falls Reservoir. The hydrograph for this 134-foot well has characteristics of the nearby two shallow wells (Figure 17) and the deeper wells to the north (Figures 15 and 16). Seasonal water-level changes were less than about five feet in the 1950's and 1960's, except for scattered low water level readings. According to the USGS record for this well, the pump in the well was operating when the scattered low water-level readings were taken.
- Well 2S 34E 33bba1 (Figure 19) is located near the Aberdeen-Springfield Canal northeast of the American Falls Reservoir. This is 40 feet deep and has high water levels in the fall and low water levels in the spring, which is typical of surface water irrigated areas. The seasonal water-level change generally is five to

six feet. The hydrograph for well 33bba1 is similar to the shallow wells shown on Figure 17. The most likely causes for the water-level pattern in well 33bba1 are changes in surface water irrigation practices in the area and possible impacts from ground-water pumping.

A number of locations have clusters of wells completed to different depths. These wells allow characterization of vertical hydraulic gradients and temporal changes in water-level elevation with depth. Water-level data are available for these wells since about 1980. The locations of the wells are shown on Figure 14.

- Wells 4S 32E 1cba1, 1cba2, 1cba3 and 1cba4 are constructed to depths of 90, 53, 242 and 433 feet respectively and are located near the Aberdeen-Springfield Canal at a site north of the northeast end of the American Falls Reservoir (Figure 14). The water-level patterns for the two shallow wells (Figure 20) are similar with seasonal changes of about 7 to 9 feet and lows in the spring and highs in the fall. The seasonal changes are likely from surface-water irrigation activities. The two deeper wells have much smaller seasonal changes. Figure 20 shows that there was an upward hydraulic gradient between the two deeper completions from the start of the record through about 2002 when the wells had about the same water-level elevation. The scatter in data for the 242-foot well starting in 2005 is difficult to explain. The overall water-level pattern, evident in the three wells with long-term records likely stems from a combination of changes in surface-water irrigation practices in the area and impacts from ground-water pumping.
- Wells 4S 33E 20cbb1, 20cbb2, 20cbb3 and 20cbb4 are located northeast of American Falls Reservoir near the Snake River and are completed at depths of 62, 108, 365 and 738 feet (Figure 14). An upward vertical gradient is evident from the water-level data from all four of these wells (Figure 21). The water-level elevation in the 108-foot well is about 10 feet higher than in the 62-foot deep well. These data indicate an upward vertical gradient of about 0.2 ft/ft. The upward gradient persists deeper in the section but is smaller. The long-term water-level pattern in the 738-foot well is typical of the basalt aquifer to the northwest. This well has one to two feet of seasonal water-level changes with water-level highs generally in early winter and water-level lows in July. This well likely reflects the seasonal impacts of ground-water pumping. The long-term water-level pattern in the 365-foot well is dissimilar from any of the other hydrographs in the area with a high water-level elevation in November 1989 and very small seasonal fluctuations. Reasons for the uniqueness of the hydrograph for the 365-foot well are unknown. The hydrograph for the 108-foot completion has considerable seasonal variation but does not fit the seasonal patterns of other shallow wells in areas of irrigation by surface water. Several significant water level changes (such as 4.5-foot drop between January and March 1992 and a 3.7-foot drop between January and March 1998) are difficult to explain. There are about two-feet of seasonal water-level change in the 62-foot completion well; water-level highs are either in May or September, probably reflecting high river conditions in May and surface-water irrigation impacts in September.
- Wells 4S 33E 25ddb1-2 and 4S 34E 8dbd1-3 are located south of the Snake River and between Ferry Butte and the American Falls Reservoir (Figure 14). Wells

25dbb1 and 25dbb2 have completions at depths of 21 and 117 feet and are located is down gradient (southwest) of wells 8dbd1, 8dbd2 and 8dbd3 which have completions at depths of 38, 99 and 232 feet. Water-level data for these wells are only available during the period of 1985 to 1994 (Figure 22). The water-level data from the 21 and 117-foot completions at 4S 33E 25ddb show an upward vertical gradient of about 0.2 ft/ft with a greater rate of decline during the period of record in the 117-foot completion than in the 21-foot completion. The three completions at 4S 34E 8dbd also show upward ground-water flow but the vertical gradient is smaller (about 0.05 ft/ft). The declining water-level trend in all five of these wells is consistent with this period of record for other wells in the area. The 232-foot completion at 25dbb has a consistent seasonal water-level pattern with low levels in late spring and a high in early winter. A consistent seasonal trend is not as identifiable in the other wells.

- Wells 3S 34E 22dab1 and 22dab2 are located northeast of Ferry Butte and are completed at depths of 85 and 569 feet (Figure 14). Limited water-level data for the 569-foot well are similar in pattern to the 85-foot well with a small downward hydraulic gradient (Figure 23). The overall water-level pattern in both wells is similar to that found in the Snake Plain aquifer to the northwest. The 569-foot well has a seasonal fluctuation of about two to three feet with low water levels in the winter and spring and high water levels in the fall. The 85-foot well has a similar seasonal range in water levels with high water levels generally in the fall.
- Wells 2S 35E 11ddd1-4 are located north-northeast of the City of Blackfoot and are completed at depths of 97, 376, 570 and 682 feet (Figure 14). Note that the scale on the right side of the Figure 24 is for well 11ddd1 (97-foot completion) is three times the range for the other three wells. The hydrograph for the 97-foot well (11ddd1) shows very large seasonal water-level changes (35 to 50 feet), water-level highs and lows that are consistent with surface-water irrigation effects and does not have long-term pattern of water-level decline. There is a downward hydraulic gradient of about 0.18 ft/ft from the 97-foot well to the 376-foot well. The deeper wells at this site have a water-level pattern that is similar to wells located north of American Falls Reservoir with a fairly large seasonal water-level change (three to seven feet). An upward hydraulic gradient was present from the 682-foot completion to the 376-foot completion in the early 1980's. However, these two wells show a downward hydraulic gradient based on the few data points in 2001 and 2002.

Mundorff (1967) notes that shallow wells respond to the large annual range in lake stage only near the southwest end of the American Falls Reservoir. The locations of wells identified by Mundorff (1967) as responding to reservoir stage are shown on Figure 25. A temporal plot of reservoir stage and water-level elevations for one of the wells (7S 30E 24ddc1) for a period of time in the 1960's is presented in Figure 26. The plot shows that the water-level in the well is lower than the surface water at high reservoir stage and higher than the surface water at low reservoir stage. Leakage of water from the west end of the reservoir is likely related to basalt present near land surface in this area.

Geologic Controls for Ground-Water Discharge

Ground water discharges in an area northeast of the American Falls Reservoir because of changes in geology that result in lower aquifer transmissivity in this area. The gravel zone that hosts a shallow ground-water flow system along the Snake River essentially terminates against the fine-grained sediments of the American Falls Lake Beds and the Raft Formation. In the same way, basalt that makes up most of the Snake Plain aquifer occurs only as individual flows within a sequence of mostly fine-grained sediment. The lower transmissivity in the immediate vicinity of the American Falls Reservoir acts similar to a subsurface dam and results in ground-water levels at or above ground surface in shallow aquifers northeast of the reservoir. Springs occur in these areas. There is also a significant upward hydraulic gradient which indicates ground-water flow occurs from deeper aquifers to shallow aquifers and then to discharge locations.

Studies by Balmer and Noble (1979) and Kjelstrom (1995) plus other authors are sufficient to conclude that the vast majority of ground-water discharge occurs upstream of the American Falls Reservoir, probably controlled by the subcrop of the Raft Formation. The amount of ground-water discharge directly into the bottom of the reservoir is unknown but believed to be small.

Estimation of Ground-Water Discharge

The amount of ground-water that discharges to the Snake River in the Near Blackfoot to Neeley reach has been estimated by a number of investigators using a variety of direct measurement and mass balance approaches. The mass balance approach involves measurement of the flow in the river at an upstream site (often the Near Blackfoot site) and subtracting that number from the flow in the river at a downstream site (often below the American Falls Dam at the Neeley site) and adjusting for known inputs and known outputs. Changes in storage within the American Falls Reservoir are also taken into account. The accuracy of the calculated river gain depends on the accuracy of flow measurements and the detail taken in accounting for all inputs and outputs and the change in storage in the reservoir.

The following sections describe the results of the selected investigation efforts.

- Studies conducted by Balmer and Noble (1979) are particularly important because flow measurements were obtained on a large number of springs and tributary streams near the northeast end of the reservoir. Their studies, conducted in the late 1970's, indicate that the Snake River gains about 650 cfs from the Near Blackfoot gage to the reservoir with about 70 percent of the gain from documented sources (individual springs and creeks) and 30 percent from ground-water discharge to the channel. Balmer and Noble (1979) calculated a gain in the Portneuf River from the Pocatello gage to the reservoir of about 1,470 cfs with about 70 percent from documented sources and about 30 percent from ground-water discharge to the channel. This gives a total gain to the rivers of about 2,100 cfs (rounded to two significant digits). Kjelstrom (1995, page C21) says that springs issuing from basalt north of the Snake River and American Falls

Reservoir discharge about 200 cfs. The largest of these springs is tributary to Danielson Creek. Combining the two sources of information, the estimated ground-water discharge to the Snake River in the Near Blackfoot to Neeley reach in the late 1970's was about 2,300 cfs.

- Kjelstrom (1995, page C17) used data from U.S. Geologic Survey stations, measurements of diversions and return flows and changes in reservoir storage to calculate ground-water discharge in the reach using the mass balance approach. He reports the mean gain from ground water between the Near Blackfoot and Neeley from 1912 to 1980 was 2,540 cfs with a standard deviation of 110 ft^3/s.
- The Hortness and Vidmar (2003) seepage run data in a mass balance approach show a range of streamflow gains of 1,390 to 2,186 cfs from the Near Blackfoot gage (M9) and Neeley gage (M12). The largest calculated gain was in November 2002 with the smallest in July 2002.
- The average calculated river gains for the reach for different time periods using the IDWR Reach Gain/Loss Program are as follows: 1) 2,559 cfs for the period of January 1970 through August 2007, 2) 2,341 cfs for the period of January 2000 through August 2007 and 3) 2,104 cfs for the period of January 2001 through August 2007. These values show that the calculated river gains have decreased with time.

Relationship of Ground-Water Levels and Ground-Water Discharge

As with any ground-water system, temporal variations in the discharge from springs in the Near Blackfoot to Neeley reach of the Snake River are related to water-level changes in the source aquifer. Higher discharge from the springs occurs because of higher ground-water levels. The converse is also true. The relationship of ground-water levels to ground-water discharge is described in this section using a well located near Aberdeen and several wells located northeast of the reservoir as compared to calculated ground-water inflow and the discharge of Spring Creek.

Mundorff (1967) compared his calculated monthly values of ground-water inflow to American Falls Reservoir to well 5S 31E 27ab1, located north of Aberdeen (Figure 14). As Mundorff shows (Figure 27), the water-level pattern in the well, which responds to surface irrigation in the area, is similar to the temporal pattern of calculated ground-water inflow to the reservoir.

Water-level data from well 5S 31E 27aba1 (the same well used by Mundorff) are plotted with the monthly reach gains calculated using the IDWR Reach Gain/Loss Program in Figure 28. The seasonal range in water levels in the well was about 15 feet in the 1950's and 1960's and decreased to less than nine in the mid 1970's and 1980's with both lower highs and higher lows. The seasonal range in water levels has been less than seven feet since about 1990. An overall downward trend in water levels is evident in the record starting in the mid 1980's although the frequency of measurement also decreased starting in the late 1980's. Ground-water levels in well 5S 31E 27aba1 show a similar pattern as the calculated reach gain starting about 1990. The drop in water level in the well after about 1998 is very similar to the decrease in the calculated river gain in the same period. The water-level pattern in this shallow well likely is a combination of

impacts from changes in surface water irrigation practices and possible impacts from ground-water pumping. This suggests that the decrease in calculated gains using the IDWR Reach Gain/Loss Program also is a result of the combined impacts of changes in surface water irrigation practices and possible impacts from ground-water pumping.

The analysis of the discharge of Spring Creek with ground-water levels in the area provides an additional opportunity to understand the relationship between ground-water levels and ground-water discharge. Spring Creek heads in a group of springs located west of Ferry Butte and is fed nearly all from ground-water discharge. According to Nathan Jacobson of the U.S. Geological Survey (Jacobson, 2008), the contribution of irrigation return flow to Spring Creek during the irrigation season is a small part (less than 5%) of the total flow. Figure 29 shows the locations of the gaging station on Spring Creek, the springs near Ferry Butte that are the primary source for the stream flow and the locations of nearby observation wells.

The temporal pattern of the discharge of Spring Creek is shown in Figure 30 along with water-level elevations in well 4S 33E 20cbb1. Well 4S 33E 20cbb1 is the shallowest (62 feet) of four wells of various depths that are located about four miles west-northwest of the gaging station location on Spring Creek and about seven miles southwest of the primary springs that feed the stream near Ferry Butte. Daily discharge data are available from the U.S. Geological Survey station Spring Creek at Sheepskin Road starting in the early 1980's. The multi-year temporal changes in the Spring Creek discharge are very similar to the long-term hydrograph for well 20cbb1. There is a high in the mid 1980's, a low in the mid 1990's, a high in the late 1990's and then the lowest discharge and water level in the period of record in 2004-2005. The seasonal features in the two records are harder to correlate, in part because of the different frequency of data points (daily for the creek and every other month for the well). In Figure 30, well 4S 33E 20cbb1 has a seasonal change of about two feet for most of the period of record with highest water levels in the fall. The seasonal water-level pattern in the well appears to change significantly in the period of March 2001 to March 2003 (almost no seasonal water level changes). Reasons for this change are unknown.

The discharge pattern for Spring Creek is compared with hydrographs of two clusters of wells located on the southeast side of the Snake River (the nearest observation wells with temporal records to the gaging station and springs) in Figure 31. Wells 4S 33E 25ddb1 and 25ddb2 are located less than a mile southeast of the Spring Creek gaging station (Figure 29). Both wells are shallow with depths of 117 and 21 feet. Wells 4S 34E 8dbd1, 8dbd2 and 8dbd3 are located south of Ferry Butte and about one mile from the springs that are the primary source of water for Spring Creek. Well depths are 232 feet, 98 feet and 38 feet respectively. Water-level data for these wells are available only from 1985 to 1994. The seasonal change in water levels is small in all five of these wells. The lack of significant seasonal water-level changes fits with the locations of the wells away from irrigated lands and near a ground-water discharge area. The downward water-level trend in the wells is similar to that shown for well 4S 33E 20cbb1 on Figure 30 and correlates with the discharge record from Spring Creek.

The variations in discharge pattern of Spring Creek during on a calendar-year basis over the period of record provide important information relative to ground-water levels and possible causes for changes in both ground-water levels and spring discharge.

Complete year discharge records are available for Spring Creek for the years 1981 through 2007. Figure 32 presents the flow data as average discharge for five-year periods (1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005) and the average of years 2006 and 2007. The entire discharge record for Spring Creek is shown on Figure 30.

- The calendar-year plot of average daily flow of Spring Creek during the period of 1981-1985 (Figure 32) shows a low of 344 cfs on January 1st and July 9th and a high of 414 cfs on October 11th. The discharge steadily increased from the low in July to the high in October with a gradual decrease through the end of the year.
- The average daily flow of Spring Creek during the period of 1986-1990 varied from a low flow of 340 cfs on July 7th to high flows of 390 cfs on May 31st and 387 on October 6th (Figure 32). The flow-rate pattern in 1986-1990 is similar to 1981-1985 except for the lack of a higher peak in the fall.
- The pattern of average daily flows of Spring Creek in 1991-1995 was similar to previous five-year periods only the discharge magnitude was considerably lower. The low flow was 301 cfs on July 9th with high flow rates of 354 cfs on June 6th and 356 cfs on October 7th.
- The 1996-2000 time period includes several years of higher stream flow including the peak flow in the period of record at 605 cfs on June 8, 1998 (Figure 30). The average daily flows of Spring Creek for the 1996-2000 time period (Figure 32) were similar to the 1981-1985 and 1986-1990 periods in shape and magnitude except for the spring high flow period. The average daily high flow value was 419 cfs on June 8th with an average daily low of 337 on July 25th.
- The 2001-2005 time period has much lower average daily discharges than any of the four preceding five-year periods. The average daily high flow was 314 cfs on January 1st with an average daily low flow of 253 cfs on July 3rd.
- The average daily flow of Spring Creek during calendar years 2006 and 2007 are lower than any of the preceding five-year averages with the exception of several short periods. The average daily high flow was 302 cfs on May 5th and October 10th. The average daily low flow was 239 cfs on June 30th.

The average daily discharge plots for Spring Creek, presented in Figure 32, may be used to identify several patterns that are reasonably consistent over the 27 years of record. First, the lowest average daily flow generally occurs in July with a range from June 30th to July 25th. Second, the highest average daily flow mostly occurs either in the spring (May or June) or in October (from 6th to 11th). Third, the July low flow is followed by an October high flow reflects a combination of the impacts of surface water irrigation and the impacts from cessation of ground-water pumping.

Relationship of Surface Water Irrigation and Ground-Water Discharge

Irrigation using both ground water and surface water occurs in the Near Blackfoot to Neeley reach of the Snake River. Figure 33, taken from Cosgrove and others (2006) shows irrigated ground from three sources: 1) ground water, 2) mixed ground water and surface water and 3) surface water.

The Aberdeen-Springfield Canal is the major supply source for surface-water irrigation on the northwest side of the Snake River in the Near-Blackfoot to Neeley reach. As such, the canal diversion records, presented in Figure 34, provide a general temporal view of this water supply source (diversion data obtained from B.A. Contor, 2007). Figure 34 shows an increase in annual diversion per water year from the 1930's into the early 1970's with a peak diversion of about 406,000 acre feet in the 1969 water year. A decrease in diversion rate occurred starting in the 1975 water year with most years less than 350,000 acre-feet per water year. Diversions during the 2000 water year were an exception to the decreasing trend with about 400,000 acre-feet diverted. The diversions during the 2001 through 2005 water years were all less than 300,000 acre feet.

The relationship between annual canal diversions and ground-water levels in a portion of the service area of the Aberdeen-Springfield Canal also is shown on Figure 34. The average annual (taken on a water-year basis) water-level elevations in well 5S 31E 27aba1 are shown along with canal diversions. Water-level data from this well have been presented three times previously in this report: 1) on Figure 17 to represent shallow ground water conditions north of the reservoir; 2) on Figure 27 to show Mundorff's (1967) relationship between calculated river gains and ground-water levels; and 3) on Figure 28 to show the relationship of ground-water levels to river gains calculated using the IDWR Reach Gain-Loss Program. Water-level data from well 5S 31E 27aba1 are presented in Figure 34 as an average over each water year (October 1 through the following September 30). The average values are based on a range in number of data points (weekly measurements in some years ranging to quarterly measurement after 1988). Figure 34 shows that average annual ground-water levels were in the range of 4,380 to 4,383 feet for the period of record up through 1988. With the exception of 1998, all of the average ground-water levels were lower than 4,380 feet. The lowest average ground-water level was 4,375 feet in 2004.

The ground-water levels in well 5S 31E 27aba1 do not immediately follow the decline in diversions in the canal that occurred starting in 1975. The general increase in diversions (with the exception of 1993) that occurred from 1984 to 2000 is also not directly replicated in the ground-water data. There are a number of possible reasons for the differences noted between canal diversion rates and shallow ground-water levels in a portion of the service area. These are: 1) changes in surface water application rates across the service area and in the general vicinity of the well; 2) changes in leakage rates from water delivery systems across the service area and in the general vicinity of the well; and 3) impacts from ground water pumping in the general vicinity of the well. Information is not available at the time of preparation of this report to develop a more detailed cause-effect relationship between canal diversions and ground-water levels in this single well. Sufficient data are available to say with certainty that changes in surface water irrigation practices in the general vicinity of the well 5S 31E 27aba1 have impacted shallow ground-water levels. It is likely that at least a portion of the water-level decline evident in the well hydrograph on Figure 34 is a result of ground-water pumping.

Relationship of Ground-Water Pumping and Ground-Water Discharge

Ground-water pumping from the Snake Plain aquifer is a major portion of the regional water budget. Figure 35, taken from Cosgrove and others (2006), shows that large areas are irrigated using ground water west and north of the Near Blackfoot to

Neeley reach. Other major ground-water pumping centers are located further west, southwest and northeast within the aquifer. The cumulative ground-water irrigation rights on the aquifer, as presented by Contor and others (2006) are presented in Figure 36. This plot shows a dramatic increase in ground-water irrigation rights starting in the 1950's and ending in the 1990's.

The seasonal hydrograph signature for a ground-water pumping area is a water-level high in the spring prior to the starting of pumping and a water-level low in the fall at the end of the pumping season. This is opposite to the signature of a surface-water irrigated area where ground-water levels are low in the spring prior to the start of irrigation and high in the fall at the end of the irrigation season.

None of the observation wells presented and discussed in the report section entitled *"Temporal Water-level Patterns in Wells"* has a seasonal ground-water pumping signature in the water-level record. The presence of the large tracts of land irrigated with surface water between the ground-water pumping areas and the Near Blackfoot to Neeley reach of the river appears to mask out any seasonal water-level changes from pumping wells. However, long-term water level trends such as those shown for wells 2N 31E 35dcc1 and 1S 30E 15bca1 on Figure 15 are detectable in deep wells in the area of interest. Examples are well 4S 33E 20cbb4 which is 738 feet deep (Figure 21) and well 3S 34E 22 dab2 which is 569 feet deep (Figure 23).

Ground-water pumping can impact ground-water discharge in the area northeast of the American Falls Reservoir via the following steps. First, there is a documented upward hydraulic gradient and thus upward ground-water flow from deep zones to shallow zones in the ground-water discharge area. An example of the upward hydraulic gradient is shown on Figure 21. Second, pumping impacts from throughout the aquifer are propagated through the aquifer to the discharge area. Deep wells near the discharge area have hydrographs similar to those near the center of the plain. Third, a decreased upward hydraulic gradient occurs because of greater water-level decline in the deeper zones than in the shallow zones. This is shown on Figure 21 by the comparison of the hydrographs for 4S 33E 20cbb1 at a depth of 62 feet to 20cbb4 at a depth of 738 feet. Fourth, the decreased upward hydraulic gradient results in a reduction in spring discharge.

The magnitude of upward ground-water flow from deep zones to shallow zones and then to discharge areas (such as springs) has not been directly estimated by any of the previous investigators. The magnitude of upward ground-water flow depends on the hydraulic gradient (for which some data are available) and the vertical hydraulic conductivity of the basalt and sediments in the area (for which essentially no data are available). The impacts of ground-water pumping on ground-water discharge also have not been estimated by any of the previous investigators except for model predictions presented in Cosgrove and others (2006).

MODEL REPRESENTATION OF THE HYDROGEOLOGIC SETTING

Characteristics of the ESPAM

ESPAM is a single layer, fixed transmissivity model with 104 rows and 209 columns constructed using the MODFLOW code (Cosgrove and others, 2006). All model cells are 1 mile x 1 mile with a 31.4 degree counter-clockwise rotation relative to east-west. Several types of boundaries were used in the model: 1) no flow, 2) specified flux and 3) head dependent.

The Snake River in the Near Blackfoot to Neeley reach is represented using the River Package. Cosgrove and others (2006) describe the function of river cells as follows.

> "Flow between the aquifer and river or drain cells is governed by equations which are based on Darcy's law (discharge is equal to the product of hydraulic conductivity times cross-sectional area times hydraulic gradient).. In a numerical model, for both river and drain cells, the hydraulic conductivity term represents the conductivity of the river-bed or drain sediments which controls the flow between the river/drain and the aquifer. The gradient … represents the head differential between river stage … and aquifer level" (pages 20-21).
>
> "The flow between the aquifer and a hydraulically connected surface water body is governed by (Darcy's Law)… In the MODFLOW River Package, (Darcy's Law) is implemented in terms of a) stage of the surface water body, b) aquifer water level and c) a conductance term describing the hydraulic conductivity of the riverbed … sediments and the wetted areas of the river bed. The user specifies river stage, elevation of the bottom of the river sediments and conductance of the riverbed sediments. As long as the water level in the aquifer is above the elevation of the bottom of the river sediments, the discharge to (or from) the river is calculated as (discharge is equal to the conductance multiplied by the difference of the river water-level elevation and the aquifer water-level elevation)… (page 30).
>
> "Since riverbed conductance is a lumped parameter (i.e. It represents multiple physical attributes) and impossible to measure, it is commonly estimated during model calibration" (page 32).

The area of the river and reservoir in the Near Blackfoot to Neeley reach is represented using river cells as is shown on Figure 37. Cosgrove and others (2006, Table 3) provide the following information for each of the river cells: 1) row and column (location in the model), 2) stage (for river or reservoir), 3) riverbed conductance in units of square feet per day and 4) riverbed elevation in feet. The stage information was given to represent field conditions. The riverbed elevation was in the range of about 39 to 53 feet lower than stage elevation. The riverbed conductance was held at 99,000 square feet per day for all of the river cells in the reach. As a comparison, the conductance term was set at 157,000 square feet per day for the cells in the Shelley to Near Blackfoot reach and 35,100 square feet per day for the cells in the Neeley to Minidoka reach.

The calibrated transmissivity values for the nodes in the portion of the model near the Near Blackfoot to Neeley reach were obtained from IDWR (Wylie, personal communication, 2008). Figure 38 shows transmissivity values for this portion of the

model in terms of ranges of values. The map shows that high transmissivity values (> 10,000,000 ft^2/day) are included in the model to represent aquifer characteristics north of the east end the American Falls Reservoir.

Calibration of the model was done using automated parameter estimation tools. Cosgrove and others (2006, page 90) describe the process as follows.

> "The goal of model calibration was to adjust model parameters (transmissivity, aquifer storage, riverbed conductance and drain conductance and elevation) until model-predicted values of aquifer water levels and discharges to the river matched observed values. The calibration was done in two steps. An initial steady state calibration was done to establish initial aquifer transmissivity and riverbed and drain conductance. After the initial steady state calibration, a coupled steady state and transient calibration was done. During the coupled steady state and transient calibration, the parameter estimation software would adjust aquifer storage and drain elevation during the transient portion, followed by a check of the steady state model fit. This forced the transient calibration to not only provide a 'best fit' to the transient data but to also honor the steady state observations. Changes to the transmissivity field and riverbed and drain conductance were allowed during the coupled steady state/transient calibration."

Cosgrove and others (2006) show comparisons of model predicted ground water levels as compared to field data. They also show model predicted river gains or losses in comparison to observed or calculated river gains or losses. Model output was compared to ground-water levels in selected wells and to calculated or measured reach gains or losses. The comparison of model predicted gain to calculated gain for the Near Blackfoot to Neeley reach is presented in Figure 39. The model predicted gains are a reasonable representation of the calculated gains over time, although with slightly less variability.

Model Representation of Site Hydrogeology

The Snake Plain aquifer model is of necessity a simplification of a complex ground-water flow system with complex interactions with surface water systems. The primary question is whether changes in the model are needed to make it better represent field conditions. Three topics are presented relative to representation of the Near Blackfoot to Neeley hydrogeology within the model.

- The general construction of the model in the vicinity of the Near Blackfoot to Neeley reach is appropriate for the intended uses of the model. However, construction of a single layer model with one-square mile node spacing does not allow assessment of vertical flow within the aquifer or discharge characteristics of individual springs or stream-gain areas.
- Representation of the Snake River including the American Falls Reservoir using the River Package is appropriate. Hydrogeologic conditions are such that higher riverbed conductance values should be applied to the area between the northeastern end of the reservoir and the Near Blackfoot gage than are applied for the body of the reservoir. The conductance value assigned for the reservoir should be low enough relative to the conductance value for the upper portion of the reach to limit direct discharge into the reservoir to a small value.

- The transmissivity array used in the model does not fit the general hydrogeologic setting of a basalt and gravel dominated system north and northeast of the American Falls Reservoir transitioning into a fine-grained, sedimentary-dominated system under the reservoir. Consideration should be given to making changes in model calibration to achieve a transmissivity array that better fits the hydrogeologic conceptual model. Care must be taken in that the transmissivity values of the single layer model need to represent not just the near-surface sediments and basalt but also the deeper basalt units.
- Consideration of multiple layers for the model should be taken carefully. A multiple layer model can provide an improved representation of areas such as upstream of the American Falls Reservoir where vertical hydraulic gradients are present. However, adding multiple layers increases complexity and thus increased uncertainty in model predictions. Also, data may not be currently available to support the construction and application of a multiple layer model.

CONCLUSIONS AND RECOMMENDATIONS

There is little doubt that ground water discharges to the Snake River in the Near Blackfoot to Neeley reach because the transmissivity in the general vicinity of the American Falls Reservoir is lower than in upstream areas. The gravel zone that hosts a shallow ground-water flow system along the Snake River essentially terminates against the fine-grained sediments of the American Falls Lake Beds and the Raft Formation. In the same way, basalt that makes up most of the Snake Plain aquifer occurs only as individual flows within a sequence of mostly fine-grained sediment. The lower transmissivity in the immediate vicinity of the American Falls Reservoir acts similar to a subsurface dam and results in ground-water levels in shallow and deep aquifers northeast of the reservoir at or above ground surface. The springs occur in these areas. There is a significant upward hydraulic gradient which indicates ground-water flows from deeper aquifers to shallow aquifers and then discharges as springs and stream gains.

The majority of ground-water discharge occurs upstream of the American Falls Reservoir, probably controlled dominantly by the subcrop of the Raft Formation. The amount of ground-water discharge directly into the bottom of the reservoir is unknown but believed to be small.

The ground water that discharges to the Snake River in the Near Blackfoot to Neeley reach is a combination of water from the shallow aquifer in gravel zones along the Snake River and upward flow from deeper aquifers that are hydraulically connected to the basalt system of the main Snake Plain aquifer. The percentage of the discharge that originates from the shallow gravel aquifer likely is higher than the percentage that originates from the deeper aquifer, but the relative amounts are unknown.

As with any ground-water system, temporal variations in the ground-water discharge in the Near Blackfoot to Neeley reach of the Snake River are related to water-level changes in the source aquifer. Higher discharge from the springs occurs because of higher ground-water levels. The converse is also true.

Changes in surface-water irrigation practices in recent years have decreased ground-water levels in shallow aquifers and thus have resulted in reduced ground-water

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discharge in the Near Blackfoot to Neeley reach. Ground-water pumping has caused ground-water level declines in the main Snake Plain aquifer and is also a factor in reduced ground-water discharge in the Near Blackfoot to Neeley reach. The well hydrographs and the discharge hydrograph for Spring Creek represent a multiple overlay of impacts from changes in surface water irrigation practices combined with the impacts from ground-water pumping.

The Enhanced Snake Plain Aquifer Model (ESPAM) is a work in progress. Model construction and operation and then modification and improvement are part of a repetitive process that is tied to improved data collection and analysis. Specific recommendations with respect to the model include the following.

- Modify the transmissivity array in the Near Blackfoot to Neeley reach to better represent the subsurface hydrogeologic conditions. The changes should be made with the objective of forcing ground-water discharge from the model to occur primarily in the area between the American Falls Reservoir and Ferry Butte.
- Modify the ground-water conductance such that ground-water discharge occurs upstream from the northeast end of the reservoir and little discharge occurs directly to the American Falls Reservoir. The conductance can be modified to allow leakage from the southwestern end of the reservoir.
- To the extent possible, ground-water discharge to the Portneuf River should be represented in the model.

A revision to the existing water resource data collection network is needed in order to provide an improved basis for understanding the interaction of surface and ground-water systems in the Near Blackfoot to Neeley reach of the Snake River. Suggested improvements to the data collection network are noted below.

- Long-term discharge monitoring stations should be established on one or more additional spring/stream sites upstream from the American Falls Reservoir that have no direct impacts from irrigation return flows or diversions. Data analysis should include comparison to data from the Spring Creek station.
- Routine water-level measurement should be reinitiated on observations wells 4S 33E 25ddb and 4S 34E 8dbd. The measurement program should include either monthly measurements or preferably installation of data loggers.
- Additional collection of water-level data from shallow wells in the immediate vicinity of the Snake and Portneuf Rivers and near major springs is needed to develop a better understanding of ground-water levels and spring discharge and/or river gains.

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Figure 1 Location Map

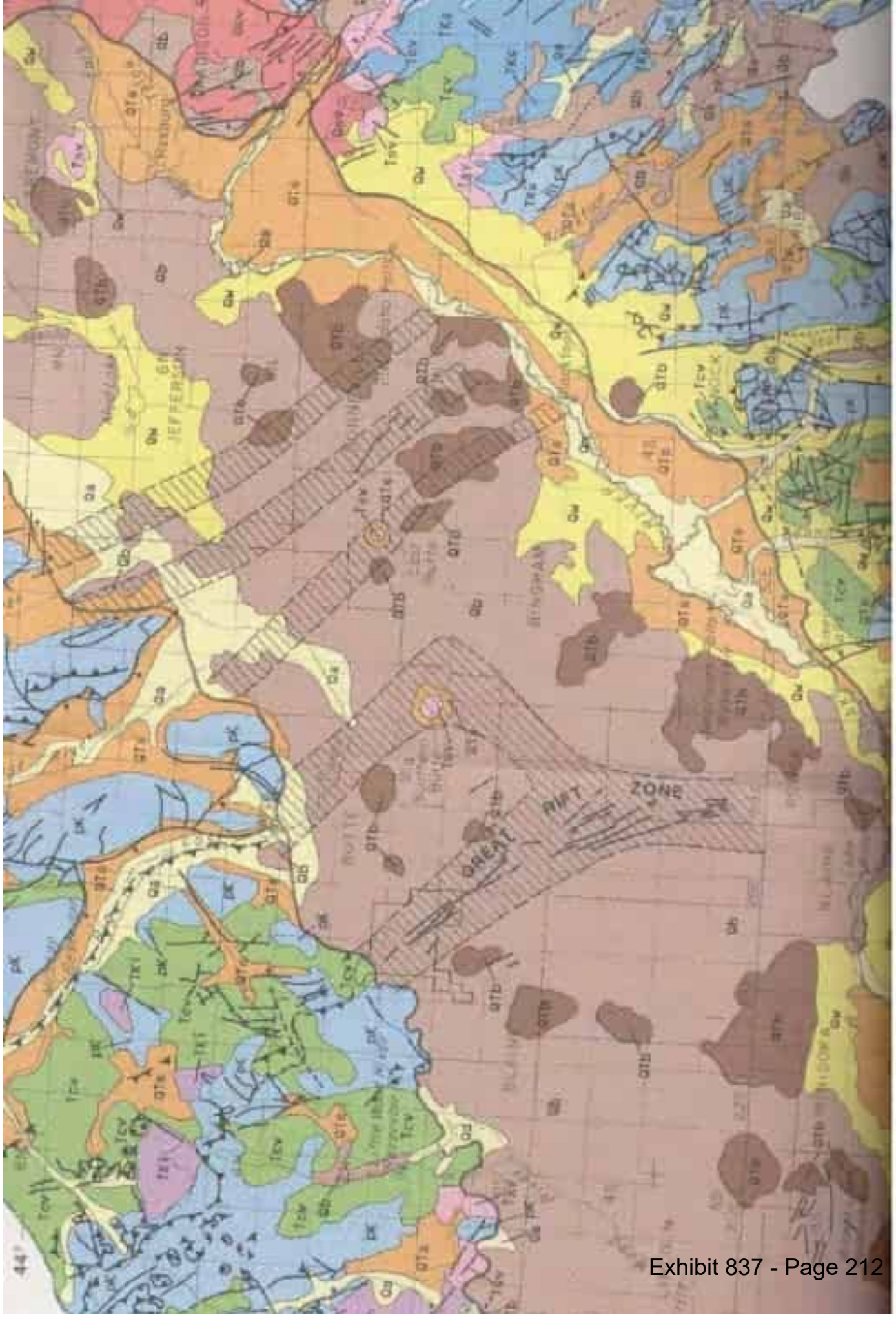

Figure 2a Regional Geologic Map (Whitehead, 1992)

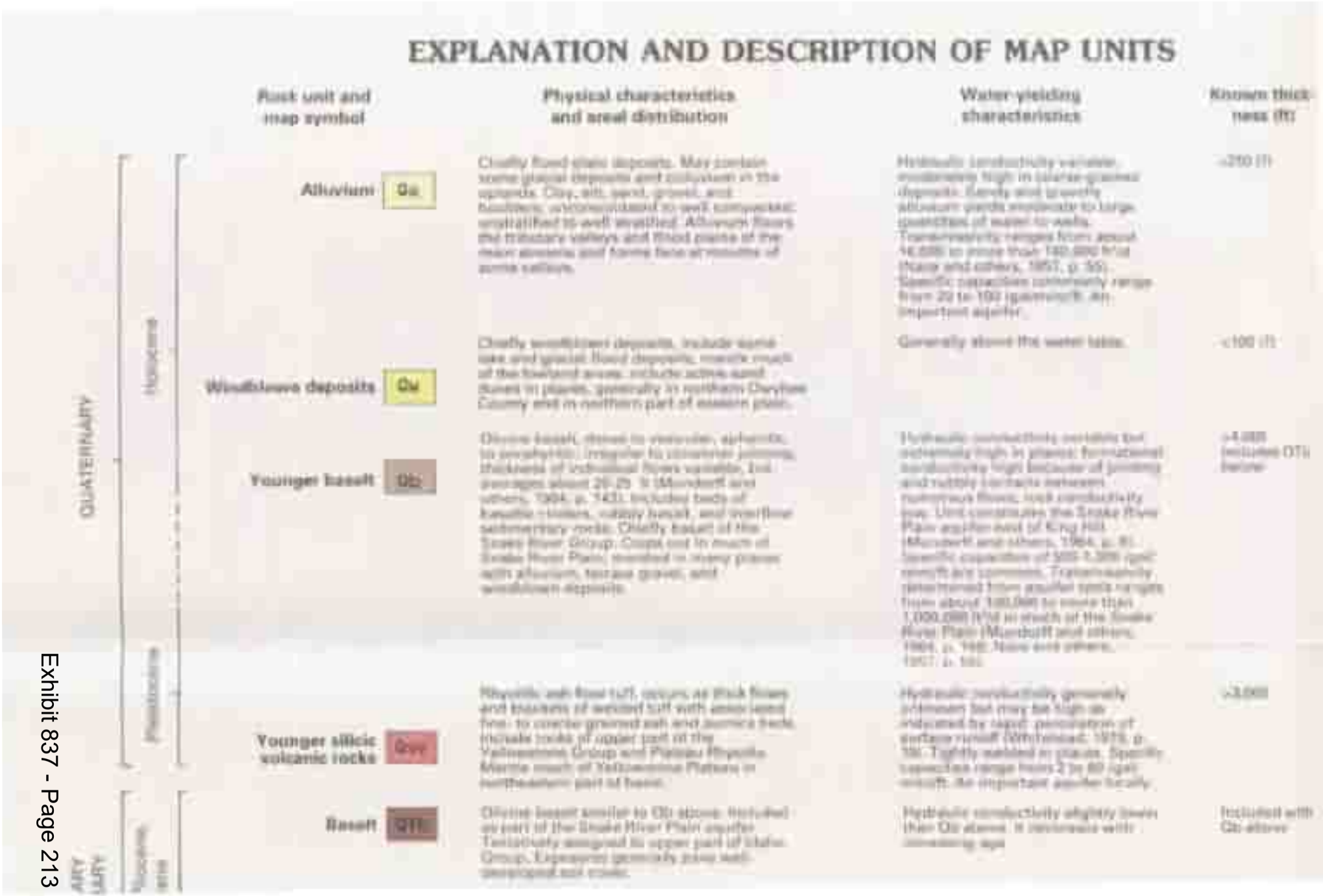

Figure 2b Regional Geologic Map (Whitehead, 1992)

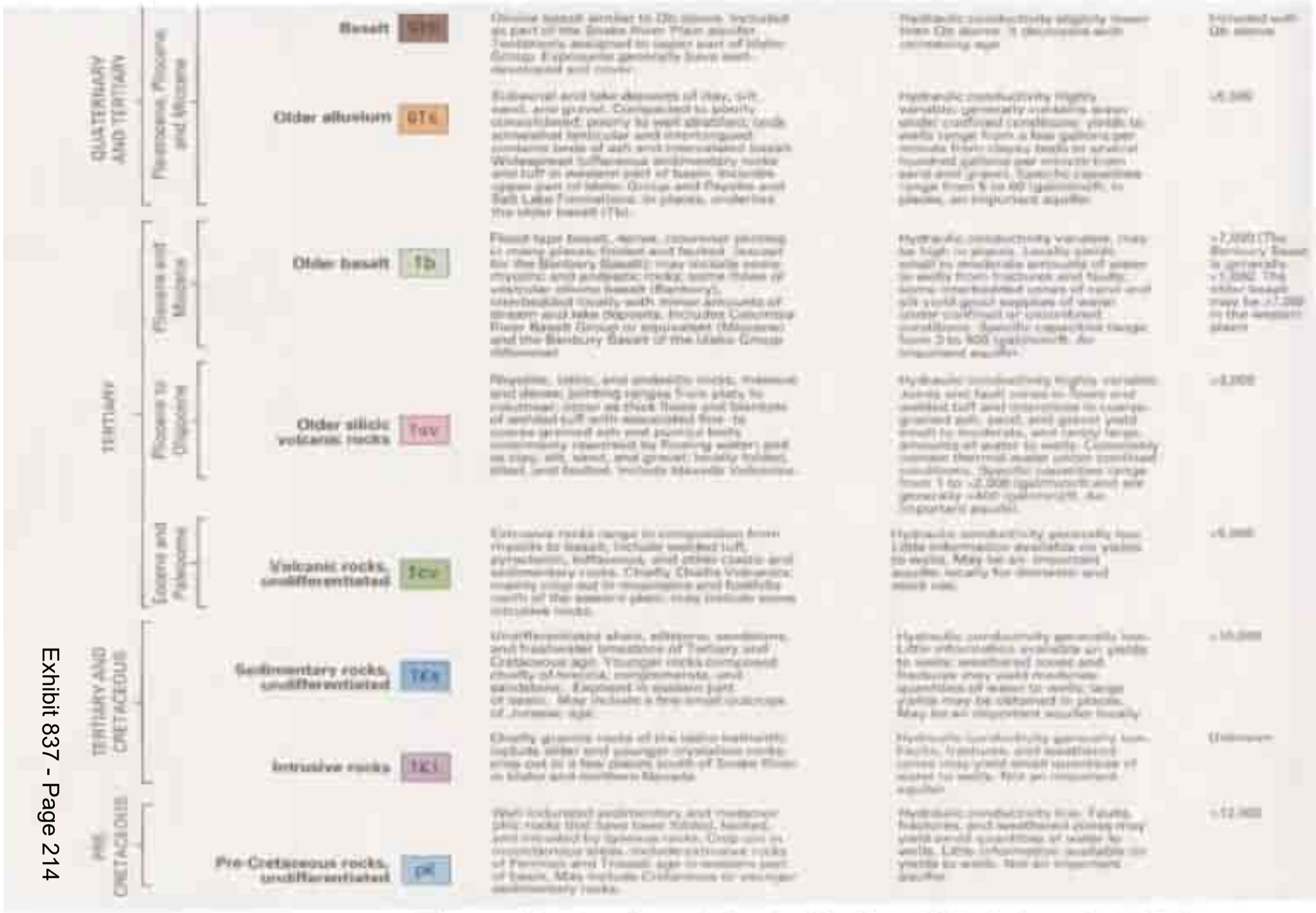

Figure 2c Regional Geologic Map (Whitehead, 1992)

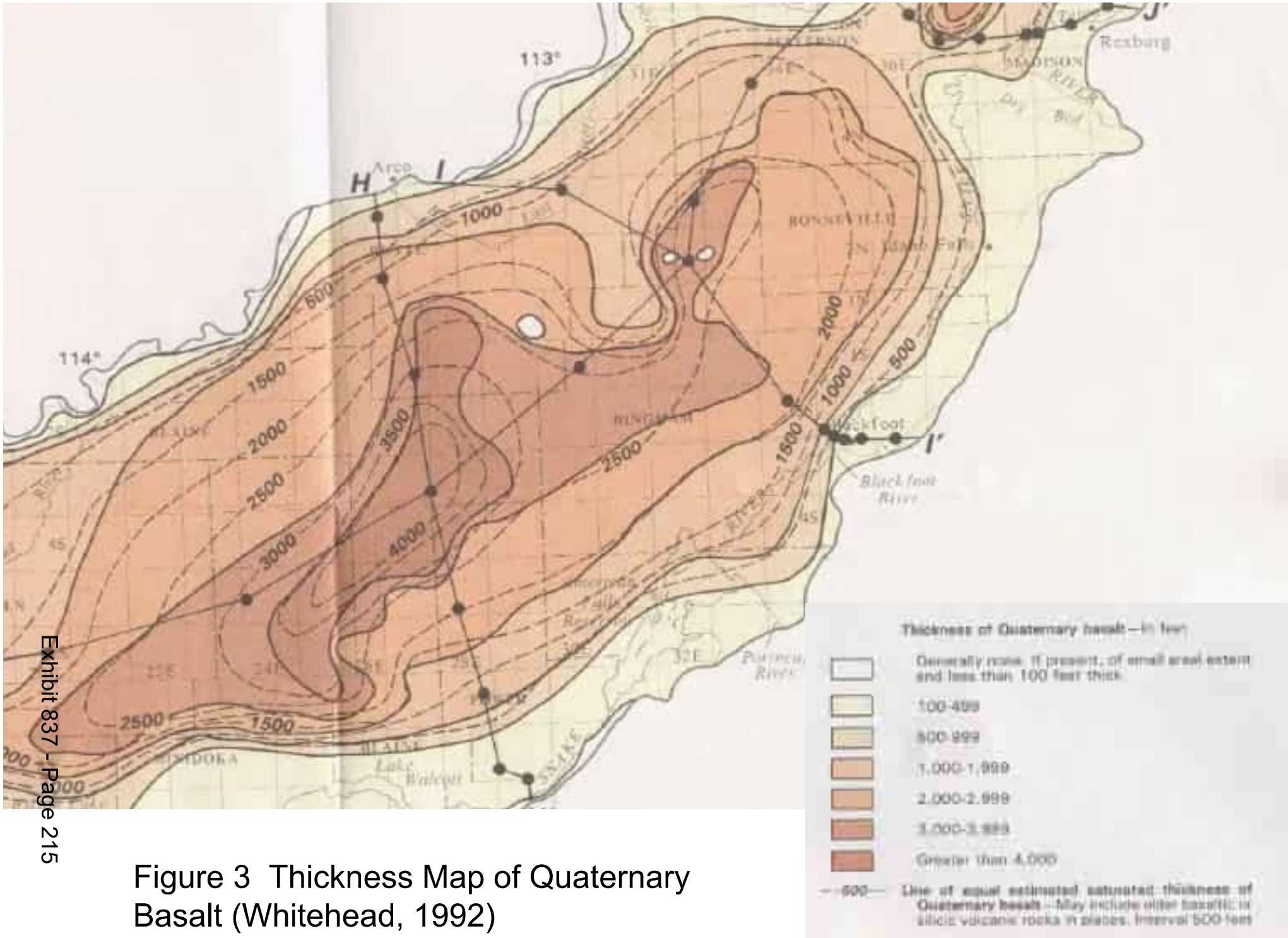

Figure 3 Thickness Map of Quaternary Basalt (Whitehead, 1992)

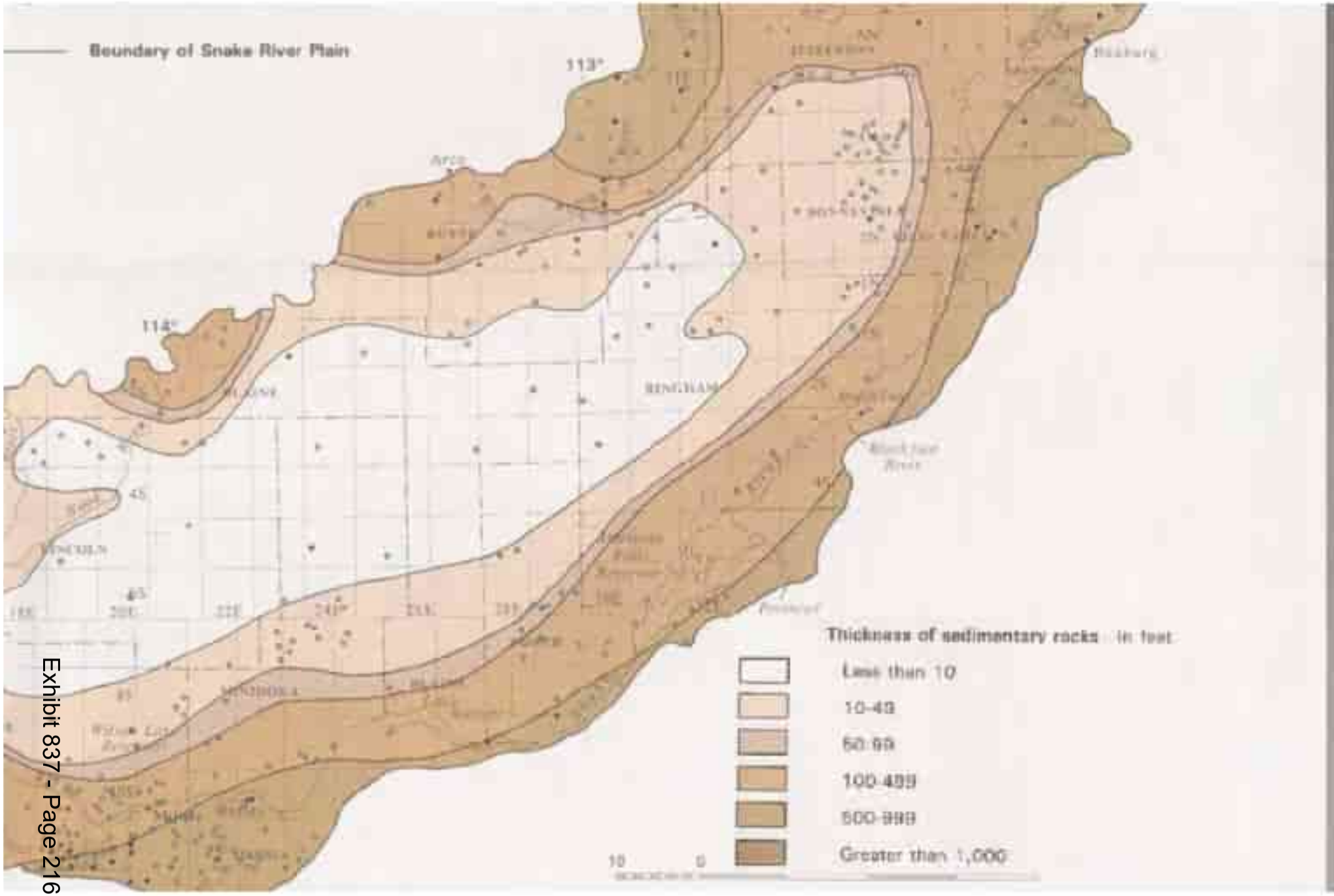

Figure 4 Thickness Map of Sediment (Whitehead, 1992)

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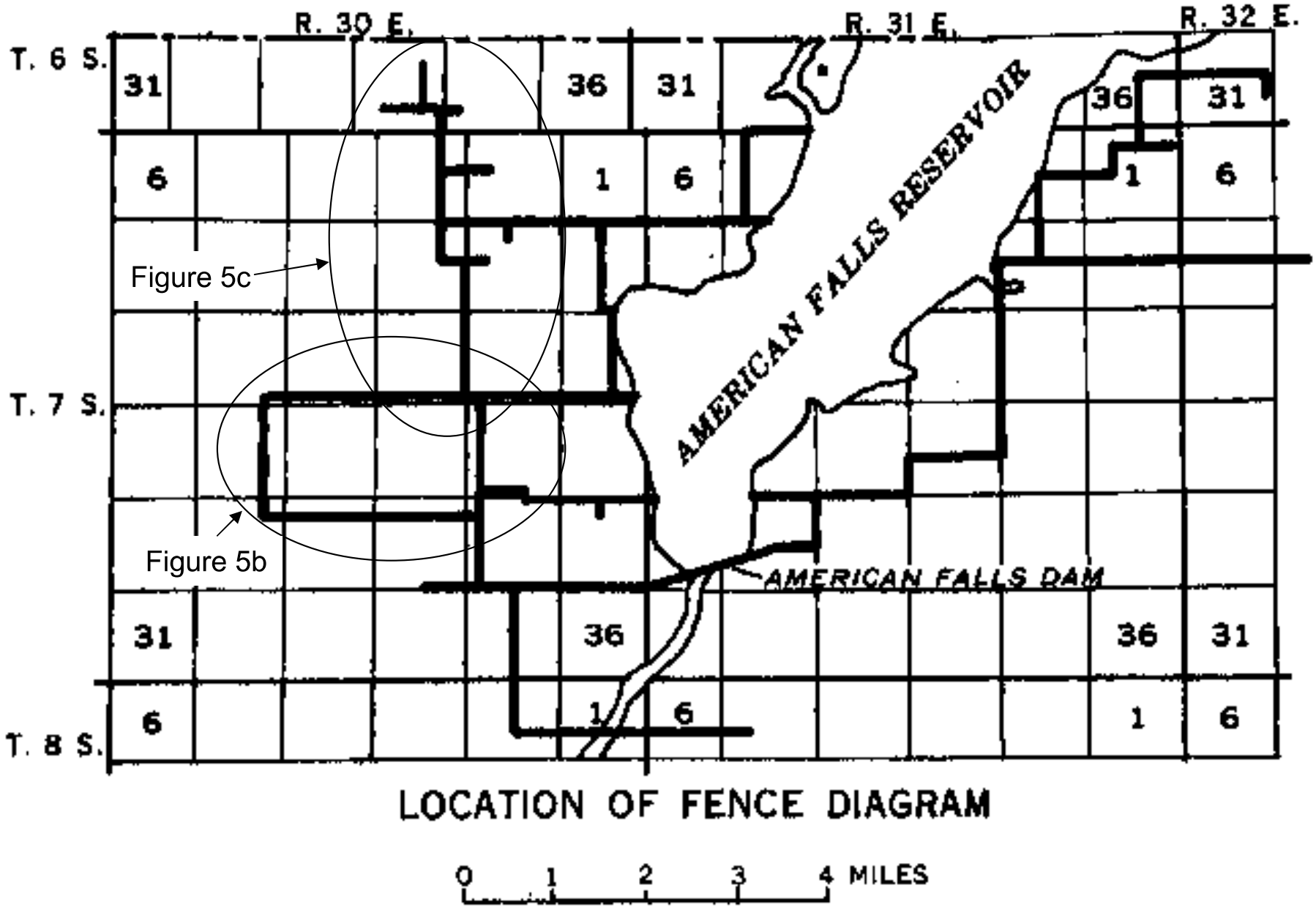

Figure 5a Fence Diagram – Location Map (Mundorff, 1967)

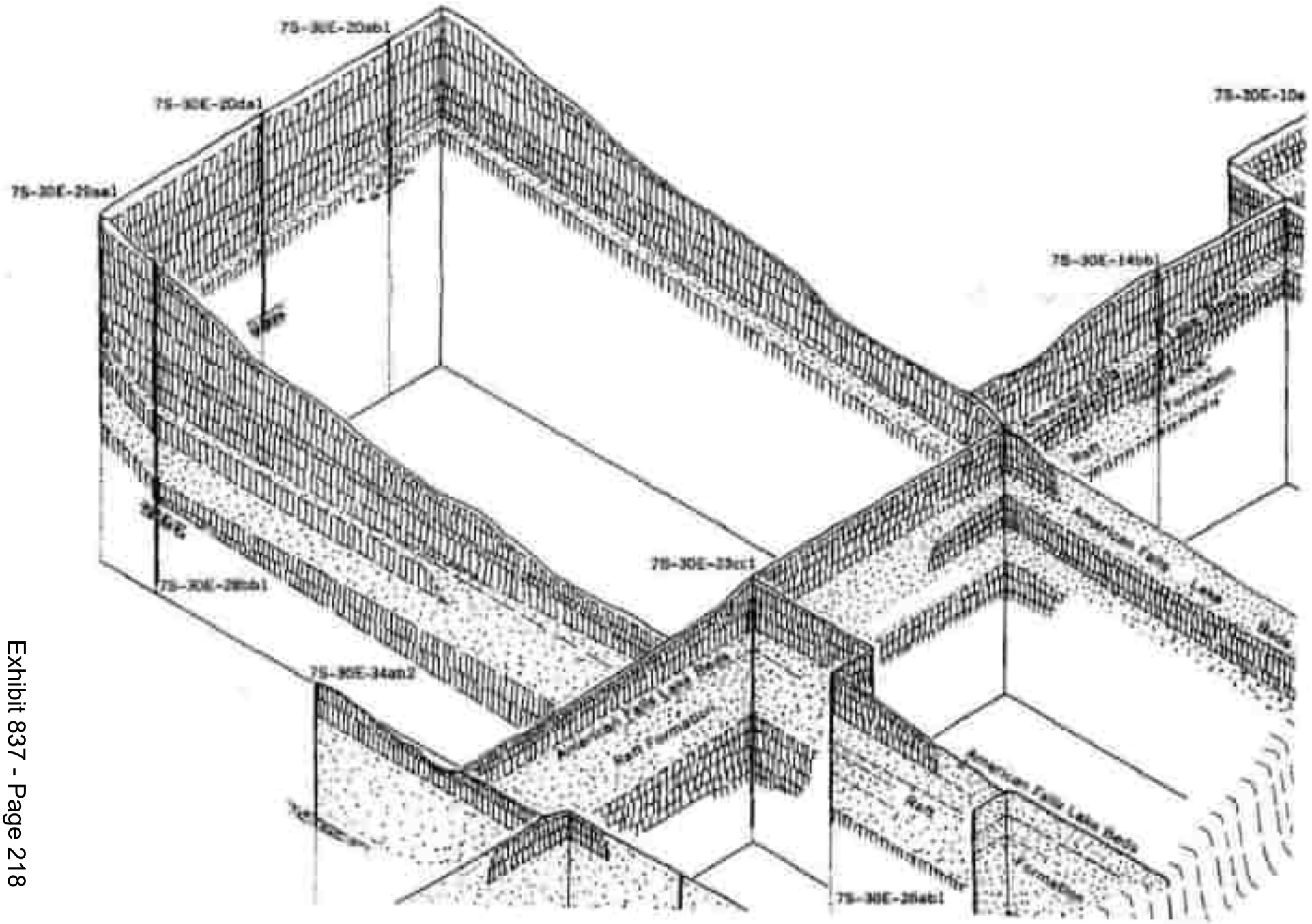

Figure 5b Fence Diagram – West Portion (Mundorff, 1967)

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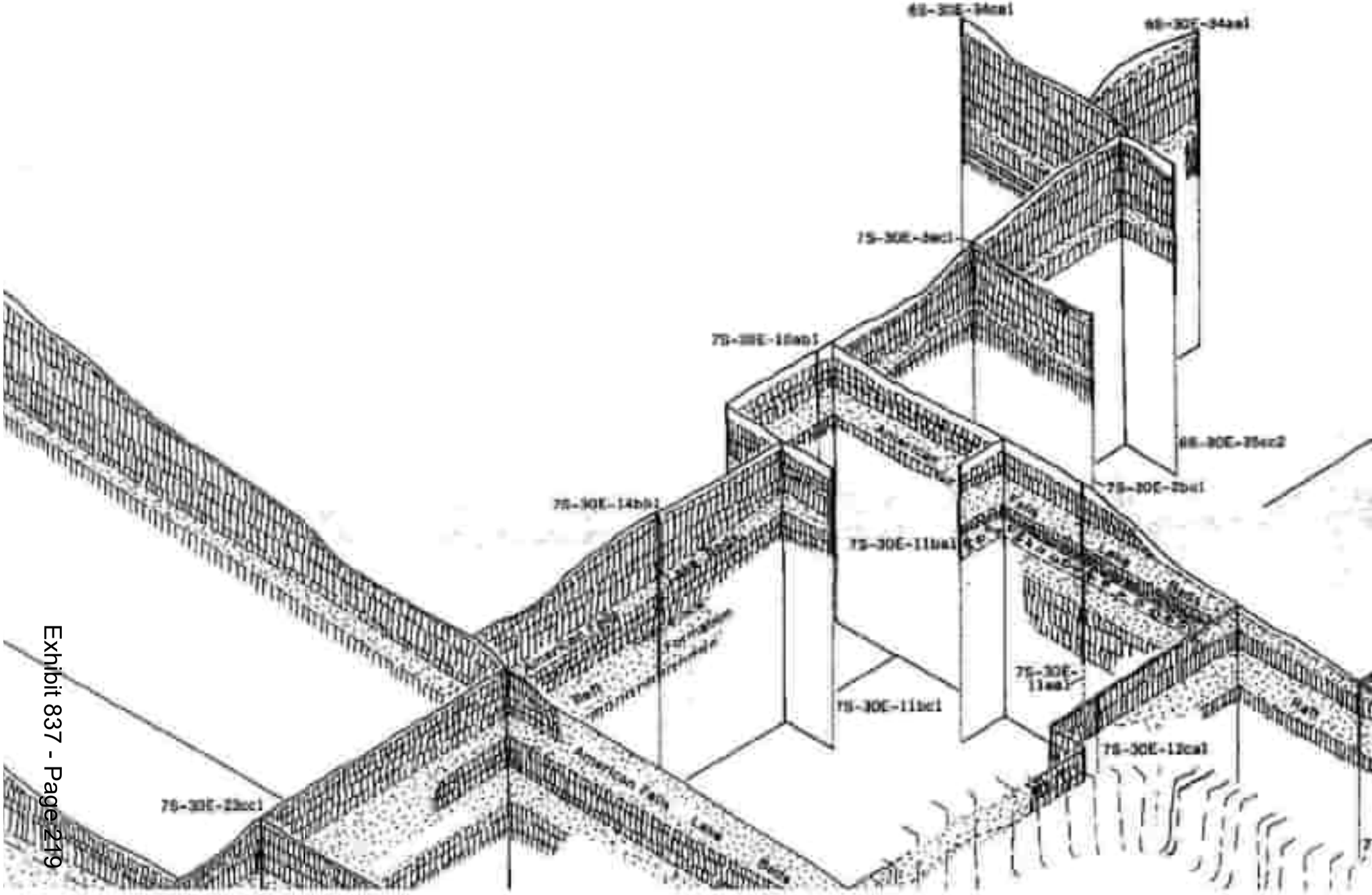

Figure 5c Fence Diagram – Northwest Portion (Mundorff, 1967)

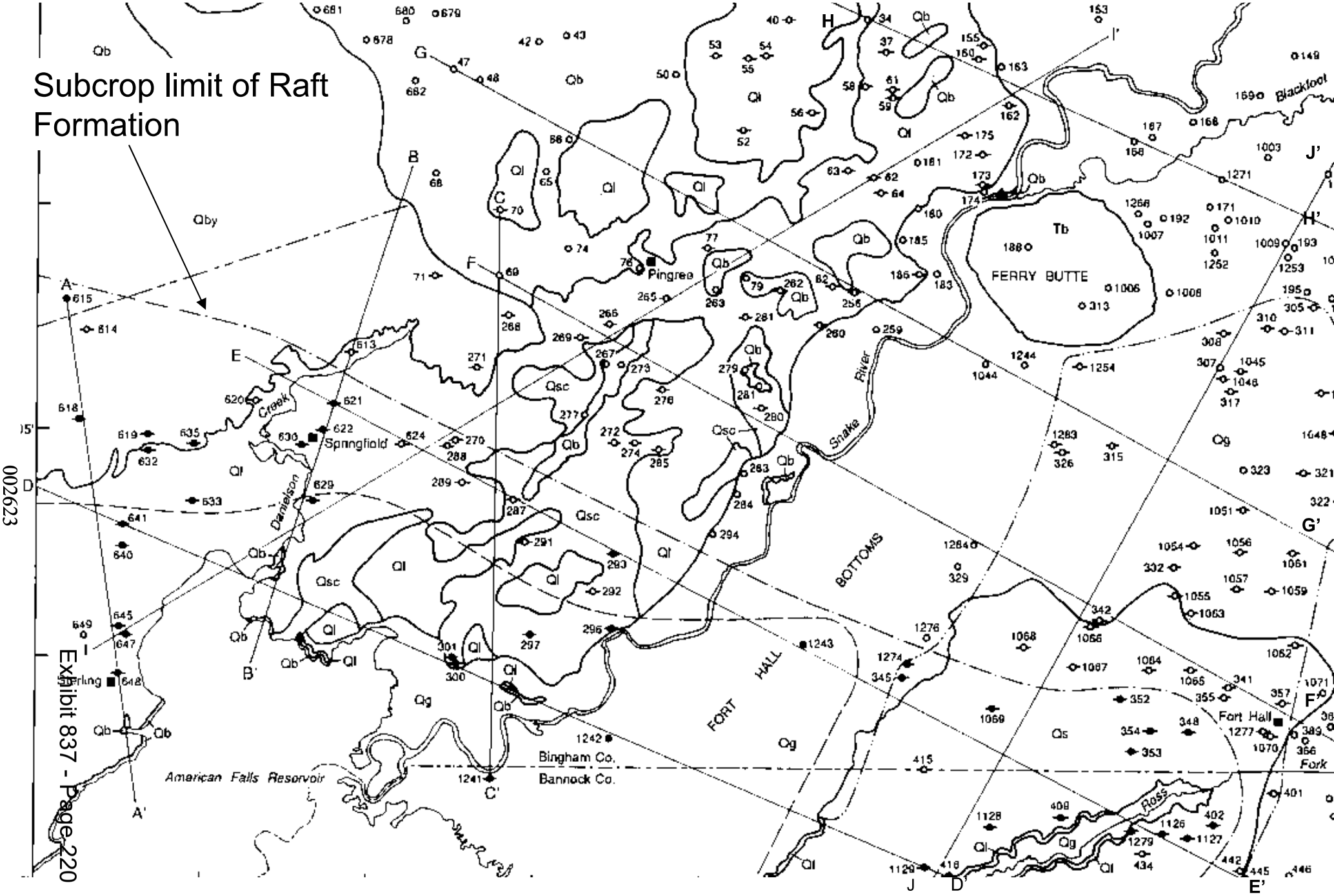

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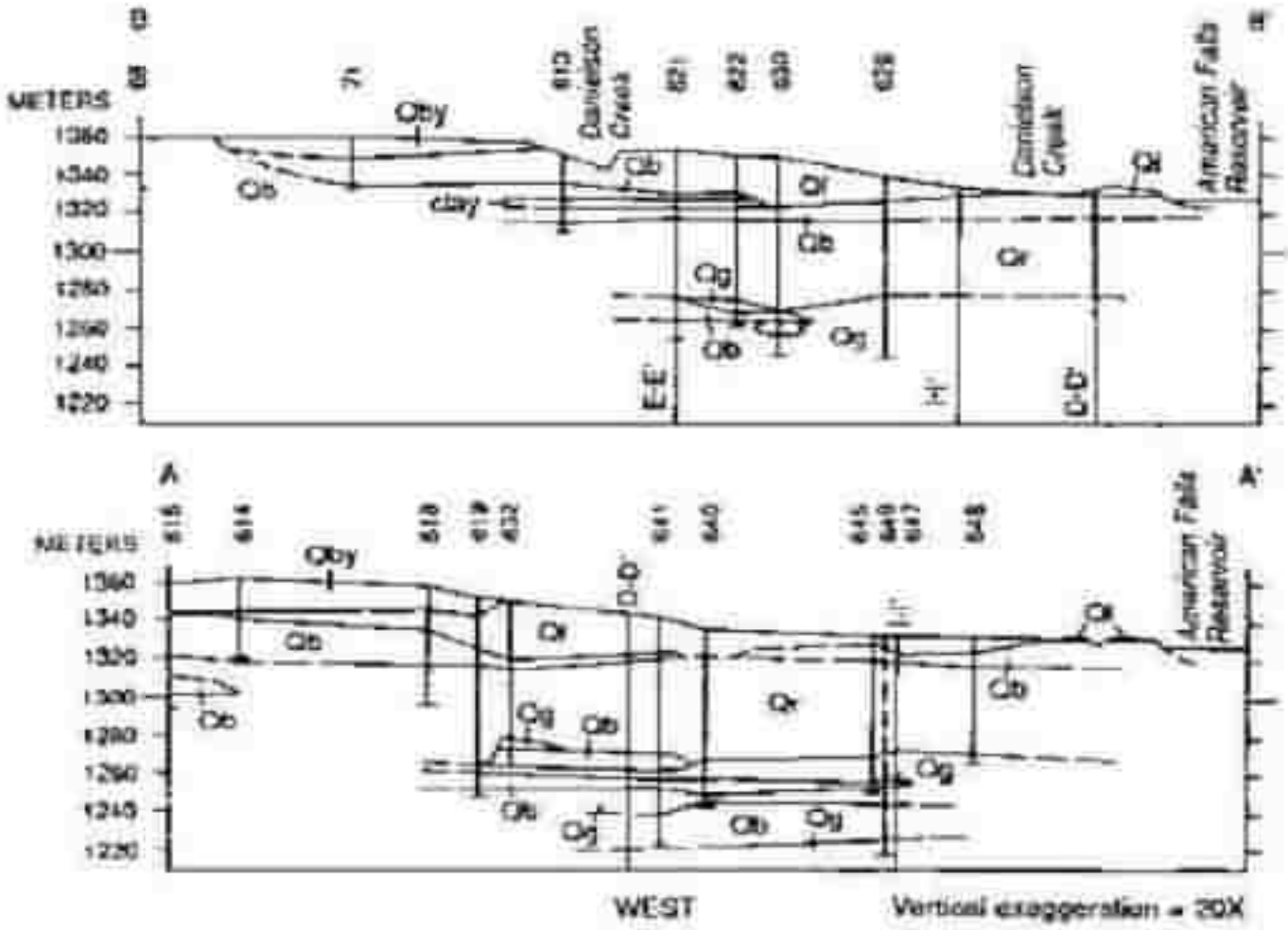
Figure 6 Geologic Map of Area Northeast of American Falls Reservoir Showing Locations of Cross Sections (Houser, 1992)



Qa Alluvial fan deposits (Holocene and Pleistocene)
Qc Snake River gravel deposits (Holocene and Pleistocene)
Qs Scabland deposits (upper Pleistocene)
Qr Sand (upper Pleistocene)
Qg American Falls Lake Beds (upper Pleistocene)
Qby Young basalt (upper Pleistocene)
Qb Basalt (Pleistocene)
Qt Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb Basalt of Buckskin Basin (Pliocene)
Tvu Undifferentiated volcanic rocks (Miocene)

Figure 7a Geologic Cross Sections A-A' and B-B' (Houser, 1992)

002624
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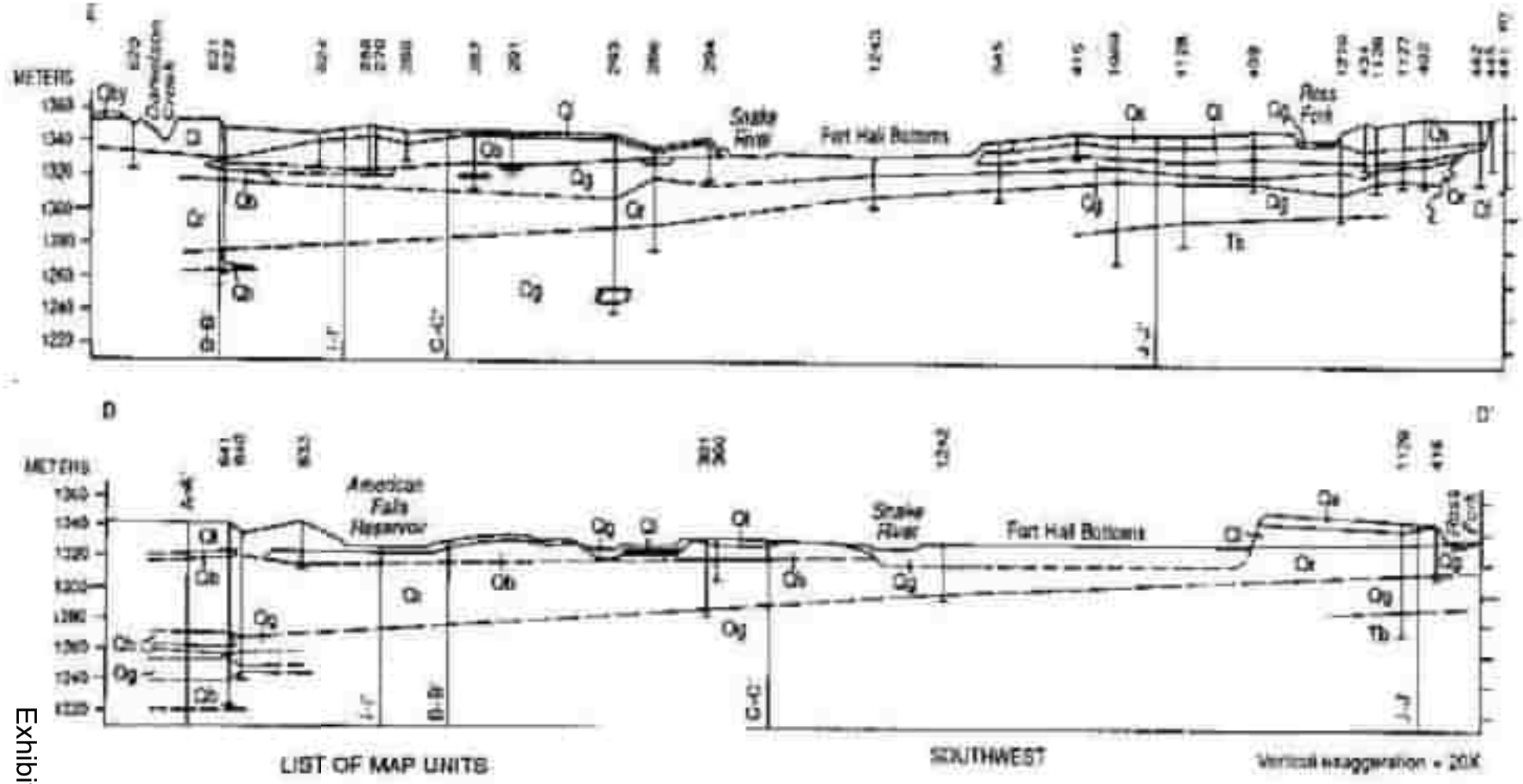

LIST OF MAP UNITS

Ql	Alluvial fan deposits (Holocene and Pleistocene)
Qg	Snake River gravel deposits (Holocene and Pleistocene)
Qsc	Scabland deposits (upper Pleistocene)
Qs	Sand (upper Pleistocene)
Ql	American Falls Lake Beds (upper Pleistocene)
Qby	Young basalt (upper Pleistocene)
Qb	Basalt (Pleistocene)
Qr	Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb	Basalt of Buckskin Basin (Pliocene)
Tvu	Undifferentiated volcanic rocks (Miocene)

Figure 7b Geologic Cross Sections D-D' and E-E' (Houser, 1992)

002625

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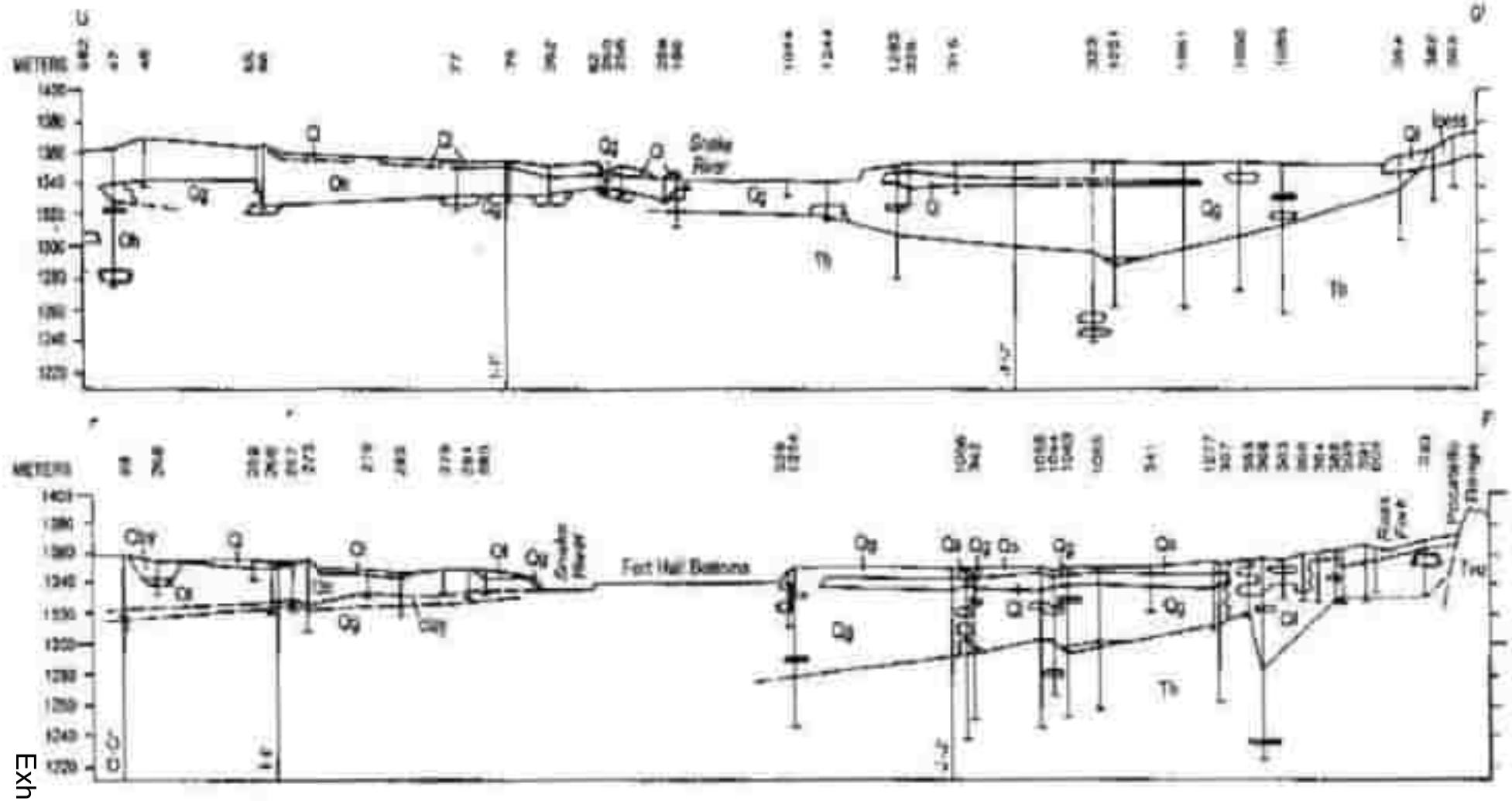

LIST OF MAP UNITS

Qal	Alluvial fan deposits (Holocene and Pleistocene)
Qg	Snake River gravel deposits (Holocene and Pleistocene)
Qsc	Scabland deposits (upper Pleistocene)
Qs	Sand (upper Pleistocene)
Ql	American Falls Lake Beds (upper Pleistocene)
Qby	Young basalt (upper Pleistocene)
Qb	Basalt (Pleistocene)
Qr	Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb	Basalt of Buckskin Basin (Pliocene)
Tvu	Undifferentiated volcanic rocks (Miocene)

Figure 7c Geologic Cross Sections F-F' and G-G' (Houser, 1992)

002626

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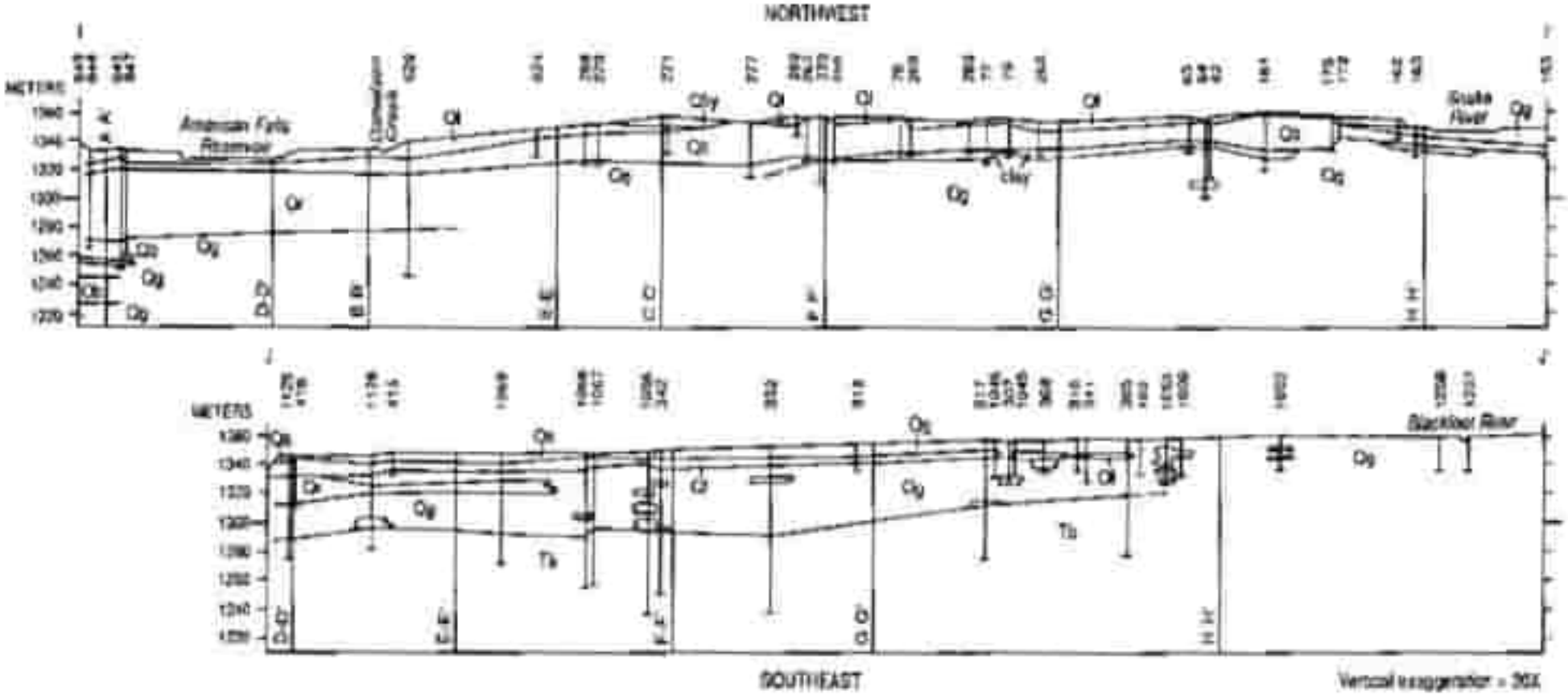


LIST OF MAP UNITS

Qf	Alluvial fan deposits (Holocene and Pleistocene)
Qg	Snake River gravel deposits (Holocene and Pleistocene)
Qsc	Scabland deposits (upper Pleistocene)
Qs	Sand (upper Pleistocene)
Qr	American Falls Lake Beds (upper Pleistocene)
Qby	Young basalt (upper Pleistocene)
Qb	Basalt (Pleistocene)
Qr	Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb	Basalt of Bucklin Basin (Pliocene)
Tvu	Undifferentiated volcanic rocks (Miocene)

Figure 7d Geologic Cross Sections I-I' and J-J' (Houser, 1992)

002627

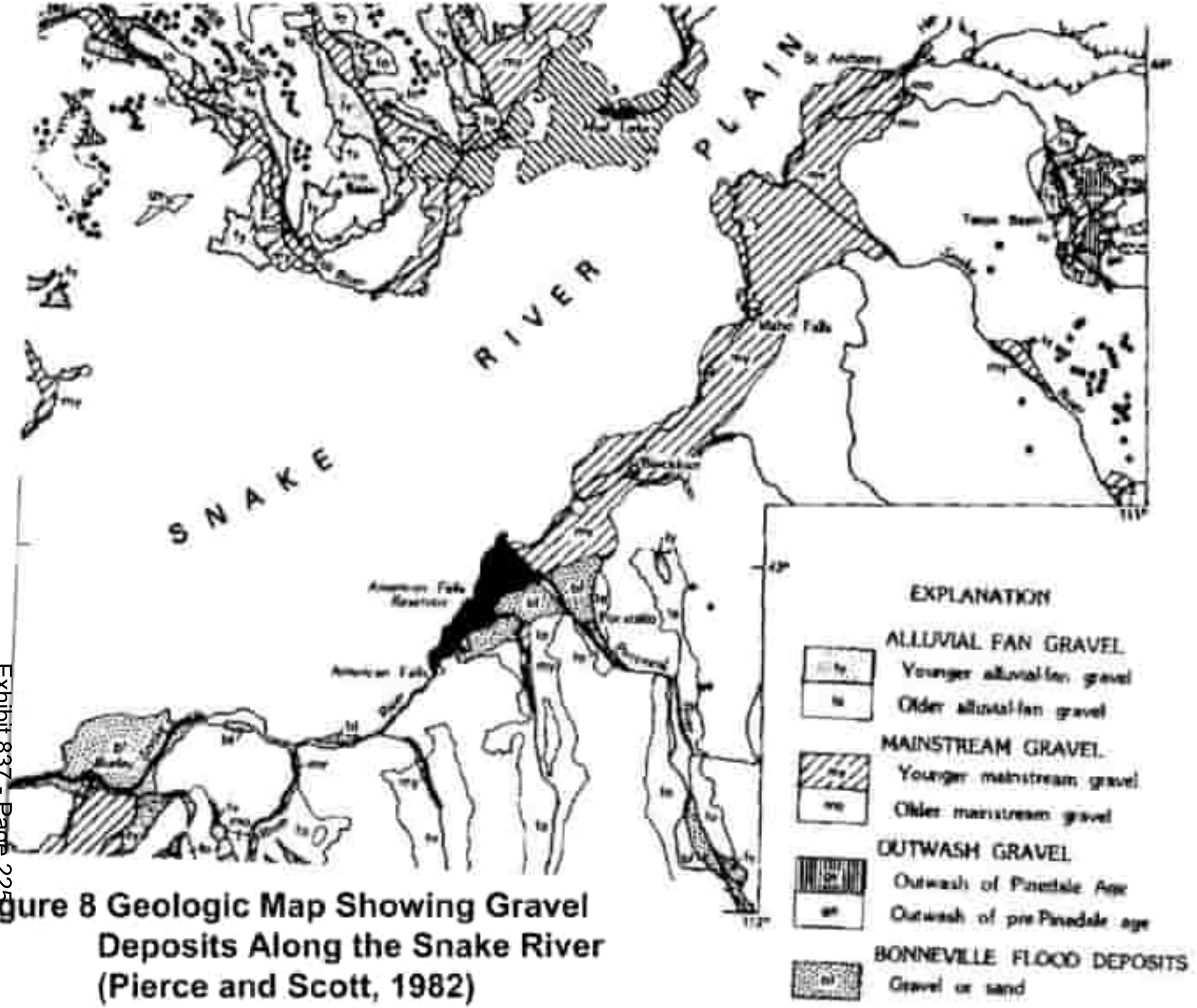
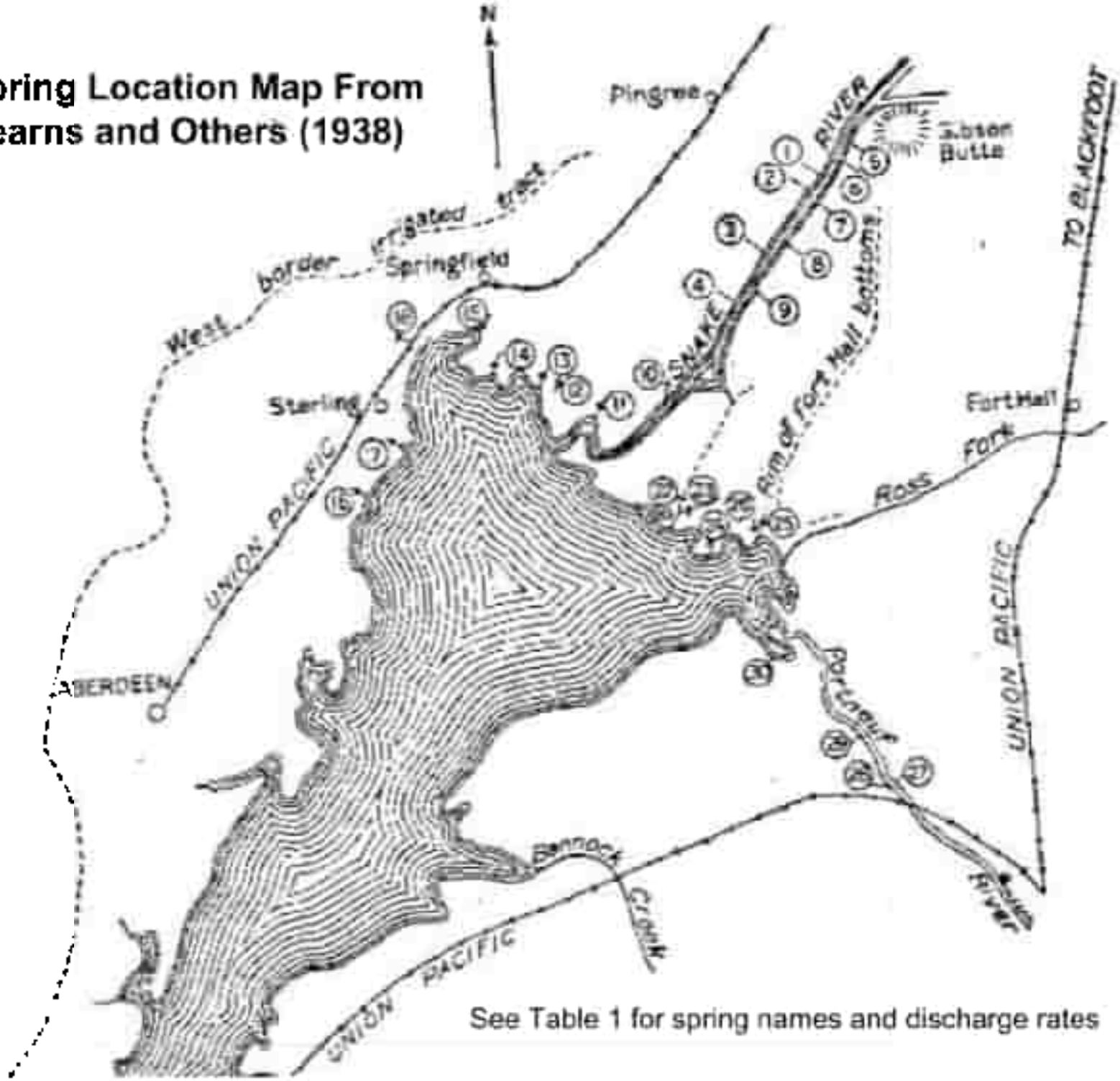


Figure 8 Geologic Map Showing Gravel Deposits Along the Snake River (Pierce and Scott, 1982)

002628

Figure 9 Spring Location Map From Stearns and Others (1938)



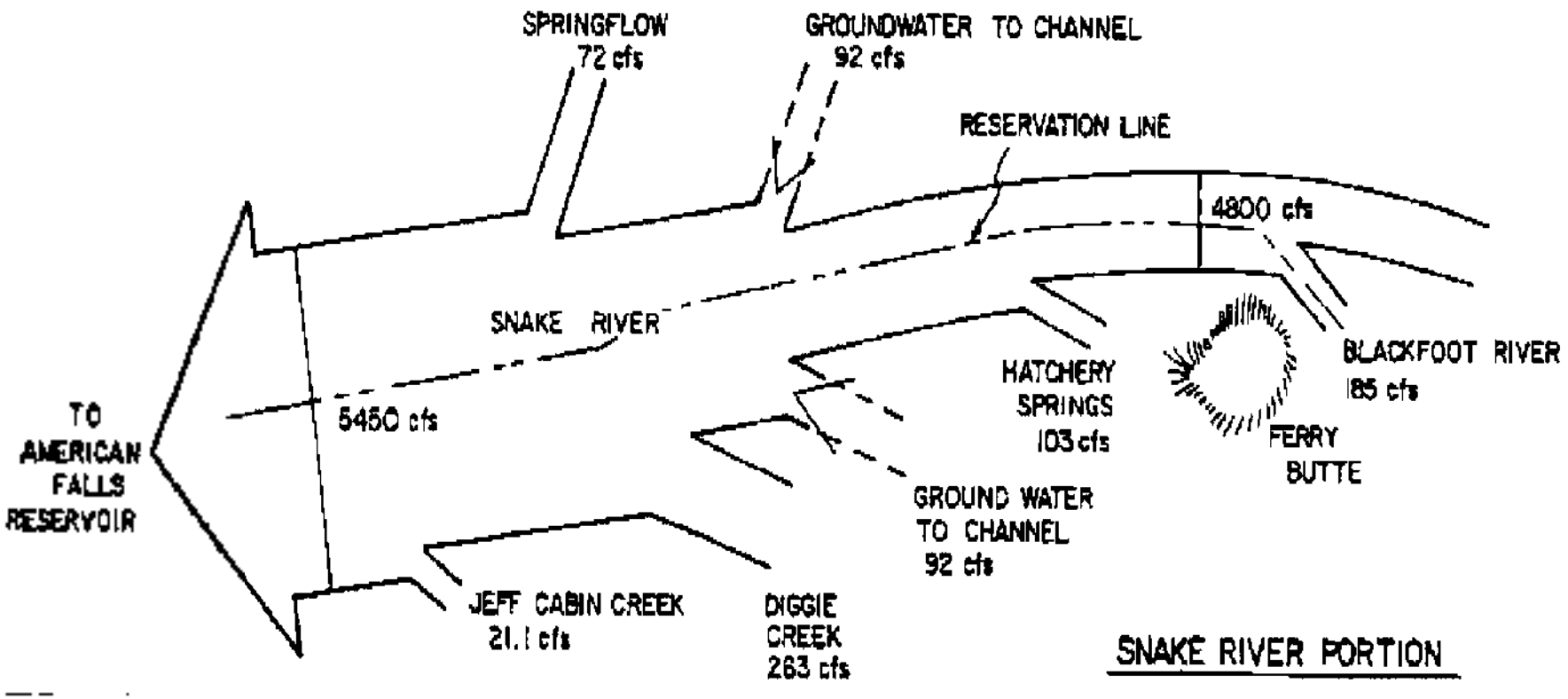


Figure 10A Fort Hall Bottoms Water Budget –Snake River Portion (Balmer and Noble, 1979)

002630

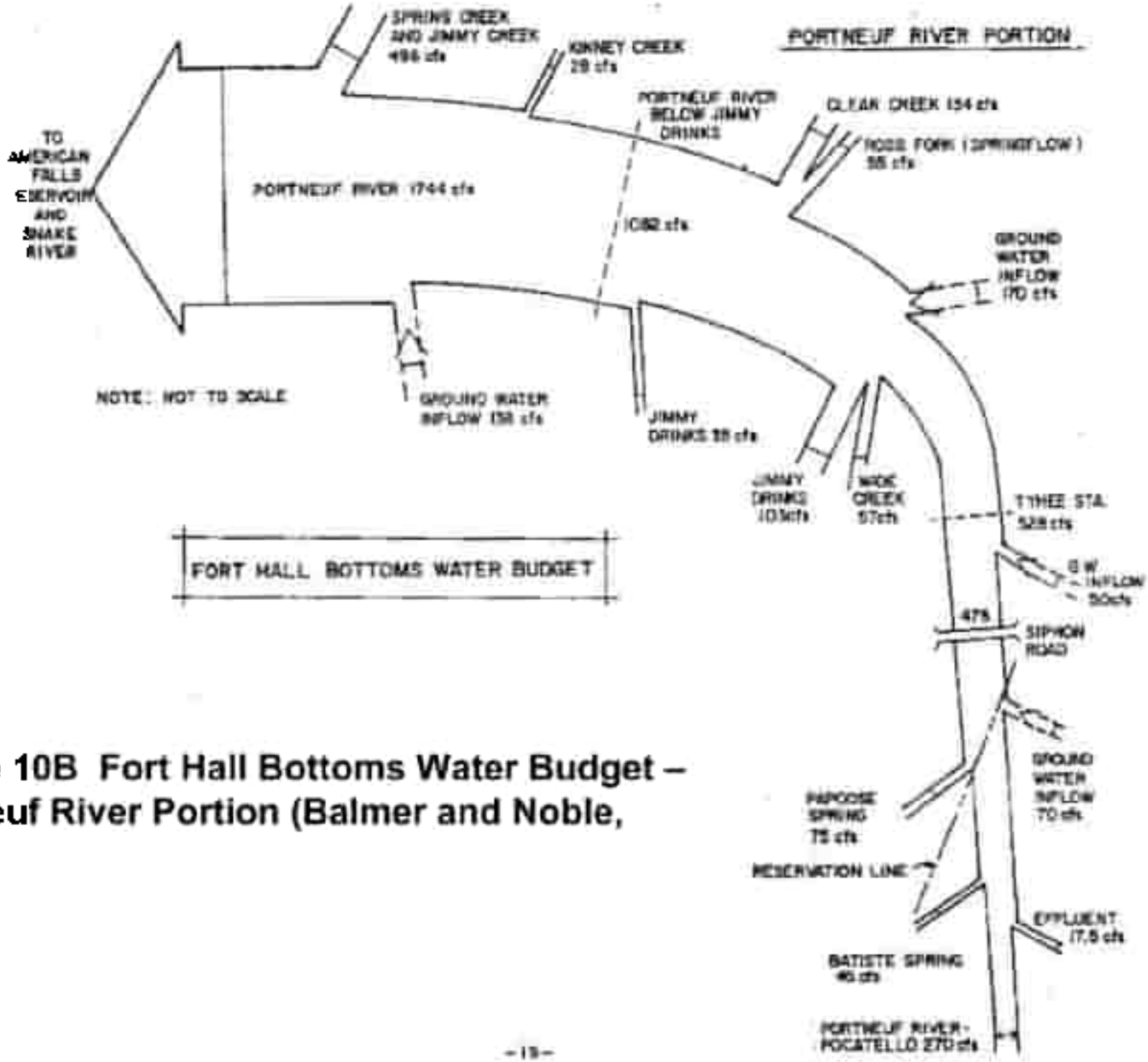


Figure 10B Fort Hall Bottoms Water Budget – Portneuf River Portion (Balmer and Noble, 1979)

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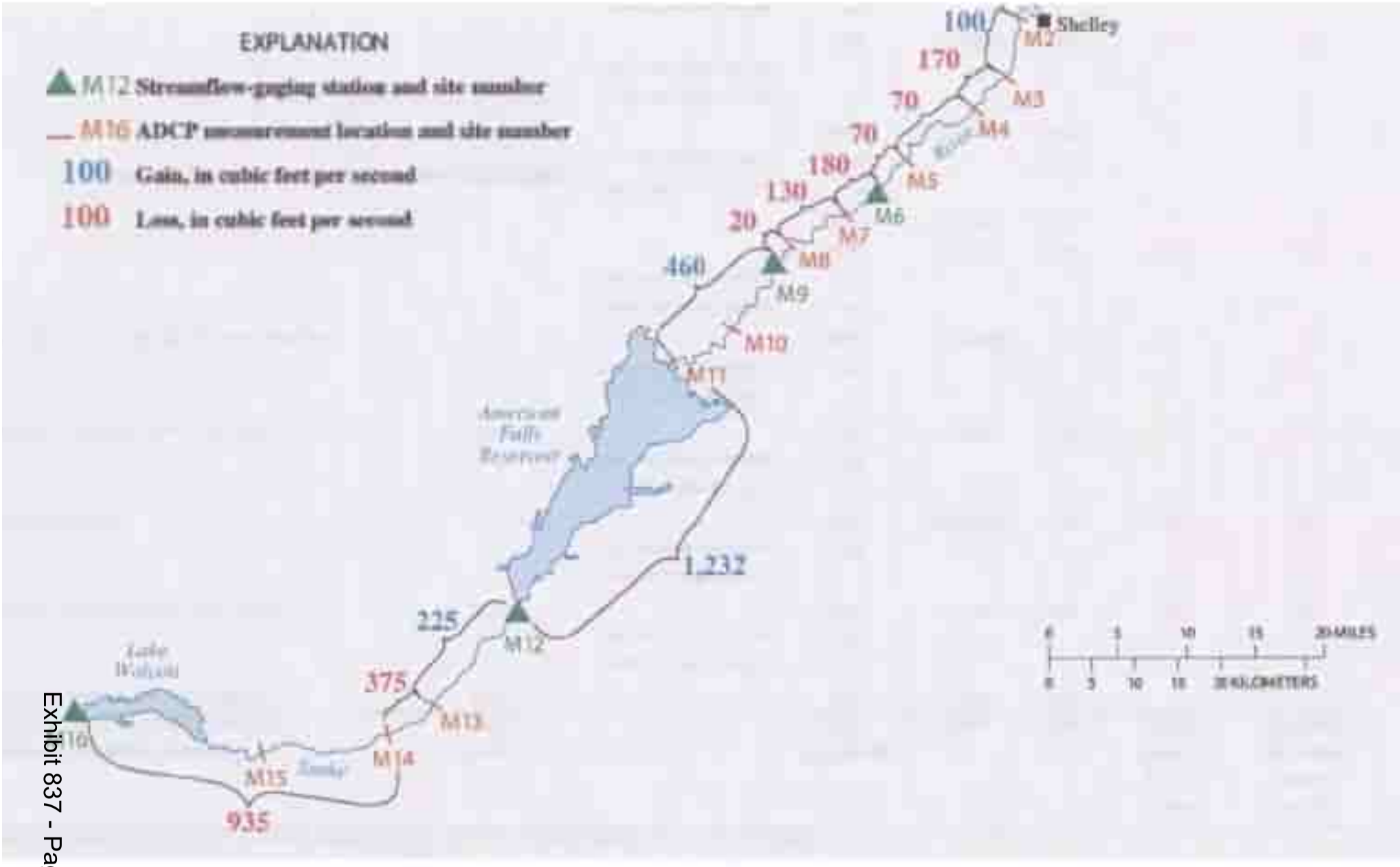

Figure 11 Seepage Run Results for April 2002 (Hortness and Vidmar, 2003)

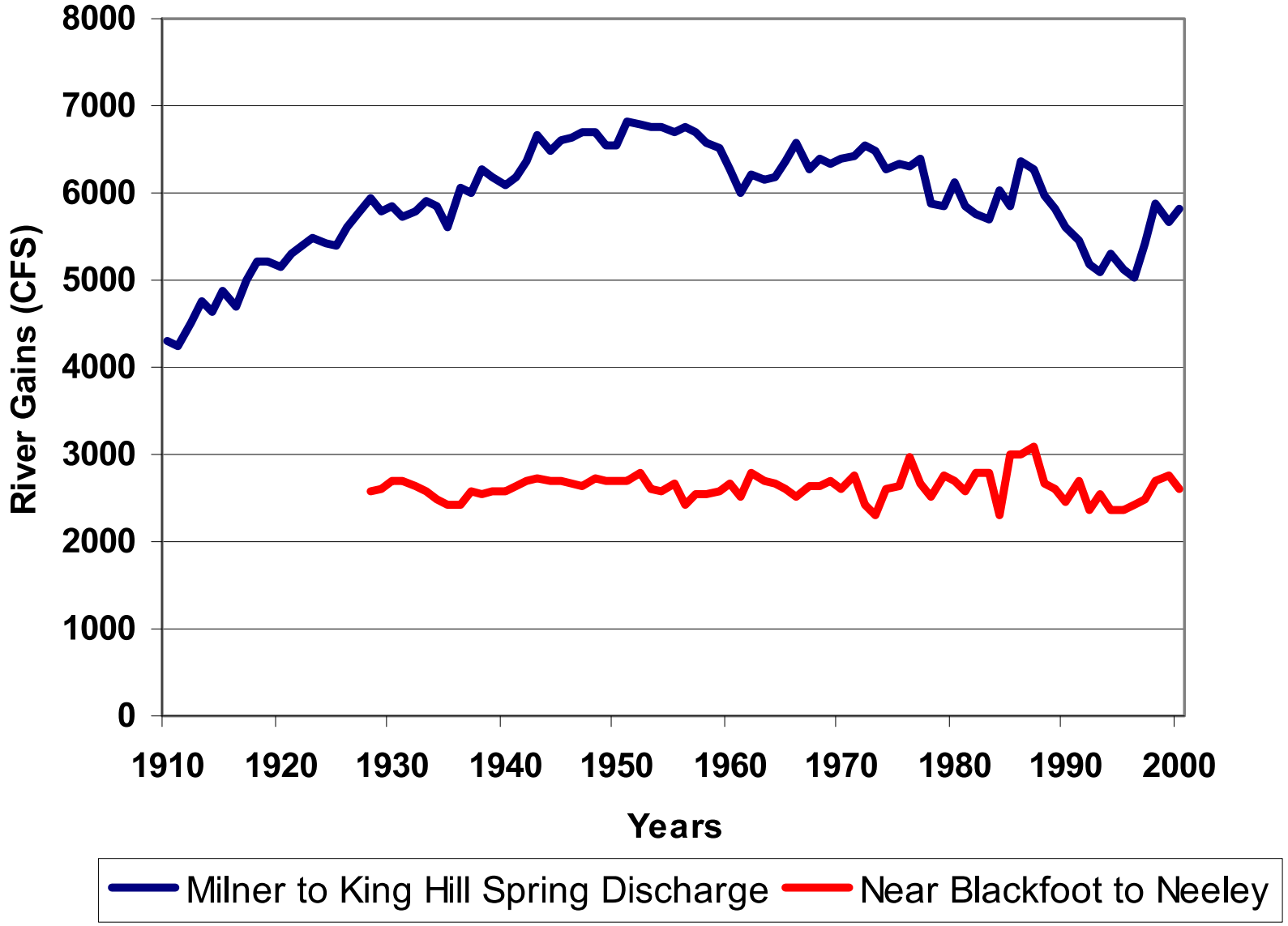

Figure 12 Average Annual River Gains from Near Blackfoot to Neeley Calculated by the IDWR Reach Gain/Loss Program (from Cosgrove and others 2006)

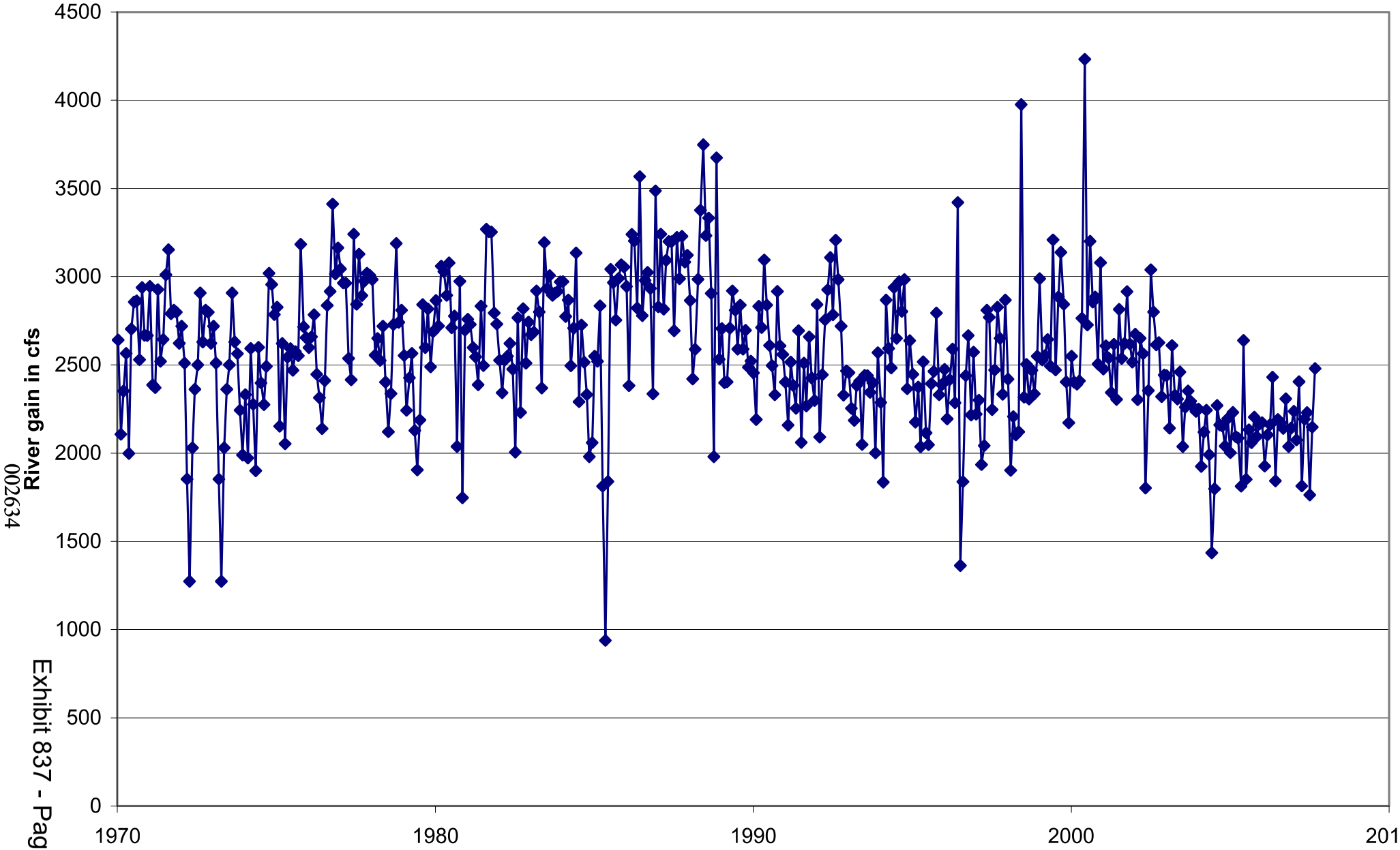

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Figure 13 Average Monthly Calculated Snake River Gain -- Near Blackfoot to Neeley Reach

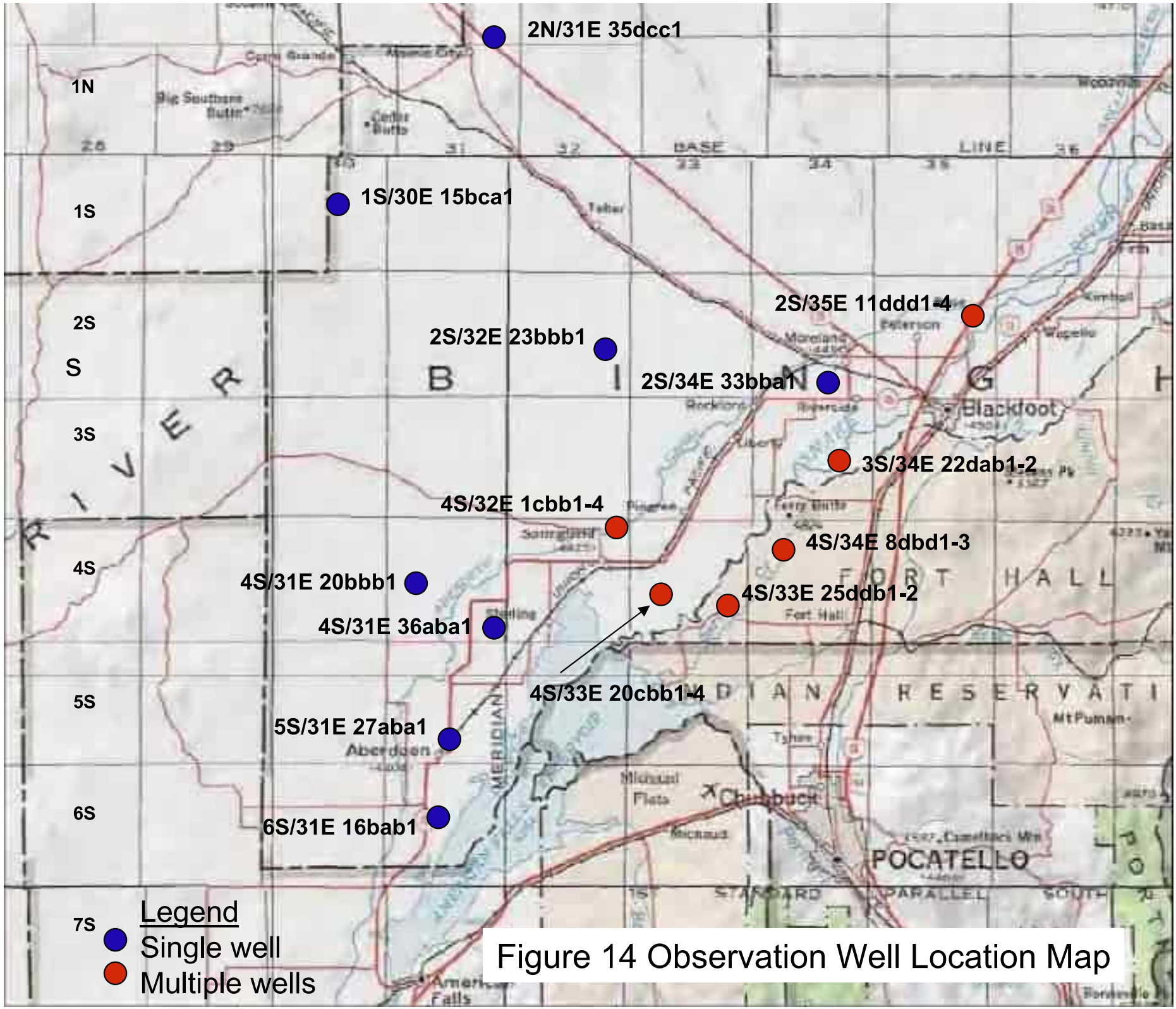

Figure 14 Observation Well Location Map

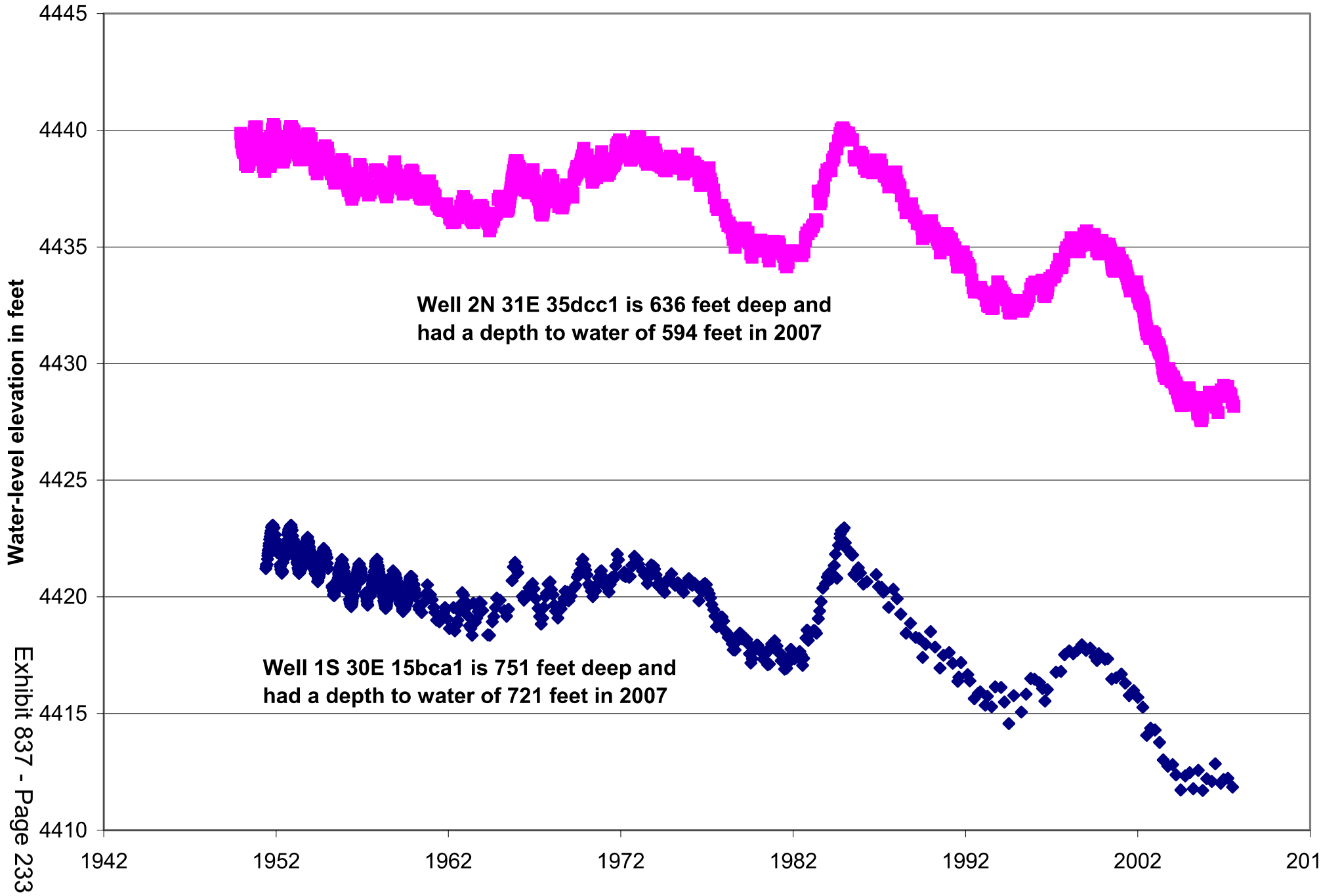

Figure 15 Hydrographs for Wells 2N 31E 35dcc1 and 1S 30E 15bca1

002636

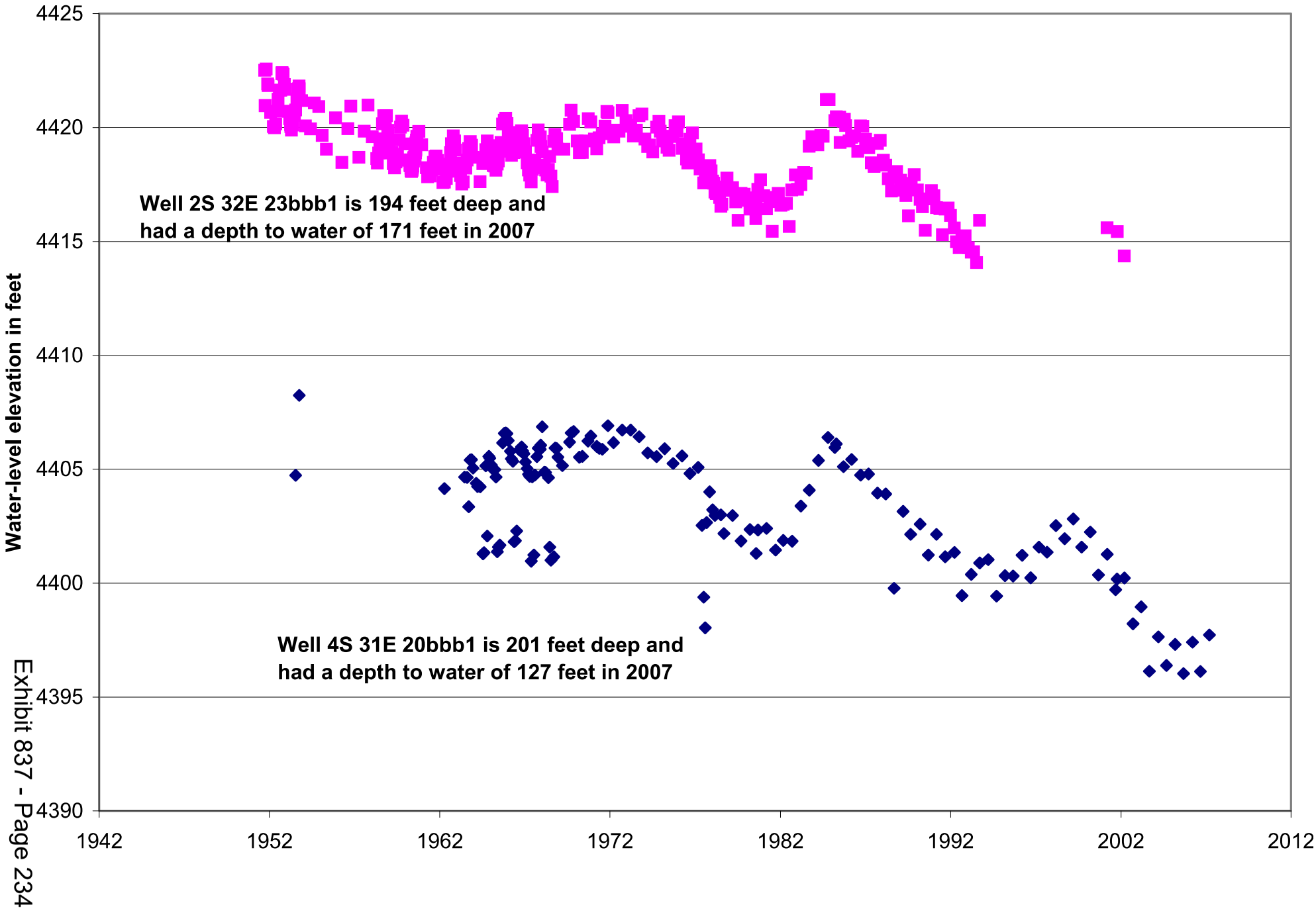

Figure 16 Hydrographs for Wells 2S 32E 23bbb1 and 4S 31E 20bbb1

002637

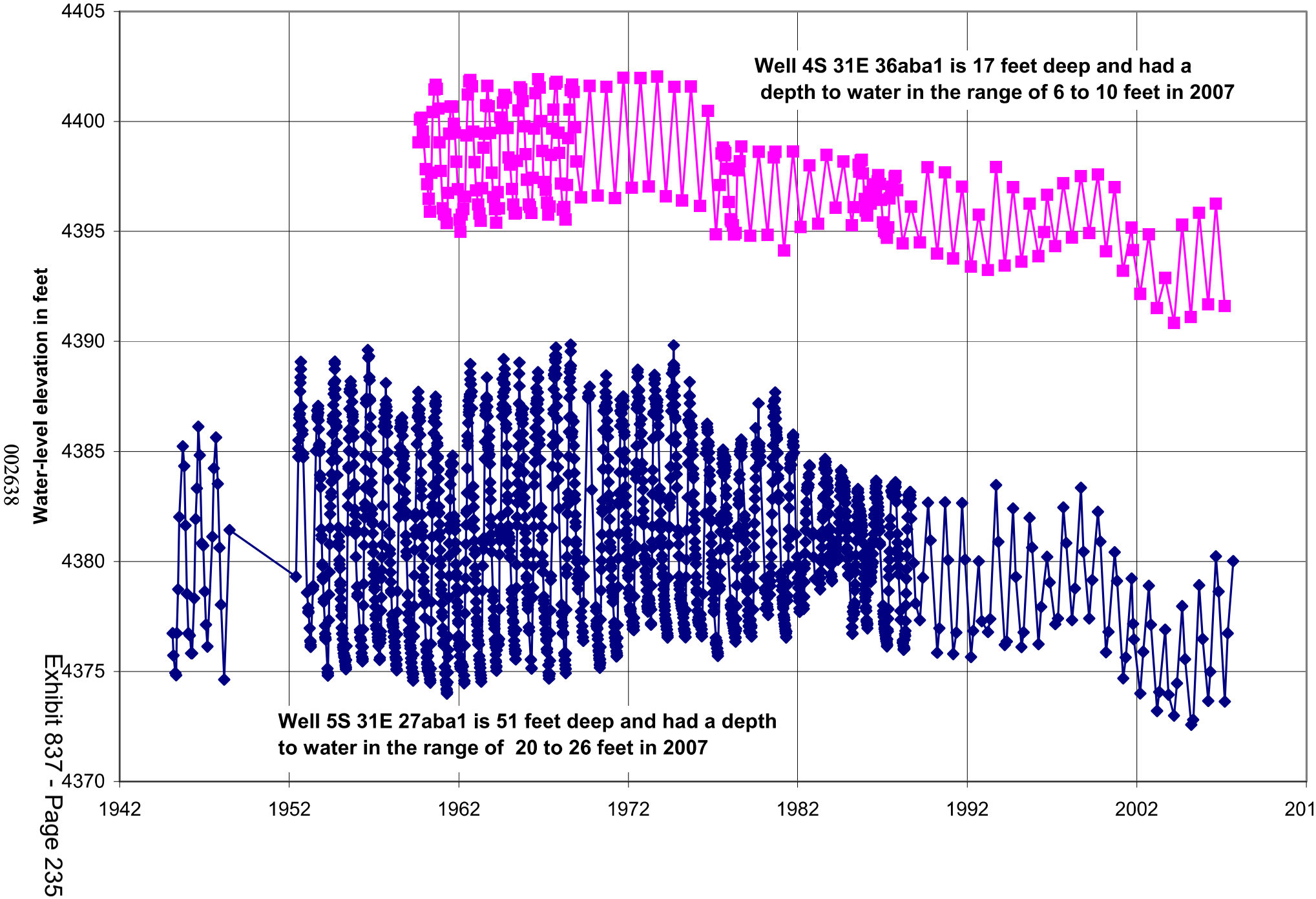

Figure 17 Hydrographs for Wells 4S 31E 36aba1 and 5S 31E 27aba1

002638

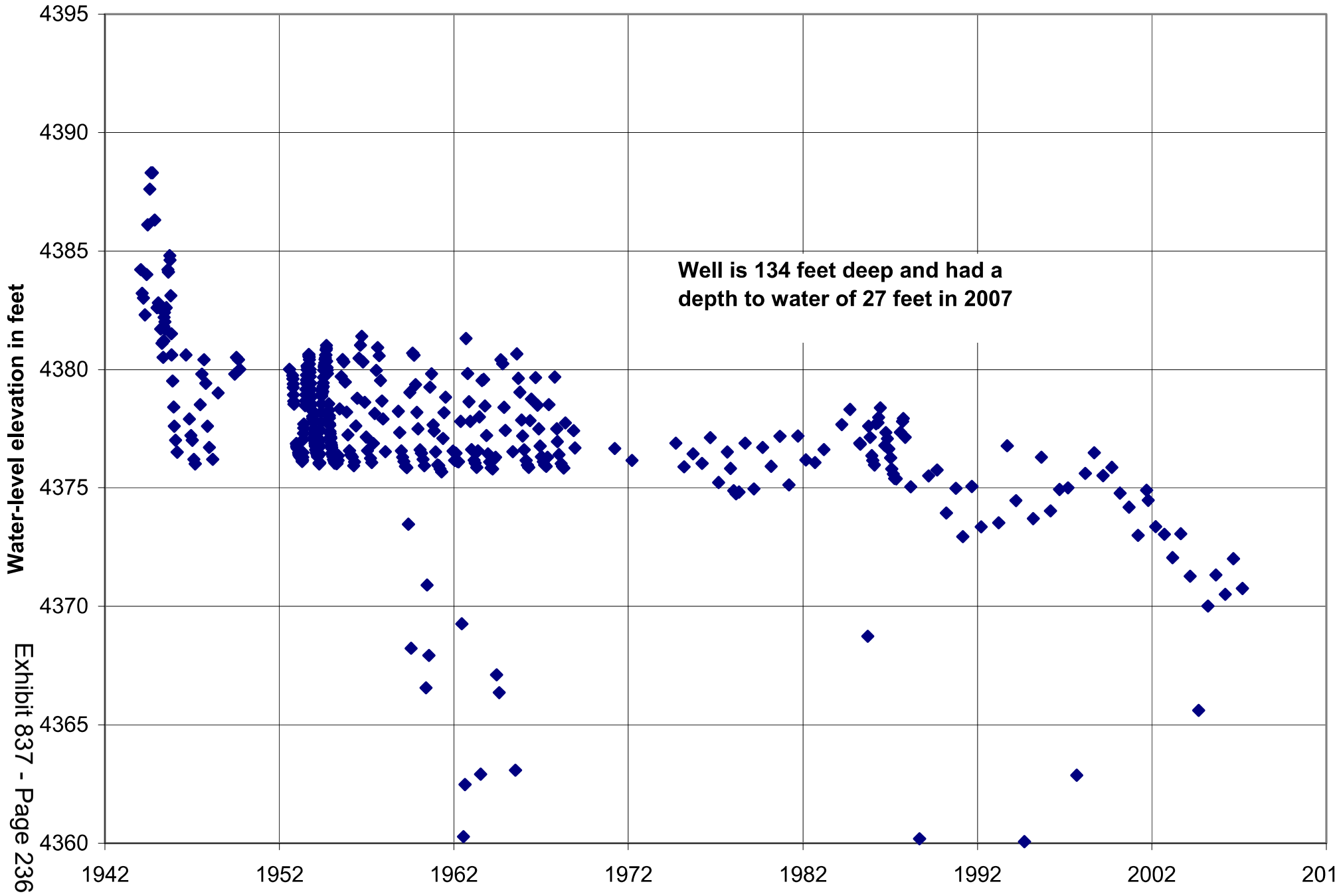

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Figure 18 Hydrograph for Well 6S 31E 16bab1

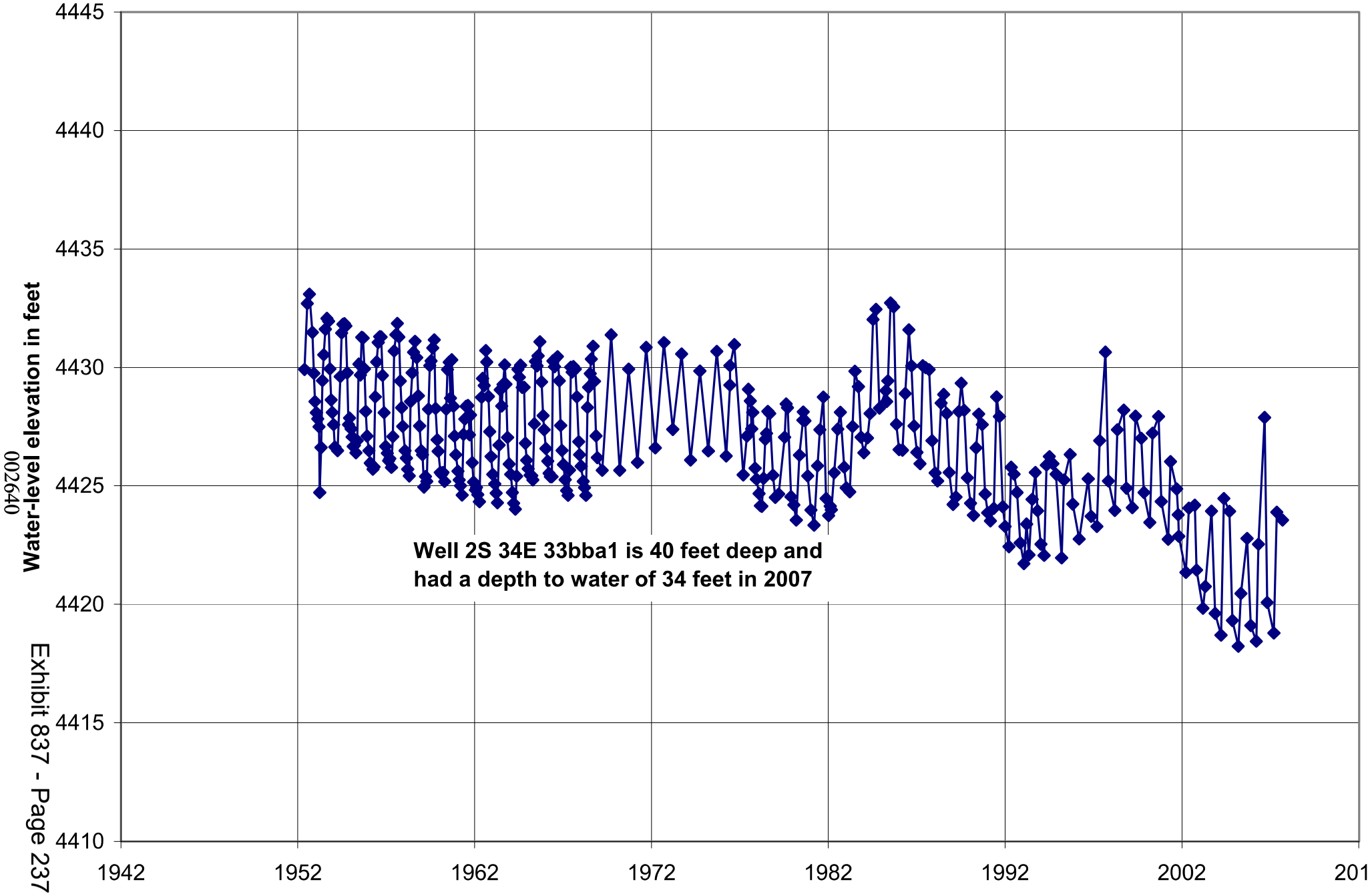

Figure 19 Hydrograph for Well 2S 34E 33bba1

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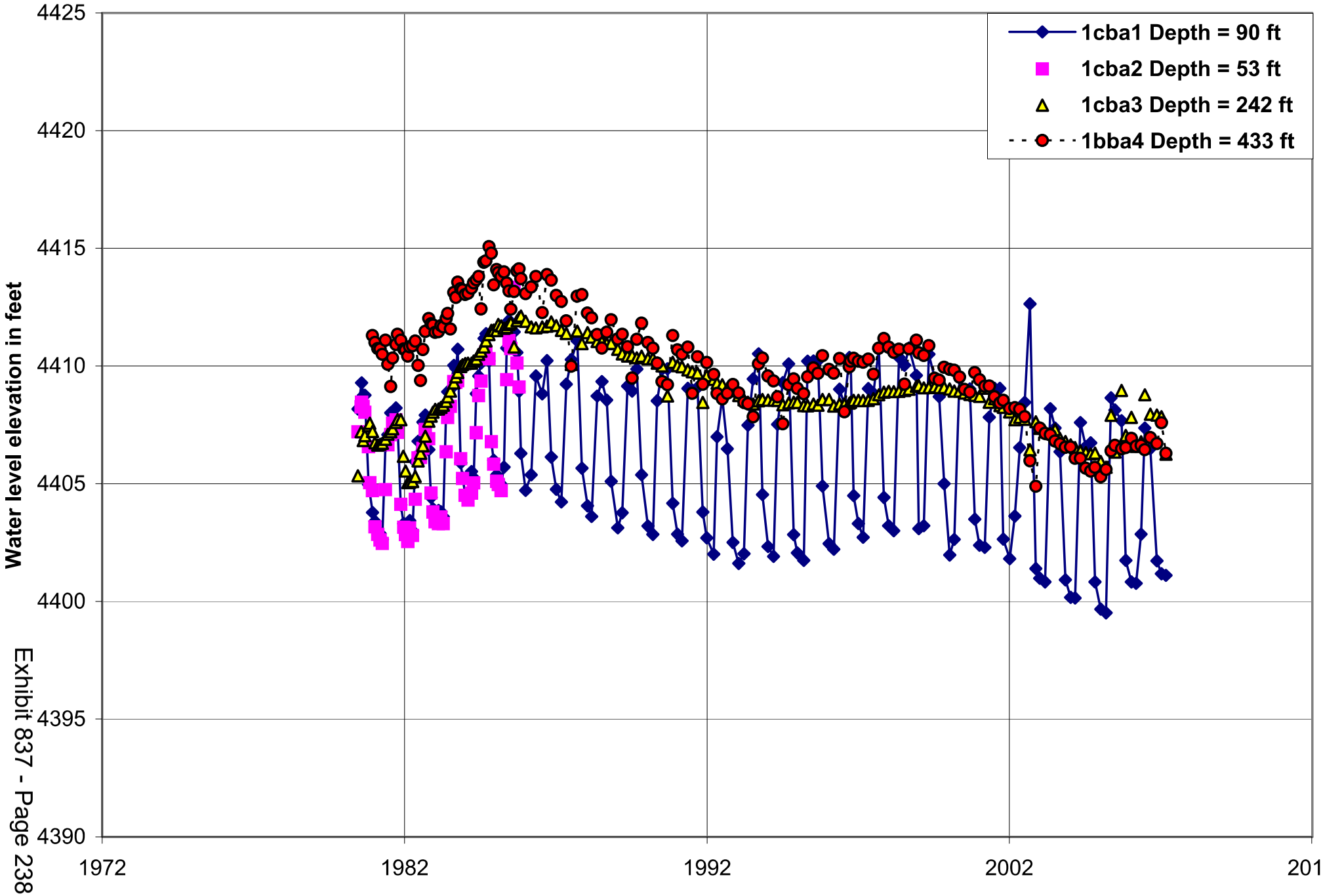

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Figure 20 Hydrographs for Wells 4S 32E 1cba1-4

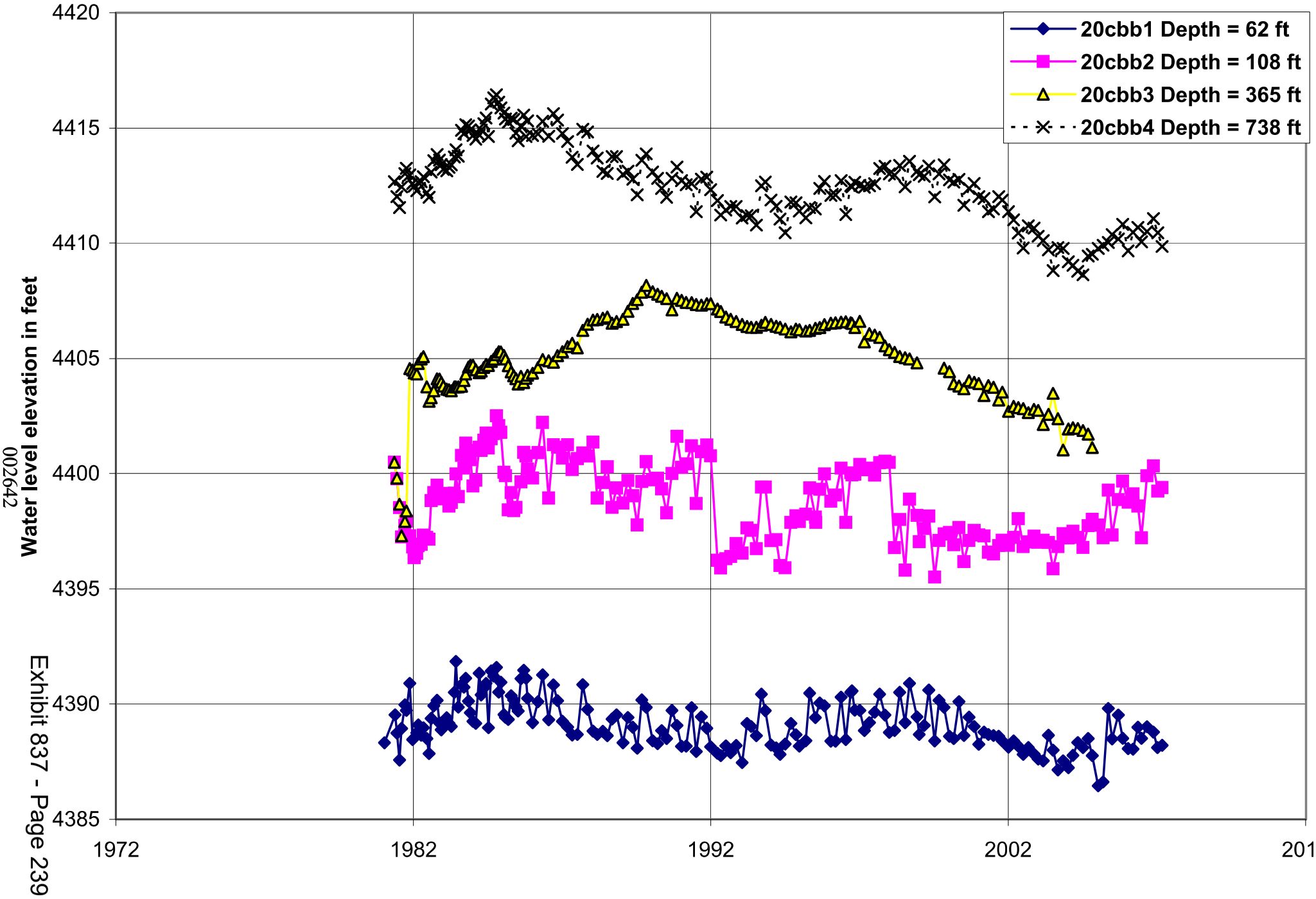

Figure 21 Hydrographs for Wells 4S 33E 20cbb1-4

002642
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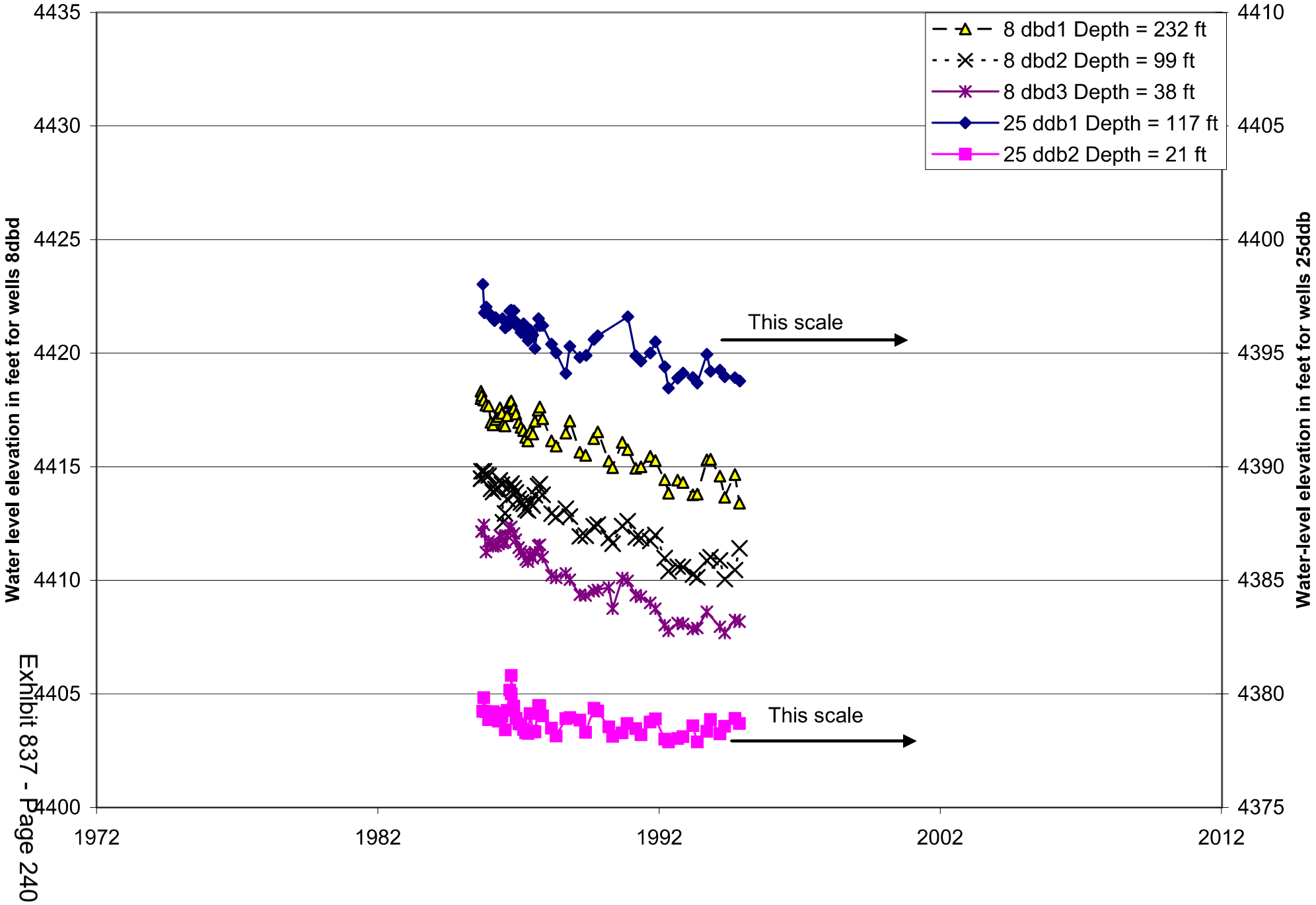

Figure 22 Hydrographs for Wells 4S 33E 25ddb1-2 and 4S 34E 8dbd1-3

002643

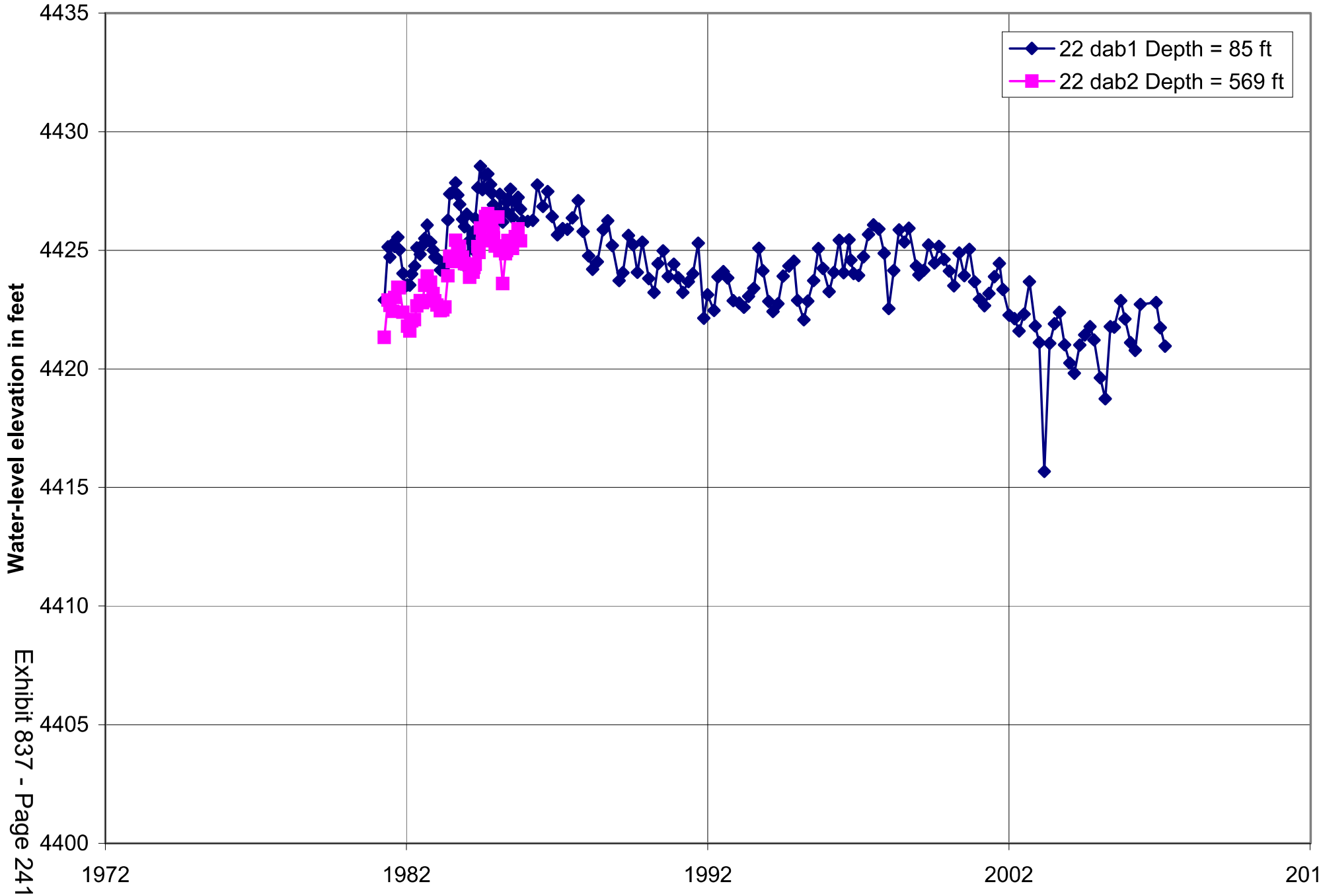

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Figure 23 Hydrographs for Wells 3S 34E 22dab1-2

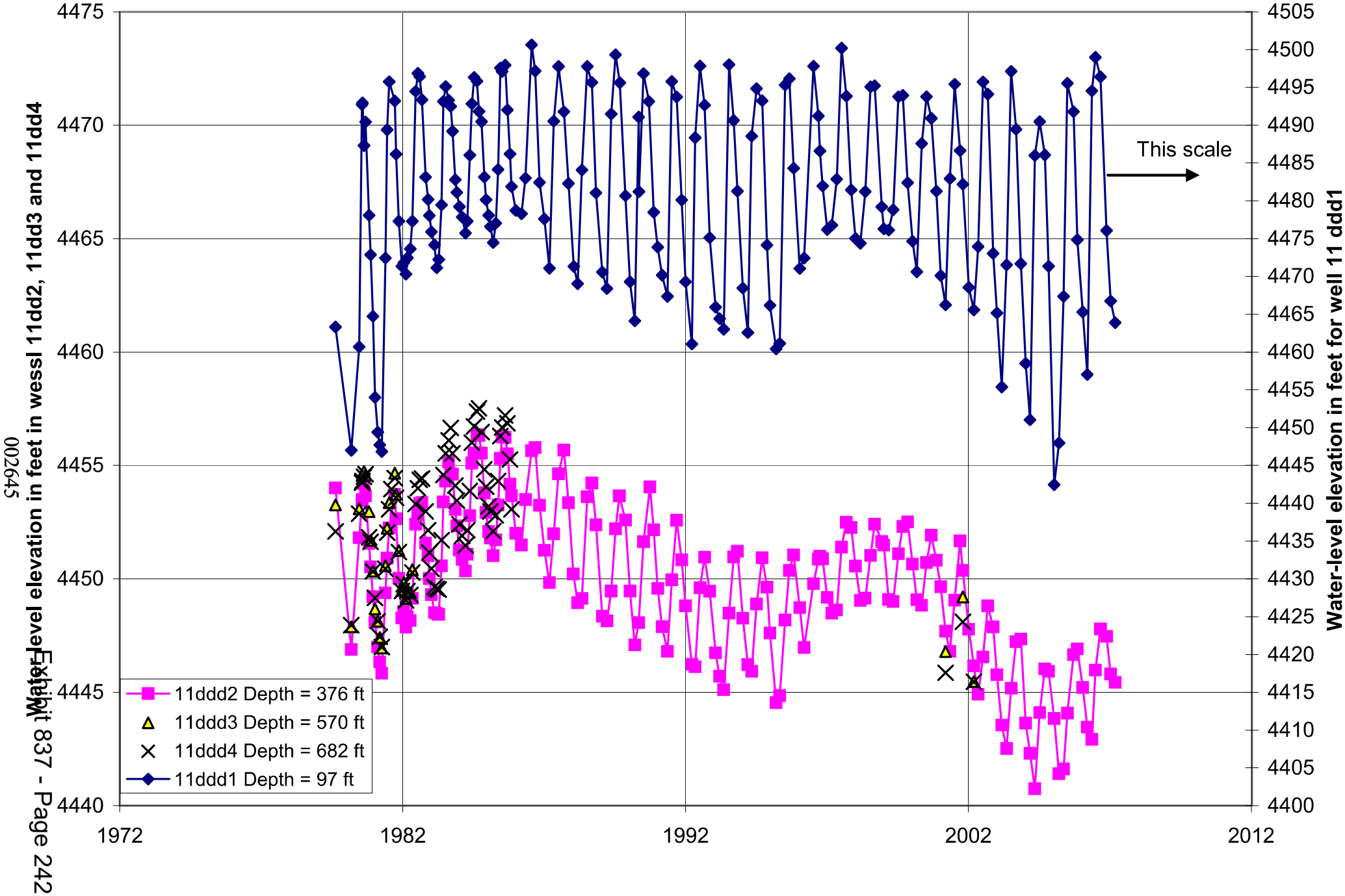

Figure 24 Hydrographs for Wells 2S 35E 11ddd1-4

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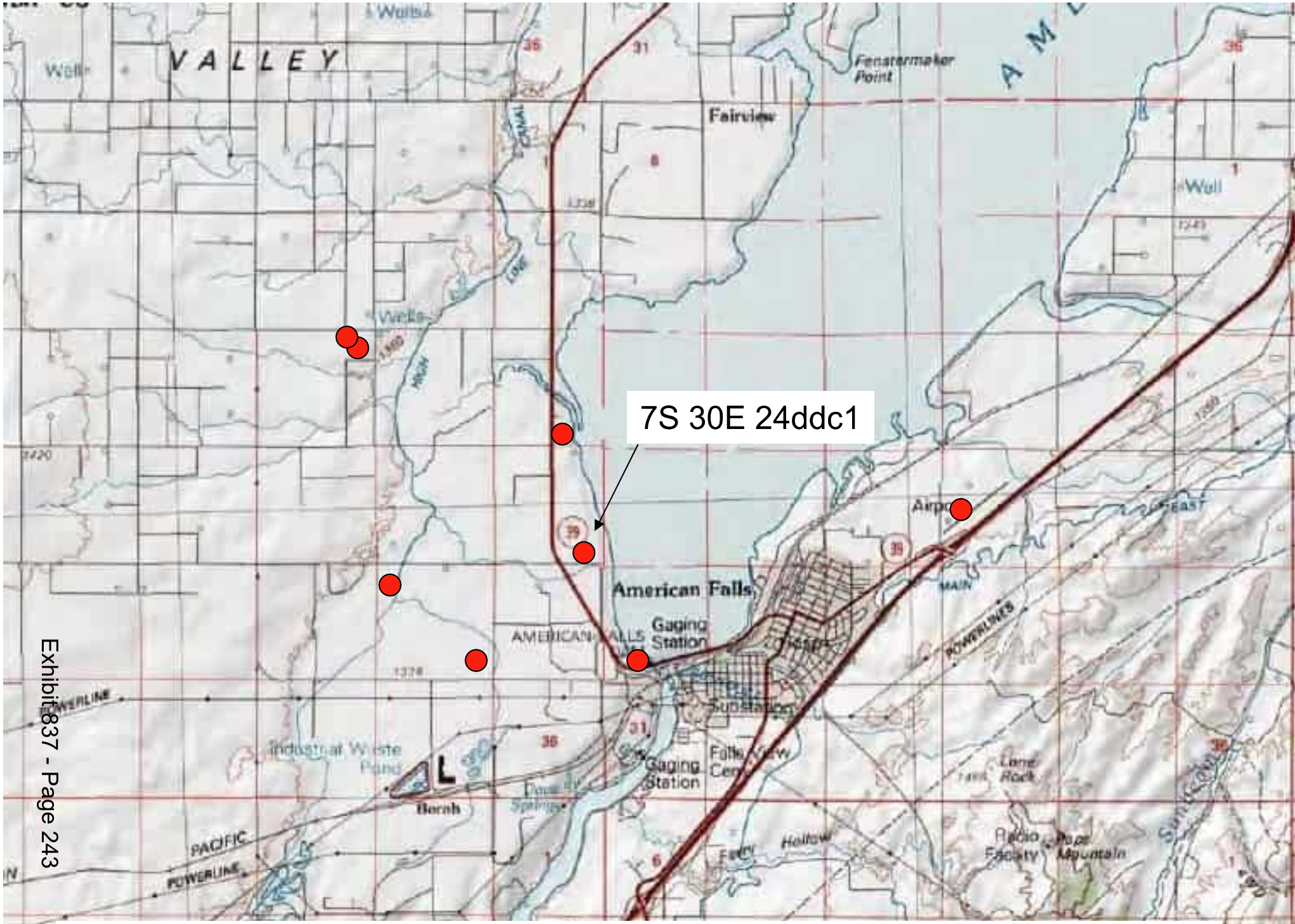

Figure 25 Locations of Wells That Respond to Stage Changes in the Reservoir

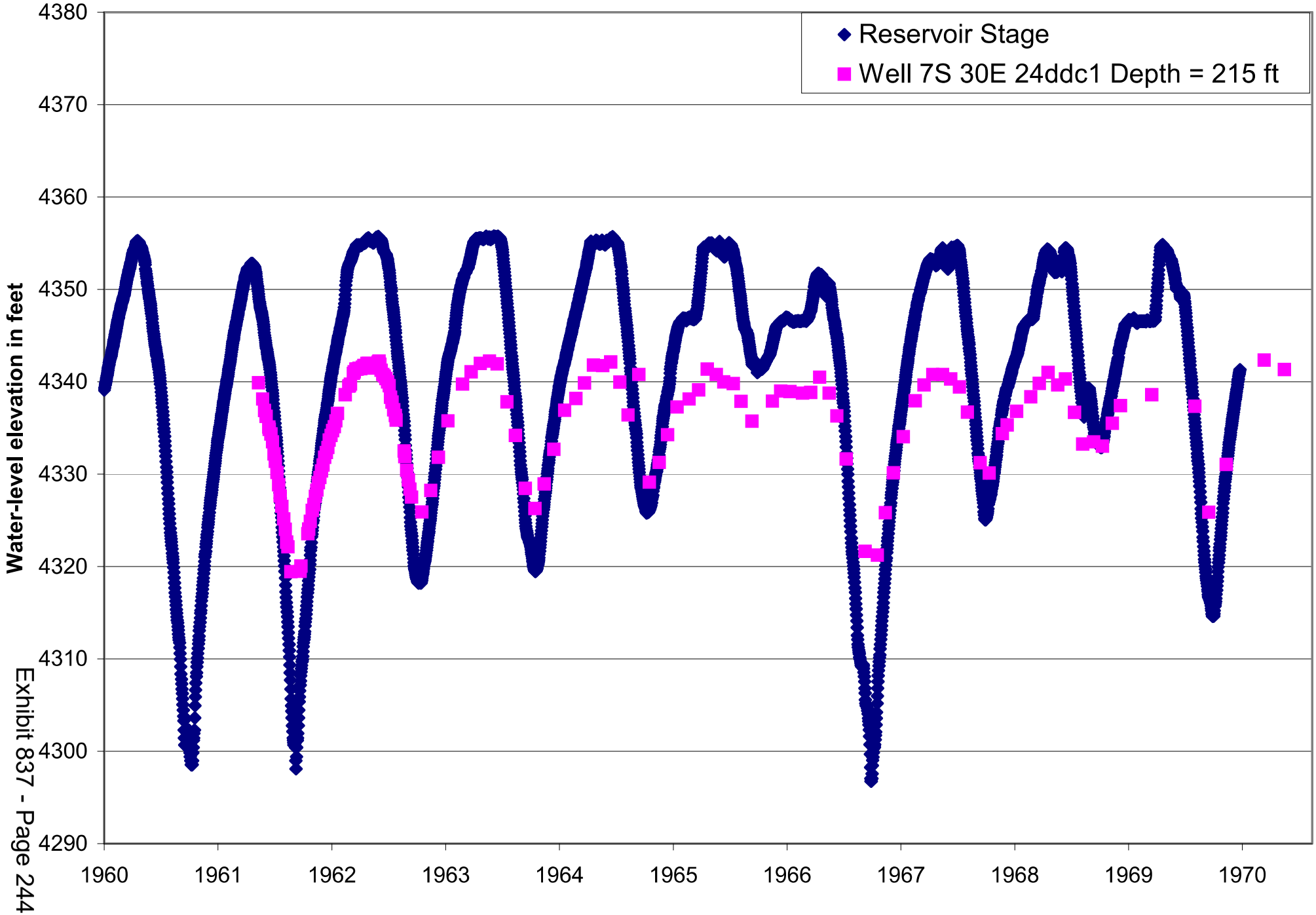

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Figure 26 Comparison of Reservoir Stage and Water Level in Well 7S 30E 24ddc1

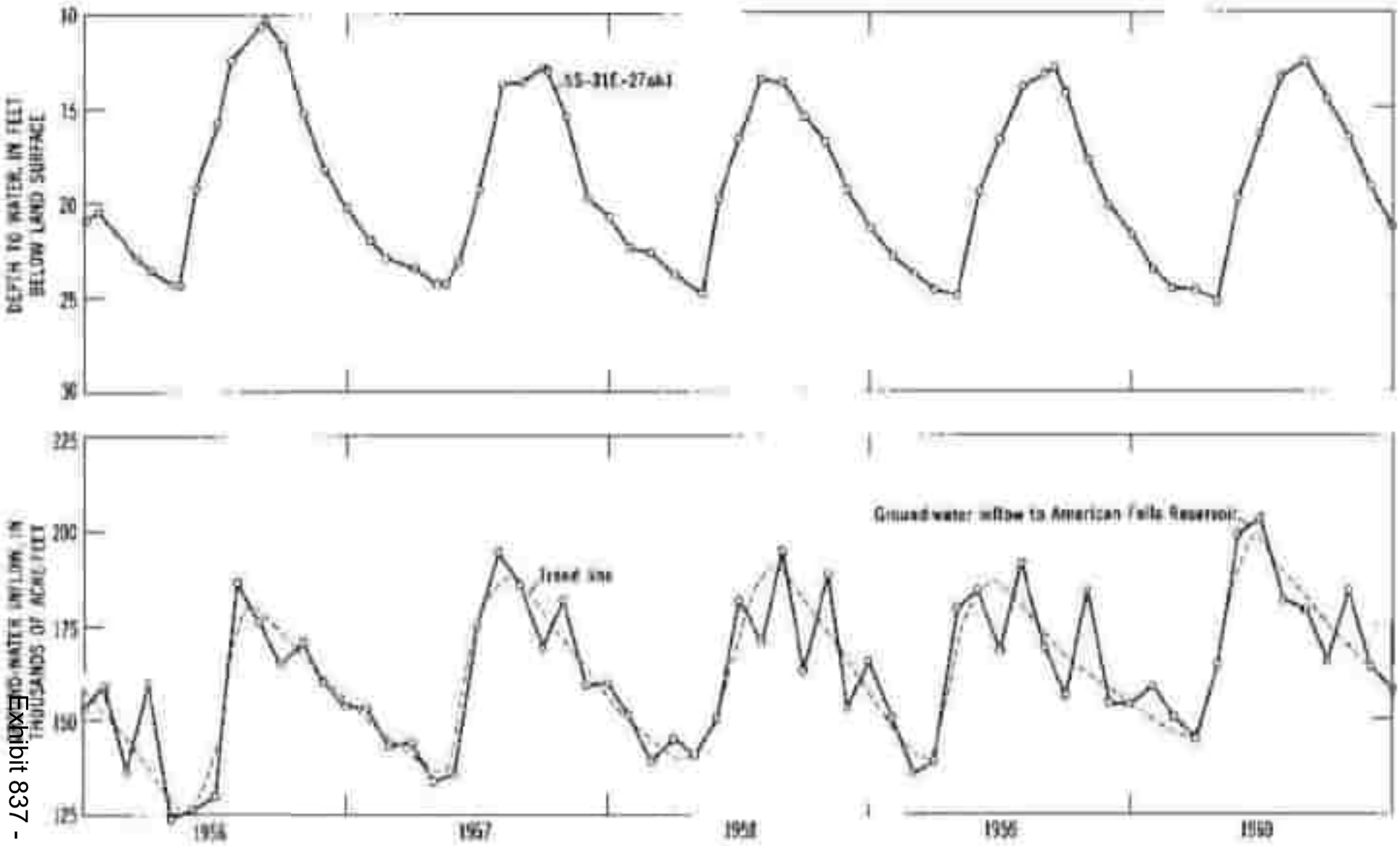

Figure 27 Comparison of Water-Level Patterns in Well 5S 31E 27ab1 to Ground-Water Inflow to American Falls Reservoir (Mundorff, 1967, page 33)

002648
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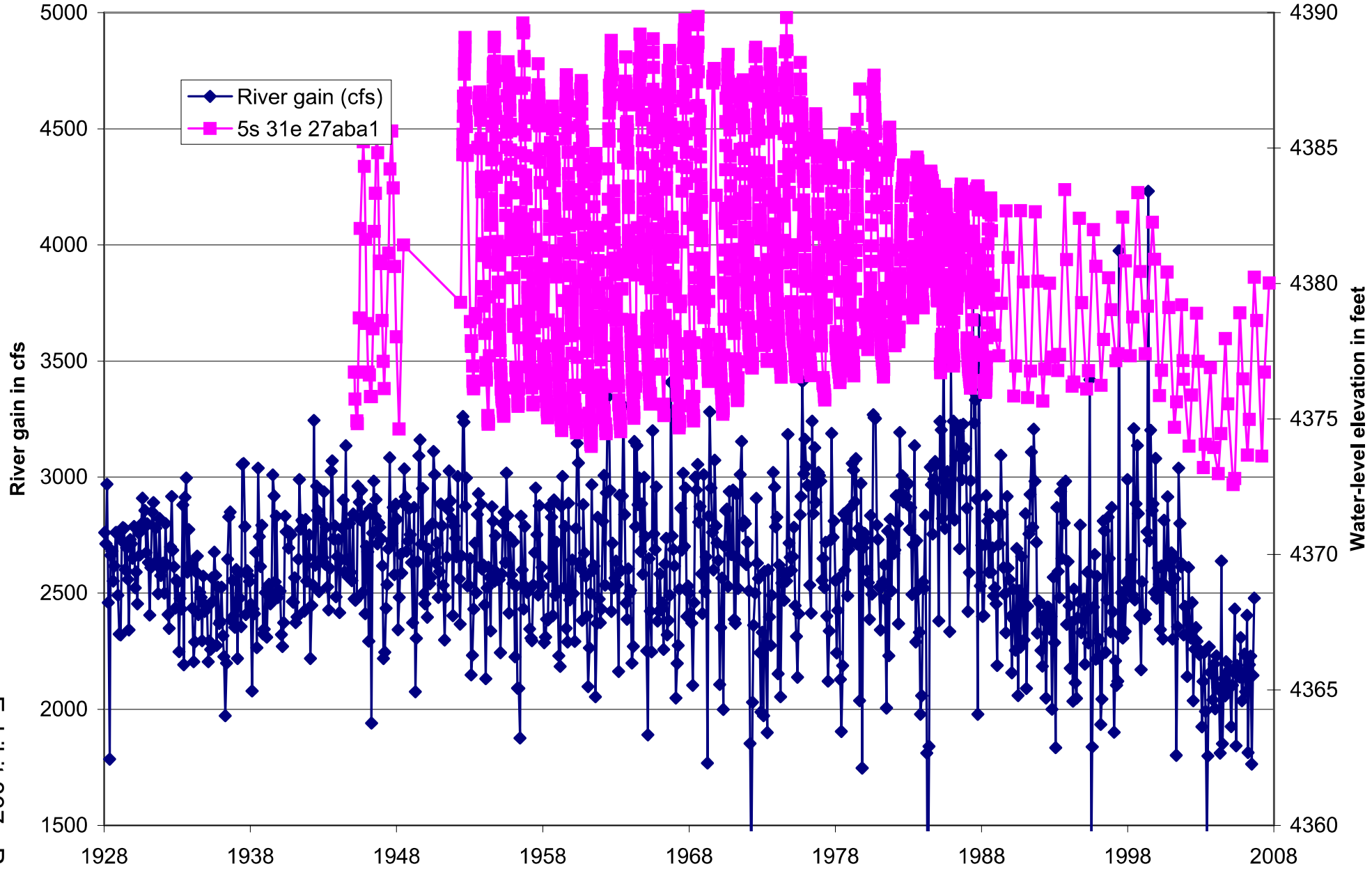

Figure 28 Plot of Calculated River Gain and Water-Level Elevation in Well 5S 31E 27aba1

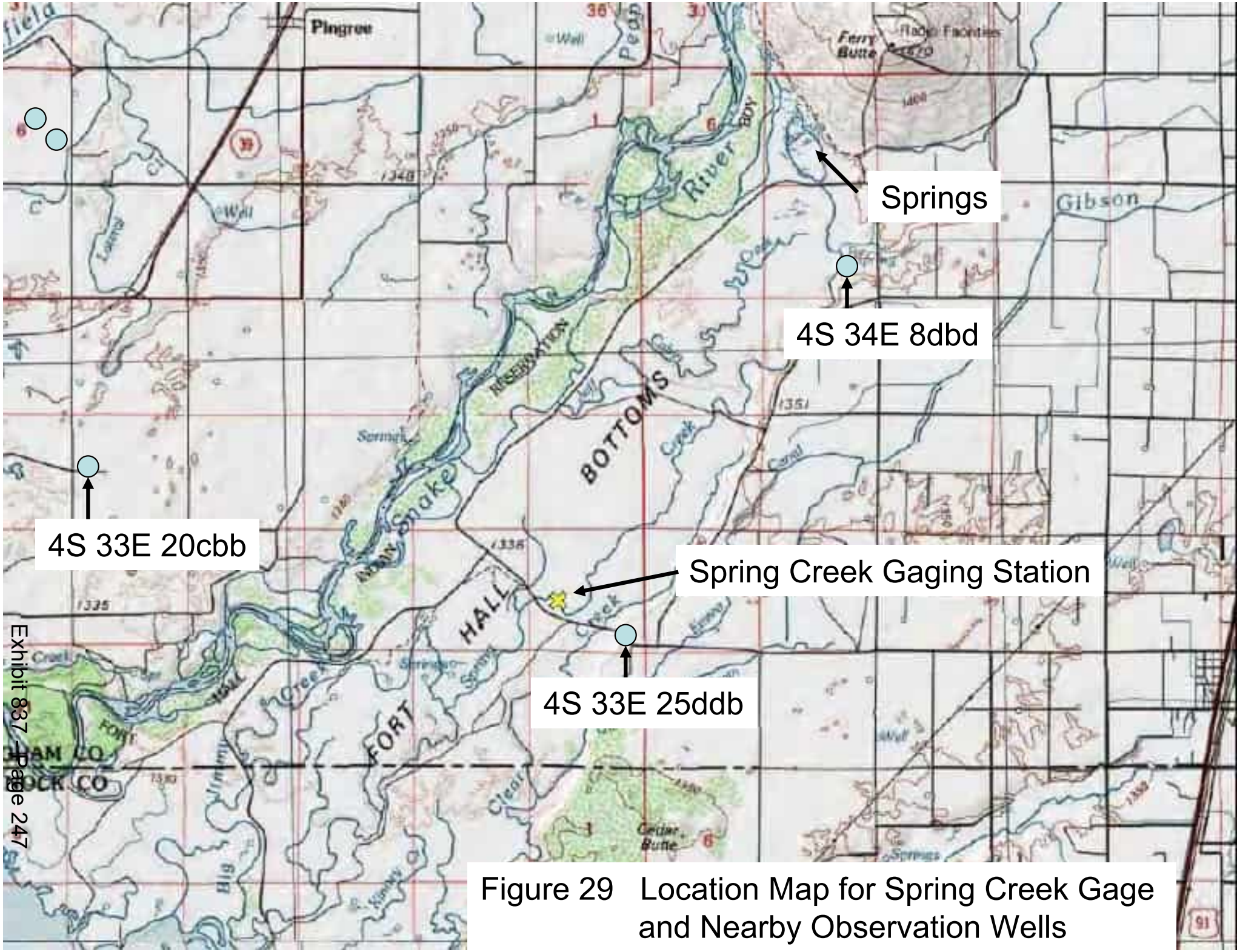

Figure 29 Location Map for Spring Creek Gage and Nearby Observation Wells

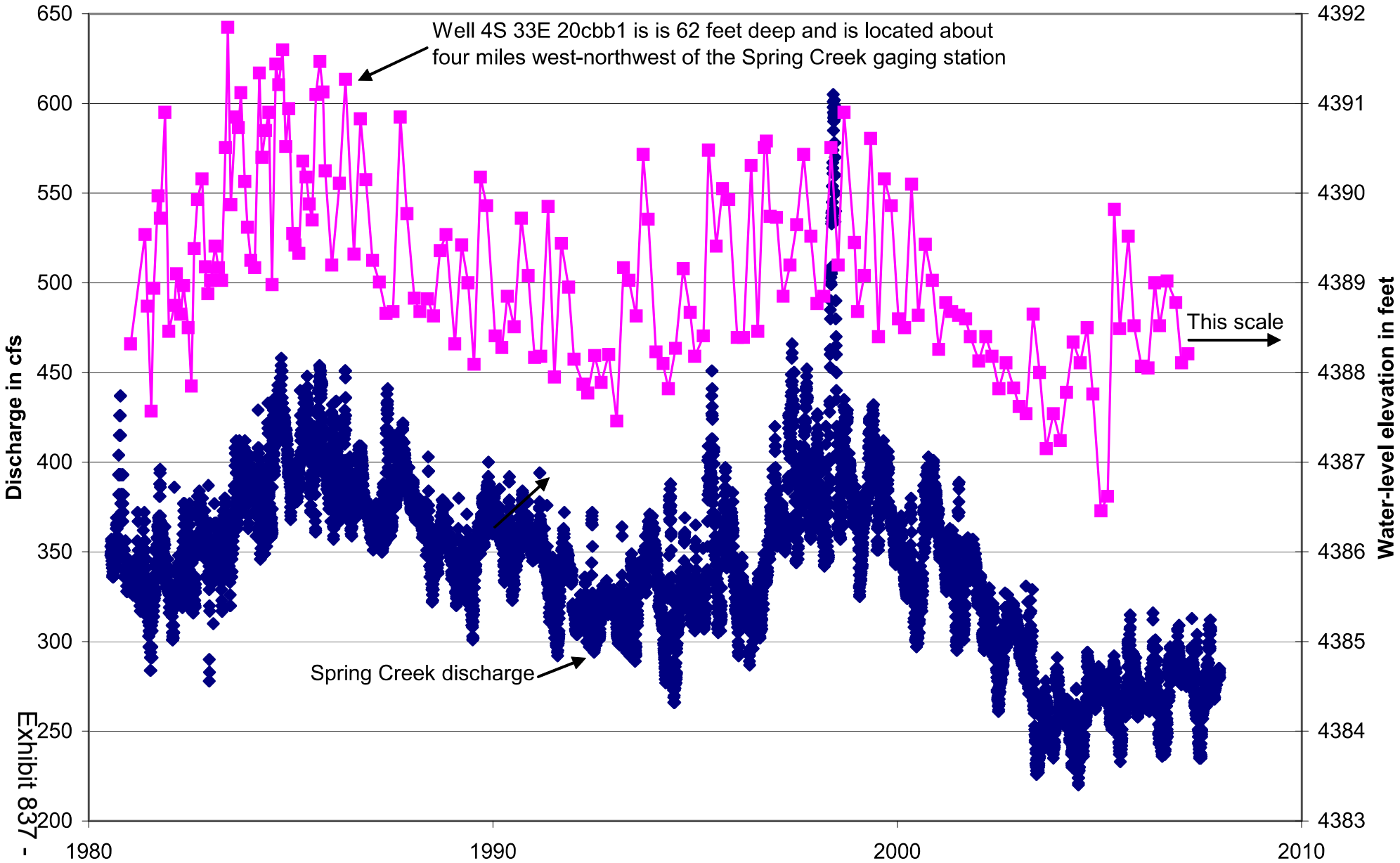

Figure 30 Discharge Plot for Spring Creek and Hydrograph for Well 4S 33E 20cbb1

002651

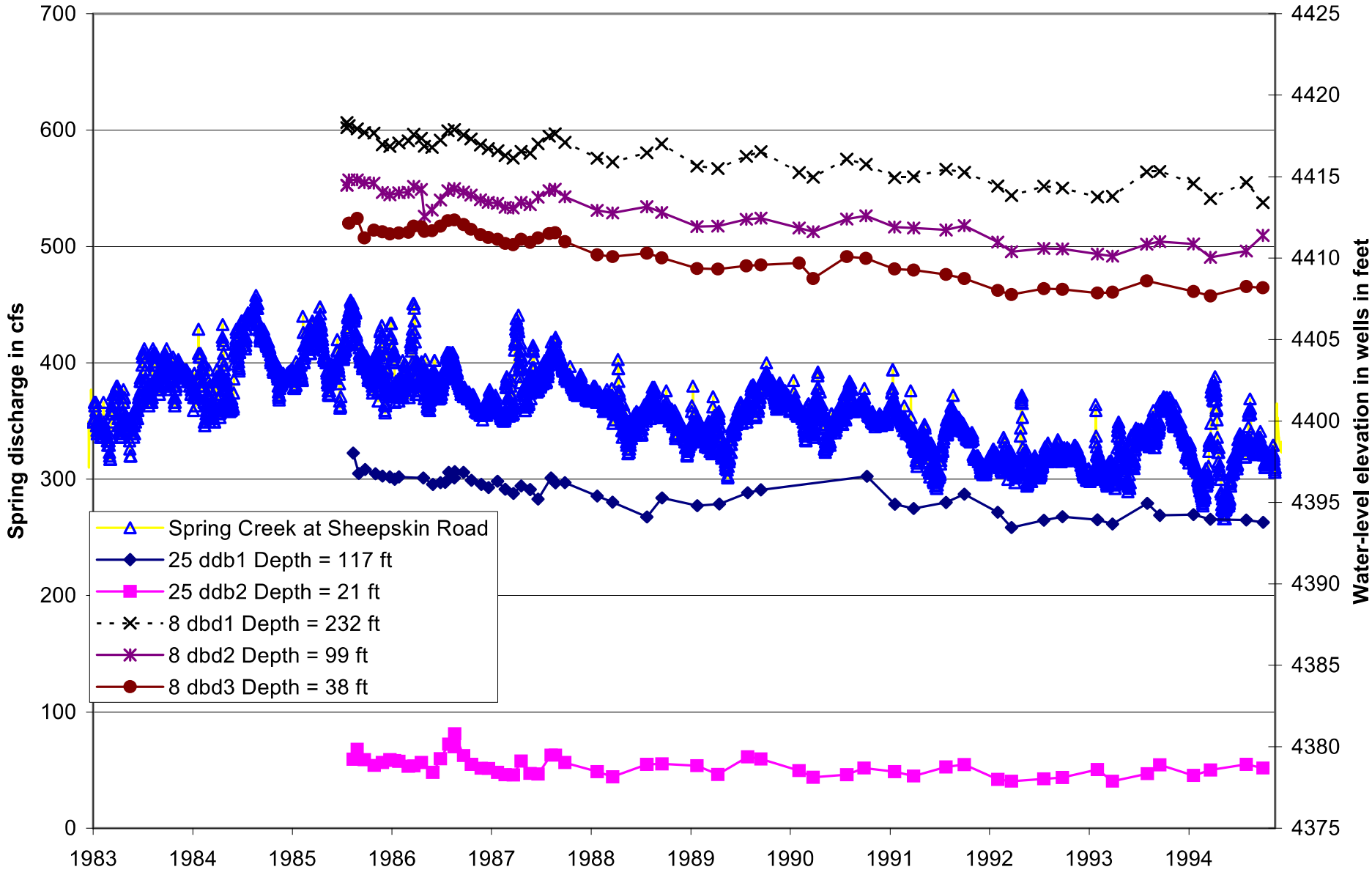

Figure 31 Discharge Plot for Spring Creek and Hydrographs for Nearby Wells

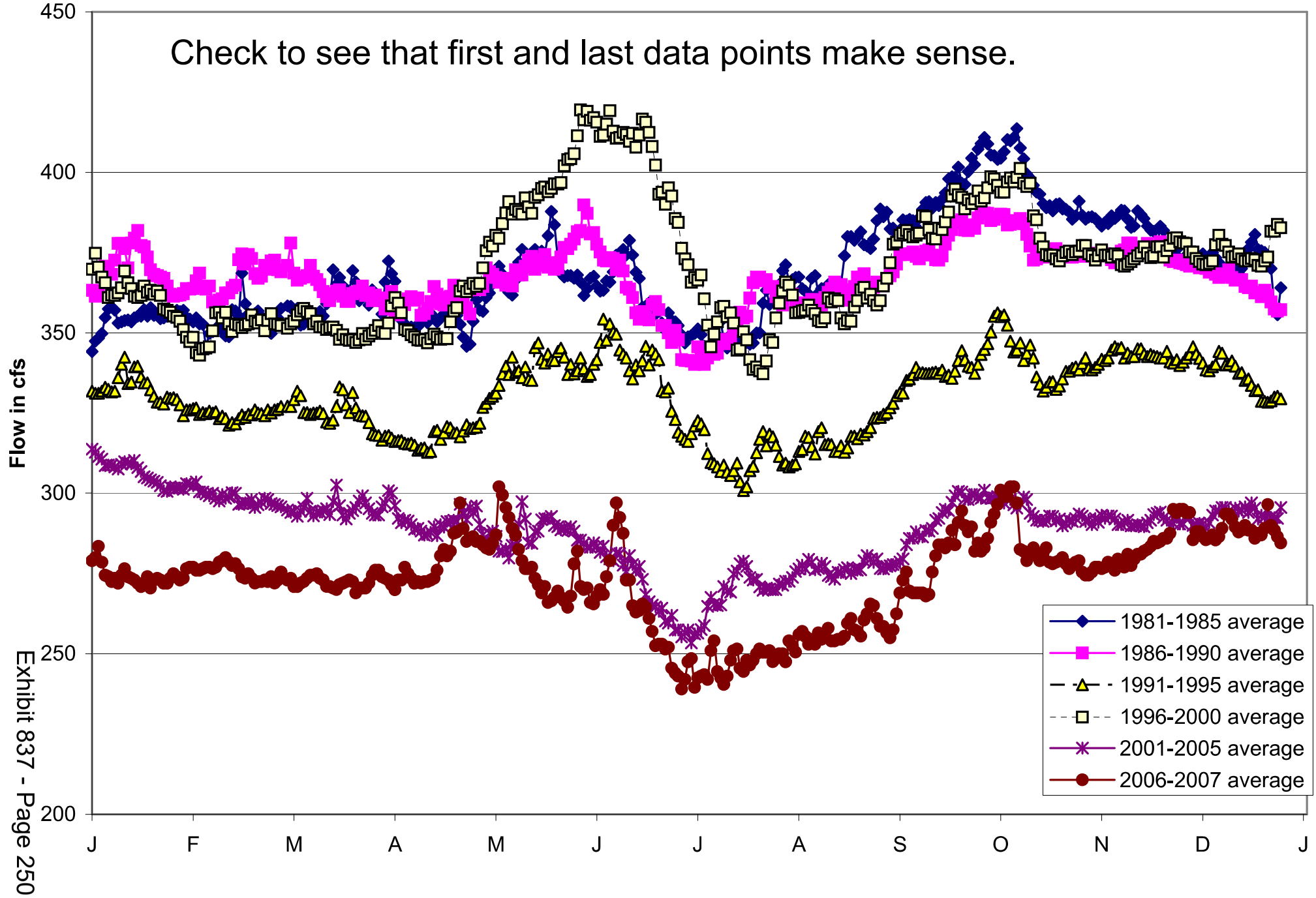

Figure 32 Spring Creek Average Flow Patterns

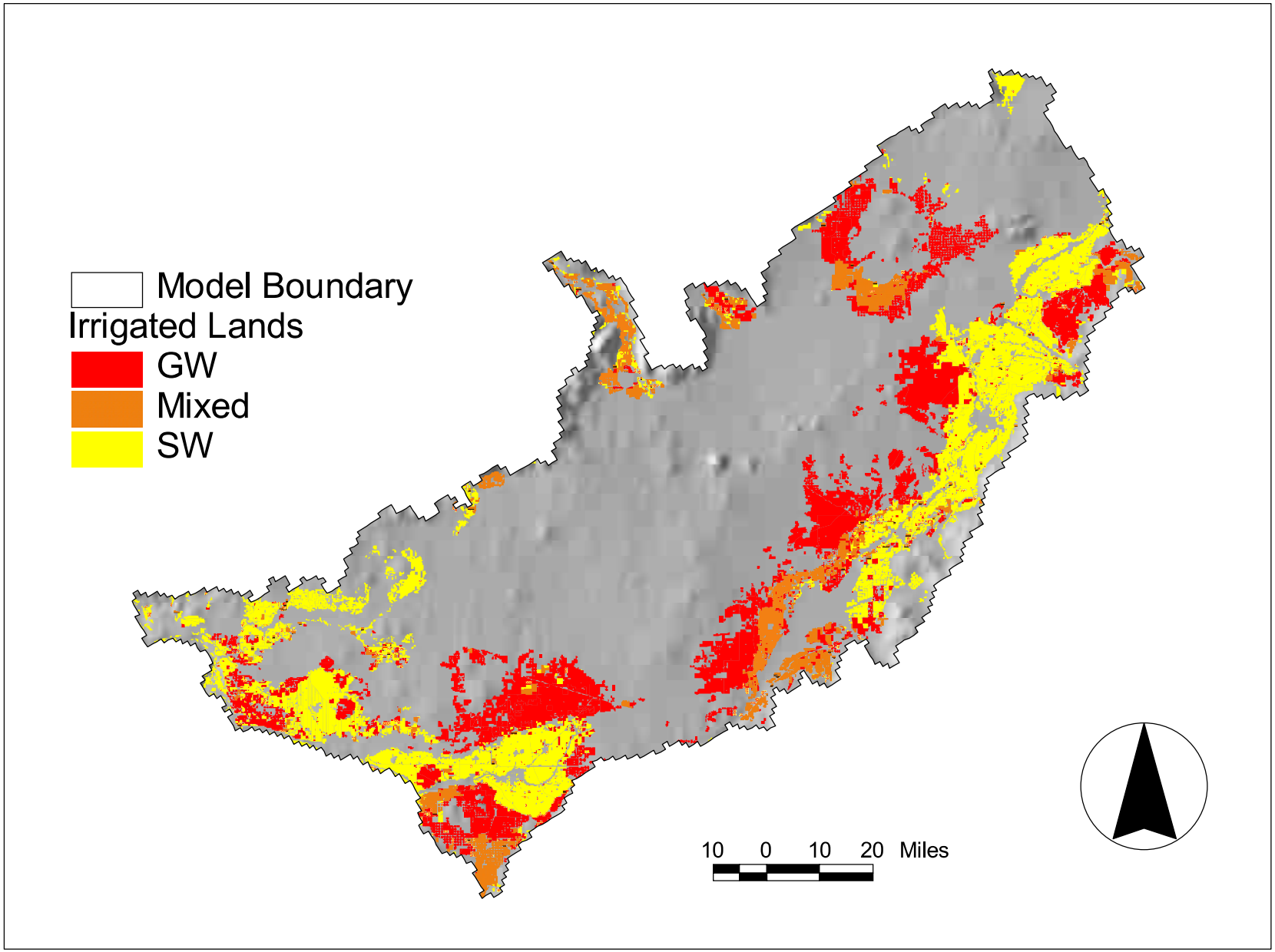

Figure 33 Irrigation Water Source Determined from Adjudication Data (from Cosgrove and others, 2006)

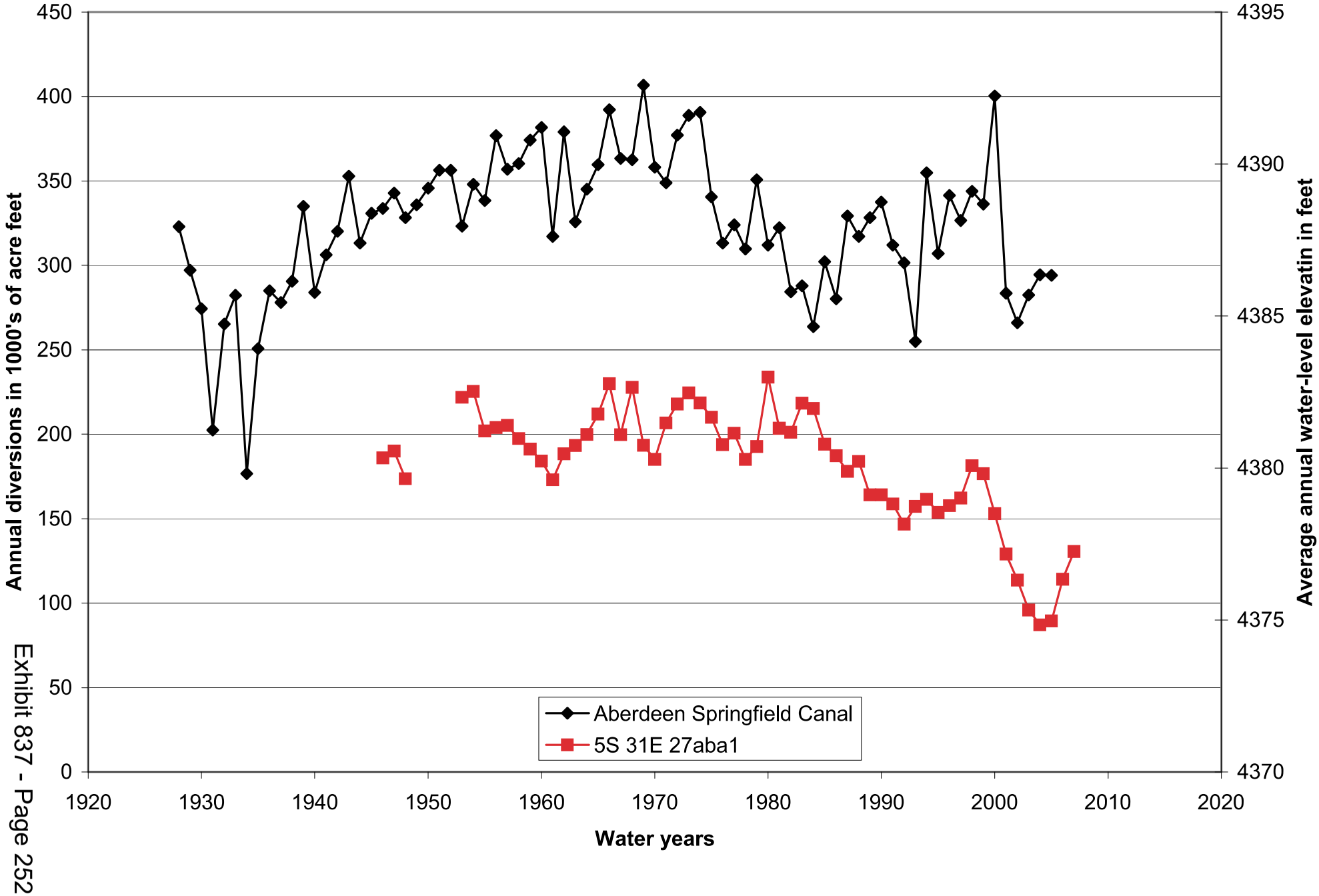

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Figure 34 Aberdeen Springfield Canal Annual Diversions and Average Annual Water-Level Elevation in Well 5S 31E 27aba1

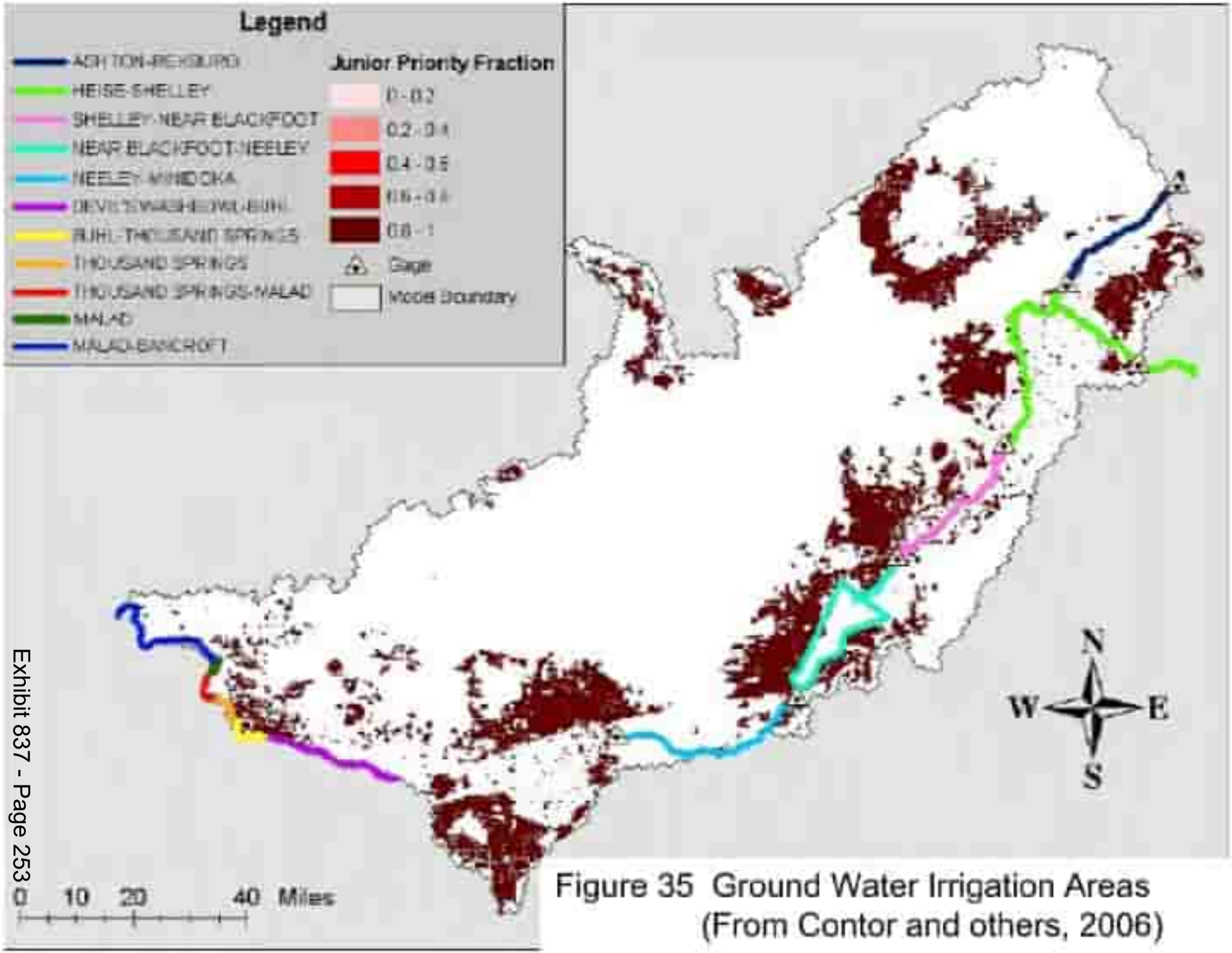

Figure 35 Ground Water Irrigation Areas
(From Contor and others, 2006)

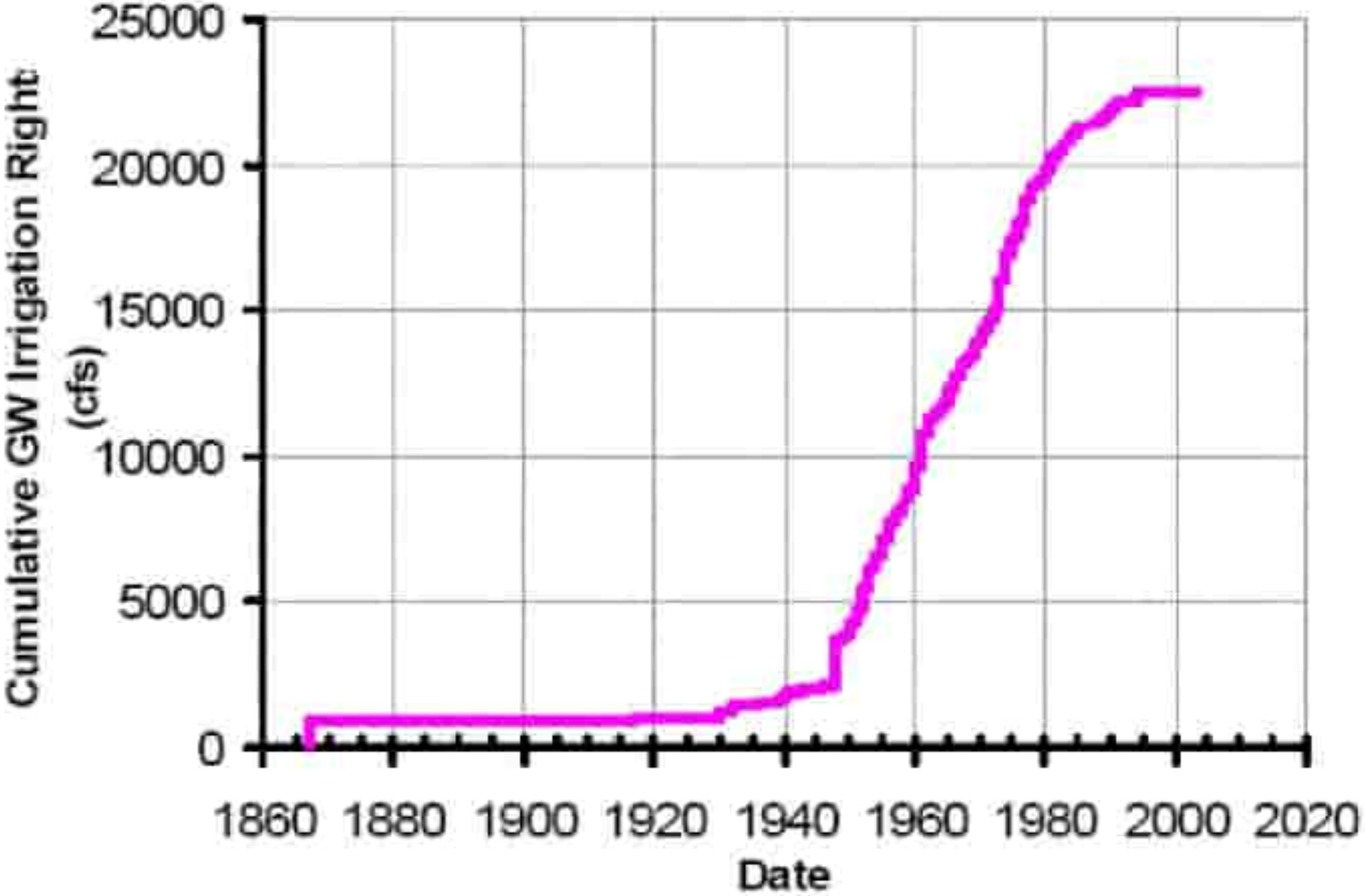

Figure 36 Ground-Water Priorities on the Eastern Snake River Plain (from Contor and others, 2006)

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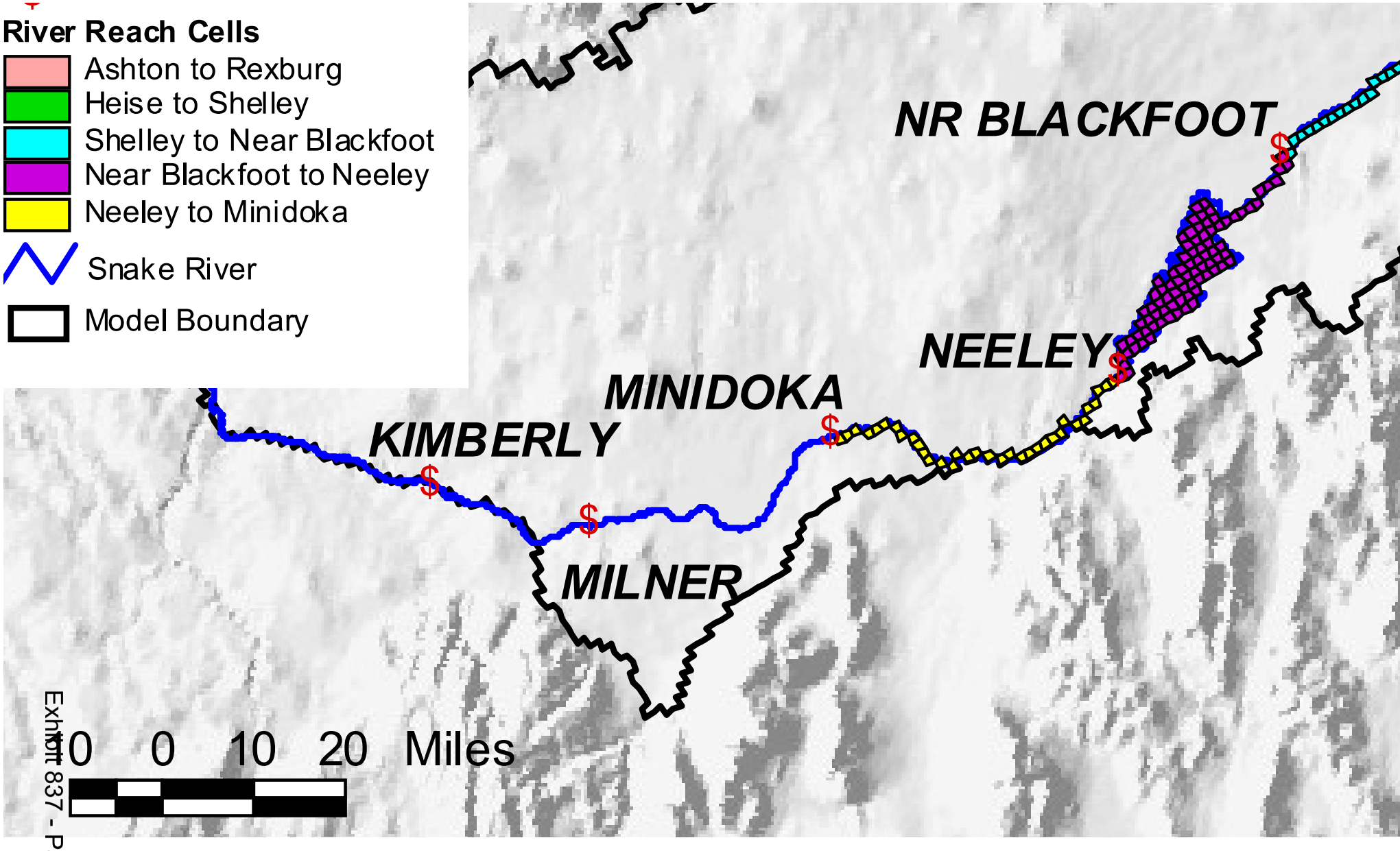

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Figure 37 Location Map for River Reach Cells in the Near Blackfoot to Neeley Reach (from Cosgrove and others 2006)

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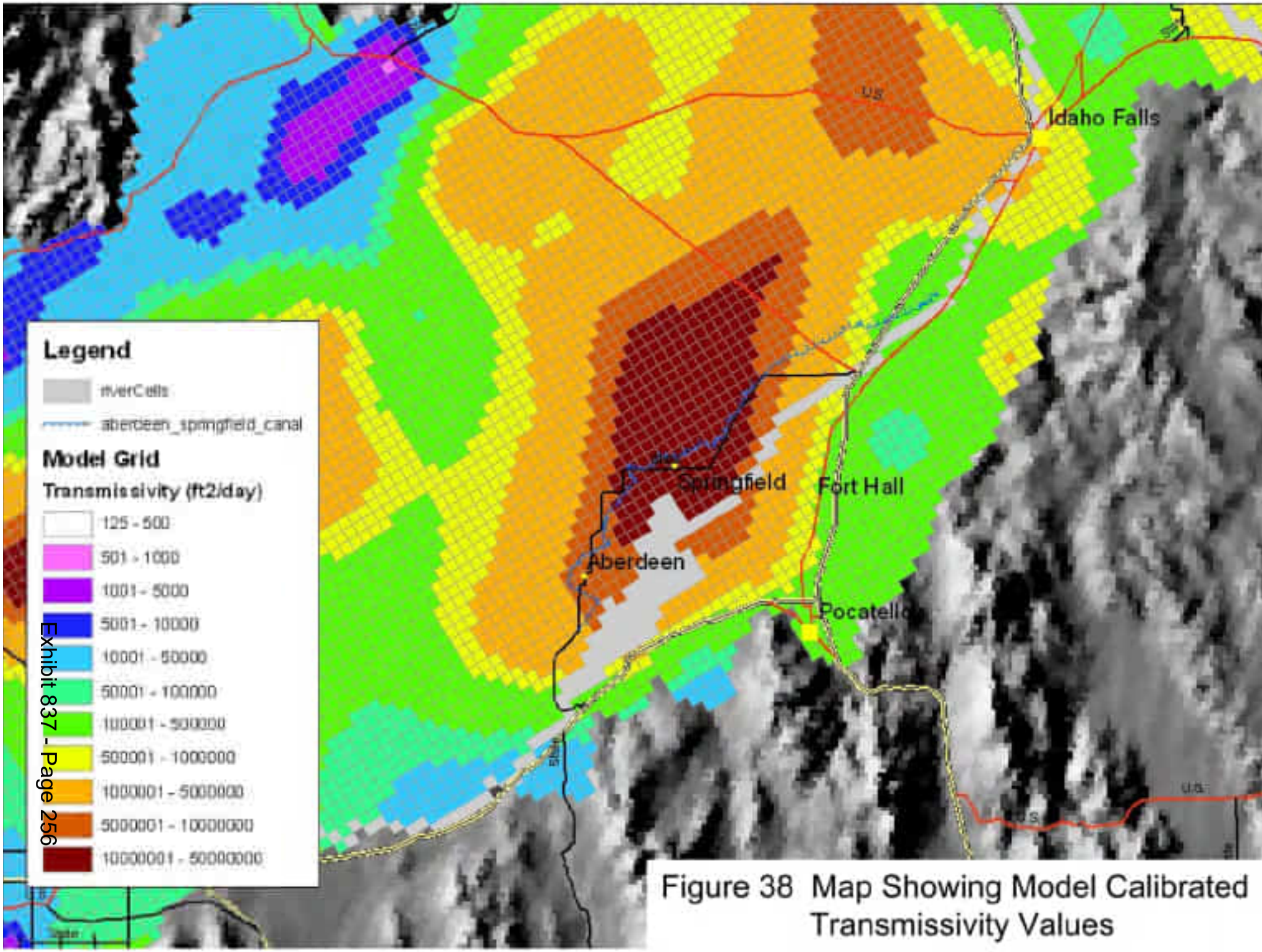

Figure 38 Map Showing Model Calibrated Transmissivity Values

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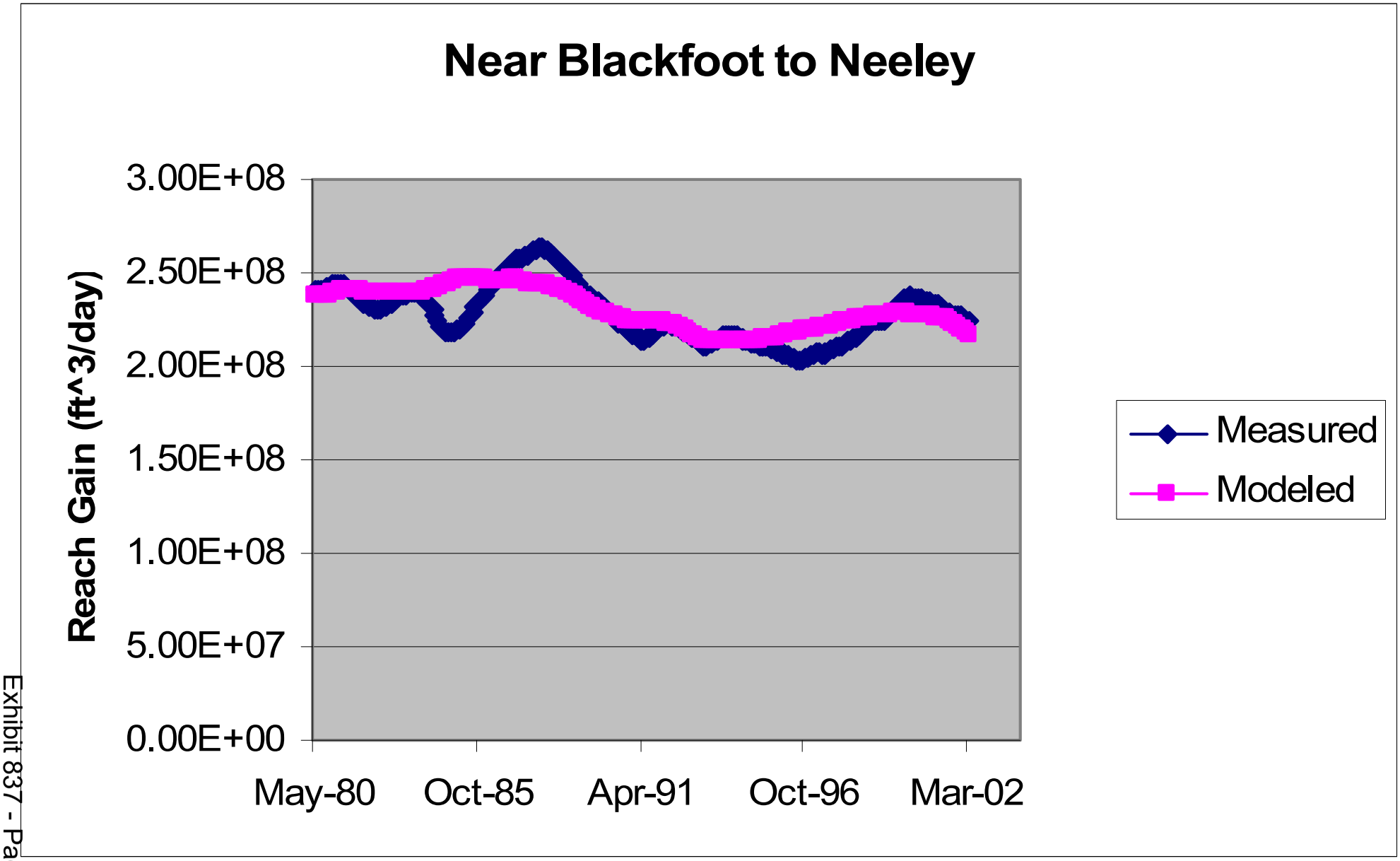

Figure 39 Modeled Versus Observed Gain for the Near Blackfoot to Neeley Reach (from Cosgrove and others 2006)

EXPERT REPORT

Hydrology, Water Rights, and Groundwater Modeling Evaluation of the Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("Fifth Methodology Order") and the Final Order Regarding April 2023 Forecast Supply ("April 2023 As-Applied Order") issued April 21, 2023, in the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of the Surface Water Coalition

Prepared For Racine Olson, PLLP

On behalf of

Idaho Ground Water Appropriators, Inc.

May 30, 2023

Submitted To:

Idaho Ground Water Appropriators, Inc. (IGWA)
Attention: T.J. Budge, General Counsel

Submitted By:

Lynker
Sophia C. Sigstedt, Senior Hydrologist, PH-GW
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301



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1 Introduction

This report has been prepared on behalf of the Idaho Groundwater Appropriates Inc., ("IGWA") in connection with the *Fifth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fifth Methodology Order*") and the *Final Order Regarding April 2023 Forecast Supply* ("*April 2023 As-Applied Order*") issued by the Director of the Idaho Department of Water Resources ("IDWR" or "Department") on April 21, 2023.

The *Fifth Methodology Order* defines the process and calculations utilized by the Director to predict material injury incurred by the Surface Water Coalition ("SWC"). The SWC comprises A&B Irrigation District ("A&B"), American Falls Reservoir District #2 ("AFRD2"), Burley Irrigation District ("BID"), Milner Irrigation District ("Milner"), Minidoka Irrigation District ("MID"), North Side Canal Company ("NSCC") and Twin Falls Canal Company ("TFCC"). The *April 2023 As-Applied Order* implements steps 1-3 of the Fifth Methodology Order to the conditions in existence at the beginning of the 2023 irrigation season.

The SWC entities divert surface waters of the Snake River at Minidoka Dam and Milner Dam. In 2005, the SWC filed a petition ("delivery call") with the Director seeking curtailment of junior-priority ground water rights that allegedly cause depletions of the Snake River and material injury to the SWC. The petition is governed by IDWR's Rules for Conjunctive Management of Surface and Ground Water Resources ("Conjunctive Management Rules) (IDAPA 37.03.11).

After an evidentiary hearing held in 2008, the hearing officer issued an *Opinion Constituting Findings of Fact, Conclusion of Law and Recommendations* on April 29, 2008 ("Hearing Officer Recommendation"). On September 5, 2008, the Director issued a final order in this matter ("2008 Final Order"), in which he ruled on all issues raised at the hearing with the exception of stating his methodology for determining material injury to the SWC reasonable in-season demand ("RISD") and reasonable carryover. On April 7, 2010, the Director issued the *Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("First Methodology Order")* setting forth the methodology for calculating material injury to RISD and reasonably carryover. A series of amendments to the First Methodology Order were made in subsequent years.

From 2016-2022, the Director administered water rights under the *Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Fourth Methodology Order*"). On April 21st, 2023, the Director issued the *Fifth Methodology Order.* This expert report addresses changes made to the methodology in the *Fifth Methodology Order*, as well as the implementation of the new methodology in the *April 2023 As-Applied Order*, in preparation for a hearing currently scheduled for June 6-10th, 2023, concerning these orders.

In forming my opinions I have relied on review of the First Methodology Order and subsequent amendments thereto, my participation in the SWC Methodology Technical Working Group (TWG) meetings held by the Department in 2015 and 2022, my participation since 2012 as a member of the Eastern Snake Hydrologic Modeling Committee (ESHMC) which gives technical support to the Department on the development of the Eastern Snake Plain Aquifer Model (ESPAM), and my professional expertise as a hydrologist and groundwater modeler. I have examined maps and cross-sections of portions of the Eastern Snake Plain Aquifer (ESPA) and tabulations and diagrams of ESPA water rights, and I have drawn upon my accumulated knowledge of the water rights and hydrology of

the ESPA. To the extent that other information becomes available, the Director or the Department modifies any information presented, or new analysis and information becomes available, I reserve the right to modify or expand upon my opinions related to this case.

1.1 Report Organization

This report is organized into 5 sections, beginning with this introduction. Section 2 presents analysis and opinions related to the Fifth Methodology and the April 2023 As-Applied Order, including components of the RISD calculation involving irrigated acres, baseline year, and reasonable carryover. Section 3 discusses the simulation of curtailment of junior groundwater rights using the ESPAM model, including background and overview of the ESPAM model development, calibration, uncertainty, and recommendations for its application in the Fifth Methodology Order. Section 4 is a summary of my conclusions, and section 5 presents sources of information relied upon for my analysis.

2 Director's Methodology and As-Applied Order

2.1 Reasonable In-Season Demand (RISD)

2.1.1 Background

The First Methodology Order laid out the Director's methodology for determining material injury to SWC's Reasonable In-Season Demand (RISD) and Reasonable Carryover. The First Methodology Order provides a brief overview of the methodology for RISD starting with paragraph 11, explaining that material injury is the product of the SWC's predicted water supply and predicted water demand stating:

> In-season demand shortfalls will be computed by taking the difference between the RISD and forecast supply ("FS"). Initially RISD will be equal to the historic demands associated with a baseline year or years ("BLY") as selected by the Director, but will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions. The above description is represented by the following equation:
>
> In-Season Demand Shortfall = RISD – Forecast Supply (FS)

In April, at the start of the irrigation season, RISD is determined solely by the BLY. As the irrigation season progresses, weather and canal system operations are taken into account to make adjustments to RISD according to the following equation:

$$(1)\ RISD_{milestone\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p_j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{milestone\_x}$ = reasonable in-season demand at specified evaluation milestones during the irrigation season,
CWN = crop water need for month, j
E_p = baseline project efficiency for month j,
BD = baseline demand for month j,
j= index variable , and
m= upper bound of summation, equal to the month calculation occurs, where April =1, May =2, … October -7

Crop Water Need ("CWN") is the project-wide volume of irrigation water required for crop growth as calculated by the following equation:

(2) $CWN = \sum_{i=1}^{n}(ET_i - W_e)A_i$

Where:

CWN= crop water need,
ET_i= consumptive use of specific crop type,
W_e= estimate effective rainfall,
A_i= total irrigated area of specific crop type,
I= index variable representing the different specific crop types grown within the irrigation entity, and
n=upper bound of summation equal to the total number of different specific crop types grown within the irrigation entity.

2.1.2 Irrigated Acres

2.1.2.1 Background on Irrigated Acres

For the purpose of water rights administration, the Hearing Officer stated in the Hearing Officer's Recommendation at page 53 states: "Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members." This recommendation was adopted in the 2008 Final Order, and was sustained on appeal. Accordingly, the First Methodology Order, paragraph 25 states:

> Estimates of irrigated acres from the hearing show a trend of decreasing irrigated acreage. R. Vol. 28, 5205-15; R. Vol. 37 at 7100. According to the Hearing Officer, beneficial use cannot occur on acres that have been hardened or are otherwise not irrigated. R. Vol. 37 at 7100.

2.1.2.2 2015 TWG regarding Irrigated Acres

On January 30, 2015, the Director instructed Department staff to convene a committee to recommend specific technical changes to the *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-season Demand and Reasonable Carryover ("*Second Methodology Order") issued June 23, 2010. The Director requested improvements to the following components of the methodology:

1) Revising natural flow forecast methods for Twin Falls Canal Company.
2) Identifying more accurate and current crop data to determine crop water need.
3) Improving the mid-season reasonable in-season demand forecast.

In response, Department employee Matt Anders gave a presentation on February 19, 2015, to outside consultants, referred to as the Technical Working Group ("TWG"), titled *Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Irrigated Acres for SWC Members*. Table 2-1 shows the actual irrigated acres of each SWC entity presented to the TWG. The TWG was also provided a spreadsheet titled "DS_RISD Calculator_2014" with data used to

calculate the DS and RISD which included a summary of irrigated acres utilized in Protocol Calculations as shown in Table 2-2.

The acreage figures shown for BID, MID, and TFCC reflect the evidence that Scott King with SPF Water Engineering[1] provided at the evidentiary hearing in 2008 which analyzed hardened acres. It was my understanding in 2015 that these would be the irrigated acres used in the Methodology Order. However, my recent review of the Department's RISD calculation spreadsheet indicates that these acres were only applied to calculations 2000-2014. Note that the Methodology was not adopted until 2010 but the Department's RISD calculation sheet includes a hindcast starting in 2000.

In the Department staff presentations to the 2015 TWG it was made clear that the Department had not adopted any type of process for reviewing the irrigated acre figures reported annually by the SWC. Consequently, there was no incentive for SWC entities to keep an accurate accounting of irrigated acres, and few SWC entities provide annual updates to their irrigated acreage figures; most simply report that there has been no change in irrigated acreage. To ensure that the Department does not include non-irrigated acres in its calculation of RISD, I submitted comments to the TWG in 2015 stating that irrigate acres should by verified using satellite and/or aerial imagery. A copy of my comments in 2015 is included as ATTACHMENT A.

Table 2-1. Summary of SWC irrigated acres 2015 TWG.

SWC Member	2005-2007 SPF	2012 Partial Decrees	2013 SWC Submitted Shapefiles	2013 RISD
A&B		14,637 (2006 PD= 15,924)		15,924
AFRD2		62,361		62,361
Burley	44,715	47,643	46,084	44,715
Milner		13,335		13,335
Minidoka	70,144	75,093	74,112	70,144
NSCC		154,067		154,067
TFCC	183,589	196,162	194,778	183,589

[1] SPF (2007), *Estimate of Non-Irrigated Acres within the Twin Falls Canal Company Service Area*, prepared for IGWA

Table 2-2. Summary of irrigated acres utilized in protocol calculations.

Summary of Irrigated Acres Utilized in Protocol Calculations

Member ID	Area of Surface Water Irr (ac)	Year Acreage Established	Reference Document
AFRD2	62,361	5/11/2006	Director's Report
A&B*	15,924	5/11/2006	Director's Report
Milner	13,335	5/11/2006	Director's Report
Minidoka	70,144	12/29/2005	Exhibit 4300 Claimed POU Analysis (BID, TFCC, NSCC),Table 6 [15], SPF - 12/29/05
BID	44,715	12/29/2005	Exhibit 4300 Claimed POU Analysis (BID, TFCC, NSCC),Table 6 [15], SPF - 12/29/05
TFCC	183,589	3/20/2007	Exhibit 4310 Estimate of Non-irrigated acres w/in the TFCC Service Area, Table 10 [25], SPF - 3/20/07
NSCC	154,067	5/11/2006	Director's Report

*For A&B the "area of surface water irr" value (15,924 ac) includes 1,176 enlargement acres that were included in the Department's recommendation.

Among the documents produced by the Department in connection with the upcoming hearing concerning the Fifth Methodology Order is a document titled *"DRAFT_SWC_Mapping_Procedures_Revised_Nov2014_v2_matt"* which appears to have been created in preparation for the 2015 TWG. The stated purpose of the document is to map the irrigated land for each of the seven SWC entities and establish a procedure for reviewing irrigated lands data submitted by SWC entities and for utilizing irrigated lands data developed by IDWR if SWC members do not submit irrigated lands data. The document indicates that irrigated lands data developed by IDWR will be used if SWC members do not submit irrigated lands data. It further indicates that as of October 2014, the latest irrigated lands data is from 2010. The document identifies information that may be utilized to identify actual irrigated acreage including the Place of Use (POU) of water rights with surface water as a source, POU of water rights with groundwater as a source, and the most recent Crop Data Layer (CDL) developed by USDA NASS which is released January for the previous year.

Under "Background Information" the document notes that irrigated lands data is not submitted by SWC members on an annual basis. That the last data for BID, MID, and TFCC is from 2013, and it does not indicate whether the source is surface water, groundwater, or mixed source. The document notes that the irrigated acres can change slightly from year to year because of permissible POU but that these should be minor changes. It also recommends that supplemental groundwater use be addressed, identifying the GIS 2006 groundwater and mixed source data layer used in ESPAM as a potential source of such information.

Consistent with this document, the irrigated acreage information in Table 2-1 was presented to the 2015 TWG with the inference that it would be utilized in the RISD component of the methodology. The use of the CDL USDA NASS data for crop mix was also presented and recommended by Department staff for incorporation in the RISD calculation. Department staff ultimately determined there was insufficient time for the committee to evaluate supplemental groundwater use given the extremely compressed timeframe of the 2015 TWG.

2.1.2.3 2022 TWG regarding Irrigated Acres

In a status conference held August 5, 2022, the Director issued a directive to Department staff to convene a TWG to review and provide comments on potential technical changes to the Fourth Methodology Order. Department staff were again tasked with RISD refinements, and Department staff presented some of their analysis on the differences between the current RISD method for CWN employing USDA NASS CDL data compared to Near Real Time METRIC (Mapping EvapoTranspiration at high Resolution and Internalized Calibration).

On November 17, 2022, Department staff gave a presentation on Near Real Time METRIC which included, as slide 6, an outline of the current method for calculating CWN, including "Remove non-irrigated land from CDL using the IDWR Irrigated Lands Dataset." Near Real Time METRIC provides a high-resolution data set that documents irrigated acreage in "near real time," making accurate irrigated acreage data available from the previous irrigation season and potentially in the current season.

However, in a subsequent presentation given on December 1, 2022, titled *Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time Metric*, the acreage information shown in Table 2-3 was presented.

Table 2-3. Summary of SWC irrigated acres 2022 TWG.

SWC Member	Shapefile Acres	If Removed Non-Irrigated Acres with 2011 Irrigated Lands Dataset (IDWR)	If Removed Non-Irrigated Acres with 2017 Irrigated Lands Dataset (IDWR)	NRT METRIC Processing Acres 2021 (IDWR)	Methodology Acres
A&B	21,976 (PPU, 2010)	21,585	21,634	21,625	15,924 (SRBA Partial Decree)
AFRD2	69,279 (PPU, 2010)	68,368	66,606	68,384	62,361 (SRBA Partial Decree)
Burley	46,035 (SWC, 2013)	44,113	44,168	44,139	46,035 (SWC, 2013)
Milner	14,844 (PPU, 2010)	13,239	13,202	13,233	13,335 (SRBA Partial Decree)
Minidoka	75,340 (SWC, 2022)	71,295	72,016	71,073	75,340 (SWC, 2022)
NSCC	224,463 (PPU, 2010)	220,935	218,498	220,937	154,067 (SRBA Partial Decree)
TFCC	194,732 (SWC, 2013)	179,486	180,956	179,456	194,732 (SWC, 2013)

It became clear from this presentation that since 2015 the Department has not utilized the most accurate irrigated acreage data to calculate RISD, but has instead utilized the lesser of either the decreed acreage or the acreage reported by SWC, without making any effort to insure that non-irrigated acres are not being accounted for in the IDWR's calculation of RISD. The Department's RISD calculation sheet show that the "Methodology Acres" from Table 2-3 are used in calculation of CWN 2015-2022.

Department staff could not explain why the more accurate and reliable acreage data was not being used in the methodology.

Every technical analysis of irrigated acres consistently shows that TFCC is irrigating approximately 15,000 acres less than the 194,732 acre figure that TFCC reports to IDWR as being irrigated. The expert report of SPF Water Engineering submitted in 2008, IDWR's irrigated lands data sets from 2011 and 2017, and Near Real Time METRIC data from 2021, consistently demonstrate actual irrigated acreage of approximately 180,000 acres. (The IDWR irrigated lands data sets and Near Real Time METRIC are discussed further below.) It is clear that the Department is not using the best science available to determine irrigated acres in the Fifth Methodology Order, relying instead on outdated acreage figures provided by the SWC entities.

2.1.2.4 IDWR's High Resolution Irrigated Lands Dataset

The IDWR has invested years of time and staff to produce a large archive of high-resolution irrigated lands data. IDWR's Irrigated Lands dataset is a three-class land-use classification including irrigated, semi-irrigated and non-irrigated areas. This data set was developed at the request of the ESHMC. It is used to calculate the ET and consumptive use components that make up one of the most important input parameters to the ESPAM. Irrigated lands acreage, as defined by the IDWR Irrigated Lands dataset, directly affects the volume of evapotranspiration (ET) in the ESPAM model. Similarly, irrigated acreage directly affects the volume of ET used to calculate RISD.

IDWR's Irrigated Lands data set utilizes satellite imagery, National Agricultural Imagery Program (NAIP) imagery, Digital Orth Photo Quadrangle (DOQQ) imagery, and other in-house, scanned aerial imagery for determining irrigation status. Attribute assignment for the irrigation status (irrigated, non-irrigated, and semi-irrigated) is determined using satellite imagery. Landsat and Sentinel Imagery provides the analyst the ability to monitor ground, moisture, and vegetation conditions over the entire growing season. Hand digitizing field boundaries using the satellite data and imagery produces a very accurate and precise depiction of irrigated acres.

In conjunction with the image data, IDWR analysts use Common Land Unit (CLU) polygons of individual fields that were digitized from the National Agricultural Inventory Program (NAIP) imagery by the Farm Services Administration (FSA). IDWR uses the unattributed CLU polygons because they are an existing, recent, highly-detailed, vector dataset the IDWR could attribute easily as irrigated or non-irrigated. These polygons were then hand edited when IDWR began working with the CLU data. IDWR then goes through a three-step classification (Figure 2-1) where step 1) used Landsat satellite data, 2) used a combination of Landsat and NAIP digital photography, and 3) used NAIP photography and CLU data.

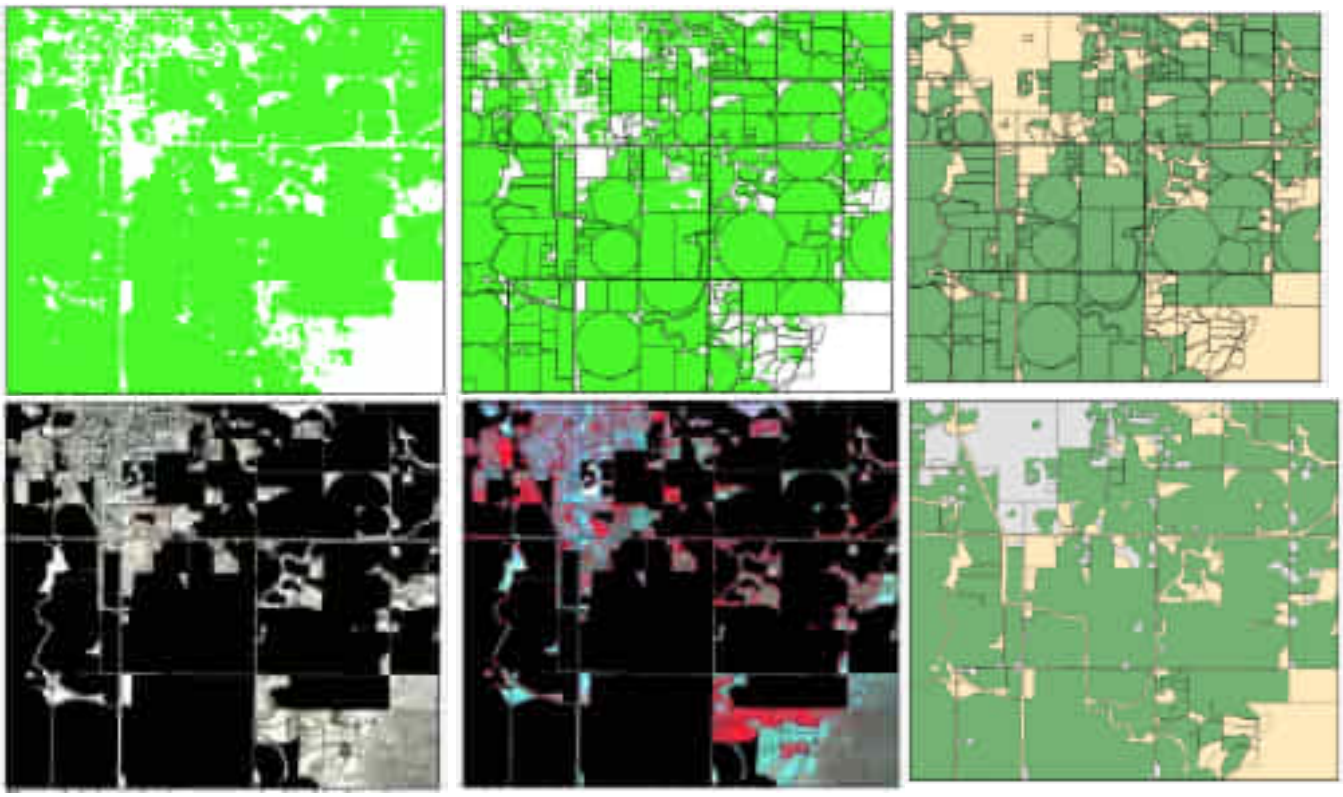

Figure 2-1: Sequence of IDWR Irrigated Land dataset processing from top left to bottom right 1)initial landsat-based classification out, 2) Landsat output with CLU polygons superimposed, 3) initial CLU polygon classification from irrigated (green) or non-irrigated based on 75% or greater rule, 4) irrigated polygons masked to black and superimposed on NAIP image, 5) irrigated polygons masked black and superimposed on Landsat data, 6) final edit classification with irrigated in green, non-irrigated in beige, and semi-irrigated (residential) in gray. (Source 2006 Irrigated Land Classification for the Eastern Snake Plain Aquifer Model, IDWR)

IDWR Irrigated Lands data sets for the ESPA include 1986, 1996, 2000, 2002, 2006, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, and 2017 (Wilkins, 2022). Department staff have reported that the Irrigated Lands data set 2021 could be complete by next year.

2.1.2.5 IDWR METRIC Dataset

IDWR and the University of Idaho worked under a NASA grant to develop the procedures to map ET from satellite data (Landsat) for water resources applications. The METRIC energy balance model was developed to compute and map ET using Landsat images. Dr. Rick Allen, Dr. M. Tasumi, and Dr. R. Trezza, of the University of Idaho, developed METRIC by making refinements to the Surface Energy Balance Algorithm for Land (SEBAL). Landsat measures visible, near-infrared, and thermal infrared radiation and has a pixel size small enough to map individual agricultural fields. METRIC also incorporates USBR AgirMet weather data into the modeling process. IDWR uses METRIC data (in years it is available) to calculate the ET rate for the ESPAM model (Figure 2-2). METRIC ET maps for eastern southern Idaho have been generated for 1986, 1996, 2000, 2006, 2008, 2009, 2010, 2011, 2013, 2016, 2017 and 2018. The partnership is also responsible for the NRT METRIC processing for 2019, 2020, and 2021.

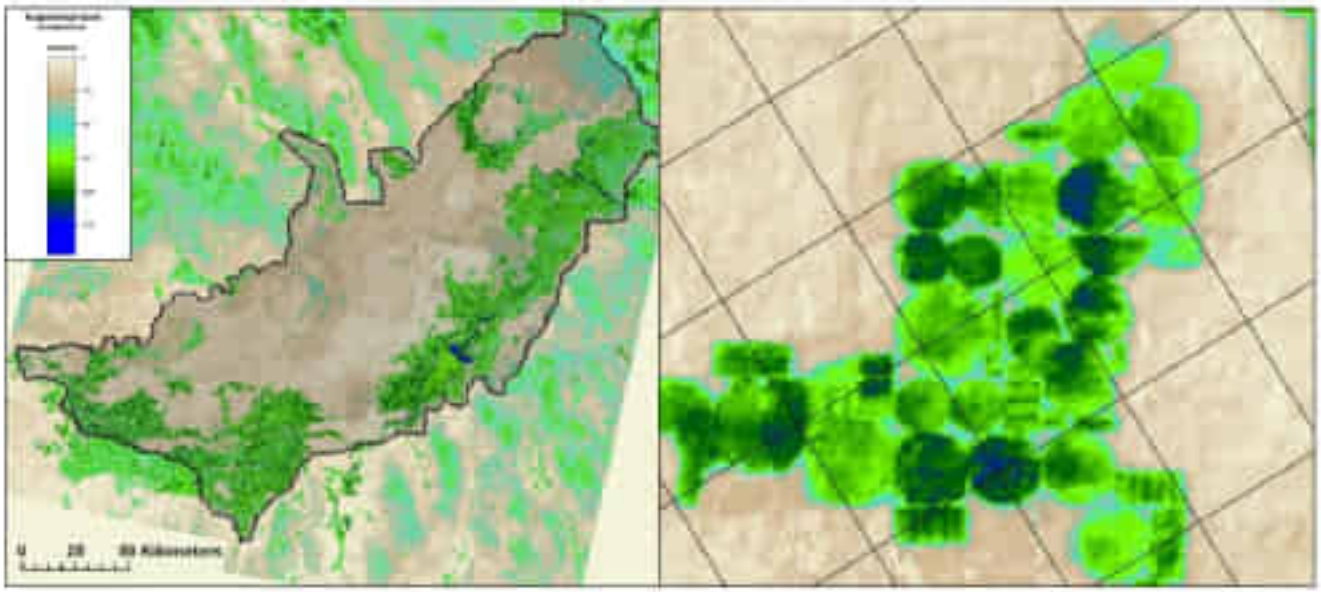

Figure 2-2: Example of seasonal 2002 METRIC ET within the ESPAM boundary (close up on the right). Each model grid cell is one square mile (Source IDWR Mapping Evapotranspiration; Hydrological Modeling https://idwr.idaho.gov/gis/mapping-evapotranspiration/).

2.1.2.6 Conclusions Regarding Irrigated Acres

The presentation by IDWR staff in November 2022 regarding NRT METRIC application revealed a significant shortcoming in the Fourth Methodology Order in that SWC irrigated acre datasets sometimes represent service areas as opposed to the actual irrigated land. If non-irrigated acres are to be excluded in calculating RISD, the Department should implement a review process in Step 1 of the Methodology Order that compares the irrigated acreage figures reported by SWC entities with the irrigated acreage data in the most recent Irrigated Lands data set and METRIC data. In any case, the Department should use the most accurate and reliable source of irrigated acreage data to calculate RISD in the Methodology Order.

As mentioned above, the most recent Irrigated Lands data set and the most recent METRIC data show that actual irrigated acreage within TFCC is approximately 15,000 acres less than the 194,732 acre figure that TFCC reports as irrigated. If the NRT METRIC acreage figure of 179,456 irrigated acres is utilized in the Department's RISD calculation sheet for 2022, the "Actual November Shortfall" calculated is reduced by 84,732 acre-feet (af). This underscores how critical it is that IDWR use care to identify actual irrigated acreage and calculate RISD based on actual irrigated acreage.

The Department's use of outdated irrigated acreage data highlights another problem of the Methodology Order relying on inferior data. The ESPAM is considered the best science available, and it utilizes the IDWR Irrigated Lands datasets and METRIC to calculate ET along with PRISM (Parameter-elevation Relationships on Independent Slopes Model) for precipitation. By contrast, in addition to using outdated irrigated acreage data, the Methodology Order uses an outdated approach with CDL data for crop mix, and Agrimet station data for the ET rate and precipitation. The ESPAM model also uses IDWR's determination for mixed sources lands where a groundwater fraction is applied on lands that have been designated as irrigated by both surface water and groundwater. The Fifth Methodology Order does not distinguish mixed source lands.

2.1.3 Baseline Year

In the First Methodology Order the BLY is characterized as a year or group of year(s) where water demands and water supplies can be used to as a benchmark to predict water demands in the current year at the start of the irrigation season. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the actual water conditions for the irrigation season. The BLY selection criteria were based on three factors 1) climate, 2) available water supply, and 3) irrigation practices, to ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

BLY selection criteria concerning available water supply include above-average SWC diversions (Figure 2-3) and available SWC supply (Figure 2-4). BLY criteria concerning climate include above-average evapotranspiration (ET) (Figure 2-5) and Growing Degree Days (GDD) (Figure 2-6), both of which are a function of temperature, and below-average precipitation (Figure 2-7) to ensure the increased diversions in that year(s) were a function of crop water need (CWN) and not other factors. To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. Id. at 7096.

These BLY selection criteria have been carried through from First Methodology Order to the Fifth Methodology Order; however, the BLY selected as the benchmark changed in the Third Methodology Order and the Fifth Methodology Order.

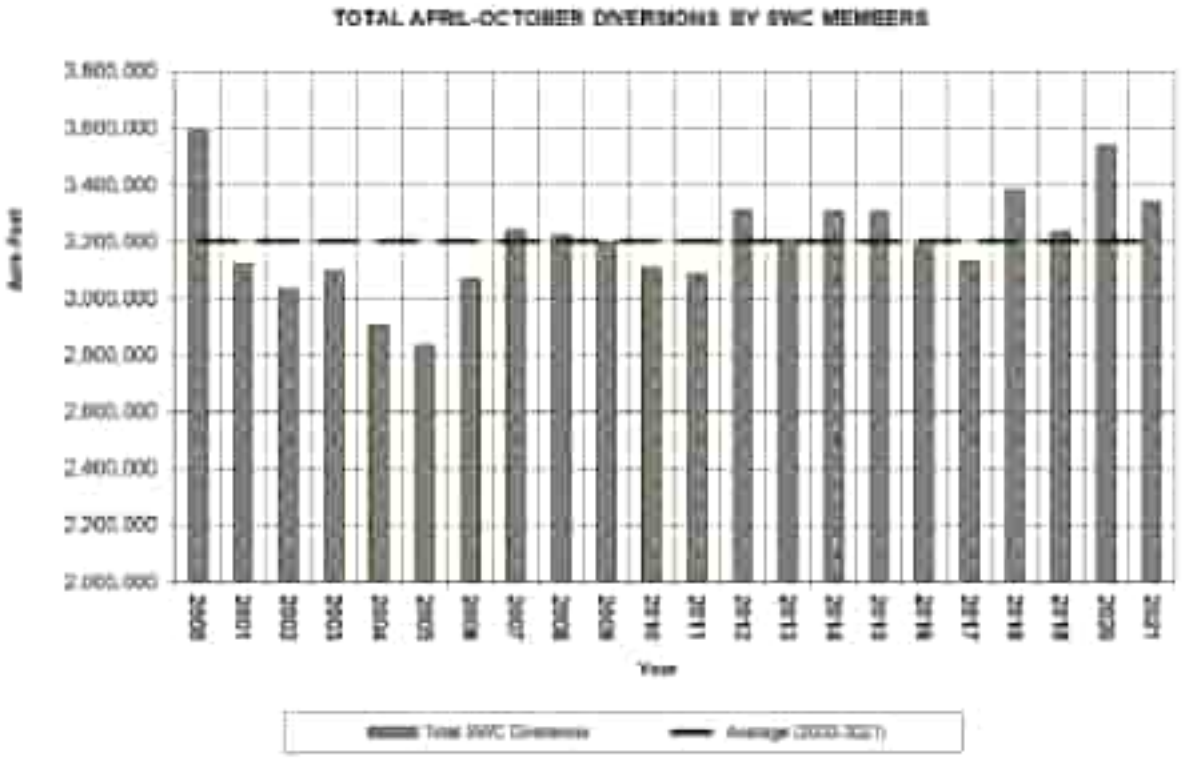

Figure 2-3. *Total SWC April-October Diversion 1992-2021.*



Figure 2-4. *The sum of the Heise natural flow and the storage allocation for the Snake River above Milner 1992-2021.*

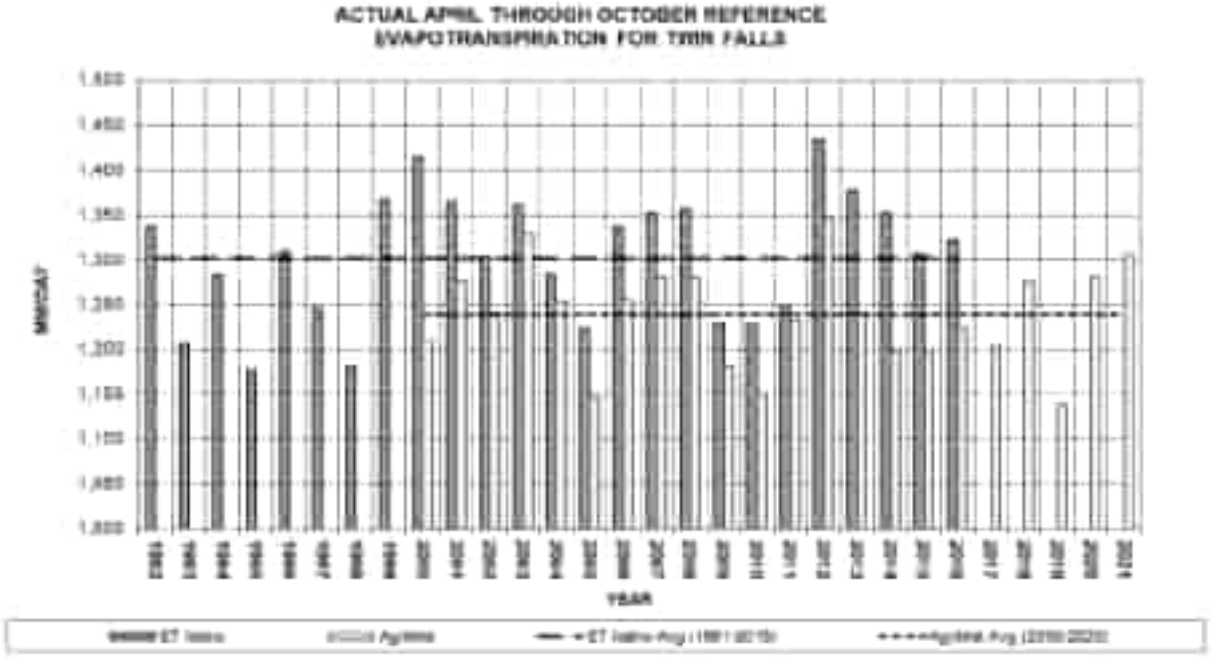

Figure 2-5. Reference ET for Twin Falls (Kimberly) with both AgriMet and ETIdaho data 1992-2021.

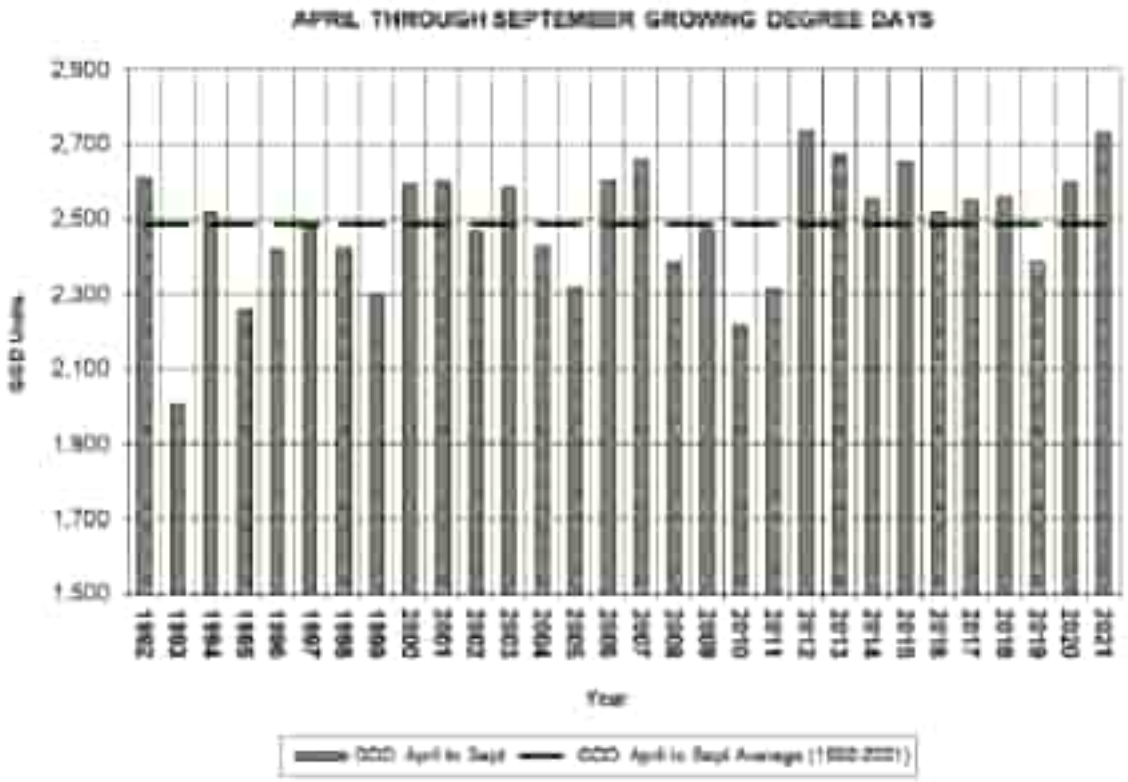

Figure 2-6. *Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1992-2021.*

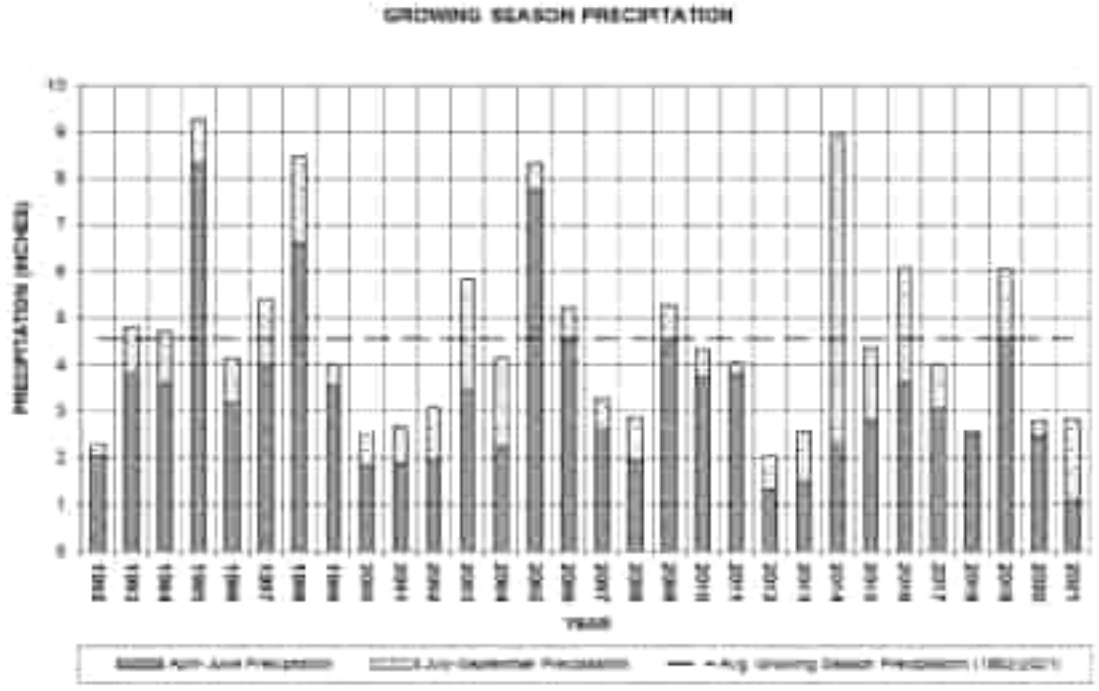

Figure 2-7. *Growing Season Precipitation at National Weather Service's Twin Falls Weather Station 1992– 2021.*

2.1.3.1 BLY First Methodology Order

In the First Methodology Order, paragraphs 27 and 28, found that "from the standpoint of total annual SWC diversion volumes, 2006 is an appropriate BLY with 97% of 2000-2008 total SWC diversion". The Director found that it would also be appropriate to use the values of 2006 and 2008 (06/08) to arrive at an average BLY that more strongly fits selection criteria for all members of the SWC. The First Methodology Order determined 06/08 as the appropriate average of years for the BLY selection. The 06/08 average is 100% of the average for 2000-2008 total SWC entity diversions. Both 2006 and the 06/08 average were determined to be appropriate BLYs.

They are appropriate because they are both so close to the BLY selection criteria averages, it is not necessary to make a determination with bias beyond that. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the particular water conditions for the irrigation season. The average for the BLY criteria ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

2.1.3.2 BLY 2015 Third Amended Order Determination

In the 2015 Third Amended Final Oder the period of record for consideration of the BLY was extended to 2000-2014. It was found that the 06/08 average no longer met the criteria for the BLY.

The 2015 Third Amended Final Order determined 06/08/12 as the appropriate average of years for the BLY which is 101% of the average 2000-2014 total SWC entity diversions. The Director found that 2012 would also meet the criteria for the BLY which is 105% of the average 2000-2014 total SWC entity diversions. However, the Director found that because 2012 represents the maximum values for some of the BLY criteria during the period of analysis, 2012 is not an appropriate single-year BLY candidate.

In terms of total SWC diversions an 08/12 average for the BLY would have resulted in 104% of the average 2000-2014 SWC entity diversions. The 06/08/12 average (101% of average) appears to be preferred because it is nearer to the average BLY selection criteria for SWC diversions. Again indicating it is not necessary to make a determination with bias beyond that. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the particular water conditions for the irrigation season. The average for the BLY criteria ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

2.1.3.3 BLY 2023 Fifth Methodology Order

In the 2023 Fifth Methodology Order the period of record for consideration of the BLY was extended to 2000-2021. The Department found that as individual years 2018 and 2020 satisfy all the BLY selection criteria. Additionally, the Department found that 2020 ranks as the second-highest year of total diversions for the SWC and is more than one standard deviation above the average for the years 2000-2021. The 2023 Fifth Methodology Order determined 2018 as the BLY which is 104% of the average 2000-2021 SWC entity diversions.

In terms of total SWC diversions the 06/18 average for the BLY would have resulted in 101% of the 2000-2021 average. Based on previous BLY determinations a selection closer to 100% should have been preferred. The difference between 1% and 4% of bias over the BLY selection criteria for total SWC diversions is 32,000 af and 128,000 af, respectively. For TFCC diversions 2018 as the BLY is 106% of average 2000-2021 where 6% bias is 60,000 af, this is almost the entire shortfall determination of 75,200 af determined in the Final Order Regarding April 2023 Forecast Supply. The 2010 and 2015 Orders make clear that this level of bias is not needed to define an appropriate BLY, 97-101% of the BLY selection criteria is adequate. The RISD calculation allows for the BLY to adapt to actual conditions by adjustment up or down depending upon the particular water conditions for the irrigation season. The average for the BLY criteria ensure the BLY is adequate to protect senior water users while providing some level of protection against unnecessary curtailment to the juniors.

A copy of my January, 2023 comments to the Department in response to their recommendations following the 2022 TWG is included as ATTACHMENT B. Some values in my comment letter were estimated from graphics provided to the TWG and have been corrected based on more accurate data below.

2.1.3.4 Conclusions on BLY selection in Methodology Order

IDWR should consider a percent of average for total SWC diversions and select an average of years closer to that of the 06/08 BLY (100%) and 06/08/12 BLY (101%) selected in 2010 and 2015, respectively. The average of diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria (as shown in Table 2-4) and is 101% of total SWC diversion. The BLY of 06/18 has a better technical basis than 2018 as the BLY.

In a hindcast analysis by IDWR staff (ATTACHMENT C), the BLY 2018 causes a huge shift in the type of water year (i.e. wet, average, dry, very dry) where Demand Shortfalls are calculated. The hindcast showed a Demand Shortfall much more frequently in average and even wet years in addition to every dry or very dry year. When you compare the bell-shaped distribution of SWC total diversion demands for the POR 2000-2014 compared to 2000-2021 in Figure 2-8 and Figure 2-9, it is apparent that they are very similar. The average total SWC diversions for the period of record 2000-2014 and 2000-2021 are 3.15 maf and 3.20 maf, respectively. Similarly, the variability in the total SWC diversions for 2000-2014 and 2000-2021, as represented by the standard deviation, are also very close with values of 180,076 af and 178,587 af, respectively. The selection of BLY 2018 translates to a much higher level of bias and is not technically justified given the similarity between mean diversions and the standard deviation for the 2000-2021 POR versus the 2000-2014 POR.

An additional reason for targeting a specific percent of average in line with the average BLY criteria within the POR when establishing a BLY, and for using an average of years (or synthetic diversion volume), is that the process for selection of the BLY otherwise appears arbitrary and subjective. If IDWR staff are presented with multiple years within the POR that fit the criteria for a BLY, and there is no guidance or standard method for selecting a single BLY or average of years, the ultimate selection becomes purely subjective. Using an average of years (or even a synthetic diversion volume) that targets a prescribed percent of average is a more objective and technically defensible process.

Table 2-4. Baseline Year Alternatives and Baseline Year Criteria

BLY Criteria	Avg 2000-2021	BLY Avg 06/18	BLY 2018	BLY 2020
Above Avg SWC diversions	3.20 maf	3.21 maf	3.34 maf	3.54 maf
Above Avg GGD	2526 units	2579 units	2557 units	2597 units
Above Avg ET	1238 mm/d	1265 mm/d	1275 mm/d	1281 mm/d
Blw Avg Precip	4.27 in	3.88 in	2.54 in	2.79 in
Abv Avg SWC Supply	7.45 maf	8.56 maf	9.04 maf	8.22 maf

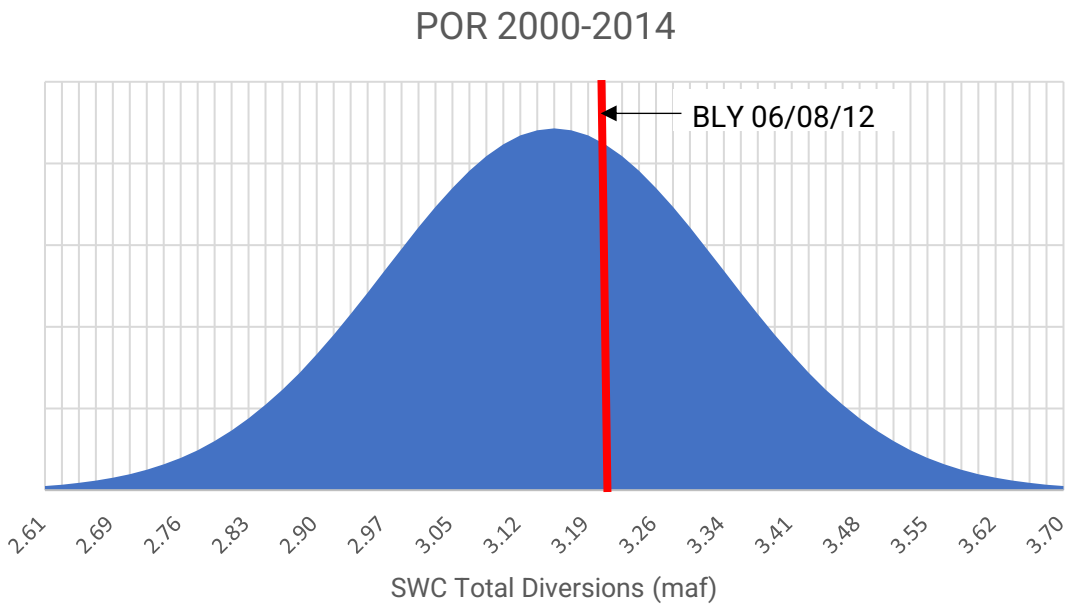

Figure 2-8: Bell Curve of SWC Total Diversion over the POR 2000-2014, the red line shows where the selected BLY 06/08/12 for the 4th Methodology Order falls within the normal distribution.

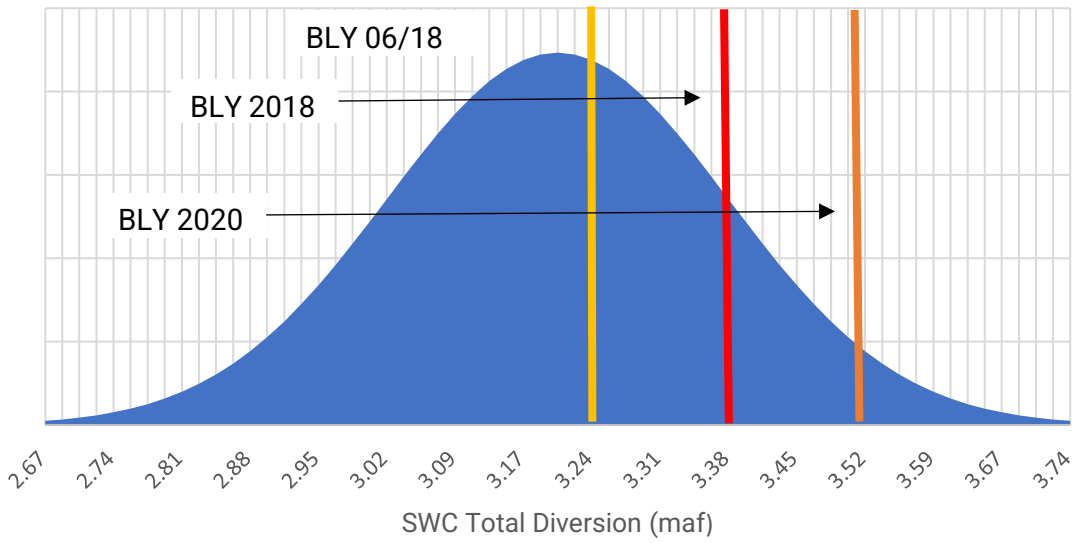

Figure 2-9: Bell Curve of SWC Total Diversion over the POR 2000-2021, the yellow line, red line, and orange line show where the proposed BLY 06/18, 2018 and 2020 falls within the normal distribution, respectively.

Another reason a better alternative would be to use diversion demands for the 06/18 irrigation seasons for the BLY is that there were unique hydrologic circumstances in 2018 that I don't believe represent the typical dry year. The 2017/2018 snowpack was very high and water year forecasts and early season streamflow led to positive water supply forecasts which resulted in a large amount of aquifer recharge in 2018. Department staff acknowledged the technical difficulties in sorting out surface water allocation adjustments like recharge in applying the Methodology Order. In the Department's RISD calculation sheet for "Demand" the table titled "SWC-Monthly Wheeled Water and In-Season Recharge Adjustment Factors (ac-ft)" show the adjustment for recharge and wheeled water. For 2018 there is a note about AFRD2 recharging between 5,000-10,000 af of recharge to MP31 for Magic Valley GWD and the calculation shows only 5,000 af of recharge was accounted for. Additionally IGWA's SWC Settlement Performance Report shows almost 4,000 af of recharge by North Snake GWD through NSCC that is not accounted. This creates a consistent bias of potentially 9,000 af in the application of 2018 as the BLY. This unaccounted for recharge water artificially inflates the 2018 BLY Demand and would directly artificially increase the DS amount calculated in April. The positive water supply outlook in 2018 may have also resulted in less stringent surface water administration and ultimately higher diversions than the crop water need alone would predict.

The BLY criteria concerning precipitation also reveal that 2018 is an extremely low precipitation year. Twin Falls Agrimet station data show the 2018 irrigation season is the only year in the 1992-2021 POR with a zero-precipitation total for July-September and that total irrigation precipitation for 2018 is about one standard deviation below the average. The fact that almost any individual water year will have some unique circumstance is a good reason for continuing to define the BLY based on an average of years as the Methodology Order has previously applied.

2.2 Forecast Supply (FS)

As previously described the shortfall issued in the Methodology Order is the difference between the forecast supply and the forecast demand for each SWC member. The forecast supply has two components: the predicted natural flow supply and the predicted storage allocation for each SWC member. The Department undertakes an April forecast and mid-irrigation season forecast.

2.2.1.1 2015 TWG regarding Forecast Supply

On January 30, 2015 the Director issued an order to staff directing them to convene a TWG to recommend specific changes to the Second Methodology Order. One of the specific recommendations for technical changes was revising the natural flow forecast for Twin Falls Canal Company.

Department staff presented analysis where both single linear regression and multiple linear regression models were considered over the period of record 1990-2013. New multiple linear regression models were recommended to replace existing regression models for TFCC, AFRD2, BID, MID, and NSCC.

In the April forecast for these entities, the final predictor variables selected included the total April through July natural flow in the Snake River near Heise and the total November to March discharge at Box Canyon Springs. Natural flow at Heise is considered a good April predictor of supplied by snowmelt, whereas Box Canyon Springs, was considered by Department staff to be a good indicator for the natural flow supplied by reach gains in the Blackfoot to Milner reach. I disagree with the latter as will be described in a later section.

For the July forecast new forecast models were developed for each SWC member. July natural flow predictors for A&B and AFRD2 are based on Snow Water Equivalent (SWE) Two Oceans Plateau Snotel on July 1. The regressions models for BID, MID, and NSCC include natural flow in Snake River near Heise (April-June), SWE Two Oceans Plateau Snotel on June 15, and March depth to water at well 05S31E27ABA1. I disagree with the use of well 05S31E27ABA1 as will be described in a later section. The predictors in the regression model for TFCC includes Snake River near Heise natural flow (April-June), SWE at Two Oceans Plateau Snotel on June 15, and Spring Creek discharge (January-May).

Table 2-5 shows a summary of all the variables tested in for the linear regression models presented to the TWG in 2015.

Table 2-5. Variables Tested in 2015 Multiple Linear Regression Models

Variable Name	Description	Units
HeiseAprtoJulKAF	**USBR Hydromet Heise Natural Flow April - July**	**KAF**
MarWell1	USGS Well: WL-9S 25E 03CAC1 March depth to water	Feet
MarWell2	USGS Well: WL-2N 37E 02ABA1 March depth to water	Feet
MarWell3	USGS Well: WL-3N 37E 12BDB1 March depth to water	Feet
MarWell4	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
MarWell5	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
RupNovtoMar	Rupert Agrimet Total Precipitation November - March	Inches
TYHEE	USGS 13075910 PORTNEUF RIVER NR TYHEE ID Total Flow November - March	AF
LastYearNF7to9	TFCC Natural flow diversions July - September, lagged by 1 year	AF
SpringCreek11to3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow November - March	AF
SpringCr3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow March	AF
Devils11to3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S Total Flow November - March	AF
Devils3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S total Flow March	AF
Box11to3	**USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow November - March**	**AF**
Box3	USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow March	AF
Briggs11to3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow November - March	AF
Briggs3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow March	AF
TwoOceans71	**NRCS Two Oceans Plateau (837) Snow Water Equivalent on July 1**	**Inches**
HEIAprtoJune	**USBR Hydromet Heise Natural Flow April - June**	**KAF**
SpringJantoMay	**USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow January - May**	**KAF**
NA	NRCS Spring Creek Divide (779) Snow Water Equivalent on July 1	Inches
NA	NRCS Togwotee Pass (822) Snow Water Equivalent on July 1	Inches
NA	NRCS Phillips Bench (689) Snow Water Equivalent on July 1	Inches
2OcTow	Sum of Two Oceans Plateau and Togwotee Pass Snow Water Equivalent on July 1	Inches
Variables in Bold were used in the models		

2.2.1.2 2022 TWG regarding Forecast Supply

In the 2022 TWG the Department presented December 14, 2022 a presentation on an evaluation of the April and July forecast supply models. This presentation was primarily an overview of how the forecast supply models performed 2014-2022 based on their R^2 values. Unlike the 2015 TWG improving the forecast supply models did not seem to be a priority in 2022 and only a very limited analysis concerning potential model improvement was performed. Table 2-6 shows the list of predictors tested in the 2022 TWG, where the only new predictors were two individual wells and the Sentinel Well index, none of which were found to improve the models for which they were tested.

Table 2-6. Variables Tested in 2022 Multiple Linear Regression Models

Variable Name	Description	Units
HeiseAprtoJulKAF	**USBR Hydromet Heise Natural Flow April-July**	**KAF**
Box11to3	**USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow November-March**	**AF**
TwoOceans71	**NRCS Two Oceans Plateau (837) Snow Water Equivalent on July 1**	**inches**
	WELL 02N31E35DCC1 (Mar Avg)	feet
	Sentinel Wells	feet
	WELL 05S31E27ABA1 (Mar 15)	feet
Variables in Bold were used in the models		

Department staff did not make a recommendation on updating April and July regression models to improve their predictive power for natural flow supply. However, the presentation to the TWG on natural flow forecasting models did show the TFCC model is degrading in the R^2 value and has decreased from 0.86 in 2014 to 0.72 in 2022. The degradation is significant in that the R^2 values is an expression of the

explanatory power of the forecast model. The technical information presented to the TWG indicates that a revised natural flow method for TFCC should be evaluated and a recommendation for an improved method should be made. There was not sufficient time during the 2022 TWG or prior to the June hearing to perform the necessary analysis as described in section 2.2.3.

2.2.2 Concerns with Current FS Predictor Variables

The next section 2.2.3 outlines my recommendations for how the natural flow models should be developed and could be improved. Aside from those recommendations I have additional concerns about two of the predictors used in the current regression models.

The first is that Box Canyon spring flows are not representative of groundwater discharge to the near Blackfoot to Minidoka reach. Box Canyon spring discharges to the Snake River along the Kimberly to King Hill reach of the Snake River. A comparison of reach gains between the near Blackfoot to Minidoka and Kimberly to King Hill reach show that spring discharge between the reaches varies in response to changes in precipitation and irrigation practices. The hydrogeologic controls on spring discharge between these reaches are also different. Aside from the fact that groundwater contributes to both spring reaches there is no logical reason that Box Canyon Springs should be representative of gains to the near Blackfoot to Minidoka reach gains.

The second concern is related to the use of well 05S31E27ABA1 as a predictor for reach gains. This is a shallow well located near the American Falls Reservoir and located in an area irrigated using surface water. The well shows a rapid response to surface water irrigation practices (Ralston, 2008). The relationship between canal diversions and observed water levels mean that this is not a good representation of groundwater conditions and more likely correlates with near Blackfoot to Minidoka gains as related to surface water supply.

2.2.3 Recommendations on Improving the Natural Flow Models used in the Methodology

The accuracy of predicting April and July natural flow available to SWC entities is dependent on reasonable predictor variables and maintaining high R^2 values over the period of record. The process for natural flow forecast model revision should be standardized in-terms of defining how frequently a thorough re-evaluation of the predictors and models is done (i.e. 3-yrs, 5-yrs, or if R^2 value drops below a threshold). This should include re-evaluating previously tested predictors over the new POR, as well as, casting a new net of total predictors for consideration by the TWG.

The standardized process should include a multicollinearity analysis to screen out variables selected to be predicted that are correlated with one another followed by something like a stepwise regression analysis used to select the most suitable model structure for predicting natural flow.

There was not time for Lynker to perform a proper analysis to demonstrate if there are more accurate models to consider in the natural flow predictions. If time had allowed Lynker would have performed something similar to the following process.

Data collection is the first step in the process. Natural flows are largely controlled by natural hydrologic processes often starting in the sub-alpine and alpine environments. Processes include snow accumulation, evapotranspiration, runoff generation, groundwater flows, and subsurface filling/spilling of subsurface storage. Many data sets exist to describe the hydroclimatic state of water supply and demand in areas that ultimately impact the generation of natural flow.

However, it is difficult to objectively select which predictor variables should be included in a linear regression model. If too few predictor variables are selected, there is a risk of not accounting for an unforeseen control on natural inflows. On the other hand, if too many predictor variables are selected, there is a risk of over-fitting the model, which degrades a model's predictive fidelity. To circumvent this challenge, I propose using stepwise linear regression analysis to construct parsimonious models for the specific SWC entities.

A stepwise linear regression analysis is a regression technique whereby explanatory variables are selected by an automatic procedure that culminates in a parsimonious model that includes only the most important explanatory variables. Provided a list of uncorrelated candidate predictor variables, stepwise linear regression analysis starts with a "maximal" model, which includes all candidate variables. The analysis iteratively removes variables whose omission results in the most statistically insignificant deterioration of the model performance. The Akaike Information Criterion (AIC) is used to objectively quantify the significance variable omission. The variable omission process stops when all predictor variables in the model are statistically significant. Stepwise linear regression analysis is a data-driven approach to construct predictive models and test the utility of additional natural flow predictor variables.

Lynker's technical memorandum included as addendum to IDWR staff recommendations in 2015 laid out an alternative forecast model approach that I continue to think should be further investigated. A better approach would use forecasted flow at Heise or some alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC. The technical basis for this suggestion is that water rights administration creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This is likely the reason it is difficult to find a high performing regression model for TFCC.

2.3 Reasonable Carryover

Reasonable Carryover is defined as the difference between the BLY demand and projected typical dry year supply. Reasonable Carryover = BLY Demand – Projected Supply (based on a typical dry year)

The Heise natural flow for the years 2002 and 2004 are well below the long-term average (1992-2021) but not the lowest years on record as shown in Figure 2-4. The percent of average for these years rank very similarly when comparing the period of record for 1990-2014 to the period of record 1990-2022, at 75-79% and 74-78%, respectively. The Fifth Methodology Order like the First Methodology Order, the 3rd Methodology Order, the 4th Methodology Order adopted the average of these years to represent the typical dry year supply.

The Fifth Methodology Order adopts 2018 as the BLY for demand. Like in the DS calculation in April the selection of 2018 as the BLY greatly increases the prediction of carryover need for the SWC (Table 2-7). When Department staff presented the difference in the projected carryover need to the 2022 TWG there was no analysis presented to indicate whether or not this increase in carryover storage was needed based on existing conditions over the time the Methodology Order has been applied. There was not time prior to my writing of this Expert Report to analyze the need for the increased projection of reasonable carryover needs to the SWC.

Table 2-7. Maximum Projected Carryover Need Fourth Methodology Order Compared to the 5th Amended Order

SWC Member	Fourth Methodology Order Reasonable Carryover (af)	5th Amended Order Reasonable Carryover (af)
A&B	18,500	22,696
AFRD2	11,500	93,160
Burley	0	2,495
Milner	4,800	16,072
Minidoka	0	0
NSCC	65,500	113,277
TFCC	25,200	86,834

2.4 Compounding Bias

Each component of the RISD and Forecast Supply calculations in the Methodology Order has a built-in bias in favor of the SWC. These biases are meant to adequately protect senior water users while providing a level of protection against unnecessary curtailment to juniors. However, these biases have a compounding effect as they propagate through the methodology, resulting in excessive Demand Shortfall predictions that provide essentially no protection against unnecessary curtailment of juniors.

This is apparent from the Department's "Summary of Hindcast SWC Delivery Call Demand Shortfall Calculation 2000-2022" which shows that the Methodology no longer offers any protection against unnecessary curtailment to the juniors. To the contrary, the Fifth Methodology Order leads to the curtailment of every junior groundwater right on the ESPA in most years even though TFCC diversion records (the SWC entity most often short and demanding the largest demand short fall volumes) demonstrate that it is short of water only occasionally. This section will analyze how the compounding biases in the Fifth Methodology Order concerning irrigated acres, BLY, FS, and Reasonable Carryover result in Demand Shortfalls that are unreasonable given the actual water supply and demand conditions over the period of record 2000-2022.

2.4.1 BLY 2018 in April Demand Shortfall Determination

IDWR completed a hindcast analysis 2000-2022 for the April Demand Shortfall volume with 2018 as the BLY, the results of this analysis are shown in column 2 in Table 2-8. The Department provided ESPAM files for May 1 curtailment dates of junior pumping ranging from Oct 1900 to April 1994 that included acres and cfs curtailed. I have used these for column 2-4 in Table 2-8 to estimate the curtailment date most closely associated with the DS calculated in the Department's hindcast. Note that under a transient ESPAM simulation any DS over about 97,700 af results in complete curtailment to the October 1900 date. The analysis shows that for the 23 years in the hindcast 14 years would have resulted in a complete curtailment of all the junior groundwater acres across the ESPA within the area of common groundwater. This means that 60% of the time using 2018 as BLY results in an April DS that demands

complete curtailment of junior groundwater rights and over 940,000 acres curtailed. In contrast column 6 shows TFCC diversion rates in incher per year and only 4 years show that their diversion rates are below the full diversion amount of 5/8" per acre (*emphasized in Bold*). The IDWR hindcast shows only 4 years over the 23-year period where less than 300,000 acres of junior groundwater rights would be curtailed. This demonstrates how extremely conservative the application of 2018 as a BLY in the April DS determination is and that the Methodology no longer offers any protection against unnecessary curtailment to the juniors.

Table 2-8. IDWR Hindcast of April Demand Shortfall with BLY 2018 and Lynker Estimated Jr GW Curtailment based on Sukow May 1 Curtailment model files

Year	April BLY 2018 (AF)	Estimated Jr GW Curtailment Date	Estimated Jr GW Acres Curtailed	Estimated Jr cfs Curtailed	TFFC inches per acre
2000	126,125	1900	941,377	3,105	3/4
2001	***334,970***	***1900***	***941,377***	***3,105***	***3/4, 5/8, 1/2***
2002	131,308	1900	941,377	3,105	5/8
2003	93,902	1900	941,377	3,105	5/8
2004	***364,958***	***1900***	***941,377***	***3,105***	***5/8, 1/2***
2005	228,241	1900	941,377	3,105	5/8
2006	0	-	-	-	3/4
2007	152,855	1900	941,377	3,105	5/8
2008	15,138	~1981	105,041	344	3/4
2009	34,109	~1973	319,515	1,050	3/4
2010	190,898	1900	941,377	3,105	3/4
2011	0	-	-	-	3/4
2012	53,778	~1936	480,838	1,571	3/4, 5/8
2013	110,912	1900	941,377	3,105	3/4, 5/8
2014	0	-	-	-	3/4, 5/8
2015	184,901	1900	941,377	3,105	3/4
2016	111,457	1900	941,377	3,105	3/4
2017	65,382	~1956	658,364	2,157	3/4
2018	44,805	~1969	394,602	1,292	3/4
2019	88,237	1900	941,377	3,105	3/4
2020	59,101	~1961	556,146	1,820	3/4
2021	***126,102***	***1900***	***941,377***	***3,105***	***3/4, 5/8, 1/2***
2022	***313,446***	***1900***	***941,377***	***3,105***	***5/8, 1/2***

2.4.2 Erroneous Non-Irrigated Acres for TFCC included in RISD November Actual Demand Shortfall Calculation

As detailed in section 2.1.2 the Department reverted to using out-dated irrigated acres for TFCC in their calculation of CWN for RISD starting in 2011. Based on the most current and accurate irrigated acres from IDWR's irrigated dataset I recalculated CWN for the November actual DS and show the

difference in Table 2-9. For the TFCC acres in my analysis I used IDWR's 2011 irrigated lands dataset for years 2011-2016, IDWR's 2017 irrigated lands dataset for years 2017-2020, and IDWR's 2021 NRT METRIC acres for years 2021-2022. This shows that the erroneous use of non-irrigated acres for TFCC results in up to 84,732 af in demand shortfall.

Table 2-9. IDWR Hindcast of November Actual Demand Shortfall based on IDWR RISD with out-dated TFCC acres applied to CWN and Lynker's Corrected RISD with most current TFCC acres

Year	Nov Actual DS (AF)-IDWR Calculation outdated acres	Nov Actual DS (AF)-Lynker Calculation updated acres	Erroneous Shortfall Volume
2011	*0*	*0*	-
2012	***139,524***	***114,248***	***25,276***
2013	22,588	22,588	-
2014	0	0	-
2015	***92,246***	***20,596***	***71,650***
2016	***7,853***	***0***	***7,853***
2017	0	0	-
2018	***10,996***	***0***	***10,996***
2019	0		-
2020	0		-
2021	***190,816***	***150,286***	***40,530***
2022	***276,551***	***191,819***	***84,732***

2.4.3 Bias in April Forecast Supply Models

The forecast supply models predictions are used to predict in April Snake River natural flow volumes for diversion by each SWC entity. To protect the senior SWC water rights each prediction of natural flow is reduced by one standard deviation. Where DS=FS-RISD, this decrease to the FS directly amounts to an equivalent increase in the DS calculated. There was not time prior to my writing of the Expert Report but I would have evaluated this bias in Forecast Supply with respect to the IDWR Hindcast presented in the previous sections.

Table 2-10. April Reduction to Forecast Supply Models for Natural Flow available to SWC entities

SWC Member	April Reduction to FS Prediction (af)
A&B	19,828
AFRD2	32,595
Burley	15,579
Milner	3,221

SWC Member	April Reduction to FS Prediction (af)
Minidoka	17,968
NSCC	54,217
TFCC	47,368

2.4.4 Bias in 2018 BLY for Reasonable Carryover

There was not time prior to my writing of this Expert Report to analyze the need for the increased projection of reasonable carryover needs to the SWC with the use of 2018 as the BLY. However, based on a hindcast analysis presented to the 2022 TWG comparing the Fourth and the Fifth Methodology Orders for Reasonable carryover we can see, like with the April DS determination, the use of 2018 creates a huge difference in how often and the type of water years in which the SWC are determined to have a shortfall to their carryover needs. Figure 2-10 is IDWR's hindcast analysis showing annual carryover volumes for TFCC 1995-2022 under the Fourth Methodology Order (BLY 06/08/12) and the Fifth Methodology Order (BLY 2018). The highlighted carryover volumes indicate years where a shortfall to reasonable carryover would be determined. We can see that under the Fourth Methodology Order only 3 out of the 30 years would have resulted in a carryover shortfall and that these all occurred in very dry or dry years. Under the Fifth Methodology Order 19 out of the 30 years would have resulted in a carryover shortfall and that these occur even in average and above average years (Figure 2-1).

			4th Amended Methodology	5th Amended Methodology
Name (AF)	Year	Upper Natural Flow April - July (UAF)	TFCC (AF)	TFCC (AF)
	2021	1,960	23,917	23,917
	1994	2,185	38,686	38,686
	2007	2,220	39,999	39,999
Very Dry <2850	2011	2,623	13,581	13,581
	2013	2,721	11,419	11,419
	2002	2,775	46,825	46,825
	2022 Preliminary	2,800	31,125	31,125
	2004	2,855	58,813	58,813
	2003	2,931	0	0
	Average	2,588	31,941	31,941
	2016	3,012	21,497	21,497
	2000	3,055	56,536	56,536
	2010	3,109	46,241	46,241
Dry 3850 - 4000	2001	3,191	68,552	68,552
	2015	3,208	44,857	44,857
	2012	3,385	72,264	72,264
	2019	3,880	94,153	94,153
	2021	3,962	66,809	66,809
	Average	3,457	58,882	58,882
	2006	4,079	78,562	78,562
	1999	4,130	104,424	104,424
Average 4000 - 4500	2020	4,288	70,192	70,192
	1995	4,447	88,576	88,576
	2008	4,498	116,432	116,432
	Average	4,286	99,687	99,687
	2014	4,394	130,086	130,086
	2009	4,483	95,533	95,533
	2018	4,706	84,286	84,286
>4500 UAF	1997	4,940	191,503	191,503
	1996	5,583	111,450	111,450
	2017	6,139	169,863	169,863
	2011	6,347	130,757	130,757
	1983	7,802	136,526	136,526
	Average	5,804	127,436	127,436

Figure 2-10: IDWR hindcast analysis showing annual carryover volumes for TFCC 1995-2022 under the Fourth Methodology Order (BLY 06/08/12) and the 5th Amended Order (BLY 2018). The highlighted carryover volumes indicate years where a shortfall to reasonable carryover would be determined.

2.4.5 Other sources of Bias in the Methodology

There are a few other sources of bias in the Methodology that increase the Demand Shortfall determination. One is that it appears that not all of the recharge water in 2018 diverted through the SWC systems has been removed in the calculation of Demand for 2018. Potentially 9,000 af have not been accounted for and this directly increases the Demand Shortfall calculated every year with 2018 used as the BLY.

The Department does not account for supplemental groundwater use on mixed source lands which represents an additional supply to the SWC.

A critical problem is that the BLY selection criteria method will continue to create additional bias. Under the established BLY criteria, increases in diversion by SWC result in higher BLY demands. There is no examination of acreage or efficiency. It needs to be established that any increase in diversion by SWC entities is related to beneficial use on irrigated lands and not caused by decreases in project efficiencies or diversion of water to meet other needs like hydropower production. As mentioned in

section 2.2.3, and raised in both my 2015 and 2022 TWG comments a better approach would use forecasted flow at Heise or some alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

3 Simulation of Curtailment of Junior Groundwater Rights Using the ESPAM Model

3.1 Background

The Enhanced Snake Plain Aquifer Model version 2.2 (ESPAM2.2) is the current configuration used for IDWR modeling of the Eastern Snake Plain Aquifer (ESPA). The ESPAM was created with review and input from the Eastern Snake Hydrologic Modeling Committee (ESHMC).

A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.1 provides a detailed description of background on the ESPAM and development.

From the outset of the ESPAM modeling effort, it was recognized that there would be a need for future enhancements to the model as new information and modeling approaches became available. ESPAM version 2.2 is the current version released in 2021. Discussion regarding the scope of future enhancements began shortly after the release with a preliminary release target date for the next model in 2026. With each model version release potential objectives to advance the model are made with ESHMC input, not all of which are accomplished because there is either insufficient time, insufficient data or are generally considered a low priority.

3.2 Model Structure

ESPAM is developed in MODFLOW, a groundwater modeling environment developed by the U.S. Geological Survey (McDonald and Harbaugh, 1988; 2000). A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.2 provides a detailed description of the ESPAM model structure.

ESPAM2.2 was converted to MODFLOW-USG a code developed by the USGS (Panday, et al, 2013). While the MODFLOW-USG code supports a wide variety of structured and unstructured grid types and includes the ability to have multiples layers across the whole domain or in select areas of the model. ESPAM2.2 uses the same structured grid as ESPAM2.1. ESPAM2.2 is represented as a single layer with uniform thickness. In the ESPAM the aquifer is represented within a defined model boundary by individual model cells at a one-mile by one-mile uniform grid. The MODFLOW code solves the equations of flow between these cells to determine aquifer responses to changes in inputs or outputs. MODFLOW has the capability to represent anisotropy (where flow occurs in preferential directions), but this feature has not been used in any versions of the ESPAM.

Key differences between ESPAM2.2 and its predecessors include a longer study period (2008-2018), the adoption of METRIC data to estimate ET, structural changes including American Falls Reservoir area springs and spring fed river reaches and the addition of the Portneuf River. Additional work also included adding the Menan gage to separate the Heise to Shelley river reach, additional calibration targets for river reaches, finer spatial resolution for aquifer recharge from surface water irrigation

entities, calibration methods, and structural changes to drain boundaries of the Kimberly to King Hill reach. ESPAM2.2, like its predecessor ESPAM2.1 (released 2013) uses monthly stress periods.

3.3 Model Calibration Process

The typical development of a groundwater flow model involves creating a conceptual model and water budget for the system to be represented. These form the basis for the model structure and model inputs. After formulation of the model the next step in development is calibration. Calibration is a form of "history matching" wherein initial values of model parameters (such as transmissivity) are adjusted to achieve a better correspondence between historical targets (e.g., measured water levels and spring and river flows) and model-predictions.

A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.4 provides a detailed description of the ESPAM model calibration process.

The software program used to calibrate all versions of the ESPAM has been the model-independent Parameter ESTimation program (PEST) developed by John Doherty (Watermark, 2005). While the calibration of models with large numbers of parameters (such as ESPAM2.2) allows consideration of more factors affecting aquifer conditions, it increases the risk that any given PEST solution (i.e., an "optimal" set of parameter values) is not unique (Watermark, 2005). This means that there may be many other combinations of parameter values could produce a similarly minimized value of overall model error. This non-uniqueness creates one dimension of overall model uncertainty, which is discussed in more detail in a later section.

The parameters that PEST was allowed to adjust in ESPAM2.2 included aquifer parameters such as transmissivity and specific yield. In addition, PEST was allowed to manipulate a number of terms in the aquifer water budget where precise values could not be known (like recharge on non-irrigated lands and tributary valley underflow).

3.4 Model Uncertainty

Any groundwater model is necessarily a simplification from the real world. The simplifying assumptions must be made to model complex natural systems. ESPAM2.2 inherently has limitations and uncertainty. As noted by IDWR in the 2021 ESPAM2.2 Model Calibration report, water budget parameters are adjusted during calibration simultaneously with the aquifer properties transmissivity and specific yield, resulting in a non-unique solution. The calibration results for these aquifer parameters are affected by assumptions regarding the uncertainty of water budget parameters. The ramifications of this are discussed in more detail in a later section.

The courts have recognized ESPAM as the best science available. Accepting that does mean that the inherent uncertainty in the model should be ignored in its application. As IDWR notes in their 2021 report of ESPAM2.2 model predicted uncertainty:

> Acknowledgement and a general understanding of the uncertainty associated with predictions made by the ESPAM2.2 is important to guide the use of the model as a tool for water management and administration.

3.4.1 Overview of Model Uncertainty

Model uncertainty has several dimensions, and these have been described in various submittals to the ESHMC (e.g., Brendecke, 2009a,b; 2012). Essentially, the principal dimensions of model uncertainty are those associated with model conceptualization, with model input and with model calibration. While all of these dimensions are important, conceptual uncertainty is fundamental. No amount of data improvement, re-sampling or recalibration can correct errors stemming from incorrect (or simply incomplete) model conceptualization (Bredehoeft, 2005).

A copy of *Hydrology, Water Right and Groundwater Modeling Evaluation of Rangen Delivery Call* (Brendecke, 2012) is included as Attachment D, section 4.6 provides a detailed description of ESPAM model uncertainty.

3.4.2 Examples of ESPAM2.2 Conceptual Model Limitations Leading to Uncertainty in near Blackfoot to Minidoka Reach Gain Prediction

The predictive uncertainty analysis of ESPAM2.2 carried out by the IDWR explores only a limited aspect of model uncertainty and does not quantify overall model uncertainty.

Fundamental to overall model uncertainty is the uncertainty associated with the conceptual model reflected in ESPAM2.2. The predictive uncertainty analysis relies on a single conceptual model and does not explore uncertainty that arises from improper conceptualization of local geology and hydrologic conditions that influence discharge to the near Blackfoot to Minidoka Reach.

The ESPAM2.2 configuration with a single layer model representation is not adequate to represent the hydrogeologic controls on groundwater discharge to the near Blackfoot to Minidoka Reach. Several hydrogeologic studies were summarized by Ralston Hydrologic Services (“Ralston”) in their report *Hydrogeologic Analysis of the Near Blackfoot to Neeley Reach of the Snake River* prepared for IDWR in 2008 (ATTACHMENT E). This report characterizes the hydrogeological conceptual model for the near Blackfoot to Neeley reach of the Snake River.

The Quaternary basalt near the center of the Snake River plain is generally considered to host a single unconfined aquifer where average hydraulic conductivity of the basalt is extremely high. The inter-fingering of Quaternary basalt flows with fine-grained sediments (i.e. Raft River Formation and American Falls Lake Beds) in the vicinity of the American Falls Reservoir results in an aquifer system composed of individual aquifers and confining units (aquitards). The presences of fine-grained sediments around American Falls Reservoir likely result in lower transmissivity compared to the aquifer to northwest where these materials are absent. Northeast of the reservoir a shallow gravel unit roughly parallel to the Snake River is present.

The presence of the fine-grained sediments (Raft River Formation and American Falls Lake Beds) likely act as restriction for southwestward ground-water flow in both the basalt and the gravel along the Snake River. This results in upward hydraulic gradients and groundwater discharge in the form of springs and river gains. The inter-fingering of the basalt and fine-grained sediments in the vicinity of the American Falls Reservoir and the distribution of the gravel deposits to the northeast is illustrated in Figure 3-1 and Figure 3-2.

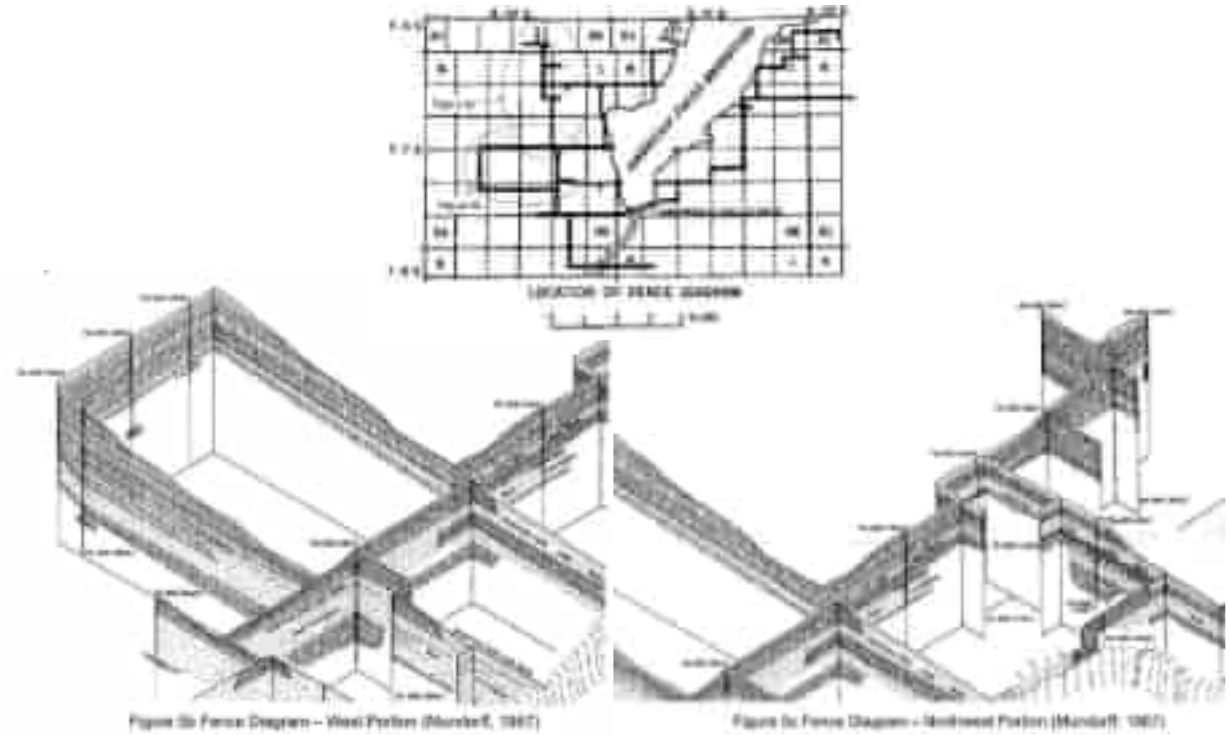

Figure 3-1: Excepts from Ralston (2008) Figures 5a,b,c showing Fence Diagrams of subsurface geology around the American Falls Reservoir from Mundorff (1967).

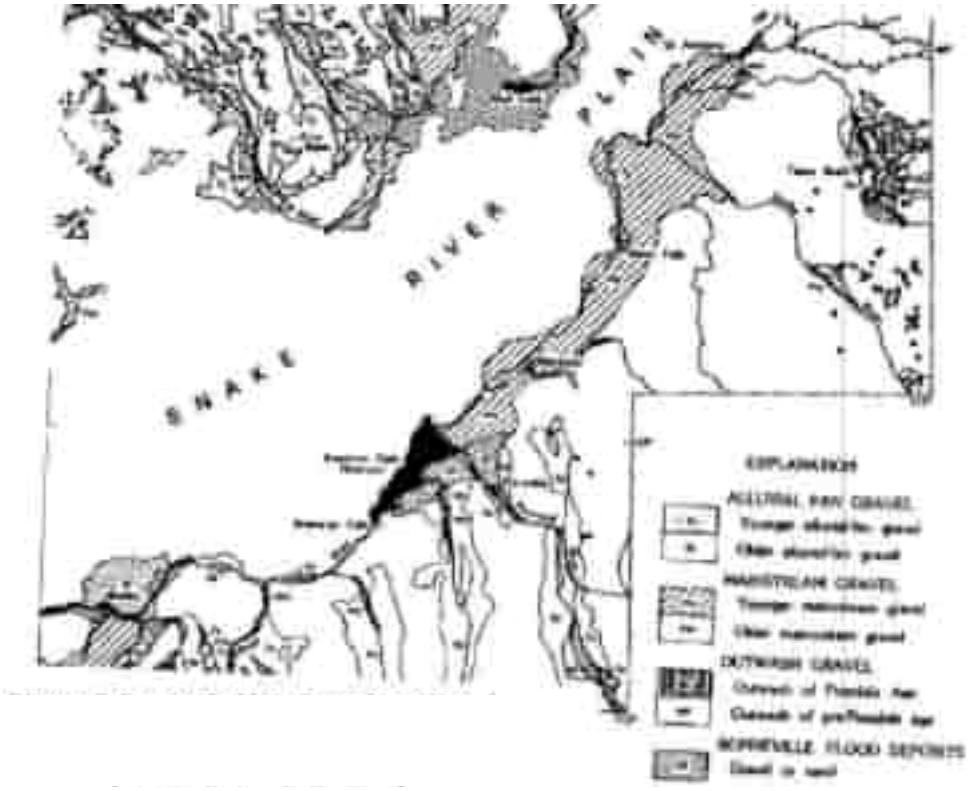

Figure 3-2: Except from Ralston (2008) Figure 8 of geologic map showing the gravel deposits along the Snake River by Piece and Scott, 1982).

These features mean that groundwater discharge to the near Blackfoot to Neeley reach is a function of the combination of water from shallow aquifers that are hydraulically connected to the basalt system of the main ESPA and vertical fluxes from the deeper aquifer units that are hydraulically connected. The magnitude of upward groundwater flow depends on the hydraulic gradient and the vertical hydraulic conductivity of the basalts and sediments in the areas. A single layer does not allow for the evaluation of vertical hydraulic conductivity or vertical flow within the aquifer or discharge characteristics of the individual springs or stream-gains areas.

The ESPAM2.2 transmissivity distribution (Figure 3-3) does not fit the know hydrogeologic characteristics of the region. Ralston (2008) describes how groundwater discharges to the Snake River in the near Blackfoot to Neeley reach because the transmissivity around and southwest of American Falls Reservoir is low compared to the upstream aquifer. The model should show high transmissivity representative of basalt and gravel dominated system north and northeast of American Falls Reservoir transitioning into low transmissivity representative fined-grained, sedimentary dominated system under the reservoir and to the southwest. Conceptual and calibration considerations should be made in the advancement of ESPAM2.2 to achieve a transmissivity array that better fits the hydrogeologic framework. In my recommendations for future improvements following the release of ESPAM2.2 I recommended an investigation to better understand groundwater gradients near the American Falls Reservoir reach.

3.4.3 Examples of ESPAM Input Parameters Leading to Uncertainty

As previously discussed, for ESPAM2.2 the water budget parameters like the ET rate for consumptive use by groundwater and components representing natural recharge to the groundwater system are adjusted during calibration simultaneously with the aquifer properties like transmissivity (T) and the aquifer storage specific yield (Sy), resulting in a non-unique solution. The calibration results for the aquifer parameters (T, Sy) are affected by assumptions regarding the uncertainty of water budget parameters.

ESPAM2.2 was adopted by the ESHMC following a vote in a September 9th, 2020 committee meeting. The Department had presented another version of the model for consideration to adopt as ESPAM2.2 in January 2020[2]. At the January, 2020 ESHMC meeting I presented an “impact analysis” of the proposed ESPAM2.2 version compared to ESPAM2.1 after my review of the model showed significant differences in model predictions, particularly for changes in water levels from simulated aquifer stresses. At the conclusion of the January ESHMC meeting it was decided that the validation run years (2015-2018) would be included in the ESPAM2.2 calibration, as well as, new irrigated lands maps (2015) to further evaluate the calibration results. At the September 2020 meeting IDWR again proposed a final ESPAM2.2 calibration with changes including updated water budget data through 2018.

3.4.3.1 ESPAM Aquifer Parameter Uncertainty ESPAM1.1 to ESPAM2.2

Figure 3-3 and Figure 3-4 below show the evolution of aquifer parameter distributions of transmissivity and specific yield, respectively, between ESPAM1.1, ESPAM2.1, ESPAM2.2 (proposed in January) and ESPAM2.2 (proposed in September and accepted as final).

[2]Based on calibration & modeling information provided to ESHMC September, 2019 and November, 2019

Compared to ESPAM2.1 the calibration results show a significant ESPA wide change of increased aquifer storage (Sy), as well as, generally lower aquifer transmissivity (T) that result in changes to pumping response functions and predicted stream depletion timing throughout the model domain.

Figure 3-5 shows the difference in simulated reach gains between ESPAM2.1 and ESPAM2.2 for the Departments 1/1/1961 curtailment scenario (Sukow, 2021). The ESPAM2.2 results in increased reach gains above Milner in response to curtailment. The near Blackfoot to Neeley reach shows one of the biggest increases overall with reach gains of 760 cfs and 931 cfs for curtailment of junior groundwater pumping to 1961priority date with ESPAM2.1 and ESPAM2.2, respectively. The percent difference is about 20%. The change in the steady state response function to the near Blackfoot to Minidoka reach between ESPAM2.1 and ESPAM2.2 is shown in Figure 3-6.

The Sentinel Wells which make-up the IGWA-SWC index for the 2015 Settlement Agreement were selected based on achieving the highest correlation (R^2~.63)[3] with the near Blackfoot to Minidoka reach gains. The aquifer level rise across the Sentinel Wells in ESPAM2.2 is about 50-60% of what was predicted with ESPAM2.1.

These changes between ESPAM2.1 and ESPAM2.2 illustrate the difference in predicted water level rise across the ESPA and modeled reach gains to the near Blackfoot to Minidoka from changes in aquifer properties transmissivity (T) and specific yield (Sy).

[3] Technique for Calculating Groundwater Level Index and Determining Compliance with Settlement Agreement Targets, August 8, 2016.

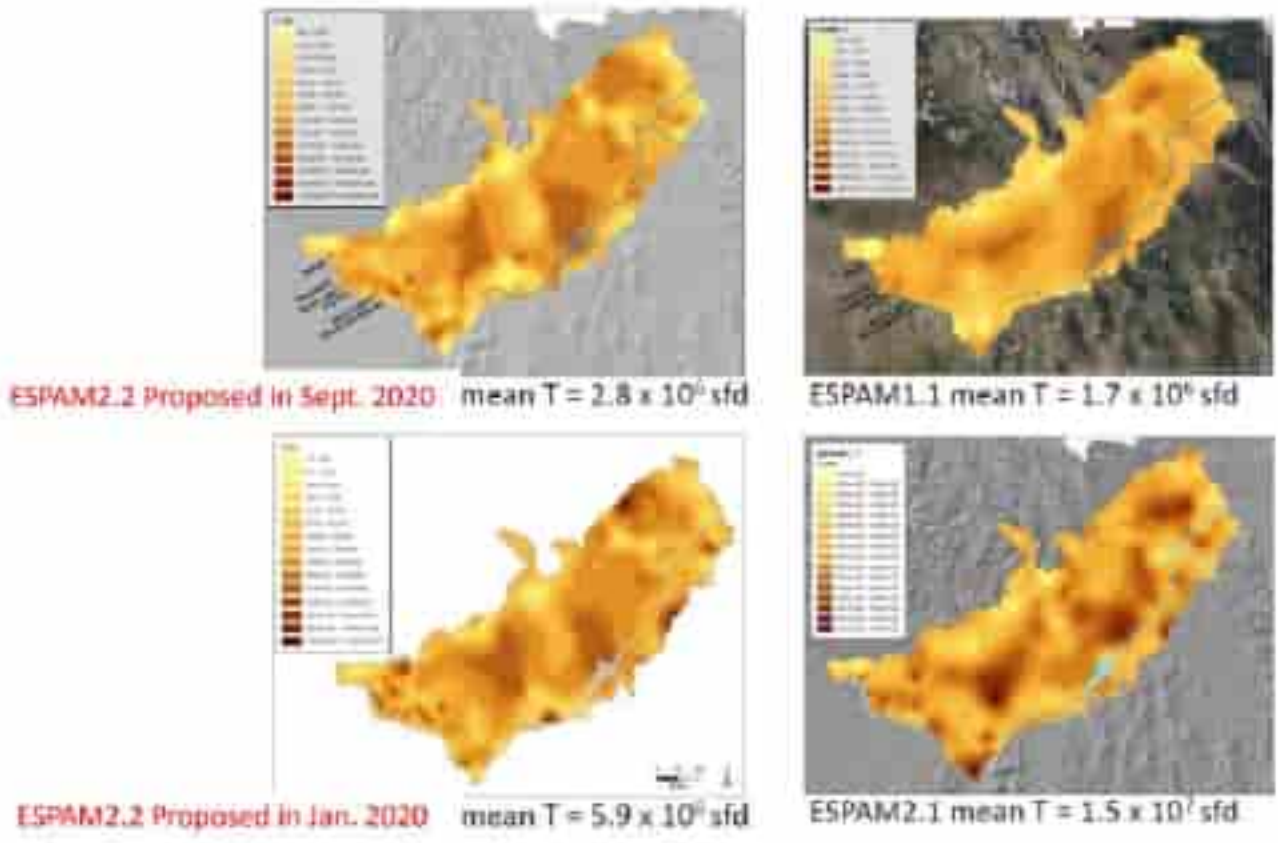

Figure 3-3: Transmissivity (T) changes ESPAM1.1 (UR), ESPAM2.1 (LR), ESPAM2.2 (proposed January 2020) (LL), ESPAM2.2 (proposed September 2020 (UL). Darker oranges indicate higher values, lighter oranges indicate lower values.

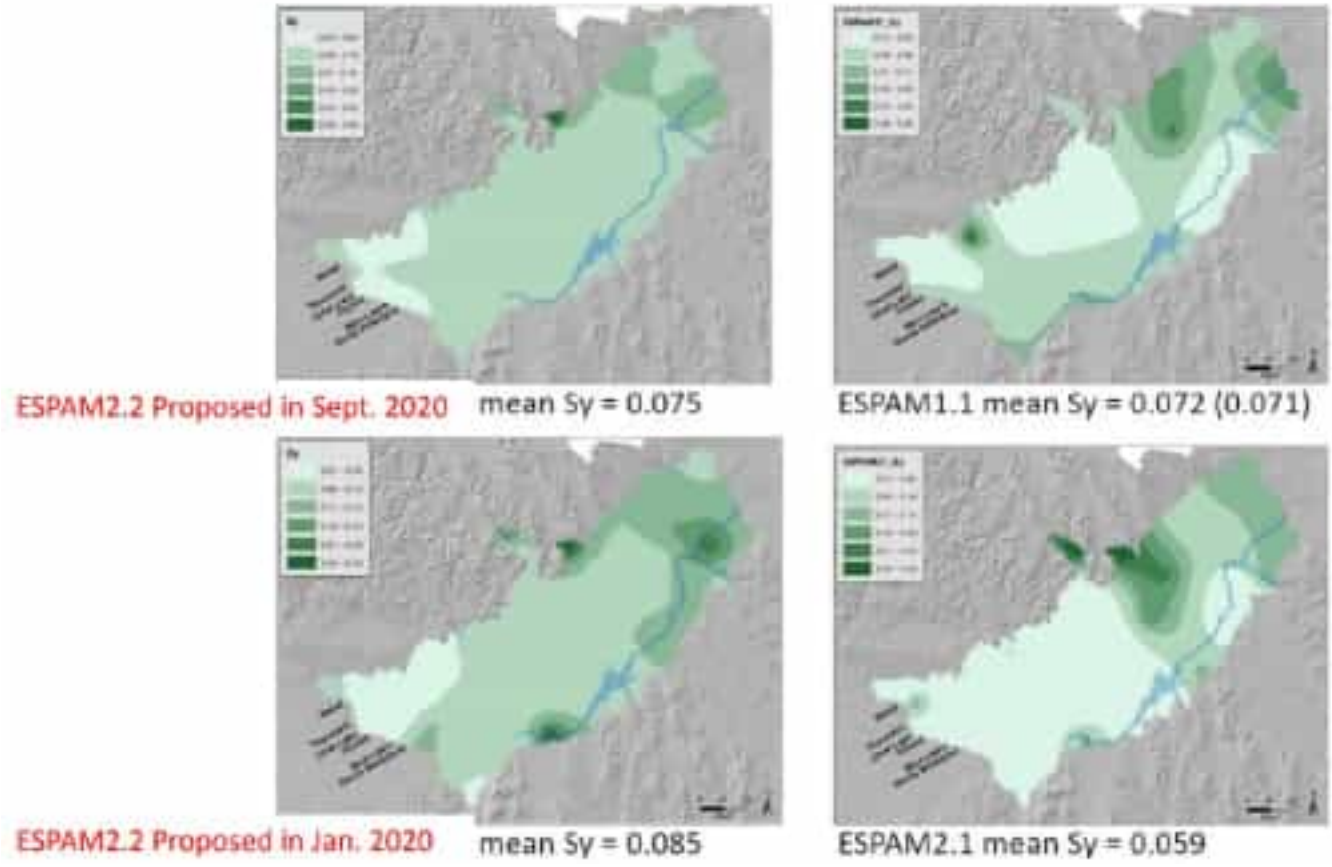

Figure 3-4: Specific Yield (Sy) changes ESPAM1.1 (UR), ESPAM2.1 (LR), ESPAM2.2 January (LL), September (UL). Darker greens indicate higher values, lighter greens indicate lower values.

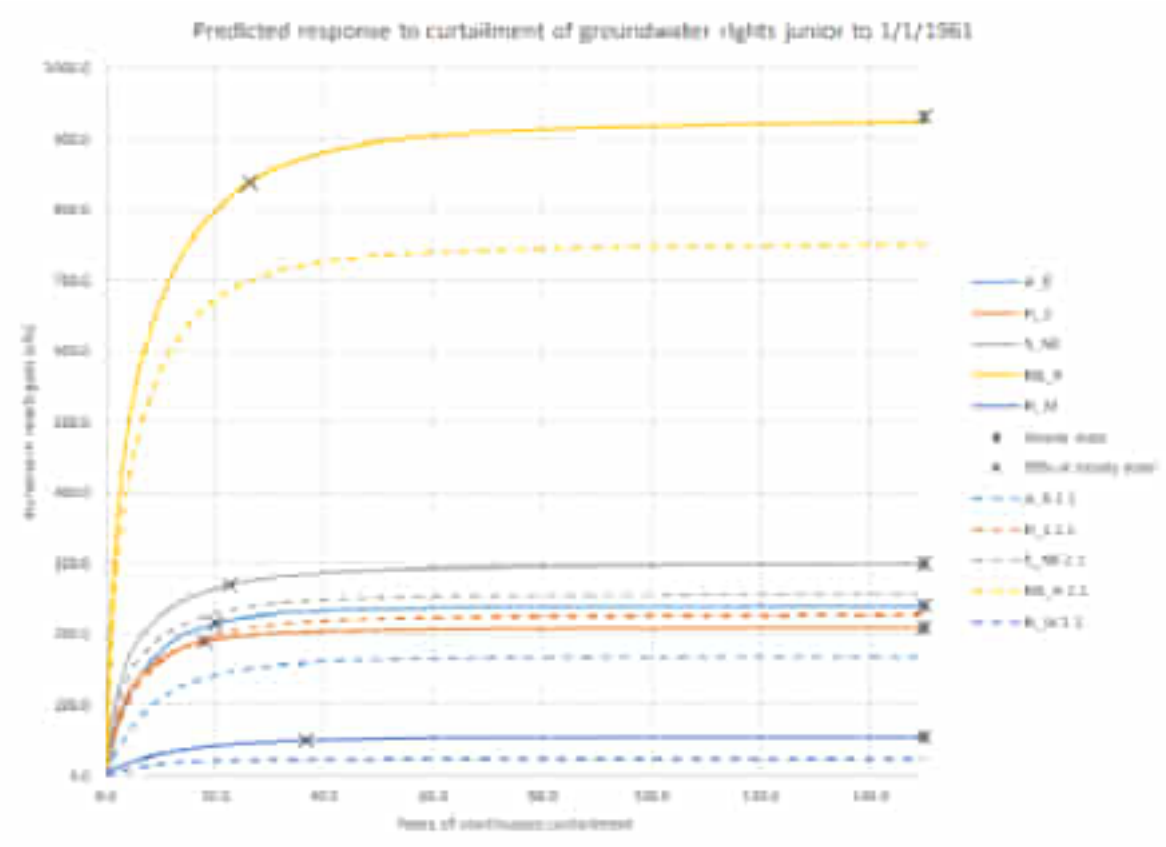

Figure 3-5: Changes in timing rate of river reach gains for ESPAM2.1 dashed line and ESPAM 2.2 solid line.

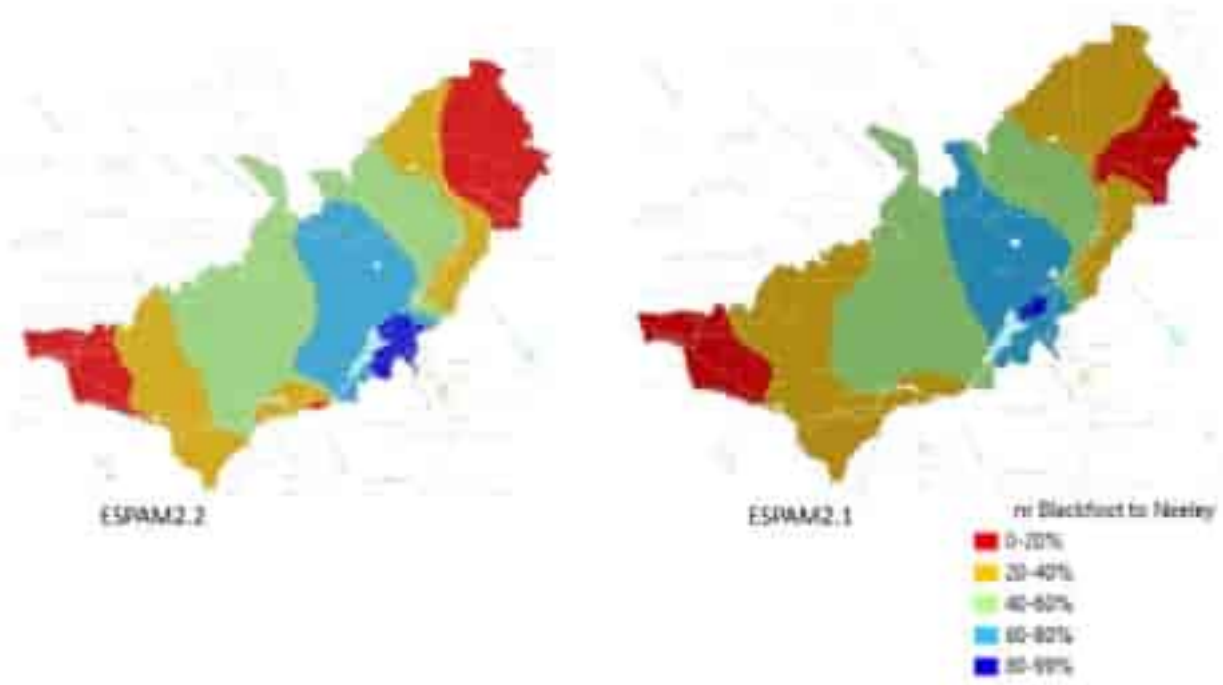

Figure 3-6: Changes in steady state response function for near Blackfoot to Minidoka river reach gains for ESPAM2.1(right) and ESPAM 2.2 (left).

3.4.3.2 ESPAM Water Budget Components Uncertainty ESPAM2.2

In ESPAM2.2 the aquifer parameters (T, Sy) and the water budget components (natural recharge, ET for consumptive groundwater use) are both adjusted during calibration. This means uncertainty in one of these components leads to uncertainty in the other. In the presentation of my impact analysis to ESHMC January, 2020 I was concerned about the change seen to aquifer storage following my review of the proposed ESPAM2.2 calibration, as shown in Figure 3-4. I did not believe the ESPA wide change in storage parameters could be explained by the localized structural model improvements and extending the period of record for the water budget components in ESPAM2.2. Because intermediary calibration results had not been presented to ESHMC it was impossible to parse out what change was leading to the new aquifer parameter distributions. I made the recommendation to the Department that ESPAM be calibrated with a step-wise approach so we could understand the result of each major model change, as well as, sensitivity testing for 1) changes in the calibration approach and 2) the METRIC processing method used to calculate ET for groundwater consumptive use

It was my belief that only either a change in the calibration method (e.g. pilot point distribution, regularization, or parameter weighting) or the METRIC processing for the ET rate for groundwater consumption (one of the biggest water budget components) could be responsible for such wide spread changes in the aquifer parameter values between ESPAM2.1 and ESPAM2.2.

My only concern around changes to the calibration method was that a simple change in calibration procedures should not significantly change the entire model results or if it did we should understand why.

I had two main areas of concern regarding the METRIC processing for ESPAM inputs. First, I was part of the METRIC TWG in 2015 that developed the processing methods for the METRIC data. The Department's processing of METRIC data for ESPAM included using a 90-meter buffer around the irrigated areas that ultimately increased the rate of ET used when applied to the irrigated lands acreage. There did not appear to be a well-founded reason around the specific choice of 90-m. That is why I recommended a sensitivity test to explore the impacts of this choice on the model calibration. The second, was that when I reviewed the calibration analysis for ESPAM2.2 it was obvious that the calibration tool PEST was adjusting parameters in ways that seemed to be compensating for the rate of groundwater ET being too high. For example, the significant increase in aquifer storage (Sy). Another example is the PEST adjustments to sources of natural recharge across the ESPA. The pre- and post-calibration time-series for water budget components that make up natural recharge are shown in Figure 3-7. It is evident that post-calibration results are much higher, indicating that to match model results to observed values the calibration tool PEST is trying to get more water into the ESPA. Again possibly compensating for groundwater ET rates being too high. This is particularly evident when comparing the pre- and post-calibration results for tributary underflow and recharge on non-irrigated lands.



Figure 3-7: Annual volume of net aquifer recharge, tributary underflow and recharge on non-irrigated lands water years 1981 through 2018

When the Department ultimately accepted the September 2020 ESPAM2.2 calibration as final they sent notice to the ESHMC members asking for suggestions for areas of improvement for the next version of ESPAM. Again, I recommended (along with several other issues), that a sensitivity analysis for the METRIC ET processing be performed. This was voted as a priority by the rest of the ESHMC. January 2023 the Department gave a presentation to ESHMC on METRIC where initial findings were that when the Department processing of METRIC for ESPAM was compared to both to a field-scale investigation using groundwater diversion data and two openly available sources of METRIC ET (ssebop and eemetric) the Department's method was consistently too high. The Department consulted with METRIC experts and concluded that it was not appropriate to apply a 90-m outer buffer and that best practices would apply an inward buffer to ensure that the most accurate METRIC pixel value was applied for to the irrigated lands dataset acres. These processing alternatives were presented to ESHMC May 2023 along with the Department's preliminary recalibration of ESPAM2.2 using the no buffer processing method alternative. Based on the preliminary recalibration of ESPAM (unbuffET_mile_003) the distribution for storage (Sy) and Transmissivity (T) compared to ESPAM2.2 are shown in Figure 3-8. This shows that model storage on average is less than ESPAM2.2, as well as, transmissivity with the alternative METRIC processing.

As previously discussed, the uncertainty in the water budget components directly results in the uncertainty of the aquifer parameters because errors in the water budget can be compensated by changes in aquifer properties to ensure the best model fit for observed versus simulated results like reach gains. The comparison of water budget components pre-and post-calibration based on the preliminary recalibration of ESPAM2.2 using alternative METRIC processing are shown in Figure 3-9.

There are several water budget components where the difference between the METRIC processing method is evident. Tributary basin under flow and recharge on non-irrigated lands are both about 300K af lower compared to ESPAM2.2 and we see that these components need to be adjusted much less pre- and post-calibration. Recharge on surface water irrigated lands is increased by about 300k af. The consumptive irrigation requirement (CIR) on groundwater irrigated lands is about 500K af lower. These differences demonstrate the uncertainty in the water budget components of the ESPAM model including those directly related to curtailment of junior groundwater rights. These uncertainties in the water budget inevitably result in uncertainty in the aquifer parameters that control the timing and magnitude of near Blackfoot to Minidoka reach gains in the ESPAM2.2 simulation of curtailment of junior groundwater rights.

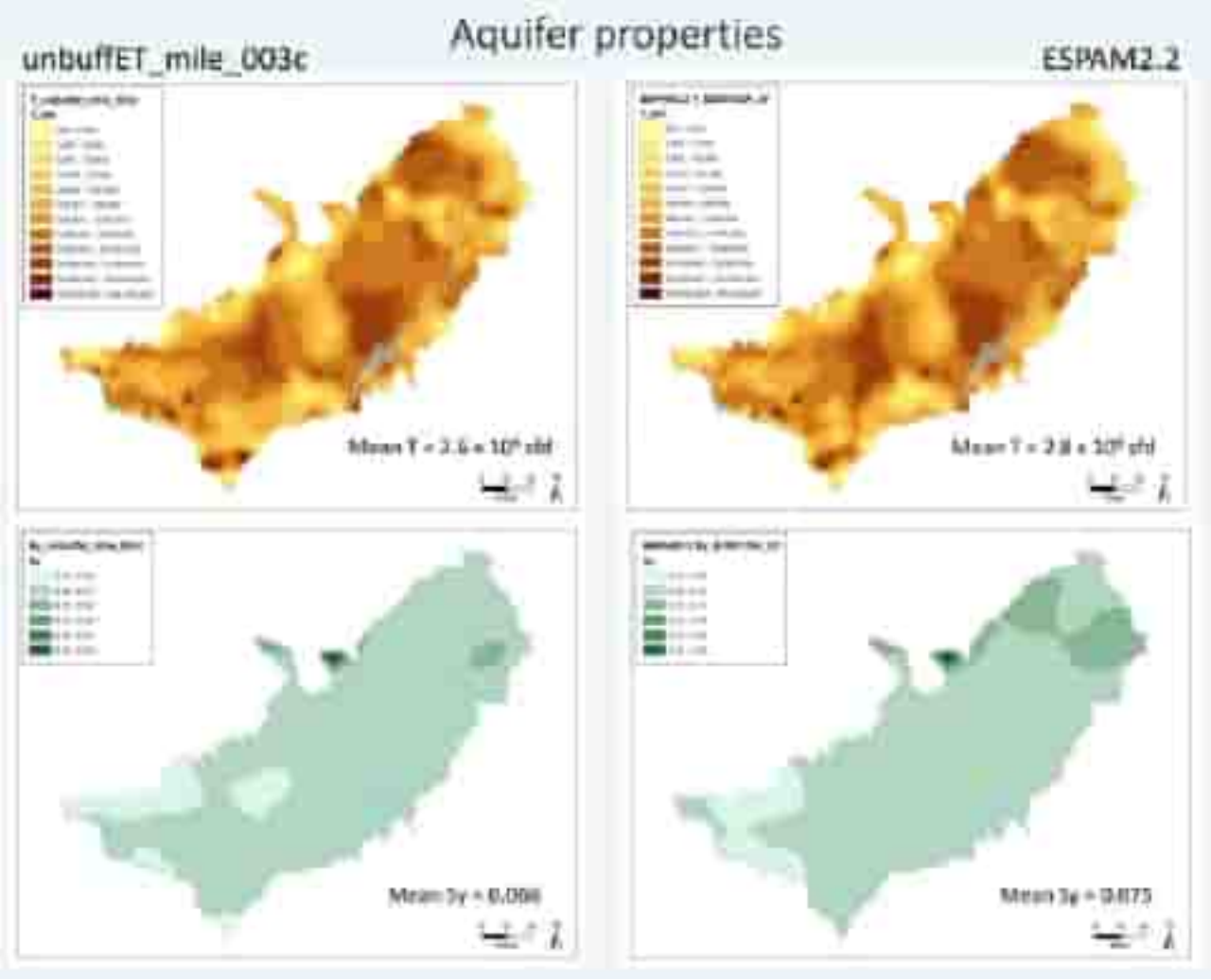

Figure 3-8: Comparison of Storage (Sy) and Transmissivity (T) distribution based on preliminary recalibration of ESPAM2.2 using alternative METRIC processing (model version "unbuffET_mile_003c"

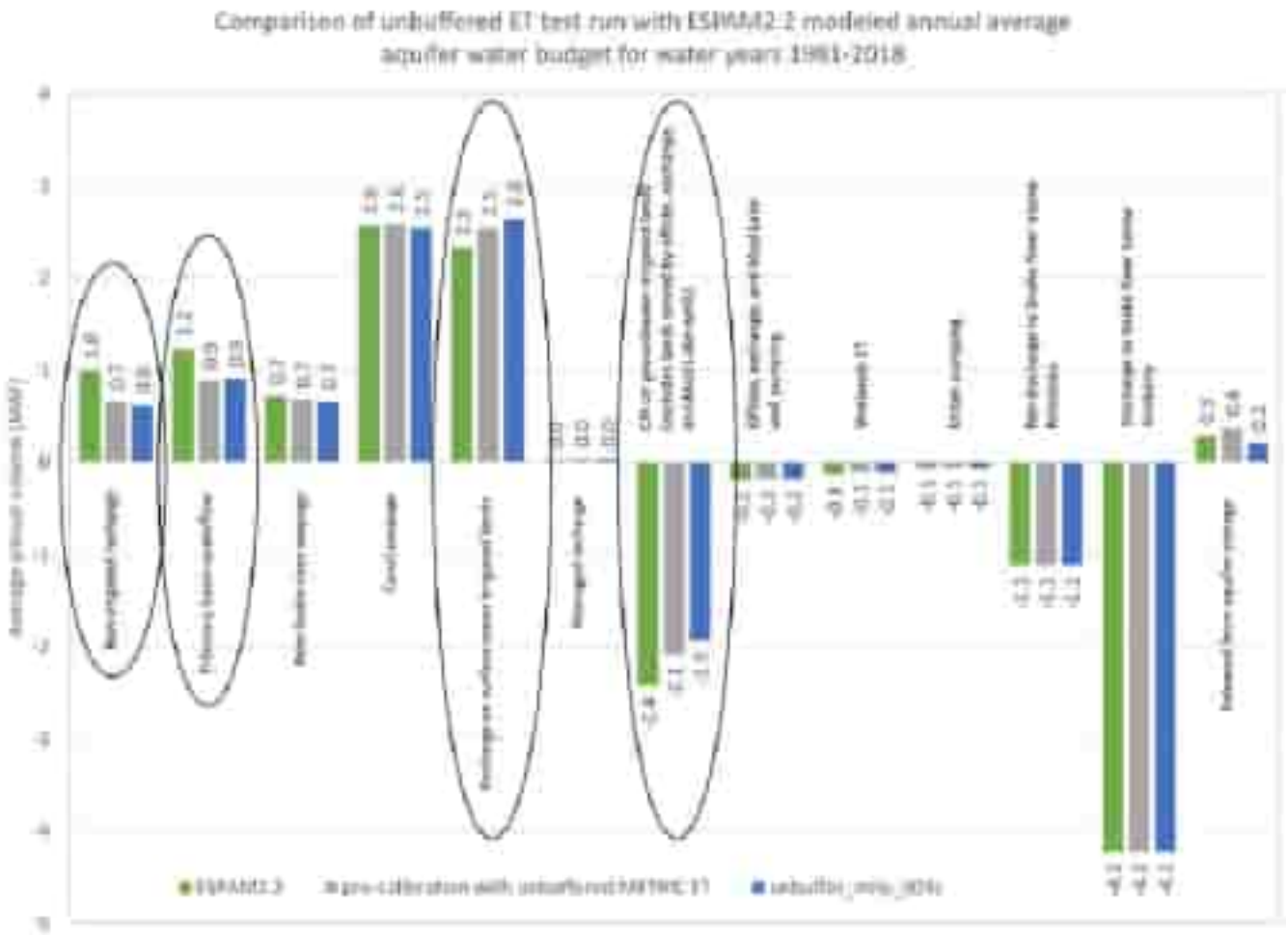

Figure 3-9: Comparison water budget components pre-and post-calibration based on preliminary recalibration of ESPAM2.2 using alternative METRIC processing (model version "unbuffET_mile_003c")

3.4.4 Conclusions on Model Uncertainty and the Application of ESPAM for Simulating Curtailment of Junior Groundwater Right for the Methodology

ESPAM2.2 is used in the Methodology to find the curtailment date of junior groundwater pumping that amounts to reach gains to the near Blackfoot to Minidoka reach of the Snake River equivalent to the Demand Shortfall calculated under the Methodology As-Applied Order. The Fifth Methodology Order transitions from a steady state to a transient ESPAM simulation to determine the amount of junior groundwater rights that must be curtailed for an in-season equivalent reach gain response to the Demand Shortfall. The April 2023 As-Applied Order determined a December 30, 1953 curtailment date and shows total proportionate share for all members of IGWA as 63,645 af.

IGWA requested that IDWR break the obligation down within IGWA by ground water district. As a response, IDWR provided the first two columns shown in Table 3-1. IGWA districts were interested in knowing the transient response given the curtailment scenario under the Fifth Methodology Order is now run using a transient ESPAM simulation. Jaxon Higgs provided the analysis but will be out of the country during the hearing and unable to testify. I reviewed the analysis and can testify to results

shown in Table 3-1. The IDWR MODFLOW wel input file was split by district based on their geographic boundaries as shown in Figure 3-10 and run with ESPAM2.2 to calculate individual district curtailment impact to the Near Blackfoot to Neeley reaches (SWC reaches) from May-September.

Table 3-1. Results of Jaxon Higgs Analysis on IGWA's Proportionate Share Related to Reach Gain Benefits and Acres Curtailed for the April 2023 As-Applied Order

GWD	IGWA % of IGWA's proportionate share	IDWR Portion of April 2023 predicted demand shortfall		Transient May - Sept Impact[1]	May - Sept Curtailed Volume[2]	Ratio of Curtailed to Benefit	Jr. to 12/1953[3]	District Total	% of Acres Curtailed	Baseline Volume[4]
	%	AF	%	AF	AF	AF	acres	acres	-	AF
American Falls Aberdeen	33.4%	21,214	25.2%	38,328	313,075	8:1	124,112	149,299	83%	283,815
Bingham	20.9%	13,284	17.8%	27,841	206,152	7:1	105,815	148,799	71%	277,021
Bonneville Jefferson	13.4%	8,469	11.3%	1,085	179,607	166:1	92,471	95,511	97%	158,133
Carey Valley	0.0%	1	0.0%	0.00	6,901	-	-	3,069	-	1,671
Henry's Fork	0.1%	90	0.1%	0.00	13,719	-	-	40,152	-	73,991
Jefferson Clark	10.8%	6,939	9.2%	69.9	347,705	3,547:1	111,792	174,039	64%	441,393
Madison	0.0%	4	0.0%	0.00	w/HF	w/HF	-	64,045	-	78,599
Magic Valley	16.1%	10,377	13.7%	23.1	227,879	9,856:1	99,110	137,466	72%	216,188
North Snake	5.1%	3,262	4.3%	0.06	217,131	3,619,180:1	88,329	101,358	87%	208,795
Sub-Total	100.0%	63,645	84.0%	67,347	1,412,049	21:1	621,630	914,358	68%	1,787,002
SWID	-	-	-	0.02	153,202	7,684,585:1	-	-	-	-
No District	-	-	-	7,373.6	31,488	4:1	-	-	-	-
Grand Total				**74,720.8**	**1,597,439**	**21:1**				

1. Impact broken down by geographic boundary. Some non-members are included in each district. For example, the A&B usage is included in Magic Valley and North Snake GWDs. See accompanying map. Acre-ft rounded to 2 decimal places.
2. Total volume split geographically as described in note 1 from IDWR model input files from Jr12301953 run. Some slight conversion and rounding errors.
3. Acres provided by each district except Carey, Henry's Fork, and Madison. Based on breakdown of combined acres to provide effective acres per water right. 4
4. Baseline volume taken from 2022 Settlement Report submitted by IGWA to IDWR and the Surface Water Coalition. Represents average usage from 2010-2014.

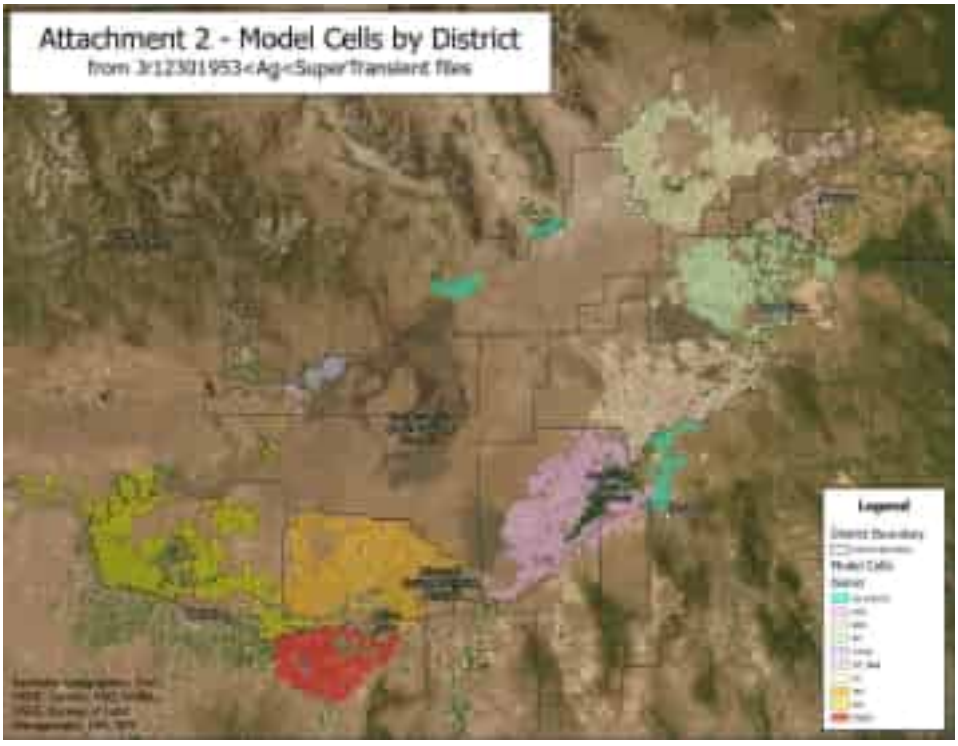

Figure 3-10: Distribution of junior groundwater pumping curtailed under 12/30/1953 priority date broken out by Groundwater District (Jaxon Higgs)

The results of Higgs' analysis show that the benefit to the SWC reach compared to the junior groundwater volume curtailed varies greatly by groundwater district. This is a result of their distance and hydrologic connection to the reach.

ESPAM2.2 is not sufficiently detailed in its representation of hydrogeologic conditions at the near Blackfoot to Minidoka reach to be used to accurately predict change in discharge due to curtailment of junior groundwater rights on the ESPA. Using ESPAM2.2 the number of junior groundwater acres that would be curtailed that do not have significant in-season benefits to the near Blackfoot to Minidoka reach is between 300,000-400,000 acres. The water from these rights will accrue to other connected river reaches, springs, without benefit to the SWC, or in years when the water is not needed. The wide-spread curtailment will, by any reasonable standard, result in waste of the resource.

ESPAM2.2 is highly simplified in the conceptual model in the near Blackfoot to Minidoka reach ignoring several critical hydrogeologic features that would make significant differences in predicted benefits of curtailment. The ESPAM water budget components related to junior groundwater use and the aquifer properties are uncertain and the variability in these components make significant differences in predicting benefits of curtailment. That ESPAM2.2 can fairly closely match observed discharge to the river is not proof that it represents the hydrogeological reality to sufficiently predict future behavior especially under aquifer wide water use conditions (e.g., curtailment of junior groundwater pumping).

If the Director uses ESPAM2.2 to quantify the benefits to the near Blackfoot to Minidoka reach from curtailment of junior groundwater uses, this quantification should reflect the substantial uncertainty in that model prediction and a trimline respective of the level of model uncertainty should be applied.

4 Summary of Conclusions

Irrigated Acreage

1. Evidence presented in prior hearings show a trend of decreasing irrigated acreage, particularly within TFCC due to urbanization of the City of Twin Falls and surrounding area. Beneficial use does not occur on acres that have been hardened or are otherwise not irrigated.
2. Every technical analysis of irrigated acres within TFCC consistently shows that TFCC is irrigating approximately 15,000 acres less than the 194,732 acre figure that TFCC reports to IDWR as being irrigated.
3. The Department is not using the best science available to determine irrigated acres in the Fifth Methodology Order, relying instead on outdated acreage figures provided by SWC entities.
4. The Department should implement a review process in Step 1 of the Methodology Order that compares the irrigated acreage figures reported by SWC entities with the irrigated acreage data in the most recent Irrigated Lands data set and/or using METRIC data. The Department should also account for supplemental groundwater use as a source of supply to SWC entities.

Baseline Year

5. The BLY demand for 2018 includes recharge water that has not been accounted for.
6. The BLY 2018 has total precipitation far below the average for the period of record.
7. Hindcast analysis show the BLY 2018 frequently predicts Demand Shortfalls for TFCC in years when TFCC is not actually short of water.

8. The BLY 2018 significantly increases the reasonable carryover demand shortfall in average and above average water supply years. No technical justification for this has been demonstrated.
9. In selecting the BLY, IDWR should consider a percent of average for SWC diversions within range of 97-101% and select an average of years closer to that of the BLY 06/08 (100%) and BLY 06/08/12 (101%) utilized in the First Methodology Order and Fourth Methodology Orders, respectively.
10. The average diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria and is 101% of total SWC diversion. This 06/18 average (or a synthetic diversion volume) should be used as the BLY as it represents 101% of average total SWC diversion.
11. A critical problem is that the BLY selection criteria utilized to date create excessive bias in favor of senior water users. Under the current BLY criteria, increases in diversion by SWC result in higher BLY demands, incentivizing SWC entities to divert more water than is needed to grow crops, and disincentivizing water conveyance efficiency. A new BLY method should be developed that accounts for non-irrigated acres , ensures that any increase in diversion by SWC entities is related to beneficial use on irrigated lands and is not caused by decreases in project efficiencies or diversion of water to meet other needs like hydropower production, and incentivizes water conveyance efficiency.

Forecast Supply

12. The forecast supply model for TFCC is degrading in its explanatory power based on regression data, resulting in inaccurate predictions for natural flow to TFCC
13. Box Canyon Springs discharge is not representative of discharge to the near Blackfoot to Neeley Reach. This should not be used in the April Forecast Supply Models.
14. Well 05S31E27ABA1 is not representative of groundwater conditions in the vicinity of the near Blackfoot to Neeley Reach. This should not be used in the July Forecast Supply Models.
15. A better alternative to the FS models could use forecasted flow at Heise or other model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

Model Uncertainty

16. ESPAM2.2 is, like all models, a simplified representation of reality, and its predictions contain a degree of uncertainty.
17. ESPAM is a single-layer model which assumes the ESPA is homogenous and isotropic. By contrast, the hydrogeology in the vicinity of the near Blackfoot to Minidoka reach suggests the aquifer system is multi-layered with vertical gradients that result in discharge to the reach that require a multi-layered modeled with anisotropic properties. ESPAM's current inability to represent multiple hydrogeologic layers may result in substantial misrepresentation of flow conditions in some parts of the aquifer.
18. Fundamental to overall model uncertainty is the uncertainty associated with the conceptual model reflected in ESPAM2.2. The predictive uncertainty analysis relies on a single conceptual model and does not explore the uncertainty that arises from improper conceptualization of local geologic and hydraulic conditions of the near Blackfoot to Minidoka reach.
19. The large number of parameters adjusted during calibration of ESPAM2.2 increases the likelihood that the model is not unique.

20. ESPAM2.2 has demonstrable uncertainty in the aquifer parameters for transmissivity and specific yield which will impact the timing and magnitude of reach gains to the near Blackfoot to Minidoka reach simulated under the curtailment of junior groundwater rights.
21. ESPAM2.2 has demonstrable uncertainty in the water budget components, particularly consumptive use of groundwater, which impact the timing and magnitude of reach gains to the near Blackfoot to Minidoka reach simulated under the curtailment of junior groundwater rights.
22. The predictive uncertainty analysis of ESPAM2.2 carried out by IDWR explores only a limited aspect of model uncertainty and does not quantify overall model uncertainty.
23. That ESPAM2.2 can fairly closely mimic the observed past behavior of the near Blackfoot to Minidoka reach is not proof that it accurately predicts the effect of curtailment of junior groundwater pumping.
24. ESPAM2.2 is not sufficiently detailed in either its general formulation or its representation of hydrogeologic conditions in the vicinity of the near Blackfoot to Minidoka reach to be used reliably to predict changes in reach gains due to curtailment of junior groundwater rights on the ESPA.
25. ESPAM2.2 represents the surrounding geology to the near Blackfoot to Minidoka reach in highly simplified form, omitting several key features and that would make significant differences in predicted benefits of curtailment.

Transient Application of ESPAM

26. Under a transient simulation with ESPAM2.2, the benefit to the near Blackfoot to Minidoka reach in-season compared to the junior groundwater volume curtailed varies greatly by groundwater district. This is a result of their distance and hydrologic connection to the reach.
27. Using ESPAM2.2 the number of junior groundwater acres that would be curtailed that do not have significant in-season benefits to the near Blackfoot to Minidoka reach is between 300,000-400,000 acres. The water from these rights will accrue to other connected river reaches, springs, without benefit to the SWC, or in years when the water is not needed. The wide-spread curtailment will, by any reasonable standard, result in waste of the resource.

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ATTACHMENT A:

2015 TWG RECOMMENDED REVISIONS TO SURFACE WATER COALITION METHODOLOGY

State of Idaho
DEPARTMENT OF WATER RESOURCES
322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098
Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: www.idwr.idaho.gov

C.L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Director

MEMORANDUM

To: Gary Spackman, Director

From: Liz Cresto, Technical Hydrologist LC
Matt Anders, Technical Hydrologist MA

Date: March 16, 2015

Subject: Recommended revisions to the Surface Water Coalition Methodology

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Introduction

On January 30, 2015, the Director of the Idaho Department of Water Resources (IDWR, Department) issued an order to staff directing them to convene a committee of experts to recommend specific technical changes to the "Second Amended Final Order Regarding Methodology For Determining Material Injury To Reasonable In-Season Demand And Reasonable Carryover" (Methodology) signed on June 23, 2010. Department staff created a committee in response to the Director's order composed of IDWR staff and experts representing parties involved in litigation of the Surface Water Coalition's (SWC) 2005 delivery call. In his January 30 order, the Director requested recommendations for technical changes to the Methodology by March 16, 2015, regarding the following specific issues:

1. Revising natural flow forecast methods for Twin Falls Canal Company.
2. Identifying more accurate and current crop data to determine crop water need.
3. Improving the mid-season reasonable in-season demand forecast.

Committee

The committee held multiple meetings and corresponded though email regarding the issues identified in the order. The committee comprises the following members:

Committee Member	Organization	Representing
Charles G. Brockway	Brockway Engineering	Surface Water Coalition
Chuck Brendecke	Lynker Technologies	Idaho Ground Water Users
Dave Shaw	ERO Resources	Surface Water Coalition
David Hoekema	IDWR	IDWR
Greg Sullivan	Spronk Water Engineers	City of Pocatello
Liz Cresto	IDWR	IDWR
Matt Anders	IDWR	IDWR
Scott King	SPF Water Engineering	Idaho Ground Water Users
Sean Vincent	IDWR	IDWR
Sophia Sigstedt	Lynker Technologies	Idaho Ground Water Users

The committee collectively decided that the most efficient method for consolidating member comments while still adhering to the March 16, 2015 deadline was to have committee members attach their comments to this memorandum. All of the committee members had an opportunity to review this memorandum and all of their comments that we received are attached in Appendix B.

Section 1 – Natural Flow Forecast

Background

The Methodology requires the Director to issue an order determining the demand shortfall of the SWC members for the irrigation season. The SWC members include A & B Irrigation District (A&B), American Falls Irrigation District #2 (AFRD2), Burley Irrigation District (BID), Milner Irrigation District (Milner), Minidoka Irrigation District (MID), North Side Canal Company (NSCC), and Twin Falls Canal Company (TFCC). The shortfall is the difference between the forecast supply and the forecast demand for each SWC member. The forecast supply is comprised of two components: the predicted natural flow supply and the predicted storage allocation for each SWC member. Pursuant to the Methodology, the Department undertakes an April forecast and mid-irrigation season forecast.

In the current Methodology, the April predicted natural flow supply is based on a regression analysis comparing the total natural flow in the Snake River near Heise between April and July to the annual natural flow diverted by each SWC member. While the Director only requested revisions to the natural flow forecast recommendations for TFCC, the committee also identified improved models for AFRD2, BID, MID, and NSCC through its work on revised natural flow forecast methods for TFCC. This memo includes recommendations for revising the April predicted natural flow supply forecasts for TFCC, AFRD2, BID, MID and NSCC.

The mid-irrigation season forecast is addressed in Step 6 of the Methodology. The forecast supply in Step 6 is the sum of the actual year-to-date natural flow diverted, plus the predicted natural flow supply for the remainder of the season, plus the actual preliminary storage allocation. The predicted natural flow supply for the remainder of the season was forecast by selecting an analogous year based on the Snake River Blackfoot to Milner reach gains. The selection of the analogous year typically occurred in August and a revised forecasted supply was issued. In working to meet the request of the Director's January 30 order, the committee reviewed a host of models that predict the natural flow supply for each SWC member from July 1 through October 31.

The natural flow supplies for each SWC member are comprised of natural flow in the Snake River passing the near Blackfoot gage and gains which occur in the Snake River between the Blackfoot to Milner reach. The committee reviewed several different models for predicting both the April and mid-season natural flow supply for each SWC member. While many different predictor variables were considered, the following variables were ultimately selected: natural flow in the Snake River near Heise as reported by the U.S. Bureau of Reclamation; snow water equivalent (SWE) data at the Two Oceans Plateau SNOTEL site; Box Canyon Springs discharge; Spring Creek discharge; and groundwater levels near American Falls Reservoir. The recommended model predictors vary by SWC member and by model implementation date (i.e. April 1 vs. July 1) and are summarized in the sections below.

April 1 Forecast

April forecast natural flow supply models were developed using data from 1990 through 2013. Data from 2014 was excluded from model development for two reasons: 1) the dataset for 2014 was still provisional at the time of model development and 2) record rainfall in August of 2014

resulted in significant data anomalies. For these reasons, we decided to exclude 2014 values from the dataset.

Both single linear regression and multiple linear regression models were considered. We recommend that natural flow supply forecast for A&B and Milner continue to be based on single linear regression models, in which the natural flow at the Snake River near Heise is the predictor variable. We believe the natural flow at the Snake River near Heise is a good predictor because A&B and Milner have relatively junior water rights and typically only divert natural flow during the spring runoff events. When applied, the April 1 forecast will utilize the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation joint forecast of total natural flow in the Snake River near Heise from April-July. Alternative models were evaluated, but we found they added additional complexity without significantly improving the existing A&B and Milner models.

New multiple linear regression models are recommended to replace the existing regression models for TFCC, AFRD2, BID, MID, and NSCC. For these entities, the final predictor variables selected for their respective April 1 models included the total April through July natural flow in the Snake River near Heise and the total November to March discharge at Box Canyon Springs. The predictor variable, natural flow in the Snake River near Heise, was considered a good indicator of the natural flow supplied by snowmelt runoff. The predictor variable, Box Canyon Springs, was considered a good indicator for the natural flow supplied by the reach gains in the Blackfoot to Milner reach. If applied, the April 1 forecast models will utilize the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation joint forecast of the natural flow in the Snake River near Heise from April-July.

Below is a table comparing the models used in the current Methodology to the recommended models. The recommended models for each member of the SWC have a better model fit (higher adjusted r^2) and a lower standard error than the models used in the current Methodology.

SWC Member	Models from Current Methodology[1]		Recommended Models	
	Adjusted r^2	Standard Error	Adjusted r^2	Standard Error
AFRD2	0.8317	39,700	0.8448	37,290
BID	0.7964	20,690	0.8546	17,100
MID	0.7896	29,710	0.8786	22,070
NSCC	0.8952	63,580	0.9151	55,950
TFCC	0.5416	71,990	0.8564	37,940

Appendix A contains graphs of the April models in comparison to the actual natural flow diversions for each SWC member.

July 1 Forecast

Step 6 of the Methodology requires the Department to issue a revised forecast supply "approximately halfway through the irrigation season". New natural flow predictor models have been developed for each SWC member for the specific period July 1 – October 31. We recommended that the July 1 models be implemented when revising the forecast supply in Step 6 of the Methodology.

Using data from 1990 to 2013, regression models were developed for A&B, AFRD2, and Milner by comparing snow water equivalent at the Two Oceans Plateau SNOTEL site on July 1 to the total

[1] Final Order Regarding April 2014 Forecast Supply, April 18, 2014.

natural flow diverted for the period July 1 through October 31. Data from 1997 was excluded from model development because of significant data anomalies as of a result of the high runoff year. The snow water equivalent at the Two Oceans Plateau SNOTEL site was considered a good indicator of additional natural flow diversions after July1. Years with zero (0) snow water equivalent on July 1 were excluded from the model dataset. It is recommended that in years with zero (0) snow water equivalent at the Two Oceans Plateau SNOTEL site on July 1, the predicted natural flow supply for the period July 1 – October 31 for A&B, AFRD2, and Milner will also be zero (0). For A&B, AFRD2, and Milner, the regression models would only be used in those years when the July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site is greater than zero.

Multiple linear regression models were developed for BID, MID, NSCC, and TFCC. The regressions for BID, MID, and NSCC were developed with data from 1990 to 2013 and correlations were developed between the total natural flow diversions from July 1 through October 31and three predictor variables: (1) natural flow in the Snake River near Heise (April – June), (2) snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15, and (3) March depth to water at well 05S31E27ABA1. Manual well measurements were historically taken from March 13 to March 30, with an average date of March 23. A transducer installed in May 2010 replaced the need for manual measurements. The combination of historical manual measurements and March 23 transducer readings will be utilized in the models.

The regression model to predict TFCC natural flow diversions from July 1 through October 31 relies on data from 1990 to 2013 and utilizes three predictor variables: (1) natural flow in the Snake River near Heise (April – June), (2) snow water equivalent at the Two Oceans Plateau SNOTEL site on June 15, and (3) Spring Creek total discharge (January – May). Below are summary statistics for the recommended models.

	Regression based on Two Oceans Plateau Snow Water Equivalent		Multiple Linear Regression	
SWC Member	Adjusted R^2	Standard Error	Adjusted R^2	Standard Error
A&B	0.9294	741		
AFRD2	0.8699	7,502		
BID			0.8932	11,480
Milner	0.8382	2,939		
MID			0.9037	15,720
NSCC			0.8615	46,930
TFCC			0.8511	29,270

Appendix A contains graphs of the July predictor models in comparison to the actual natural flow diversions for each SWC member.

Section 2 – Current Crop Mix Data

Current Method

Crop mix is one of the variables used in the current Methodology to calculate the crop water need of the SWC members. Crop mix is defined as the acreage of each crop type grown by each SWC member. The current method for determining crop mix is a three step process:

1) Tabular crop acreages from 1990 to the present are downloaded by county from the USDA National Agricultural Statistics Service (NASS).

2) Based on the tabular data available from 1990 to the present, an average crop mix for each county is determined.

3) The average crop mix of the counties is applied to each SWC member based on the proportion of land the SWC member has in each county.

Shortcomings of the current cropping pattern method include: NASS tabular data is adjusted to protect farmer privacy and is becoming increasing incomplete with fewer acreage totals being reported since 2005, average acreages for a 25-year period do not reflect current crop mix patterns, and county-wide crop mix may not represent the crop mix of SWC members.

Recommended Revision

Based on testing and with consideration of input from the committee, we recommend revising the method for determining crop mix. Instead of relying on county-wide tabular data, we propose using the digital Crop Data Layer (CDL) from the USDA National Agricultural Statistics Service (NASS). Benefits of this proposed method include: (1) using the most recent data available; and (2) restricting the geographic area of the data to the service area of each SWC member. The proposed method would involve the following steps each year:

1) Downloading the digital CDL dataset from the NASS website.

2) Removing crop type classification errors (speckling) in the CDL dataset with Zonal Statics in ArcGIS. A potential source of error associated with the Zonal Statics process is the intermittent availability of an annual field boundary dataset. However, our review of field boundary datasets and historical aerial photography revealed that field boundaries change infrequently and substituting field boundary datasets from previous years introduces minimal error. An additional possible source of error associated with the Zonal Statics process is the assignment of a single crop type to fields actually planted with multiple crop types. With respect to this concern our qualitative review of historical aerial photography and CDL datasets establishes that fields with multiple crops are rare and we conclude this concern represents a minimal source of error.

3) Clipping the CDL dataset in ArcGIS with an irrigated lands dataset for each SWC member.

4) Calculating the acreage by crop type for each SWC member.

5) Computing a 3-year average by crop type for each SWC member. In our analysis we have found the seven years of CDL data that are currently available do not depict a clear relation between cropping pattern and water supply. Because of this finding, a 3-year average appears adequate to reduce the influence of a single year while still being representative of the current cropping pattern.

Our comparison of the results of the tabular and CDL methods establishes that making this revision will cause the percentage of crop types identified for each SWC member to change between 0 and 30 percent (table below). This range of adjustment appears plausible given the change from a 20-year to a 3-year average and from a county-wide geographic area to the service areas of SWC members. A preliminary comparison of the crop water need calculated using the CDL and METRIC indicates the CDL and METRIC are in general agreement.

Comparison of Crop Mix Derived From NASS Tabular and NASS CDL.

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
Alfalfa	20.2%	42.5%	40.4%	27.8%	36.9%	14.0%	29.5%
	19.2%	26.5%	16.8%	20.9%	29.8%	22.4%	22.4%
Barley	11.6%	3.3%	3.7%	12.0%	11.9%	20.1%	12.7%
	31.1%	5.6%	4.3%	15.4%	13.2%	6.9%	10.8%
Corn	3.6%	5.7%	27.8%	14.9%	0.1%	2.0%	11.2%
	3.1%	28.1%	6.8%	11.2%	2.7%	31.3%	18.9%
Developed-Open Space	—	—	—	—	—	—	—
	0.9%	1.1%	3.0%	0.4%	2.0%	1.6%	2.6%
Developed-Low Intensity	—	—	—	—	—	—	—
	0.0%	1.4%	1.9%	0.0%	3.4%	0.9%	2.0%
Developed-Med Intensity	—	—	—	—	—	—	—
	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.9%
Developed-High Intensity	—	—	—	—	—	—	—
	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Dry Beans	3.4%	4.4%	2.9%	9.2%	2.1%	3.6%	16.7%
	8.4%	2.5%	7.6%	13.0%	3.0%	3.6%	11.1%
Oats	0.2%	0.4%	0.4%	0.1%	0.8%	0.2%	0.2%
	0.1%	0.7%	0.1%	0.3%	0.2%	0.1%	1.0%
Pasture/Hay	—	—	—	—	—	—	—
	2.6%	17.1%	5.3%	1.6%	8.9%	11.9%	14.9%
Peas	—	—	—	—	—	—	—
	0.1%	0.0%	0.0%	0.4%	0.1%	0.1%	1.6%
Potatoes	12.2%	11.9%	10.2%	10.5%	7.1%	13.7%	6.3%
	8.7%	3.3%	10.7%	7.6%	11.9%	7.3%	2.7%
Spring Wheat	13.2%	5.2%	5.3%	8.3%	14.6%	15.0%	4.2%
	3.7%	3.7%	4.1%	3.7%	3.6%	1.8%	0.7%
Sugarbeets	12.6%	11.7%	4.0%	9.6%	12.0%	23.0%	6.7%
	18.7%	4.4%	20.6%	10.5%	11.9%	5.6%	3.0%
Winter Wheat	23.0%	14.9%	5.2%	7.5%	5.5%	8.4%	12.5%
	3.5%	5.5%	18.7%	15.0%	8.8%	6.5%	7.4%

—	Data not included in the NASS Tabular Data
Clear Cells	NASS Tabular Data: Average (1990-2010) % of Crop Harvested vs. Total Crops Harvested Irrigation District Wide
Shaded Cells	NASS CDL Data: 3-Year (2011-2013) Average Crop Pattern per SWC Member

Section 3- Reasonable In-Season Demand (RISD)

The committee began discussions on improving the mid-season reasonable in-season demand forecast. With the limited timeframe the committee was given, we were unable to conclude an analysis of methods to improve RISD forecasts. Because this analysis is not yet complete, we cannot currently recommend any changes to the current Methodology regarding this issue.

Section 4 – Future Committee Meetings

Committee members provided valuable technical input for revising the Methodology. We recommend continuing to convene this committee in the following manner:

1) At least one annual meeting to review implementation of the Methodology during the previous irrigation season. This would be an ongoing forum for identifying and reviewing potential technical revisions to the Methodology.

2) Multiple meetings during 2015 to finish reviewing the following subjects that were discussed by the committee, but require further discussion and analysis to develop a recommendation:

    a. Mid-season calculation of reasonable in-season demand (RISD): The current method uses average demand in 2006/2008 to predict the RISD for the remainder of the irrigation season. We are analyzing the potential for refining this predication by selecting a representative historical analogous year(s).

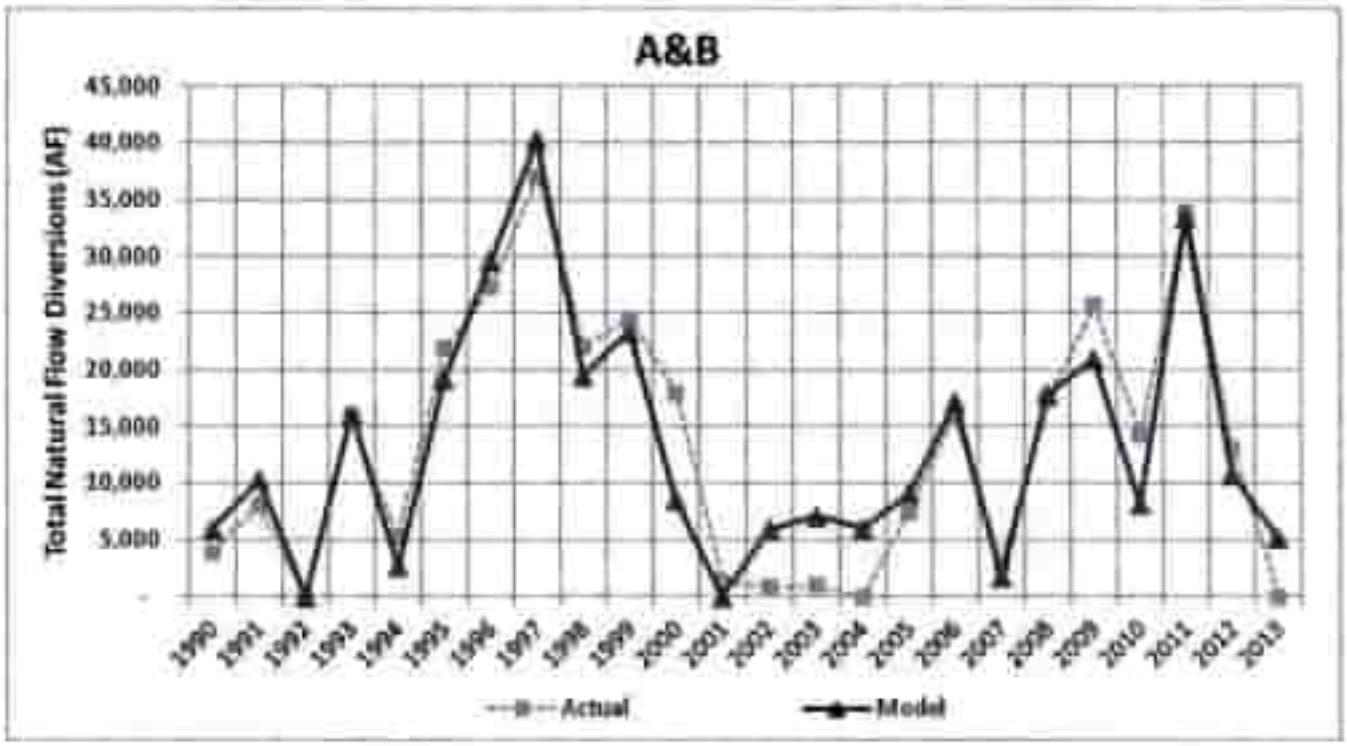
    b. Supplemental ground water use: There was insufficient time for the committee to evaluate this subject.

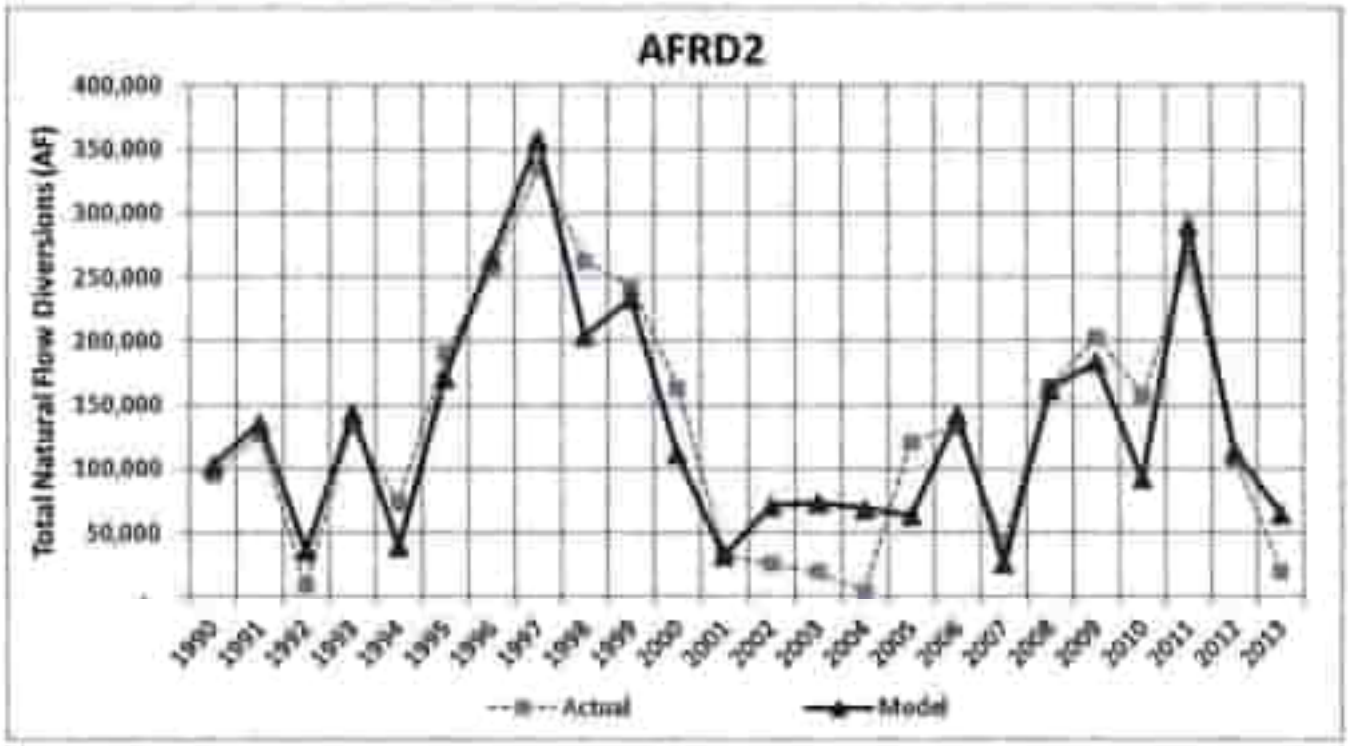
    c. Project efficiency: The project efficiency variable used in the RISD calculation has not been updated since the Methodology was originally developed. The committee had preliminary discussion about the need to update project efficiency and committee members expressed interest in providing input.

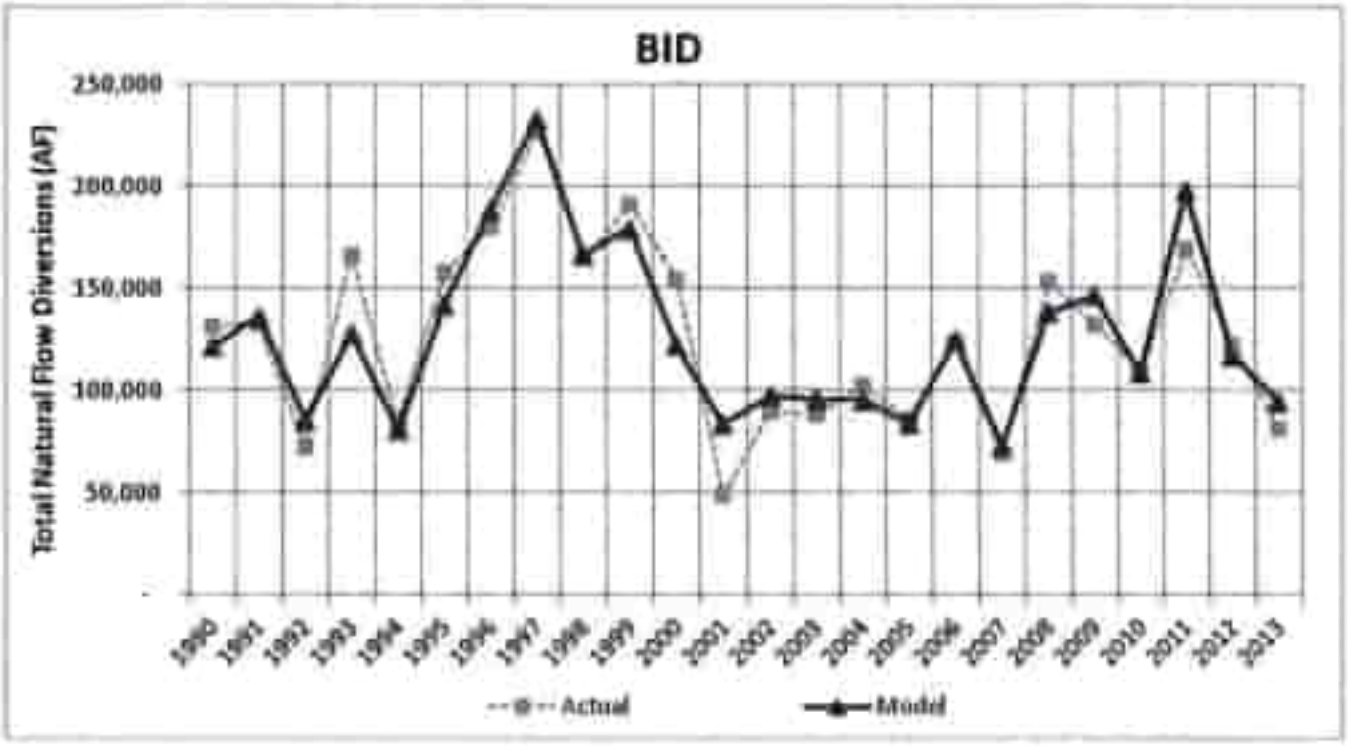
    d. Irrigated acres: Significant discussion focused on this topic and it was generally agreed that the process for determining irrigated acres for SWC members could be improved.

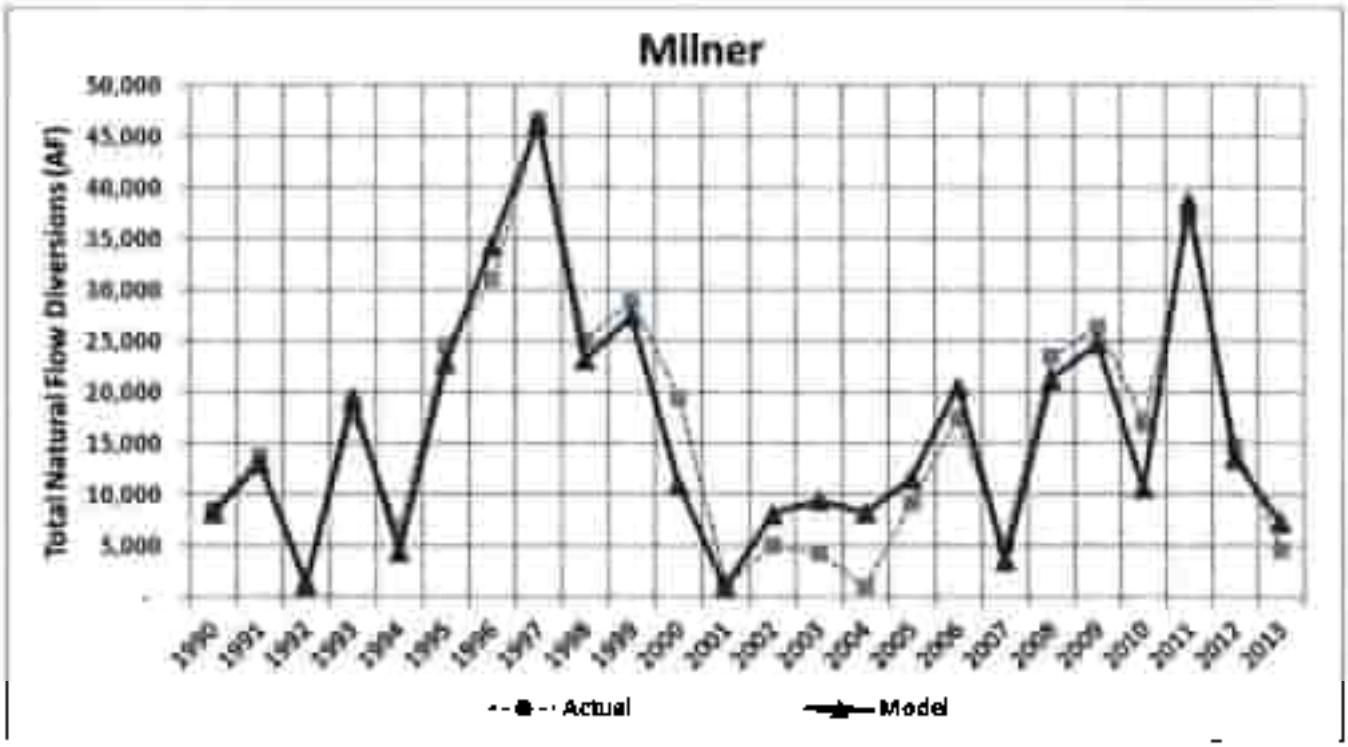
APPENDIX A

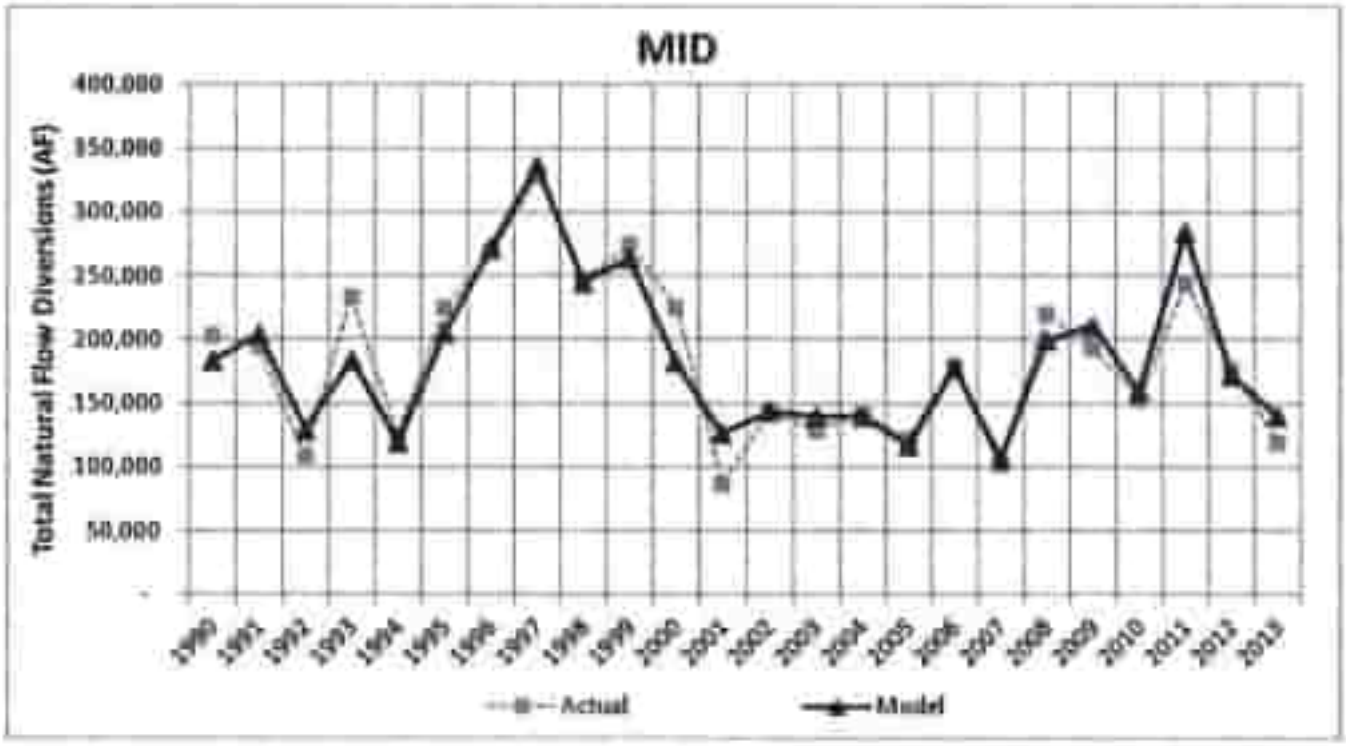
Recommended April Forecast Flow Predictor Models

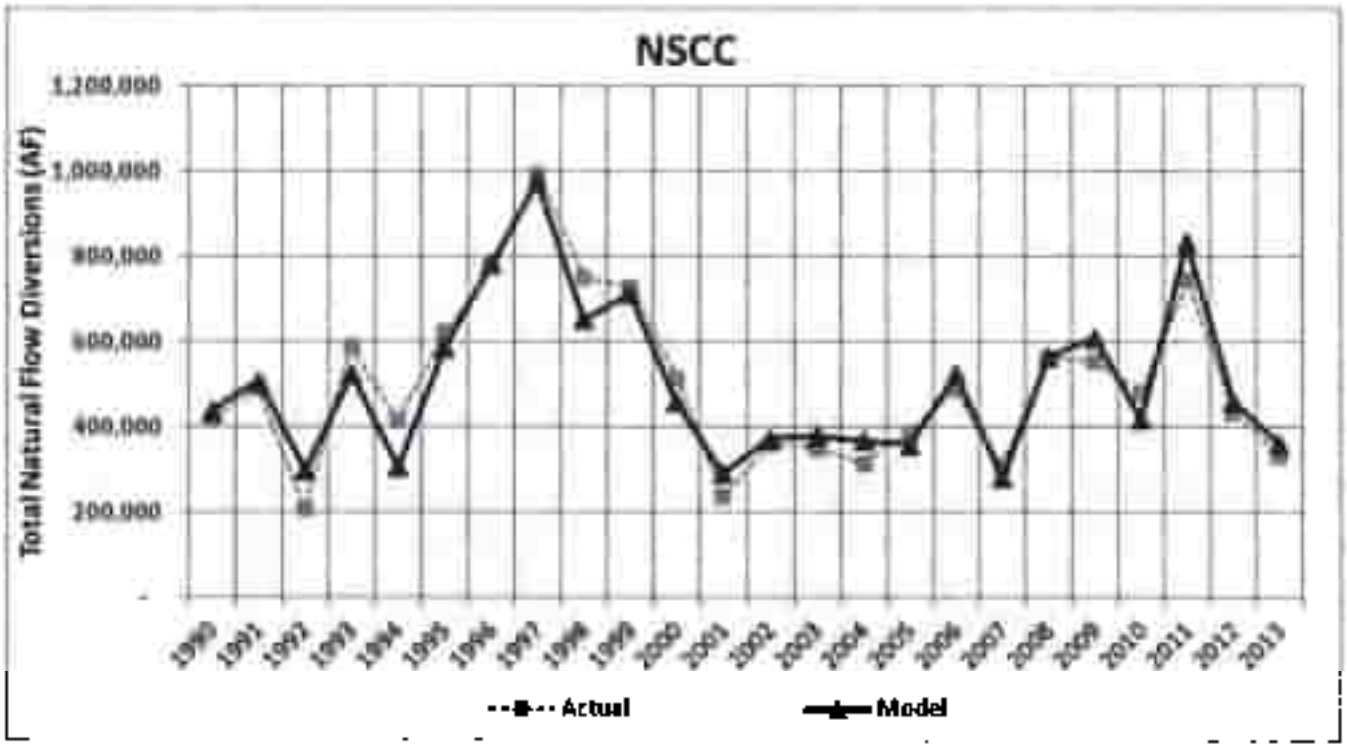


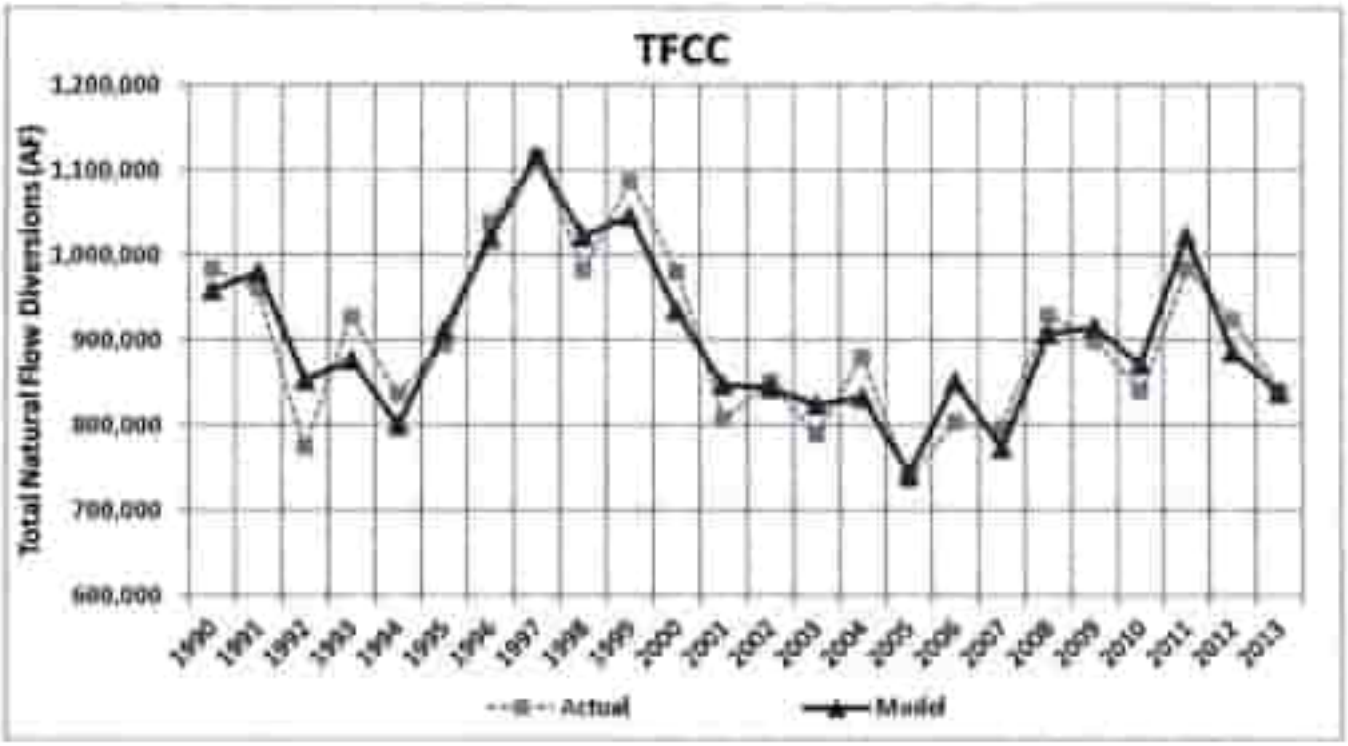



BID
Total Natural Flow Diversions (AF)
250,000
200,000
150,000
100,000
50,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

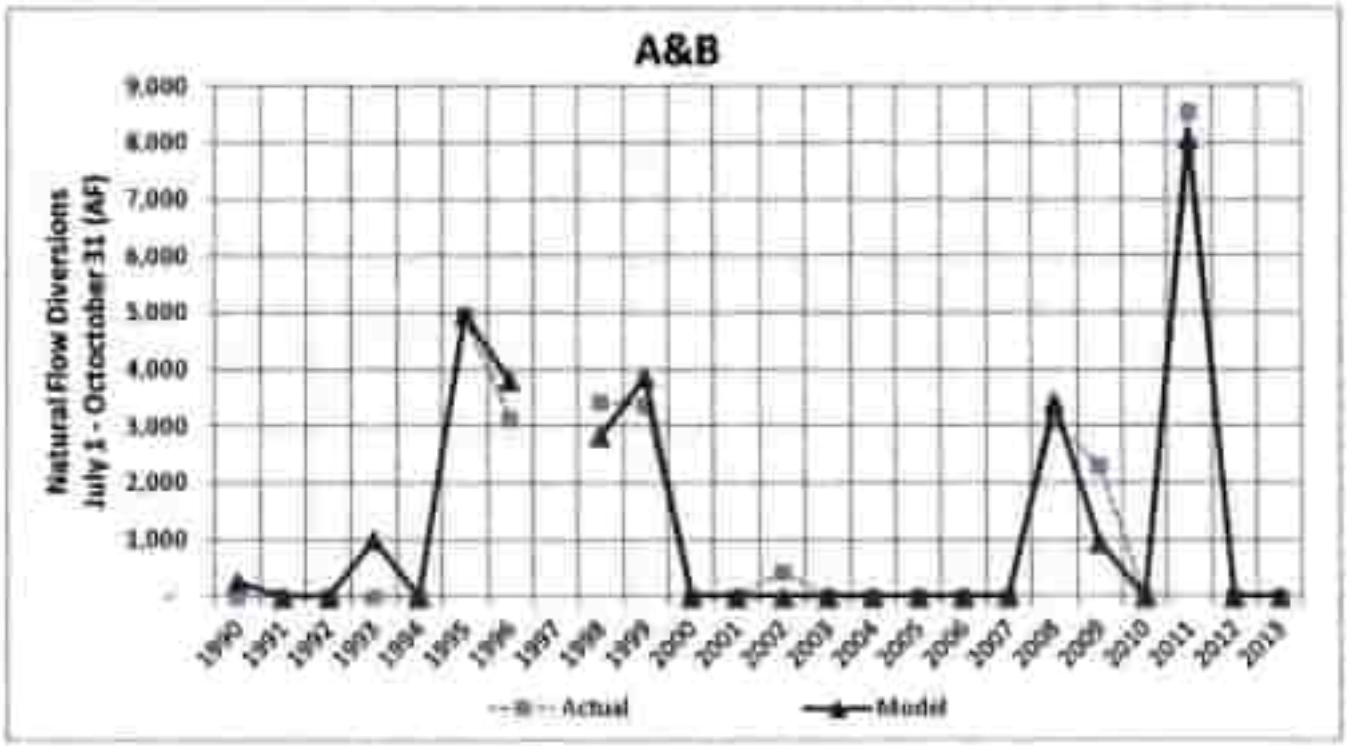

Milner
Total Natural Flow Diversions (AF)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

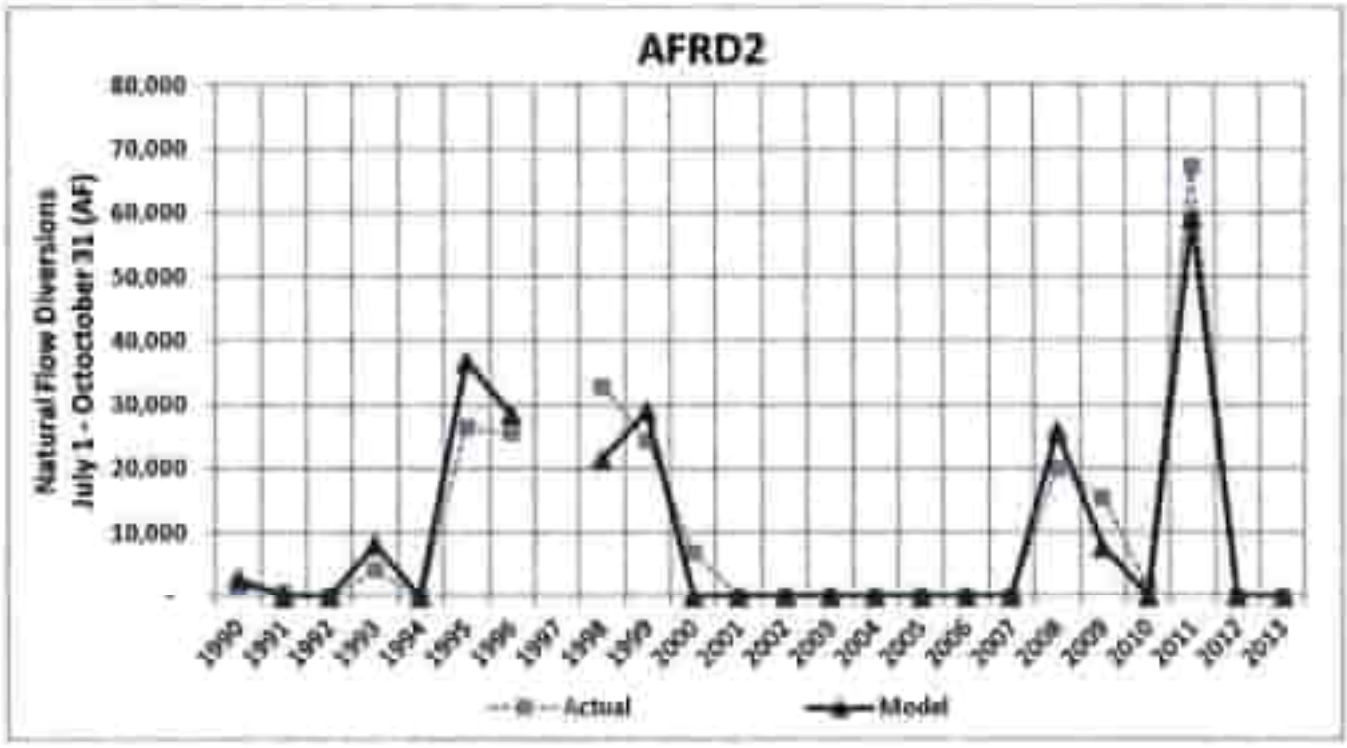

MID
Total Natural Flow Diversions (AF)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model

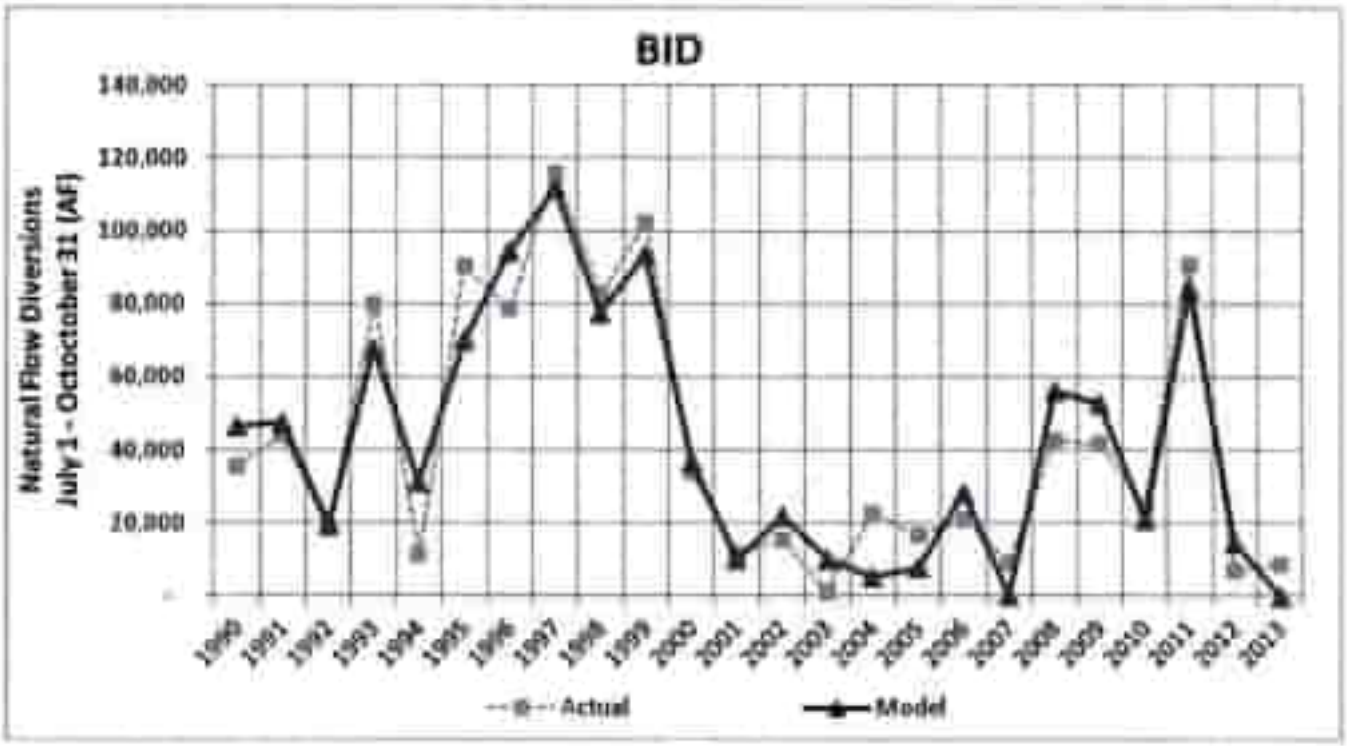

NSCC
Total Natural Flow Diversions (AF)
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Model


TFCC
Total Natural Flow Diversions (AF)
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model

Recommended July Forecast Natural Flow Models






BID
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
140,000
120,000
100,000
80,000
60,000
40,000
20,000
1990
1991
1992
1993
1994
1995
1996
1997
1998
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2004
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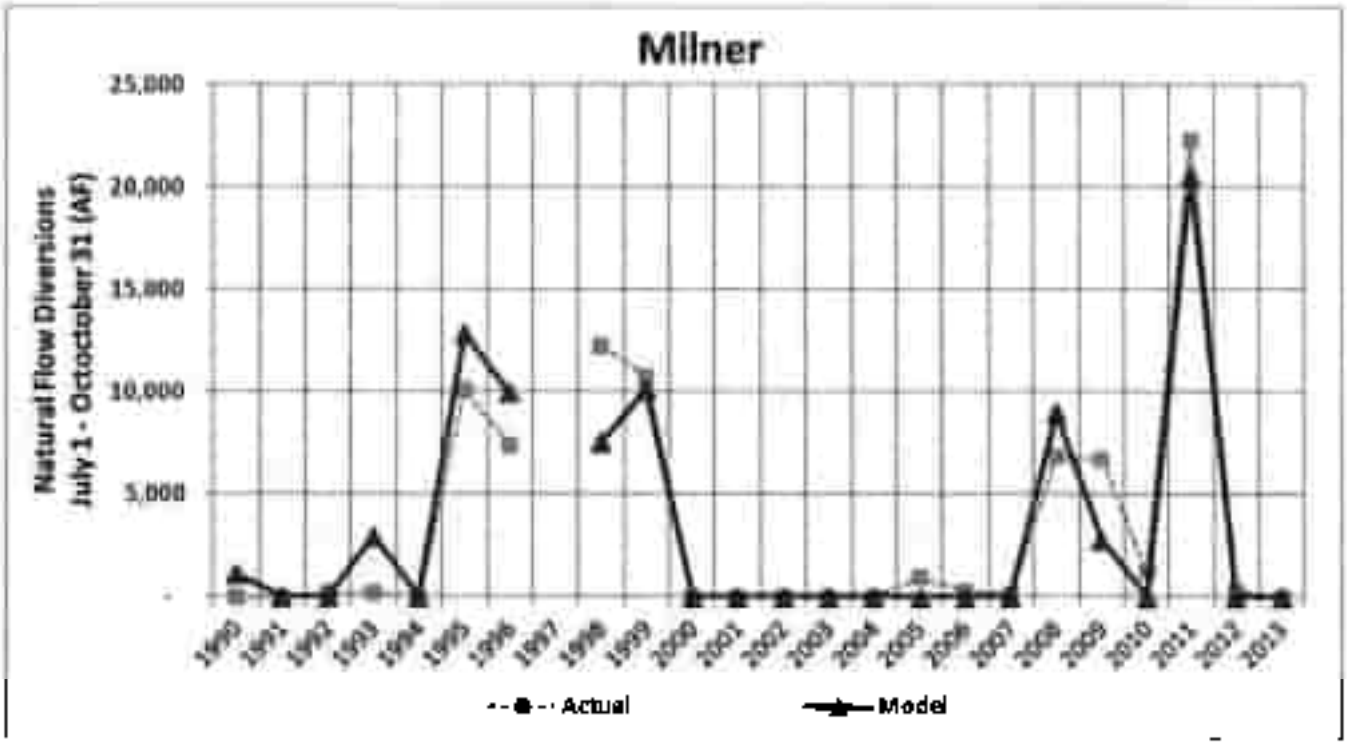
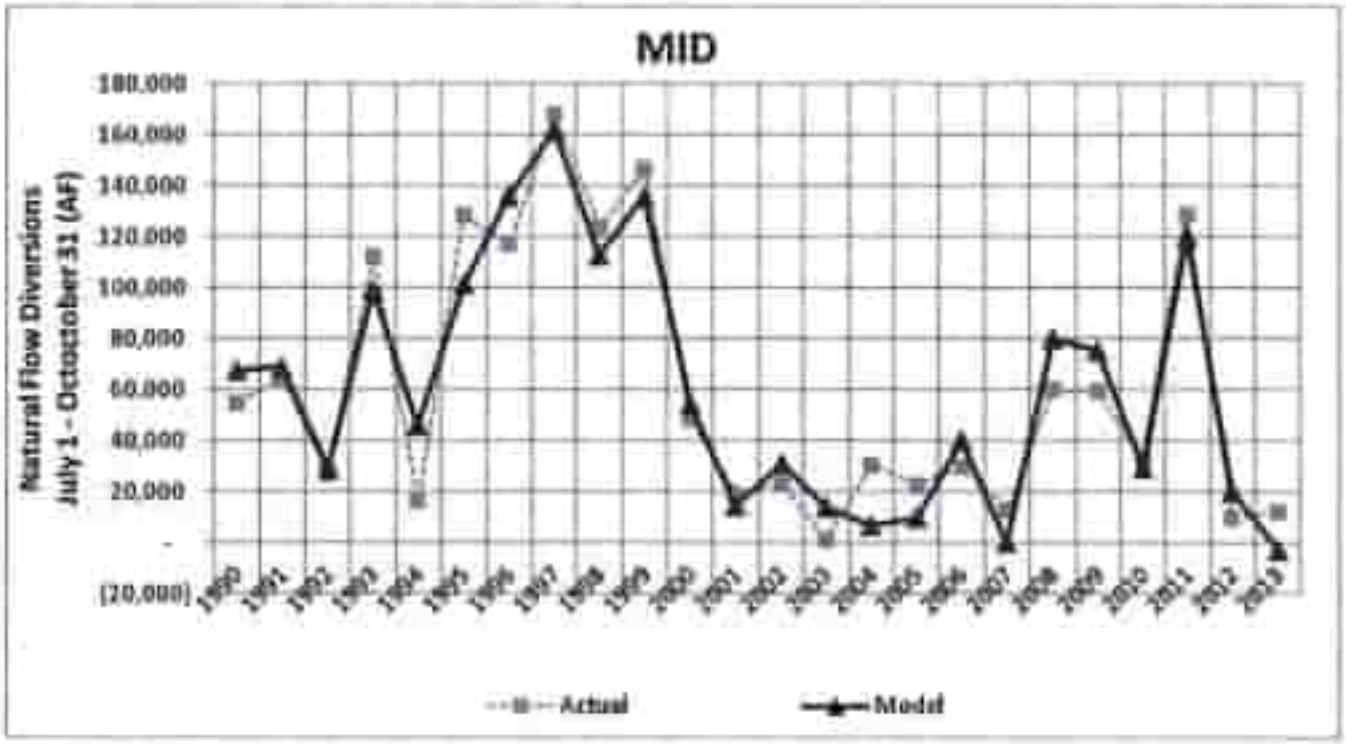
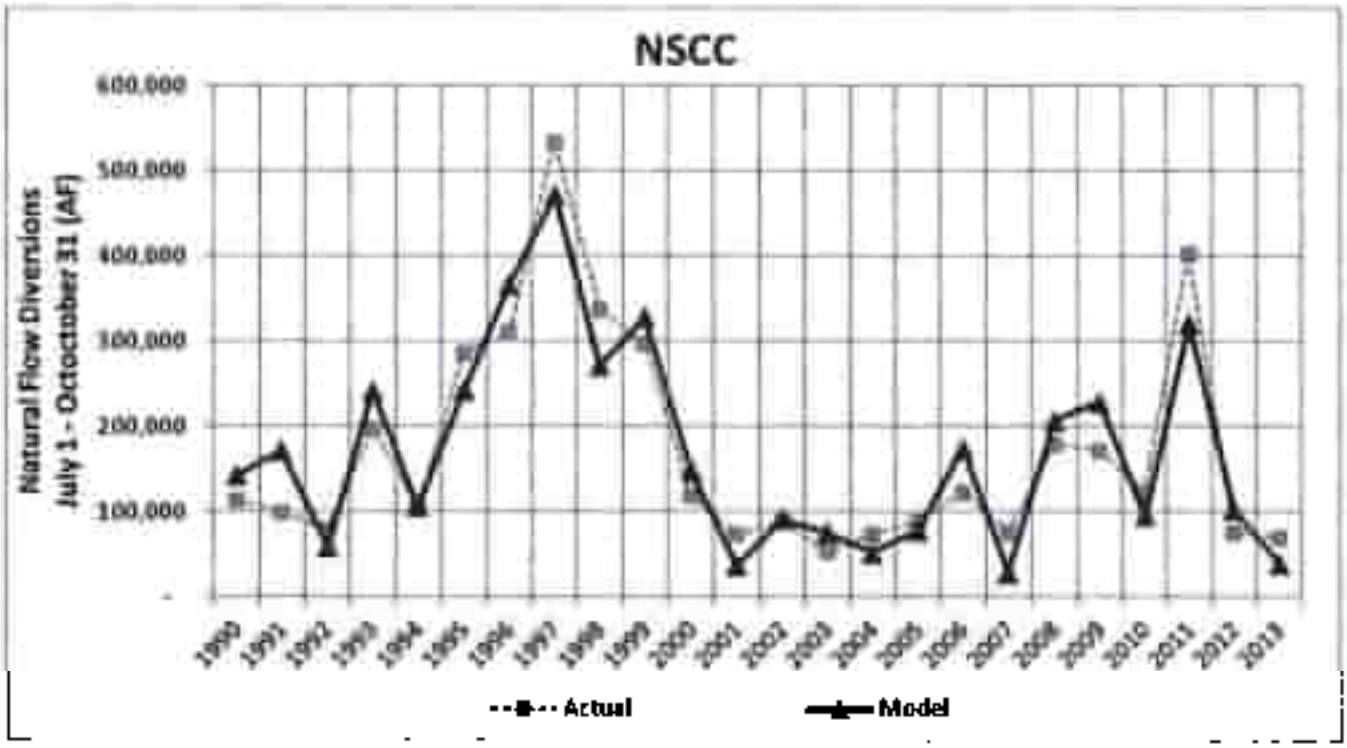
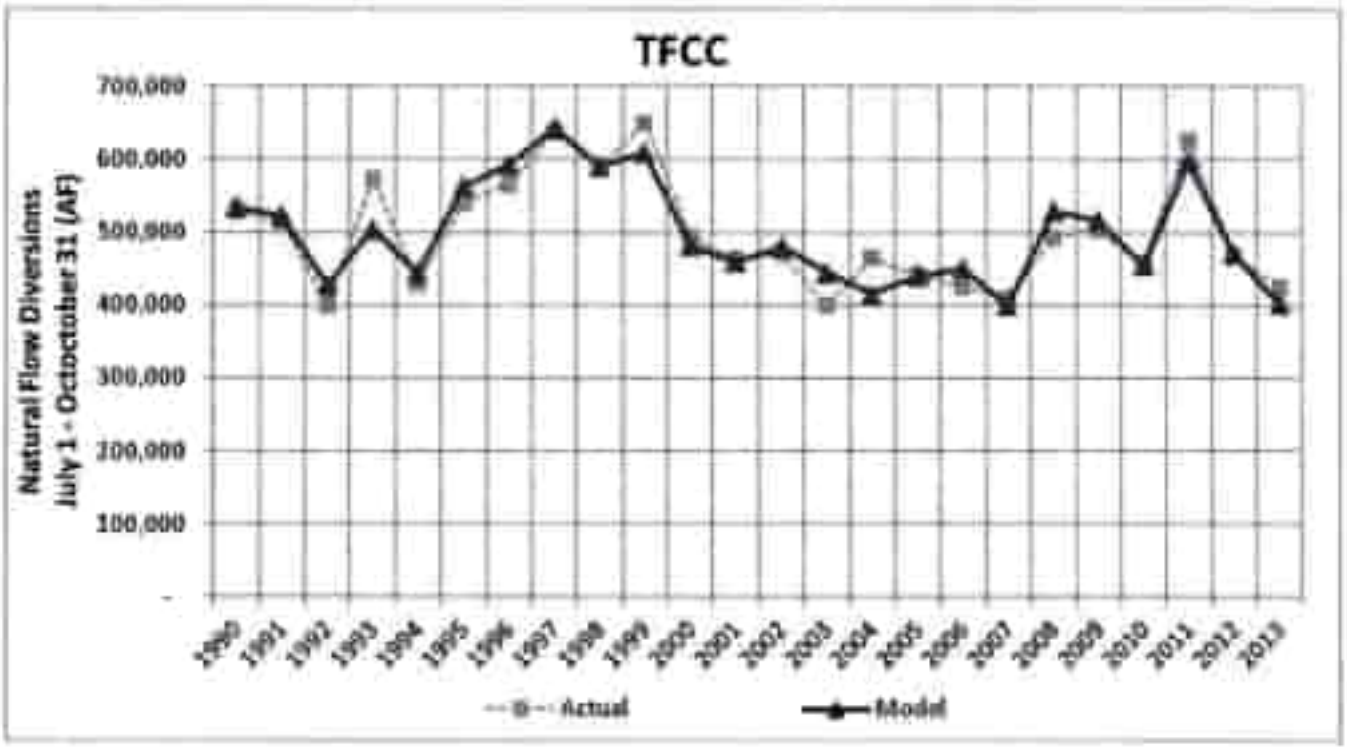
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model


Milner
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
25,000
20,000
15,000
10,000
5,000
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model


MID
Natural Flow Diversions
July 1 - October 31 (AF)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
(20,000)
Actual
Model


NSCC
Natural Flow Diversions
July 1 - October 31 (AF)
600,000
500,000
400,000
300,000
200,000
100,000
-
Actual
Model


TFCC
Natural Flow Diversions
July 1 - Octoctober 31 (AF)
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Actual
Model

APPENDIX B

Comments Received From Committee Members

MEMORANDUM
Settlement Document Subject to I.R.E 408

To: Liz Cresto

From: Charles Brendecke and Sophia Sigstedt

Subject: Comments on Staff Recommendations

Date: March 16, 2015

This memorandum addresses our comments on the analyses presented to the Technical Working Group related to revisions to the Methodology Order for determining injury to water rights held by members of the Surface Water Coalition. It serves as an addendum to the Idaho Department of Water Resources (IDWR or Department) staff memorandum regarding recommended revisions. Department staff were asked to provide recommendations to the Director on the following topics[1]:

1. Revised natural flow forecast methods for Twin Fall Canal Company (TFCC).
2. Identify more current and accurate crop data to determine crop water need.
3. Improvement of mid-season reasonable in-season demand forecast (RISD).

Topics 1 and 2 were assigned priority and due to time constraints are the only topics the Department staff make recommendations on in their memorandum.

Sections 1 and 2 below summarize our comments based on the proceedings of the committee regarding the recommendations to topics 1 and 2, respectively, in the staff memorandum. It is our understanding that Department staff recommendations on topics 1 and 2 are based on analyses that could be completed within the time constraints provided, and that while they are intended to provide guidance for administration of TFCC's water rights for the 2015 irrigation there will be opportunity for further analyses and recommendations concerning both topics for future irrigation seasons. It is also our understanding further work will be done on topic 3 prior to the need for the mid-season adjustment. Section 3 summarizes our preliminary comments regarding aspects of the mid-season RISD calculation.

The three topics identified above are not the only items in the Amended Methodology Order that were set aside or remanded by the District Court. The comments in our memorandum should not be considered a comprehensive summary of our opinion on all the technical aspects under consideration in the remand of the Amended Methodology Order.

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[1] Status Conference, January 28th 2015

Lynker Technologies
5685 Conestoga Court Suite 220
Boulder, Colorado 80301

Tel: 303.384.8627

Section 1

Part D. of the Memorandum Decision and Order on Petitions for Judicial Review of the Amended Methodology Order found that "The *Methodology Order's* reliance upon the Joint Forecast, and its use of the Heise Gage, to determine the available water supply for Twin Falls Canal Company is set aside and remanded for further proceedings as necessary." The issue was unopposed and the Department expressed that the Joint Forecast is "not the best evidence" for purposes of predicting TFCC's supply and that they would be willing to work with TFCC to improve the predictors for future application.

The Department staff's recommendations for revised natural flow forecast methods for TFCC began with the assumption that the need to predict TFCC's supply must occur prior to April 1. The comments provided here neither support nor reject that assumption. The Department staff' recommendations for revising TFCC's supply improves the current relationship used in the Methodology Order. However the analysis and committee review process was undertaken in a highly compressed timeframe and many things warrant additional consideration. We support the idea of treating the refinements to the Methodology Order as a "living document" that allows for continual improvement and to use the staff's recommendation as an interim solution for the upcoming 2015 irrigation season only.

We believe that one reason the Heise Gage forecast is not a good predictor for TFCC supply is that the predictor is physically based while the TFCC supply is considered to be the historical TFCC diversion record. TFCC diversions are not the same as the physical supply available to TFCC because the diversions reflect administrative and operational influences in addition to being a condition of the physical natural flow supply. For example, TFCC has the more senior water right relative to the other surface water diverters below Blackfoot and their diversions in early season are often capped by the water right amount rather than the physically available supply. The water right cap creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This difference is a probable reason the Heise forecast alone had such a low correlation to TFCC compared to the other entities. In light of this, an approach that we believe should be further investigated is creating a regression relationship or alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC.

The natural flow forecasts for TFCC and subsequently a selection of other entities were improved by moving from a single variable linear regression model to a multilinear regression. The improvement in the TFCC prediction supports the Department staff recommendation in the use of the additional Box Canyon data in April and the Snotel and Spring Creek discharge data in July. The Department Staff also recommended new models for some entities that showed improvement in the July forecast with the addition of Snotel and March groundwater level data. While these newly developed models can be tested over the upcoming irrigation season we believe they can be further improved.

Section 2

Our comments are limited on the succinct issue of the Department staff recommendation to use the digital Crop Data Layer (CDL) from the USDA National Agricultural Statistics Service (NASS) as a more current and accurate crop data source to determine crop water need. One concern here is how the data is post processed. We recommend sensitivity tests to different program settings when raster processing is applied. We also recommend further investigation into the method behind the development of the NASS dataset to determine how and to what extent the data set is field verified or if there are common misrepresentations that should be considered in the process of data quality assurance checks.

Section 3

As the Department memorandum stated there was not sufficient time for the staff to make a recommendation on the RISD forecast. There are multiple components to the RISD forecast calculation that are under review in the current Methodology Order. These include but may not be limited to:

- The mid-season calculation of RISD
- Project efficiency
- Irrigated acres
- Supplemental groundwater use

Regarding the mid-season calculation of RISD the sensitivity and appropriate use of crop coefficients and climate data behind the reference ET in the calculation should be investigated and analyzed for proper application to local conditions.

Regarding project effiencies we recommend investigation into trends among the entities related to each of the factors the Methodology Order considers in their determination.

Regarding irrigated acres it appears there is not a standard review process for the updates by the SWC or for the critique by IDWR of the submittal of the irrigated acres. With only a check against the total acres in the decreed place of use, there is little or no incentive to keep these shapefiles up to date. Based on the discussion in the technical working group the determination of irrigated acres will likely not be addressed in this review process. Updating irrigated acres by verification of claimed irrigated polygons by satellite and/or aerial imagery is a detailed, time consuming process. But it is essential to protect the valid water rights of juniors.

If SWC members are going to be responsible for this task a first step that the Department should take is to develop a standardized method for this update. This should include pointers to the preferred irrigated polygon base layer, satellite/aerial imagery, and a comprehensive list of items that need to be clipped out (i.e. roads, homesteads, brush land, fallow acres, water features, urban areas, sub-divisions), how alignment issues could be improved and recommendations for how to streamline as many of these processes as possible. This process will only be fair if each user does the analysis in the same way. Once a more accurate representation of the irrigated acres for each entity is created and approved updates in the future can be based more on accounting of the movement of water throughout the district as some of the entities already track. The 5% change standard should also be considered in light of large districts like TFCC where a 5% error

in irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation.

Regarding supplemental groundwater use there was not sufficient time for the working group or Department staff to address this issue. However, it was one of the specific technical items cited for revision by the District Court. Accordingly, we believe that the process that has been established for identifying Methodology revisions be continued until all the technical issues presented in the remand are addressed.

SPF WATER ENGINEERING

MEMORANDUM

DATE: March 16, 2015

TO: Liz Cresto, Technical Hydrologist

FROM: Scott King, P.E., SPF Water Engineering LLC on behalf of IGWA

RE: **Comments on Staff Recommendations**

Job: **535.0190**

Liz,

This memo provides comments to be included with your March 16, 2015 Settlement Document Memorandum.

1. The committee discussed the importance of methodology guidance being a living document and that the Technical Working Group (TWG) should continue meeting occasionally to improve the methodology and address items that were neglected due to limited time. I want to express my support for this approach.

2. Supplemental ground water use was a topic of importance to the Technical Working Group's (TWC), but was not evaluated sufficiently due to time constraints. Supplemental ground water use within much of the surface water coalition's delivery area is measured and reported to IDWR. However, we expect not all ground water use is measured due to the wells being located outside of the ground water measurement program area. Unmeasured supplemental ground water use should be addressed and may need to be measured.

3. The total area of lands receiving surface water irrigation deliveries has been updated for some but not all SWC members. The TWC discussed a methodology whereby irrigated acres would be updated if that area changed more than five percent from currently used values. A five percent change is significantly different when comparing between the smaller and larger delivery entities. For example, five percent approaches ten thousand acres for Twin Falls Canal Company. The committee may consider also including an acreage threshold in this decision point. For example: "the lesser of five percent or one thousand acres." This approach is supported by high quality aerial imagery currently available, limited land use changes within the SWC areas, and prior efforts in identifying and digitizing irrigated and non-irrigated areas.

300 E. Mallard Drive, Suite 350, Boise, Idaho 83706 Tel: 208-383-4140 Fax: 208-383-4156

4. Some delivery entities have reported that irrigated acres are unchanged from decreed values. There is not an incentive for SWC entities to identify and report reductions in irrigated acres. This deficiency should be addressed.

Thank you for the opportunity to participate in the committee and provide these comments.

Memorandum Subject to I.R.E. 408

To: Gary Spackman, Director IDWR

From: Charles G. Brockway, Brockway Engineering on behalf of the SWC
David Shaw, ERO Resources Corp. on behalf of the SWC

Date: March 16, 2015

Re: Recommended Revisions to the Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

The SWC generally supports the efforts of the Director, IDWR Staff and other members of the TWG for their efforts and the recommendations proposed in the staff memorandum to the Director dated March 16, 2015. The recommended natural flow forecasting methods and crop mix determination are improvements to the original methodology procedure and we urge the Director to implement those changes. We also support the annual review of the implementation of the Methodology.

In the second paragraph under the April 1 Forecast section the statement is made that A&B and Milner irrigation districts have relatively junior priority water rights and typically only divert natural flow during spring runoff events. We believe it would be worth noting that Milner's priority is good enough to sometimes divert natural flow at other times, particularly late in the irrigation season.

The SWC supports the use of the NASS CDL data to estimate crop mix for the current year based on the 3 previous years' data. We notice in the example on page 6 of the staff memo the average used is for 2011 – 2013. We assume this is the result of a timing issue since the 2014 CDL was not released until after January 1, 2015. We assume the intent is to use the most recent 3 years' data when used to calculate RISD in the Methodology process. We also want to ensure the SWC Managers can submit crop mix data that becomes available to them if they believe any particular year is an anomaly and would not be fairly represented by the previous 3 years' CDL data.

The SWC is concerned about the topics in the final recommendation for multiple meetings for the remainder of 2015. Most of the proposed topics are not part of the Court's remand order. In particular, project efficiency was fully supported by the court in spite of the ongoing efforts by others to attack that aspect of the methodology or the efficiencies themselves. On remand the Court simply said the Director should follow the order when considering irrigated acreage submitted by members of the SWC. We understand the need to change the water supply forecasting methods to make a mid-season determination and the July 1 methods in the staff memorandum address that need but there has not been a compelling reason given to change the method of estimating demand for the remainder of the year.

Again, thank you to everyone who participated and to the Director and his staff for the opportunity to participate in this effort.

ATTACHMENT B:

LYNKER MEMORANDUM: COMMENTS ON 2022 IDWR STAFF RECOMMENDATIONS

MEMORANDUM

To: Matt Anders and Kara Ferguson, IDWR

From: Sophia C. Sigstedt, Lynker

Subject: Comments on 2022 IDWR Staff Recommendations

Date: January 16, 2023

This memorandum addresses my comments on the analyses presented to the 2022 Technical Working Group (TWG) related to revisions to the Methodology Order for determining injury to water rights held by members of the Surface Water Coalition. It serves as an addendum to Idaho Department of Water Resources (IDWR or Department) staff recommendations for the 2022 Methodology Update. IDWR staff and other members of the TWG presented analyses and recommendations regarding the following topics:

1. Baseline Year (BLY)
2. Forecasting Natural Flow Supply
3. Near-Real-Time METRIC for ET
4. Project Efficiency (PE)
5. ESPAM2.2 Steady State v. Transient

IDWR staff proposed changes related to BLY and PE, but only presented the results of internal analysis without recommending changes to the other topics investigated. TWG members were asked to consider whether the proposed recommendations provide a better technical basis than the current technique, or if there was an alternative with a better technical basis.

Sections 1-5 summarize my comments based on the proceedings for each TWG topic as listed above, respectively.

The topics identified above are not the only items in the Amended Methodology Order that should be considered regarding technical improvements. The comments in this memo are primarily in response to recommended changes made by IDWR staff in their memorandum dated December 23rd, 2022[1] and should not be considered a comprehensive summary of my opinions on all the technical aspects presented to the TWG or any other outstanding issues in the proceeding.

Section 1: Baseline Year Update

The IDWR staff recommended:

- Update the BLY irrigation demand used to determine Reasonable In-Season Demand (RISD) from the current average of diversion demands for the 2006, 2008, and 2012 (06/08/12) irrigation seasons to the diversion demand for the 2018 irrigation season.
- Update the BLY irrigation demand used to determine Reasonable Carryover for each SWC member from the current average of diversion demands for the 06/08/12 irrigation seasons to the diversion demand for the 2018 irrigation season.

[1] Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition (IDWR, December 23rd 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

In my opinion the recommendation to replace average diversions for the 06/08/12 irrigation seasons with single-year diversions in 2018 as the BLY does not have an adequate technical basis, and alternatives should be considered due to the following:

1. IDWR should consider rank within the period-of-record (POR) and select an average of years closer to the rank of the 06/08/12 BLY selected in 2015. IDWR staff presented analysis to the TWG for individual years 2018 and 2020 for consideration as the updated BLY. Either of these individual years are inadequate to represent reasonably dry baseline conditions for SWC diversions.

   When the average of diversion demands for the 06/08/12 irrigation seasons was selected as the BLY in 2015, the 06/08/12 average ranked between 7th and 8th highest for diversions, or about the 55th percentile (based on a normal distribution), for the POR 2000-2015 (**Figure 1**). IDWR staff presented analysis of Demand Shortfall calculations using 2018 and 2020 as an alternative BLY as they were both found to individually meet all the BLY criteria as shown in **Table 1**. For the POR 2000-2021 the diversion demand for 2018 and 2020 rank 3rd and 2nd, respectively, highest for diversions out of the 22 years, or about the 90th and 95th percentile (based on a normal distribution) for the POR (**Figure 2**).

   In a hindcast analysis by IDWR staff, the higher rank in BLY SWC diversions appears to cause a huge shift in the type of water year (i.e. wet, average, dry, very dry) where Demand Shortfalls are calculated. The hindcast showed a Demand Shortfall much more frequently in average and even wet years in addition to every dry or very dry year. When you compare the distribution of SWC total diversion demands for the POR 2000-2015 compared to 2000-2021 in **Figures 1** and **2**, however, it is apparent that they are very similar with mean diversions of 3.16 maf and 3.2 maf, respectively. The standard deviation is also very similar for the POR 2000-2015 compared to 2000-2021 at 178,089 af and 178,587 af, respectively. The selection of the BLY is meant to be conservative as defined by the BLY criteria. The shift to SWC diversions of a much higher rank (compared to the previous BLY) like 2018 or 2020 translates to a much higher level of conservatism and is not technically justified given the similarity between mean diversions and the standard deviation for the 2000-2021 POR versus the 2000-2015 POR.

   The Methodology Order states that the BLY can be a year or an average of years that meet the BLY criteria (**Table 1**). IDWR staff considered rank within the POR when they recommend keeping the 2002 and 2004 average Heise natural flows as the Supply in the Reasonable Carryover calculation from the 4th Amended Methodology Order for the 2022 update[2]. The average of diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria as shown in **Table 1** and is closer to the 55th percentile based on a normal distribution for diversions 2000-2021 similar to the rank of the BLY 06/08/12 (**Figures 1** and **2**) as applied in the 4th Amended Methodology Order. The BLY of 06/18 has a better technical basis than the proposed update to 2018 as the BLY.

Table 1. Baseline Year and Baseline Year Criteria

BLY Criteria	BLY Avg 06/18	BLY 2018	BLY 2020	Avg 2000-2021
Abv Avg SWC Diversions	3.22 maf	3.38 maf	3.53 maf	3.20 maf
Abv Avg GDD	2575 units	2550 units	2600 units	2495 units
Abv ET	1265 mm/d	1275 mm/d	1280 mm/d	1245 mm/d
Blw Avg Precipitation	3.9 in	2.6 in	2.7 in	4.5 in
Abv Avg SWC Supply	8.52 maf	9.00 maf	8.10 maf	7.70 maf

[2] Proposed Modification of the Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: Reasonable Carryover (IDWR, presentation slide no. 4, December 9th, 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

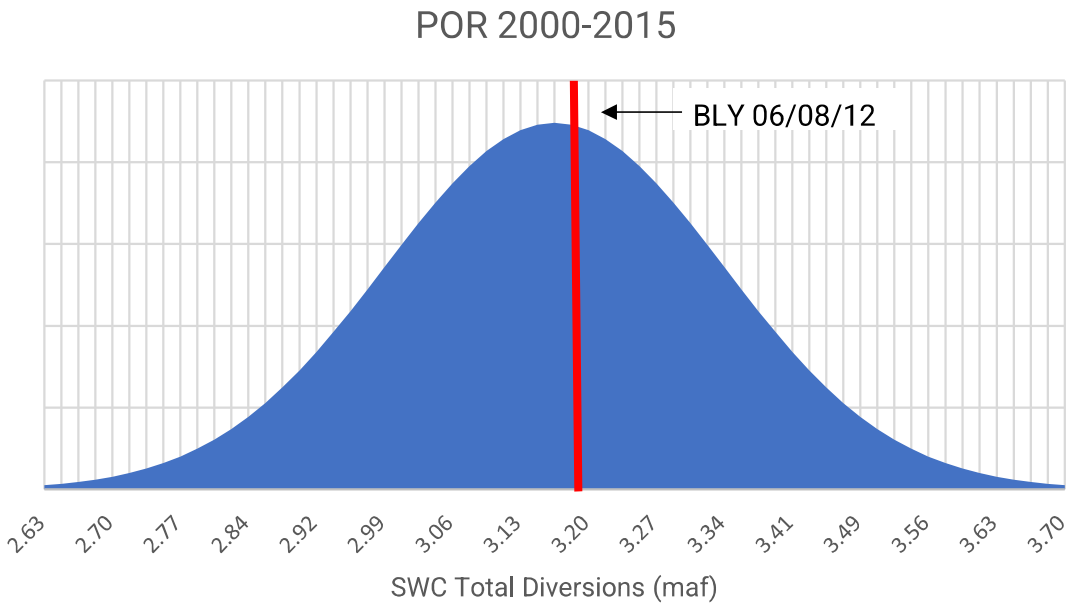

Figure 2. Normal distribution of SWC Total Diversion over the POR 2000-2015, the *red line* shows where the selected BLY 06/08/12 for the 4th Methodology Order falls within the normal distribution.

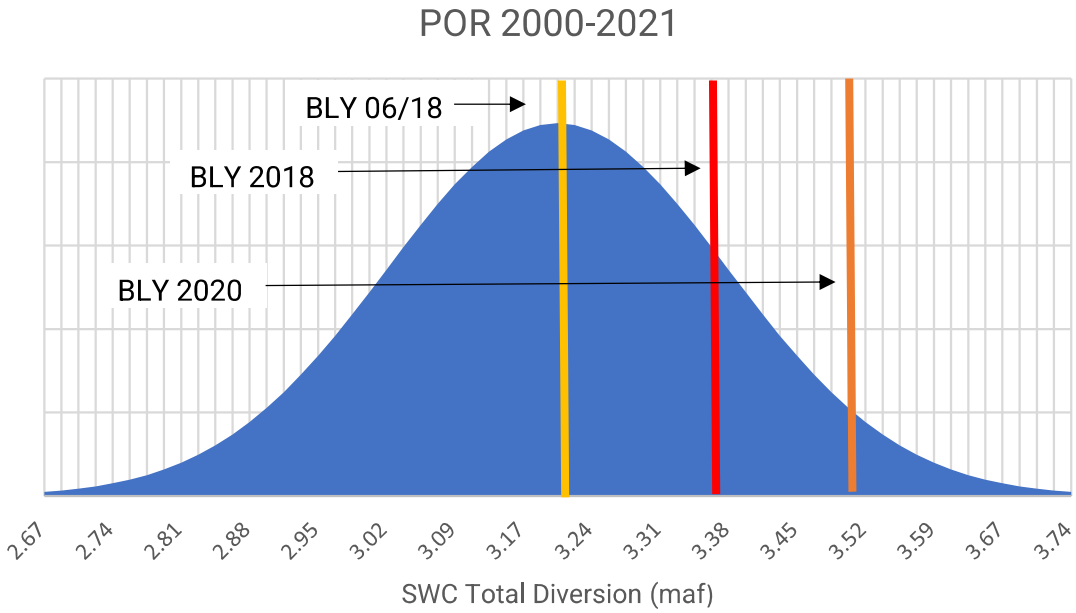

Figure 2. Normal distribution of SWC Total Diversion over the POR 2000-2021, the *yellow line*, *red line*, and *orange line* show where the proposed BLY 06/18, 2018 and 2020 falls within the normal distribution, respectively.

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

2. Another reason a better alternative would be to use diversion demands for the 06/18 irrigation seasons for the BLY is that there were unique hydrologic circumstances in 2018 that I don't believe represent the typical dry year. The 2017/2018 snowpack was very high and water year forecasts and early season streamflow led to positive water supply forecasts which resulted in a record amount of aquifer recharge in 2018. IDWR staff acknowledged the technical difficulties in sorting out surface water adjustments like recharge in applying the Methodology Order. The combination of large volumes of widely distributed canal recharge, often in relatively rarely used or new systems, may have exacerbated uncertainty in the adjustment. The positive water supply outlook may have also resulted in less stringent surface water administration and ultimately higher diversions than the crop water need alone would predict. Consequently, using gross diversions in 2018 as the BLY effectively overstates surface water irrigation demand. IDWR staff presentations and a review of Twin Falls Agrimet station data also showed the 2018 irrigation season is the only year in the 1992-2021 POR with a zero-precipitation total for July-September. The fact that almost any individual water year will have some unique circumstance is a good reason for continuing to define the BLY based on an average of years as the Methodology Order does currently.
3. An additional reason for using a specific percentile (or rank) within the POR when establishing a BLY, and for using an average of years, is that the process for selection of the BLY otherwise appears arbitrary and subjective. If IDWR staff are presented with multiple years within the POR that fit the criteria for a BLY, and there is no guidance or standard method for selecting a single BLY, the ultimate selection becomes purely subjective. Using an average of years that targets a prescribed rank is a more objective and technically defensible process.

Section 2: Forecasting Natural Flow Supply

IDWR staff did not make a recommendation on updating April and July regression models to improve their predictive power for natural flow supply. The staff did make presentations to the TWG on natural flow forecasting models that showed the Twin Fall Canal Company (TFCC) model is degrading in the R^2 value. This degradation is significant in that the R^2 values is an expression of the explanatory power of the forecast model. The TFCC natural flow forecast models also started with the lowest R^2 values based on the previously revised forecast. The technical information presented to the TWG indicated that a revised natural flow method for TFCC should be evaluated and a recommendation for an improved method should be made. However, given the extremely compressed timeframe for staff and TWG members to conduct a thorough evaluation I understand why a recommendation was not made at this point.

Lynker's technical memorandum included as addendum to IDWR staff recommendations in 2015[3] laid out an alternative forecast model approach that I continue to think should be further investigated. The approach is creating a regression relationship or alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC. The technical basis for this suggestion is that water rights administration creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This is likely the reason it is difficult to find a high performing regression model for TFCC.

The process for natural flow forecast model revision should also be standardized in-terms of defining how frequently a thorough re-evaluation of the predictors and models is done (i.e. 3-yrs, 5-yrs, if R^2 value drops below a threshold). This should include re-evaluating previously tested predictors over the new POR, as well as, casting a new net of total predictors for consideration by the TWG. While the TFCC model stands out in needing a refinement all of the models could be improved if sufficient time for the analysis were allowed. Several of the models utilize a depth to groundwater measurement as a predictor from a specific Sentinel Well flagged by a separate TWG (IGWA-SWC)[4], as likely impacted by American Falls Reservoir level.

[3] Recommended Revisions to the Surface Water Coalition Methodology (DWR, March 16th, 2015)
[4] IGWA/SWC Steering Committee TM: 2021 Sentinel Well Recommendations (IGWA/SWC TWG, August 20th, 2021)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

Section 3: Near-Real-Time METRIC for ET

The IDWR staff did not make a recommendation on utilizing near-real-time METRIC for determining Crop Water Need (CWN) in the RISD calculation. The application of METRIC in the determination of crop demands deals with a complex dataset that requires complex processing. Given the magnitude of the task to incorporate METRIC data I understand the staff not making a recommendation at this time. The IDWR staff should keep track of the calculation utilizing the METRIC data in parallel to the current CWN calculation method as way to continue to evaluate its use. The Department's Eastern Snake Plain Aquifer (ESPA) model already utilizes METRIC data for consumptive use calculations used for model input data. Given the complexity of the METRIC data I also recommend further investigation into the method behind the calibration and processing of the dataset to determine how and to what extent the METRIC data can be validated at the field-scale or if there are common misrepresentations that should be considered in the process of data quality assurance checks. This should be done in coordination with validation efforts by the Department on their ESPAM Metric calibration and processing.

The IDWR staff presentation regarding near-real-time METRIC application identified a significant shortcoming in the current method for calculating CWN as the fact that the most up-to-date crop data is from the previous year and that SWC irrigated acre datasets sometimes represent service areas, not the actual irrigated land[5]. Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members[6]. The METRIC data could first be used to create a standard review process for the Methodology Order Step 1 submittal of irrigated acres by the SWC entities. IDWR staff should use a precise determination of irrigated acreage irrespective of whether it uses METRIC in the calculation of CWN. With IDWR staff only checking against the total acres for the decreed place of use, there is little to no incentive to keep the spatial data for the irrigated acres up to date. The METRIC data would be available for the current irrigation season and can be used to assess actual irrigated land. Some of the preliminary analysis by IDWR staff using METRIC data illustrated that through processing they were able to identify about 15,000 acres within the TFCC irrigated acres dataset that should not qualify as irrigated. The mischaracterized acres were all minor areal corrections but over a large service area such as TFCC added up to a significant amount of erroneous total acres. This just highlights the importance of spending the time to get an accurate picture of irrigated acres for an accurate RISD calculation. As previously noted in Lynker's 2015 comment letter the 5% change standard for SWC submittals should be reconsidered in light of large districts like TFCC where a 5% error in the irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation. Liz Cresto an IDWR staff member on the TWG in 2015 also made a similar recommendation in her comment letter attached to the staff memorandum.

Neither the 2015 nor the 2022 TWG has provided an opportunity to address concerns regarding supplemental groundwater use. This is a critical aspect of the RISD calculation and was one of the specific technical items cited for revision by the District Court. Analysis of supplemental groundwater use is likely critical to accurately applying METRIC in the RISD calculation.

Section 4: Project Efficiency

The IDWR staff recommended:

- Update the project efficiency value used to calculate monthly reasonable in-season demand from a rolling average of the previous eight years to a rolling average of the previous fifteen years.

[5] Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time Metric (IDWR, presentation slide no. 8, November 17th 2022)

[6] Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover-pg 4

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

The technical basis for the IDWR staff recommendation was based on there being an extended POR available. TWG discussions and subsequent presentations identified other issues that should be considered in Methodology applications of project efficiency (PE) to RISD calculation.

1. There is higher uncertainty in the April and October project efficiency values. April and October represent months during the irrigation season when the method of calculating RISD strictly as a function CWN and PE is less reliable because CWN is often not the driving factor in diversions[7].
2. Project efficiency among SWC entities are almost all flat or declining (6 out of 7 entities), which is contrary to what would be expected with technology advancements and constrained water supplies[8].

Change in Project Efficiency (2001-2021) (percentage point change)	
A&B	-4.6%
AFRD2	-3.6%
BID	-1.0%
Milner	-12.6%
Minidoka	+12.2%
NSCC	-3.0%
TFCC	+1.8%

3. Scatter plots by SWC entity comparing Annual Crop Water Need to Annual Diversions show Crop Water Need is limited as a predictor given the low explanatory power indicated by the low R^2 values in the analysis[9].

Regarding the mid-season calculation of RISD, the sensitivity and appropriate use of CWN as a predictor for in-season demands for SWC entities should be evaluated. Technical analysis to the TWG showed that this is not a strong relationship[10]. This disconnect should be evaluated by the TWG so a recommendation can be made. The trends in declining PE are concerning in that they are contrary to our expectations given the direction technology advancements and constrained water supply. The declines in PE are significant in that any decline in PE will result in increased demands and subsequently increased calculated Demand Shortfalls. The IDWR staff presentation on PE illustrated how the very minor change in PE resulting from extending the POR for the average translated to tens of thousands of acre-feet differences in the Short Fall determination[11]. Sullivan (e-mail to TWG 12/21/2022) found that when analyzing monthly PE the low PE in some months cause monthly demands calculated based on CWN/PE to be very sensitive to changes in CWN. I agree with Sullivan's recommendation that given the outside influences and uncertainty in some of the monthly PE values IDWR staff should consider using a seasonal PE value in computing monthly diversion demands. I also agree with Sullivan's recommendation that consideration should be given to PE values that better reflect reasonable and efficient operations of SWC members. Given the observed declining trends in PE and the historically wide range in operational PE by entity it is hard to know when SWC supplies are short under reasonable and efficient operations. This is consistent with Lynker's 2015 recommendation for an investigation into trends among entities related to PE factors.

[7] Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover-pg 18
[8] Greg Sullivan e-mail, Updated Comparison of Adjusted Diversion and Crop Water Needs for SWC Members, to TWG December 21, 2022
[9] Analysis in Greg Sullivan datasheet "2022-12-21 SWC Diversions and CWN.xls"
[10] Analysis in Greg Sullivan datasheet "2022-12-21 SWC Diversions and CWN.xls"
[11] Proposed Modification of the Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: Project Efficiency (IDWR, presentation slide no. 15, November 28th, 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

Given the compressed timeframe around the 2022 TWG meeting there was not sufficient time for the TWG members to analyze or address these outstanding issues. Additional time should be set aside for the TWG to conduct an analysis and make a recommendation.

Section 5: Steady State v. Transient

The Department staff did not make a recommendation on using transient model simulation for determining curtailment priority dates in the Methodology. The IDWR staff presented to the TWG the following:

1. Technically the steady state application is not consistent with the variable curtailment dates and mitigation volumes under the Methodology.
2. Transient analysis shows that in-season shortfalls can generally not be met at Time of Need by in-season curtailment.
3. There is a huge difference in resulting determination of the curtailment priority date if a steady state v. transient model is applied.
4. Under a transient model application any Demand Shortfall above ~100K af would result in aquifer wide curtailment

It is not clear what additional analysis the Department staff need to conduct to make a recommendation on steady state v. transient model application. What is clear is that this represents a huge uncertainty to the water users and how they make planning and management decisions moving forward.

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

ATTACHMENT C:

SUMMARY OF HINDCAST SWC DELIVERY CALL DEMAND SHORTFALL CALCULATIONS 2000-2022

Table 1 - Summary of Hindcast SWC Delivery Call Demand Shortfall Calculations 2000-2022

Year	April BLY 06-08-12 (AF)	April BLY 2018 (AF)	July BLY 06-08-12 (AF)	July BLY 2018 (AF)	November Actual Demand Shortfall (AF)
2000	30,183	126,125	0	0	0
2001	179,947	334,970	160,472	200,546	243,565
2002	42,800	131,308	17,381	45,136	31,217
2003	10,124	93,902	43,808	80,241	0
2004	199,101	364,958	223,032	264,426	264,340
2005	114,916	228,241	0	0	0
2006	0	0	365,880	388,939	23,792
2007	56,914	152,855	201,036	253,185	289,065
2008	0	15,138	46,525	55,334	0
2009	0	34,109	0	0	0
2010	94,957	190,898	0	0	0
2011	0	0	0	0	0
2012	0	53,778	69,066	92,125	139,524
2013	28,802	110,912	114,058	154,132	22,588
2014	0	0	0	0	0
2015	88,959	184,901	107,418	138,684	92,246
2016	44,163	111,457	21,271	44,330	7,853
2017	0	65,382	0	0	0
2018	0	44,805	0	0	10,996
2019	20,943	88,237	0	0	0
2020	0	59,101	0	0	0
2021	40,491	126,102	162,873	194,139	190,816
2022	162,613	313,446	52,771	84,036	276,551
Average:	48,474	123,071	68,939	86,750	69,241
Median:	28,802	110,912	21,271	45,136	7,853
75th Percentile	72,937	168,878	110,738	146,408	115,885
80th Percentile:	92,558	188,499	141,906	178,136	170,299
85th Percentile:	108,928	217,038	162,153	198,624	227,740
86th Percentile:	113,319	225,254	162,681	200,033	239,345
87th Percentile:	121,594	240,170	168,216	207,915	246,474
88th Percentile:	132,087	258,915	176,612	219,496	251,044
89th Percentile:	142,580	277,660	185,008	231,077	255,615
90th Percentile:	153,074	296,405	193,403	242,657	260,185
95th Percentile:	178,214	332,818	220,832	263,302	275,330
Max:	199,101	364,958	365,880	388,939	289,065

Hindcasting and spreadsheet summary developed by IDWR (Matt Anders, Kara Furgason) as part of the Nov-Dec 2022 SWC Delivery Call TWG meetings.

ATTACHMENT D:

HYDROLOGY, WATER RIGHT AND GROUNDWATER MODELING EVALUATION OF RANGEN DELIVERY CALL (Brendecke, 2012)

Hydrology, Water Right and Groundwater Modeling Evaluation Of Rangen Delivery Call

By

Charles M. Brendecke, PhD, PE

AMEC Environment & Infrastructure



For

Racine, Olson, Nye, Budge and Bailey, Chartered
Boise Idaho

December 21, 2012

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1.0 INTRODUCTION

1.1 Objectives

The objective of this report is to review the hydrology, water rights and groundwater modeling of the Eastern Snake Plain Aquifer (ESPA) in the vicinity of the Rangen, Inc., (Rangen) aquaculture facility, as they relate to the delivery call placed by Rangen on December 13, 2011. That delivery call requests the curtailment of all groundwater rights within the domain of the Enhanced Snake Plain Aquifer Model (ESPAM) that are junior to July 13, 1962. The primary study area of focus of this report is shown on Figure 1.1.

1.2 Organization of Report

This report is organized into 6 sections, beginning with this Introduction and Summary of Conclusions. Section 2 presents an overview of hydrology and water development in the area of the Rangen facility. Section 3 provides a detailed description of the Rangen facility itself and the water rights pertinent to it. Section 4 describes development and calibration of the ESPAM Version 2.1 (ESPAM2.1) by the Idaho Department of Water Resources (IDWR). Section 5 describes analysis of the effects of curtailment of junior groundwater rights using ESPAM2.1 and its predecessor, ESPAM2.0. Section 6 presents an analysis of curtailment effects using a modified version of ESPAM2.1 that more closely reflects hydrogeologic conditions near Rangen.

A related discussion of hydrogeology of the Rangen area is presented in Hinckley (2012).

1.3 Summary of Conclusions

Based on the analyses and evaluations I carried out in preparing this report, I conclude that:

1. The Martin-Curren Tunnel is a distinct source of water separate from natural springs that also supply Rangen.
2. The July 13, 1962, Rangen water right that is the basis of the delivery call (36-2551) is sourced at the Martin-Curren Tunnel.
3. The April 12, 1977, water right (36-7694) held by Rangen is sourced at the Martin-Curren Tunnel.
4. The Martin-Curren Tunnel is an artificial excavation that was constructed to access groundwater for irrigation purposes.
5. The Martin-Curren Tunnel meets the physical definition of a well contained in Idaho Code 42-230(b).
6. Neither observed nor estimated flows from the Martin-Curren Tunnel have ever been high enough to provide water in-priority to the 1977 water right (36-7694) held by Rangen.
7. Observed flows of Billingsley Creek reported by Rangen have not been high enough to provide any water to Rangen's 1977 water right (36-7694) since October of 1976, a date which precedes the priority of the water right.
8. Inspection of Rangen facilities and diversions by the Department of Water Resources concluded, among other things, that water right 36-7694 "should not have been issued."

9. Water right 36-7694 has never been able to divert and beneficially use water in priority.
10. Neither observed nor estimated flows from the Martin-Curren Tunnel have ever been high enough to deliver the maximum rate of diversion authorized under water right 36-2551.
11. Rangen's measurement of water flows through its property underestimates actual flows by 10-12%
12. It is feasible for Rangen to make more efficient use of available flows by delivering water from Billingsley Creek to its small raceways.
13. As a result of incidental recharge from surface water irrigation, spring flows in the Milner to King Hill reach are currently 25 percent greater than natural, pre-development flows.
14. Much of the change in spring discharge in the Milner to King Hill reach since 1960 can be attributed to reduction in incidental recharge from surface water irrigation due to changes intended to reduce waste.
15. Neither ESPAM 2.1 nor its predecessors is capable of separating the effects of groundwater pumping on flows from the Martin-Curren Tunnel from the effects of groundwater pumping on flows from other springs in the Rangen complex. .
16. The predictive uncertainty analysis of ESPAM2 and ESPAM2.1 carried out by the IDWR explores only a limited aspect of model uncertainty and does not quantify overall model uncertainty.
17. Fundamental to overall model uncertainty is the uncertainty associated with the conceptual model reflected in ESPAM2.1. The predictive uncertainty analysis relies on a single conceptual model and does not explore the uncertainty that arises from improper conceptualization of local geologic and hydraulic conditions that influence discharge of specific spring complexes, such as those at Rangen.
18. Alternative conceptual models can be developed that better reflect hydro-geologic conditions near Rangen and which produce substantially different effects of curtailment than does ESPAM2.1.
19. That ESPAM2.1 can fairly closely mimic the observed past behavior of a spring complex is not proof that it represents hydrogeologic reality sufficiently to predict accurately future behaviour of that complex, especially under aquifer water use conditions (e.g., curtailment of junior groundwater pumping) that are radically different from those extant in the model calibration period.
20. The ESPAM2.1 is not sufficiently detailed in either its general formulation or its representation of hydrogeologic conditions at Rangen, to be used reliably to predict changes in flow available to water right 36-2551 due to curtailment of junior groundwater rights on the ESPA.
21. ESPAM2.1 represents the details of the Rangen spring complex and the surrounding geology in highly simplified form, omitting several key features and that would make significant differences in predicted benefits of curtailment.
22. Using ESPAM2 and ESPAM2.1, less than 3 % of the curtailed groundwater rights junior to Rangen's 1962 priority, under the 10% trimline, would accrue to the Rangen complex; the rest would accrue to other connected river reaches, springs and baseflows, including those on which there are no water rights or diversions, those on which there are no delivery calls, those on which

approved mitigation plans are already in place, and those on which diversions occur under water rights junior to those of the curtailed rights.

23. An even smaller amount of the curtailed water use described in conclusion (23) above would accrue to the Martin-Curren Tunnel.

24. Using ESPAM2, less than 1% of the curtailed groundwater rights junior to Rangen's 1962 priority over the entire model domain, such as requested by Rangen, would accrue to the Rangen complex, the rest accruing to other connected river reaches, springs and baseflows, including those on which there are no water rights or diversions, those on which there are no delivery calls, those on which approved mitigation plans are already in place, and those on which diversions occur under water rights junior to those of the curtailed rights.

25. Because the model domain, irrigated lands and water rights are the same in ESPAM2.1 as in ESPAM2, conclusion (25) above would also apply to results from ESPAM2.1.

26. An even smaller amount of the curtailed water rights described in conclusion (25) above would accrue to the Martin-Curren Tunnel.

27. Alternative calibrated models that better reflect hydro-geologic conditions near Rangen show that curtailment of groundwater rights, within the 10% trimline and junior to Rangen's 1962 right, would produce only half, and possibly as little as 5%, of the benefit to Rangen predicted by ESPAM2.1.

28. Analysis using ESPAM2.1 shows that implementation of Rangen's request for widespread curtailment will, by any reasonable standard, result in waste of the water resource.

29. If the Director uses ESPAM2.1 to quantify the benefits to water right 36-2551 from curtailment of junior groundwater uses, this quantification should reflect the substantial uncertainty of that benefit that derives from use of a regional model to predict discharge from a particular spring outlet at the edge of the aquifer system. Due to this uncertainty, any curtailment based on ESPAM2.1 should be limited to junior-priority rights for which ESPAM2.1 predicts a significant benefit to Rangen. In my opinion, to recognize uncertainty and prevent unreasonable waste, application of ESPAM2.1 should at a minimum restrict curtailment to junior rights for which ESPAM2.1 predicts at least 10% of the curtailed water will accrue to Rangen.

30. Even use of a 10% trimline results in waste of the water resource because the vast majority of that foregone use would not accrue to the benefit of Rangen.

31. Use of trimlines smaller than 10% increases the relative waste of the water resource.

Hydrology and Water Development

32. Spring discharge is closely related to incidental recharge from surface water irrigation within the service area of the North Side Canal Company.

33. The sensitivity of spring discharge to incidental recharge is likely increased near the edges of the aquifer system near the Hagerman Rim and Rangen.

34. The Winter Water Savings Program of the North Side Canal Company alone may have reduced incidental discharge to the ESPA above the Thousand Springs reach by roughly 150,000 acre-feet per year beginning in 1961.

35. Conversion of irrigated lands from flood and furrow irrigation to sprinkler irrigation has significantly reduced incidental recharge.

36. Sprinkler usage under the North Side Canal Company grew from zero percent of the service area in 1982 to 100% of the service area by 2008.

37. Approximately 24,000 linear feet of lateral off the W-canal in the area west of Wendell, in proximity to Rangen, have been lined or placed in pipe since the 1990s, primarily to reduce excessive seepage losses, which are incidental recharge.

38. All of the foregoing reductions in incidental discharge are reductions in waste of water.

39. Prior to development of irrigation under the North Side Canal Company natural flow from springs in the Milner to King Hill reach was estimated to be about 4,000 cfs. Spring flows reached a peak at about 7,000 cfs in the early 1950s and have declined since that time. The average annual discharge for the 10-year period ending in 2011 is about 5,000 cfs, which is still above the natural (predevelopment) levels

40. When significant surface water irrigation began in the NSCC area the seasonal variability of spring discharges increased in addition to the magnitude of average annual flows. Prior to development, the pronounced seasonal pattern of spring flows that currently exists did not appear to exist.

41. Reductions in total annual spring discharge are also related to drought episodes.

Rangen Water Use

42. Discharges from the Curren Tunnel are divided between Rangen pipelines, three irrigation diversions, and spills to Billingsley Creek from the Rangen Box.

43. The North Snake Groundwater District has been providing mitigation supplies to the irrigation water users through the Sandy Pipeline since 2003. This pipeline is believed to have nearly eliminated irrigation diversions from the Curren Tunnel outlet.

44. Flows in Billingsley Creek are divertible by gravity to Rangen's large raceways but not to the hatch house, upper (small) raceways, or culinary use, all of which are presently supplied only by pipelines from the Tunnel.

45. Spills from the Rangen Box may remain in Billingsley Creek and bypass the Rangen facilities under some circumstances.

46. It is feasible to pump water from Billingsley Creek to Rangen's small raceways from the same point where Rangen diverts water into the large raceways. This would increase the efficiency of use of Rangen's existing physical supplies by making the total discharge of the Rangen complex available to all of Rangen's raceways.

ESPAM2.1 Model

47. Observations of ESPA geology suggest it is highly complex, comprised of overlapping fractured basalts interspersed with sedimentary formations, with hydraulic characteristics that can vary substantially over short distances.

48. ESPAM2.1 is, like all models, a simplified representation of reality, and this leads to model uncertainty.

49. ESPAM2.1 is comprised of cells that are one mile square.

50. Within each ESPAM2.1 grid cell, aquifer characteristics are assumed to be homogenous and isotropic.

51. This assumption of homogeneity means that hydrologic and geologic details of a scale smaller than the cell cannot be explicitly represented in the model.

52. Considerable amounts of pertinent input data are not known at even the one-square mile level of spatial resolution of the ESPAM2.1 grid.

53. ESPAM2.1 is comprised of a single layer of cells of uniform thickness.

54. ESPAM2.1 assumes constant thickness throughout the model domain and constant transmissivity within each cell. These assumptions may result in substantial misrepresentation of flow conditions in some parts of the aquifer, such as the Hagerman rim, where thinning occurs and preferential flow pathways become more restricted.

55. The discharges at Rangen are represented in ESPAM2.1 as a single drain.

56. This single-drain representation does not allow ESPAM2.1 to distinguish flows emanating from the Curren Tunnel from flows emanating from natural springs in the Rangen complex.

57. The generalizations and simplifications in ESPAM2.1 can introduce significant error into model results, particularly for highly localized conditions such as those governing discharge from specific outlets of a specific spring complex.

58. ESPAM2.1 has a large number of cells and each cell has a large number of adjustable parameters, so the total number of adjustable parameters in the ESPAM2.1 model is large.

59. The large number of parameters reflected in ESPAM2.1 increases the likelihood that the model is not unique.

60. ESPAM2.1 simulates conditions that are not physically possible and conditions that are in direct opposition to observed conditions in the real system. These discrepancies reveal serious model misrepresentation of detailed aquifer behaviour in the Rangen area, and raise doubt as to the accuracy of model predictions there.

61. Many of the conceptual aspects of ESPAM2.1 fail to reflect observed characteristics of the aquifer system in the Rangen area. These failures lead to conceptual uncertainty in the ESPAM2.1.

62. Each of the input data types used in ESPAM2.1 carries its own uncertainties that can stem from, among other things, the inability to measure a condition accurately (or at all) and from the spatial or temporal resolution of measurements.

ESPAM2.1 Calibration

63. Calibration uncertainty reflects the fact that many combinations of model parameter values may lead to equally well-calibrated models.

64. The ESPAM2.1 was calibrated under the assumption that aquifer transmissivity in any given cell is constant over the calibration period. This assumption has not been validated, and there are many locations and situations in the model domain and over the model calibration period where it is probably not true.

65. ESPAM2.1 was calibrated using an automated approach implemented in a computer program called PEST.

66. ESPAM2.1 systematically under-estimates discharge at the Rangen spring in the early years of the calibration period while over-estimating it in the later years.

67. ESPAM2.1 systematically under-predicts the water level at the closest well to Rangen that was used for calibration by 20 feet. ESPAM2.1 also consistently under-predicts the water level in another nearby well.

68. The under-prediction of water levels near Rangen is partly a result of the fact that discharge targets were weighted more heavily than water level targets in the calibration process.

69. Because predicted water levels are too low, PEST increased the drain conductance to values higher than are suggested by observation, thereby embodying in ESPAM2.1 a mischaracterization of the real physical relationship between water levels and flows at Rangen.

70. This mischaracterization results in over-sensitivity of the change in drain flow to a simulated change in water level due to curtailment. This over-sensitivity is carried into the superposition model used for curtailment, with the result that changes in spring flows are over-predicted by nearly a factor of 4.

71. The calibrated drain conductances in ESPAM2.1 range over 4 orders of magnitude. This extremely large variation suggests that the set of calibrated parameters is quite fragile and that PEST can readily find alternative parameter sets that provide acceptable calibrations.

72. ESPAM2.1 differs from ESPAM2 in the correction of an error that arose in the calculation of the water budget in the Mud Lake area and overestimated aquifer recharge by approximately 89,000 acre-feet/year in that area of the model domain. This represents a change of less than one percent in the overall water balance for the ESPA.

73. Correction of this error required re-calibration of the model, so a new set of model parameters, including drain conductances were developed. These are the parameters used in ESPAM2.1.

74. The drain conductances in ESPAM2.1 differ from those used in ESPAM2 by more than the 1% change in water budget associated with the correction. The conductance for the Rangen drain decreased by about 4%, but some drain conductances in the area changed by nearly 1000%. Some cell transmissivities in the area near Rangen changed by more than 100%.

75. These changes in conductance and transmissivity are carried directly into the superposition models used to calculate the flow changes resulting from curtailment.

76. The area encompassed by the 5% trimline is substantially larger with ESPAM2.1 compared to ESPAM2, and this expansion is mainly in areas on the opposite side of the Malad Gorge from Rangen, which are hydrogeologically disconnected from the Rangen spring.

77. Large changes in calibrated parameter values and model results suggest that ESPAM2 and ESPAM2.1 may be over-parameterized, and that other comparable calibration solutions easily can be reached with only minor perturbations in model assumptions.

Estimation of Benefits from Curtailment

78. ESPAM2.1 represents the Rangen spring as a drain and the flow in that drain as a linear function of water level in the cell that contains the drain.

79. Application of ESPAM2.1 to estimate changes in spring flow due to curtailment employs the method of superposition.

80. The principle of superposition relies on the assumption that the system being modeled and the model behaves in a completely linear way.

81. If the system being simulated or the model exhibits important non-linear behaviours, a superposition model can introduce significant error into the analysis of effects of stress changes.

82. Analysis of observed water levels and Range spring flows by Hinckley demonstrates that the relationship of Rangen flow to water levels in nearby wells is not linear.

83. The structure of the aquifer and conditions in the aquifer along the Hagerman Rim in the region of Rangen indicate that the behaviour of the aquifer in that region is not linear.

84. The large number of parameters reflected in ESPAM2.1 increases the likelihood that the model is not linear.

85. There are a total of 406 groundwater irrigated acres relying on rights junior to Rangen's 1962 priority within the 10% trimline, using 1,445 acre-feet of groundwater. At steady state, curtailment of pumping on these lands would cause total modeled flow at the Rangen springs to increase by 0.19 cfs (141 af/y assuming year around flow). Not all of this increase would accrue to the Martin-Curren Tunnel, but the ESPAM2.1 model does not represent flows in the tunnel. It would take somewhat less than a year for discharge to reach 90% of this modeled steady state increase.

86. There are a total of 565,023 groundwater irrigated acres within the model domain relying on rights junior to Rangen's1962 priority, using 1.46 million acre-feet (MAF) of groundwater. At steady state, ESPAM2 predicts that curtailment of pumping on these lands would cause modeled discharge at Rangen to increase by 18.07 cfs. It would take approximately 16 years for modeled discharge to reach 90% of this steady state increase.

87. Because the model domain, irrigated lands and water rights are the same in ESPAM2.1 as in ESPAM2, conclusion (86) above would also be expected to apply to results from ESPAM2.1.

2.0 WATER DEVELOPMENT AND USE ON THE EASTERN SNAKE PLAIN

2.1 Hydrology

The Snake River flows along the southern edge of the Eastern Snake River Plain (ESRP), a broad arcuate plain that covers an area of approximately 10,000 square miles in southeastern Idaho. As shown on Figure 2.1, the two main branches of the Snake River are the South Fork, which primarily drains the eastern side of the Teton mountain range, and the Henry's Fork, which primarily drains the western side of the Teton Range and joins the South Fork near Idaho Falls. Several smaller tributaries enter the Snake River from the south, the largest being Willow Creek and the Blackfoot, Portneuf and Raft rivers. With few exceptions, tributaries from the mountains to the north of the plain flow out onto the plain and recharge the underlying aquifer. Because of its porous surface, there are no significant surface water features on the plain itself.

At Milner Dam, northeast of Twin Falls, the Snake River drops into a canyon making gravity diversion of river flows impossible; large irrigation canals at Milner seasonally divert all but a small amount of the river flow. The canals diverting from the Snake River at Milner Dam, as well as others diverting from the lower Big and Little Wood Rivers, deliver large amounts of irrigation water to lands in Jerome, Gooding and Lincoln Counties above the north rim of the river canyon. The Snake River itself is largely restored by the time it reaches King Hill due to spring discharges from the north wall of the Snake River canyon and tributary streams such as Rock Creek, Salmon Falls Creek and the Malad River.

The ESRP is underlain by a vast basalt aquifer system, the Eastern Snake Plain Aquifer (ESPA), formed when intermittent lava flows filled ancestral valleys and canyons of the Snake River (Stearns and Crandall, 1938). In the central part of the ESPA, these and other formations extend to a depth of more than 3,000 feet (Whitehead, 1992). The total volume of water stored in the ESPA has been estimated to be as high as 1 billion acre-feet (IDEQ, 2006).

The agriculturally productive areas of the Plain occur in sedimentary and aeolian deposits overlying the most recent (Quaternary) basalts, which outcrop in numerous places. The porous and fractured basalt formations in the upper part of the ESPA can store and transmit large amounts of water and have been developed as a groundwater resource. Lindholm (1996) estimated that the upper 500 feet of the aquifer may contain 200-300 million acre-feet, an amount approximately 50 times greater than the combined surface water storage above King Hill.

Between Milner Dam and King Hill are numerous springs that emerge from the north side of the canyon and flow to the river. In some cases there are very well-defined outlets for these springs while in other cases they discharge through talus slopes and the actual outlets in the canyon wall can't be seen. There are also some springs that emerge in the river itself. This reach of the river is often referred to as the Thousand Springs Reach, though there is also an individual spring complex named Thousand Springs. A few of the larger spring complexes along the north wall of the canyon are at Crystal Springs, Clear Lakes, Box Canyon, Thousand Springs, Billingsley Creek and the Malad Gorge.

Figure 2.2 shows the annual average water budget for the period 1981-2008 used in development of the ESPAM2.1. Note that this is not a water budget for the ESPA, as it includes surface water supplies that are consumed directly without entering the aquifer. Based on Figure 2.1, average recharge to the aquifer system from precipitation on non-irrigated lands, from tributary underflow, and from non-Snake River seepage is 2.46 million acre-feet (MAF). This relatively small component of overall aquifer recharge is still greater than the total groundwater consumption simulated in curtailment to 1870 (Sukow, 2012) indicating that groundwater use remains less than the reasonably anticipated rate of future natural recharge.

2.2 North Side Canal Company

Early irrigation development on the ESRP was concentrated in the upper portions of the basin, above Blackfoot. Irrigation development in the lower portion of the plain began in 1877 with appropriations from the lower Big and Little Wood Rivers north of Wendell and Shoshone. By 1900, surface water rights totalling more than 900 cfs had begun operating to irrigate lands above the Malad Gorge (at their confluence, the Big and Little Wood Rivers become the Malad River).

Diversions from the Snake River onto the western ESPA began in 1905 with the development of the Twin Falls Project. Small diversions by the Twin Falls North Side Land & Water Company (predecessor to the North Side Canal Company) began in 1908. Diversions quickly grew from 250 thousand acre-feet (KAF) in 1909 to 1.2 million acre-feet (MAF) in 1912 (USGS, 1956). Considerable water was diverted in the first decade of canal operation to fill the Jerome Reservoir, but that project was abandoned in 1918 after it became clear that seepage losses from the reservoir would prevent it ever being filled (Crandall, 1923; USGS, 1956). North Side Canal Company (NSCC) diversions at Milner Dam have averaged about 986,000 af/y over the last 10 years. Present acreage served by the NSCC is reported to be 154,067 acres. Figure 2.3 shows the present service area and main canals and laterals of the NSCC.

For the first half of the 20th century, the NSCC diverted water in the winter as well as during the irrigation season. This was done primarily to provide domestic and stock water to small towns and farms. There is no significant crop water demand in the winter, so considerable amounts of the winter diversions undoubtedly recharged the ESPA in Jerome and Gooding Counties or were spilled over the canyon rim at the ends of laterals.

As part of its Regional Aquifer System Analysis (RASA) study, the USGS estimated that by 1952 more than 24 MAF of water had been added to the aquifer by incidental recharge from surface water irrigation (Kjelstrom, 1995). The importance of incidental recharge resulting from seepage losses from surface irrigation systems is evident in Figure 2.4a, b which is reproduced from the RASA study. Figure 2.4a shows the close correlation between incidental recharge and spring discharges in the Milner to King Hill reach of the river. The pattern of incidental recharge is clearly superimposed on a longer term increasing trend of spring discharge from 1912 to the mid-1950s, and is very closely related to the declining trend in spring discharge since the mid-1950s. Figure 2.4b shows the estimated change in ground water storage from this incidental recharge.

Figures 2.5 and 2.6 are from another RASA report (Goodell, 1988). Figure 2.5 shows the early 20th century increase in water levels in three observation wells, the locations of which are shown on Figure 2.6. Water levels in observation well 8S-17E-19BBB1 reflect water levels in the aquifer beneath the area irrigated by the North Side Canal Company. It can be seen that the aquifer water level in this area rose by approximately 45 feet between 1900 and 1950 as the result of incidental recharge from surface water irrigation.

Winter diversions all but ended in about 1960 as the Company participated in the Winter Water Savings Program, which sought to stop 435,000 af of "wasteful non-irrigation season diversions" and redirect this water to storage in Palisades and American Falls Reservoirs (USBR, 1946). The Palisades Winter Water Savings agreements went into operation in 1961 and generally required participating canal companies to cease diversions in the months of November through March. Figure 2.7 is derived from records of the USGS and the IDWR and shows the historical November through March diversions of the NSCC. The onset of the Winter Water Savings Program is clearly evident in this diversion record. Based on Figure 2.7, the Winter Water Savings of the North Side Canal Company alone may have reduced incidental recharge to the ESPA above the Thousand Springs reach by roughly 150,000 acre-feet per year (207 cfs).

Prior to the 1950s, flood and furrow irrigation was the primary method of water application on the ESRP. Kjelstrom (1995) notes that by the 1970s about 20 percent of surface water irrigation distribution systems had converted from gravity application methods to sprinkler application methods and that this conversion had reduced deep percolation to the aquifer. In 1981 the University of Idaho published (Hamilton, et al., 1981) the results of a survey of the responses of irrigators to the severe drought of 1977. Table 2.1 is reproduced from the Hamilton report. It shows that many irrigators on the ESRP had installed sprinkler systems, had added gated pipe, and had lined ditches as a result of the 1977 drought.

Information provided to the IDWR by the North Side Canal Company in connection with the 2005 delivery call of the Surface Water Coalition shows that in 2004 sprinklers were the primary method of water application on 88 percent of the North Side service area. Documentation for the current groundwater model of the Eastern Snake Plain Aquifer (ESPAM2.1) reflect a growth in sprinkler usage under the NSCC from 0% of the service area in 1982 to 100% by 2008. This has undoubtedly further reduced aquifer recharge in the area of the springs.

Figure 2.8 shows the portion of the NSCC service area generally between the town of Wendell and the head of Billingsley Creek. The irrigation laterals shown in this area are part of the W-lateral system. Lateral W-40 extends nearly to the head of Billingsley Creek, ultimately reaching a spill point on the canyon rim immediately to the north of the Rangen aquaculture facility. Recent data (Sullivan, 2012) show that flows into the lower portion of the W-lateral system, have declined about 20,000 af/y since the late 1980s. Interviews of NSCC personnel (Wertz, pers. comm., 2012) revealed that approximately 24,000 linear feet of laterals off the W-Canal in the area west of Wendell have been lined or placed in pipe since the 1990s, primarily to reduce excessive seepage losses.

The spill point at the end of W-40 was visited in June, 2012, and did not show evidence of current use. As with other canal companies in the area, the NSCC has been attempting in recent years to consolidate and reduce spills to the river for water quality management purposes. The primary spill point for the W-Canal system is now into the Malad Gorge just downstream of the State Park.

2.3 Springs in the Milner to King Hill Reach

As mentioned previously, between Milner Dam and King Hill the Snake River flows in a deep canyon. There are numerous springs discharging from the walls of this canyon, the majority of them being on the north side in an area known as the Thousand Springs reach, including an individual spring complex named Thousand Springs. In some cases there are very well-defined outlets for these springs while in other cases they discharge through talus slopes and the actual outlets in the canyon wall can't be seen. There are also some springs that emerge in the river itself. Figure 2.9 shows the locations of major spring complexes in the Milner to King Hill reach.

The earliest records of spring discharge measurements in this reach of the river date back to 1902. In the spring of that year the U.S. Department of Agriculture and the U.S. Geological Survey (USGS) separately made measurements on several of the springs in this reach of the river. These and other early measurements are summarized in Nace, et al., (1958). J.D. Stannard, the investigator for the Department of Agriculture estimated the total discharge of springs on both sides of the river between a point 3 miles above Twin Falls and a point 10 miles below the Malad River (roughly the entire Milner to King Hill reach) to be 3,833 cfs. These 1902 measurements were made before irrigation development under the North Side Canal system, though not before irrigation diversions began from the lower Wood River to supply lands north of Wendell and Shoshone. Kjelstrom (1995) estimated that the pre-irrigation (pre-1880) discharge of springs between Milner and King Hill averaged about 3.0 maf, or 4,140 cfs. Mundorff, et.al. (1964) estimated the natural discharge from the aquifer in the Thousand Springs Reach to be 4,000 cfs, and possibly less.

When significant surface water irrigation began in the North Side Canal area spring discharges changed, increasing in seasonal variability and in overall magnitude. Meinzer (1927) prepared an inventory and description of large springs in the United States, including the springs in the reach of the Snake River between Milner Dam and King Hill. Figure 2.10, reproduced from the Meinzer report, illustrates the close relationship he found between the combined spring discharges at the Blue Lakes and Clear Lakes spring complexes and the quantity of irrigation water applied to the Eastern Snake River Plain above the springs via the North Side Canal Company. Figure 2.10 shows that the monthly rise and fall pattern of North Side Canal diversion is followed, in a slightly delayed fashion, by a similar monthly pattern in spring discharge. Canal diversions were substantially smaller in 1919 (shortly after the Jerome Reservoir project was abandoned) than they were in the preceding two years, and the subsequent rise in spring discharge is also substantially smaller. A comparison of the two 1902 observations of flow at Blue Lakes given in Nace, one in April and one in August, showed almost equal flow rates. So the seasonal spring discharge pattern evident in the period 1917-1920 didn't appear to exist in 1902 at Blue Lakes and Clear Lakes, prior to major irrigation development above the springs. This emphasizes the importance of localized patterns of incidental recharge to flows of specific springs.

The IDWR prepares estimates of the annual spring discharge to the Thousand Springs Reach based on a method originally developed by Kjelstrom (1995b) and documented in USGS Water-Resources Investigation Report 95-4055. Figure 2.11 is a plot of the discharge estimates prepared by the IDWR for the period 1902-2011. The average of the annual discharge values for the 10-year period from 1902-1911 is 4,207 cfs. The average annual discharge for the 10-year period ending in 2011 is 5,019 cfs.

Also shown on Figure 2.11 is the annual value of the Palmer Drought Severity Index (PDSI) for NOAA Climate Zone 7 (NOAA Earth System Research Laboratory Physical Sciences Division 2012). The PDSI is a commonly used water supply index that incorporates precipitation, temperature, runoff and soil moisture conditions. Greater positive values of the PDSI reflect increasingly cooler and wetter conditions; greater negative values reflect increasingly warmer and drier conditions. A relationship can be seen in Figure 2.11 between drought episodes and reductions in total estimated spring discharge to the Milner to King Hill reach.

From the foregoing, it can be concluded that pre-development springs flows in the Thousand Springs Reach were probably not greater than 4100 cfs; that flows peaked in the early 1950s at approximately 6900 cfs primarily as a result of surface water irrigation development; and that flows have declined to current levels as a result of changes in surface water irrigation practices, drought and groundwater development. However, spring discharge between Milner and King Hill remains above natural (predevelopment) levels.

2.4 Groundwater Development

With the exception of shallow wells constructed in the Mud Lake area in the 1920s, ground water development of the ESPA did not begin in earnest until the late 1940s. The first project relying heavily on ground water supplies was the Minidoka North Side Pumping Division of the Minidoka Project (now the A&B Irrigation District) which began operation in 1948. While the majority of the subsequent permits were for irrigation of new lands, many were for supplemental irrigation of lands already irrigated with surface water supplies. In addition, the benefits of sprinkler irrigation have led to the conversion of some formerly surface-water irrigated lands to ground water use. Ground water development began to level off in the 1980s and a moratorium on new irrigation well development has been in place since 1992.

Farms in the Wendell area were initially supplied with irrigation water by the NSCC (Sullivan, 2012). Conversion of irrigated lands from surface to groundwater sources and development of new groundwater-supplied lands in the area began in the 1950s. Figure 2.12 shows the growth in groundwater permits in the area from 1948 until 1992, when a moratorium on further groundwater irrigation permitting went into effect. Notable increases in permitting occurred in 1960-61, just prior to Rangen's application for water right 36-2551, and in 1973-76, just prior to Rangen's application for water right 36-7469. Figure 2.13 shows the current Points of Diversion for groundwater rights in the area between Wendell and the head of Billingsley Creek; these points are color-coded to show their priorities relative to July 13, 1962.

Sullivan estimates that there were approximately 25,000 acres of irrigated land under the W Canal in 1953 and about 30,500 acres in 2009. In 1953 there was little or no groundwater irrigation under the W Canal. By 2009 roughly 10,000 of the formerly surface-water irrigated acres were supplied in whole or in part with groundwater and about 9,300 acres of new acreage was being served by groundwater (about 3,500 acres of surface water irrigation had been retired). Given the 1992 moratorium on new groundwater irrigation, it is reasonable to assume that nearly all of this groundwater use was actually in place by 1992.

Figure 2.14 shows observed groundwater levels in two wells in the area between Wendell and Rangen. Records of groundwater levels are less complete as one goes back in time, so the wells shown in Figure 2.14 do not illuminate aquifer conditions in earlier periods. It can be seen from Figure 2.14 that that seasonal fluctuations in water levels are about 5 feet in this area, with lows generally occurring in the months of March (well 992) and July (well 989). Annually, water levels have declined somewhat since 1985, with levels appearing more stable in the last 10 years. These declines are likely due to changes in surface water irrigation practices, including spill management, lining or piping of laterals, and conversions from surface to groundwater use, to drought, and to that increment of groundwater pumping brought online since 1985.

3.0 RANGEN SPRINGS DEVELOPMENT AND USE

3.1 Billingsley Creek Overview

Billingsley Creek enters the Snake River northwest of the town of Hagerman, just upstream from Lower Salmon Falls Dam. The creek is fed by a series of springs emanating from the Quaternary basalts forming the canyon rim in western Gooding County. Figure 3.1 is an aerial photo of the area showing the creek and the locations of selected spring discharge points. Figure 3.2 shows the measured flows of Billingsley Creek at the USGS gaging station (13134600) at the Highway 30 bridge just north of Hagerman. Records at this station are not continuous, and spring and creek flows are diverted both above and below the station for aquaculture, irrigation and other uses.

The Martin-Curren (aka Curran, Kearn) Tunnel and Rangen aquaculture facility are located at the upper end of Billingsley Creek. Figure 3.3 is an aerial photo of the Rangen facility showing key features of the area that will be referred to later in this section. Flows from the Tunnel and from other spring outlets and seeps in the Rangen area form the headwaters of Billingsley Creek.

The Rangen facility was constructed in 1962, apparently expanding on an earlier, smaller aquaculture operation purchased by Rangen in May of that year (Twin Falls Times-News, December 30, 1962). The facility was launched as a research center focused on trout diseases and diet, and on hatchery management problems.

The primary physical sources of water used at the Rangen facility are the Martin-Curren Tunnel and natural springs, most of which emerge from the talus slope about 45 feet in elevation below the tunnel portal (Farmer, 2009). Water from the Tunnel is divided between Rangen pipelines and three irrigation diversions. The natural springs all discharge to Billingsley Creek. Flows in Billingsley Creek are divertible by gravity to Rangen's large raceways but not to the hatch house, upper raceways, or culinary use, all of which are presently supplied only by pipelines from the Tunnel. Inspection of the Rangen facilities by IDWR personnel in 2003 concluded that some spring inflow to Billingsley Creek also occurs below the diversion for the large raceways (Berkey, 2003a).

3.2 Water Rights

Water rights for flows in the headwaters of Billingsley Creek in the area of the Rangen facility are listed in Table 3.1. The earliest rights date to 1884 and are for irrigation and domestic use.

The earliest right for fish propagation is Rangen's 1957 priority for 1.46 cubic feet per second (cfs). This may have been the primary water right for Rangen's predecessor. The present delivery call seeks administration of groundwater rights junior to Rangen's 1962 priority (36-2551), which is sourced by the Snake River Basin Adjudication (SRBA) Court at the Martin-Curren Tunnel.

The irrigation rights of Candy, Morris and Musser are also sourced at the Martin-Curren Tunnel. These diversions provide water to irrigate parcels south of Billingsley Creek. The water rights for these diversions are senior to the Rangen rights, dating to as early as 1884. Because the irrigation diversions are consumptive with respect to Billingsley Creek, they reduce the water supply available to Rangen from the Tunnel.

In 2003, anticipating that groundwater users might in the future be required to mitigate declines in Tunnel and spring flows, the North Snake Groundwater District (NSGWD) voluntarily constructed a pipeline (the "Sandy Pipeline") from ponds in Section 5 of T8S, R14E (the "Sandy Ponds") to the Curren Ditch. The pipeline was constructed so that it could also supply irrigation water to Candy, Morris and Musser, thereby reducing or eliminating those irrigation diversions at the Tunnel and increasing the Tunnel supply available for Rangen. This pipeline is in operation and is believed to have nearly eliminated irrigation diversions from the Tunnel outlet.

The Curren Ditch diverts from the creek below the Rangen facility under irrigation rights that are also senior to the Rangen aquaculture rights. However, since Rangen's aquaculture use is non-consumptive, the Curren Ditch does not call for bypass of Rangen's more junior aquaculture rights.

Groundwater development on the plain above the Curren Tunnel began in the early 1950's. Figure 2.12 showed the evolution of groundwater rights in the area east of Billingsley Creek. The earliest groundwater rights in the immediate area date to 1952. Notable increases in permitted acreage occurred in 1959-61 and in 1973-76, just prior to Rangen's applications for water rights 36-2551 and 36-7694. By the time of Rangen's 1962 water right, about 3900 acres had been permitted. At the time of Rangen's 1977 water right, about 8300 acres had been permitted. By 1992, when the moratorium on new groundwater irrigation went into effect, permits for about 10,000 acres had been issued.

3.3 Curren Tunnel Development

The Curren Tunnel is excavated into the canyon rim above the Rangen facility. It extends roughly 100-300 ft into the basalt forming the rim (Tate deposition testimony, 2012), at a depth roughly 70 feet below the ground surface above the rim (Hinckley, 2012). The tunnel is bifurcated some distance into the cliff into north and east forks. Water flows out of the Tunnel by gravity.

It appears that the Tunnel excavation had at least commenced by October of 1884 (New International Mortgage, 1932) with the aim to deliver irrigation water via a ditch (i.e., by gravity) to lands on the bench area south of Rangen. A feature article in the December 30, 1962, Twin Falls Times-News describes the source of Rangen's supply as "man-made springs on the north side of the canyon" where "early pioneers in search of irrigation water drilled a hole into the cliff and struck water." USGS Water Supply Paper 1463 (Nace, et.al., 1958) contains a Billingsley Creek flow observation made in April, 1902, with remarks that "Water emerges from a tunnel dug into brecciated, highly permeable basalt, and from the talus slope below the tunnel…" The 1932 decree from New International Mortgage Bank v Idaho Power Company, et.al., an adjudication of

water rights in Billingsley and Riley Creeks, grants 1884 priority rights to water "…developed and diverted…by means of a tunnel commonly known as the Curran Tunnel…".

According to Idaho Code 42-230(b) a "well" is defined as "an artificial excavation or opening in the ground more than eighteen (18) feet in vertical depth below land surface by which groundwater of any temperature is sought or obtained." Based on the foregoing descriptions of its development, the Curren Tunnel appears to meet this definition.

About the first 50 feet of the Tunnel is lined with large diameter corrugated steel pipe; beyond this the tunnel is unlined. It is not known when the corrugated steel lining was installed. A 6" diameter PVC pipe is laid along the bottom of the steel pipe, extending beyond it into the unlined portion to the bifurcation. This PVC pipe carries water for laboratory, culinary and landscape irrigation use at the Rangen facility. Based on a diagram produced by Rangen (RANGEN001907), it is believed that this PVC pipe was installed in 1976.

The PVC pipe does not carry all the water emerging from the Tunnel. The remainder of tunnel discharge is collected in a concrete division box (the "Farmers box") at the mouth of the tunnel, shown in Figure 3.4. The Candy, Morris and Musser pipelines deliver water from this division box to parcels south of the Rangen facility; the elevation of the Tunnel outlet allows this irrigation delivery to operate by gravity.

Two Rangen pipelines also take water from the Farmers box and water can spill from the box. The two Rangen pipelines flow into another concrete box, the "Rangen box" shown in Figure 3.5, which is further down the slope toward the Rangen facility. There they enter the pipeline serving the hatch house and research facility. Spills from the Rangen box, as well as flows from other spring outlets, flow into Billingsley Creek and can be diverted into Rangen's large raceways.

There are other spring outlets in the vicinity that also supply water to the Rangen facility. The largest of these emerges about 45 ft below the Curren Tunnel and flows to Billingsley Creek. Based on recent discharge records, discussed in more detail below, these "lower" springs produce roughly twice the flow of the Tunnel.

3.4 Discharge Records

The earliest record of discharge from springs in the Rangen area is contained in Nace (1958). Table 27 in that report shows a Billingsley Creek flow of 54.3 cfs in April, 1902, at a location where Road E2900S (aka Hagerman Highway) crosses Billingsley Creek. This observation post-dates the excavation of the Tunnel, and potentially includes discharges from other springs in the area. Other than a few subsequent measurements in the general vicinity, systematic recording of spring discharge in the area did not begin until the Rangen facility was operating.

The only measurement of discharge specifically from the Curren Tunnel was in the period between 1993 and 2009 when the IDWR operated a sonic measuring device inside the tunnel. This measured the portion of tunnel flow not conveyed in the 6" PVC pipe installed in the tunnel

by Rangen. All other historical measurements of spring discharge are derived from measurements made by Rangen at locations within the hatchery or on Billingsley Creek.

Flow measurement within the Rangen facility relies primarily on recording the depth of water flowing over the check dams in the "large" and "CTR" raceways, and depth of water flowing over the "lodge dam" in Billingsley Creek shown in Figure 3.6. Flow depth is apparently measured by a metal ruler placed on the crest of the dams as shown in Figure 3.7 (Exhibit 7a from Rangen 1st Request; Yenter, 2003). It appears that the flow from the CTR raceways reflects flow through the Rangen hatchery and, when combined with discharge over the lodge dam and diversions for irrigation, gives the total discharge of the spring complex.

Along with most other spring users, Rangen began submitting diversion records to the IDWR in 1995. In late 2003, responding to a request from IDWR Director Karl Dreher, Rangen submitted monthly flow records covering the period 1966-2003. These data, and the measurement methods used by Rangen, were subsequently reviewed by IDWR technical staff (Yenter, 2003; Berkey, 2003, 2003a). This review included field inspection of measurement sites and methods, and verification of various estimates used by Rangen in its flow summarization. The inspection concluded, among other things, that the flow record reflected total spring complex discharge rather than Rangen diversions and found that Rangen's flow measurement methods could underestimate the total discharge by 10-12%.

Figure 3.8 shows the IDWR records of total discharge from the Rangen complex, as well as observed flows from the Curren Tunnel and IDWR records for flow in the 6" PVC pipe from the Tunnel. Seasonal variability of flow is plainly evident as are longer term wet and dry spells. In the period of overlap between total flow and Tunnel flow records, it appears the Tunnel flow is the greater source of this seasonal variability. This is to be expected as the Tunnel penetrates the aquifer at a higher elevation than that of the natural springs. In his May 19, 2005, Order, former Director Dreher found decreases in the springs supplying the Rangen hatchery facilities to be correlated with repairs made to the facilities of the North Side Canal Company to reduce losses of surface water to ground water from the canal company's facilities above those springs in 1987, 1998, and 2000 (Order, FF 23). The 1992 moratorium on new irrigation wells suggests that decreases in discharge after the mid-1990's are not the result of groundwater pumping.

Figure 3.9 shows a regression analysis of total Rangen flow against observed Curren Tunnel flow. It can be seen that the relative contribution of the Tunnel is somewhat greater at higher total flow; this is to be expected from the relative elevations of the Tunnel and the natural springs that contribute to the total flow. At lower flow levels, the Tunnel may represent as little as 20% of the total Rangen flow. Over the last 10 years, the Tunnel discharge has represented roughly one-third of the total Rangen flow.

The regression shown in Figure 3.9 was used to generate estimates of Curren Tunnel flow for the entire period of record for Rangen total flow. The results of this procedure are shown on Figure 3.10, which plots both the monthly total Rangen flow and the monthly Curren Tunnel flow for the period 1966 through 2012. Also shown on Figure 3.10 are the cumulative water rights sourced at the Martin-Curren Tunnel by the Snake River Basin Adjudication (SRBA). The cumulative rights

at the Tunnel were 61.29 cfs prior to Rangen's April, 1977, appropriation. With that appropriation, cumulative rights at the Tunnel rose to 87.29 cfs.

It can be seen from Figure 3.10 that the flows from the Martin-Curren Tunnel have never been high enough to fully satisfy Rangen's 1962 priority (36-2551) and have never been high enough to provide any water to Rangen's 1977 priority (36-7694). Accordingly, it can be concluded that water was not available to water right 36-7694 at the time of its appropriation nor at any later time.

In his May 19, 2005, Order former Director Dreher found that the Department of Water Resources erred in licensing water right 36-7694 and should not have recommended it in the SRBA, because water was not available to it either at the time of its appropriation or subsequently (Order, FF 62, 63, 72). The foregoing analysis of Rangen discharge records shown in Figure 3.10 supports this conclusion.

Director Dreher also found that curtailment of water rights junior to July 13, 1962 (Rangen water right 36-2551) would "not at any time result in a meaningful increase in the quantity of water discharging from springs in the Thousand Springs to Malad Gorge reach of the Snake River, which includes the Curran Springs from which Rangen diverts surface water." (Order, FF 84). In its disclosure of June 12, 2012, the Department produced modeling results, apparently related to this finding, showing an analysis by Allan Wylie with a conclusion that Rangen could "at best expect" an increase of 0.22 cfs from curtailment.

A decomposition and back-casting of the historical monthly total discharge of the Rangen spring complex was also undertaken by Brannon (2009) apparently in anticipation of its use as a target for groundwater model calibration. This decomposition relied on Rangen measurements dating back to 1966. Figure 3.11 shows the results of this effort. Documentation of this work has not been provided by Rangen, though notes in the spreadsheet file submitted by Brannon to the IDWR allude to such documentation (Rangen Water History for IDWR.xls). Inspection of this decomposition supports the preceding conclusions that there has never been water available to water right 36-7694 since its time of appropriation.

While flows diverted from the Martin-Curren Tunnel can be delivered through the small raceways and reused in the large raceways, spring flows emerging below the Tunnel cannot. Based on a reconnaissance-level analysis (Coleman, 2012), it is feasible to pump water from Billingsley Creek to the small raceways from the same point where the diversion to the large raceways is made. This would increase the efficiency of use of Rangen's existing physical supplies by making the total discharge of the Rangen complex available to all of Rangen's raceways.

4.0 MODEL DEVELOPMENT

4.1 Background

The Enhanced Snake Plain Aquifer Model (ESPAM) is the current incarnation of numerical modeling of the Eastern Snake Plain Aquifer (ESPA) that began in 1974 (deSonneville, 1974). The ESPAM was created with review and input from the Eastern Snake Hydrologic Modeling Committee (ESHMC). The ESHMC is comprised of professionals working on water issues on the eastern Snake River Plain. Regular members include agency representatives (Idaho Department of Water Resources, U.S. Bureau of Reclamation, U.S. Geological Survey, U.S. Fish and Wildlife Service), industry representatives (Idaho Power), researchers (University of Idaho, Idaho Water Resources Research Institute) and private consultants representing various water user interests. While a diversity of interests are represented on the ESHMC, the committee is constituted by request and invitation and not through election or appointment on the basis of population, water right amounts, irrigated acreage, or other such factors. Committee decisions are generally reached by consensus, though this is not always possible to achieve.

Actual development of ESPAM was carried out by the IDWR and the Idaho Water Resources Research Institute (IWRRI). Model design, construction and calibration were reviewed and in some instances redirected by the ESHMC.

From the outset of the ESPAM modeling effort, it was recognized that there would be a need for future enhancements to the model as new information and modeling approaches became available. ESPAM Version 1.0 (ESPAM1.0) was released in 2004, followed shortly by ESPAM1.1 which corrected an input data error. Discussions regarding the scope of future enhancements to ESPAM1.1 began shortly after its release (e.g., Brendecke, 2009a). ESPAM2.0 was released in the summer of 2012; correction of an input data error has recently resulted in the distribution of ESPAM2.1.

4.2 Model Structure

4.2.1 Overview

Like its predecessors, the ESPAM2.1 is developed in MODFLOW, a groundwater modeling environment developed by the U.S. Geological Survey (McDonald and Harbaugh, 1988; 2000). In MODFLOW, aquifers are represented as a collection of rectilinear elements or “cells”. The MODFLOW code solves the equations of flow between these cells to determine how the aquifer will respond to changes in inputs or outputs. Figure 4.1 shows the grid of model cells used for ESPAM2.1.

Within each cell, aquifer characteristics (e.g., porosity, hydraulic conductivity) are assumed to be homogenous (the same throughout the cell) and isotropic (allowing flow to occur in all directions with equal ease) as would be the case if the cell were filled with clean sand of uniform grain size. This assumption of homogeneity means that hydrologic and geologic details of a scale smaller

than the cell cannot be explicitly represented in the model. MODFLOW has the capability to represent anisotropy (where flow occurs in preferential directions), but this feature has not been used in any versions of the ESPAM.

A MODFLOW model may be comprised of one or more vertical layers of cells. Multiple layers are typically used when there is more than one geologic layer that is meaningful to groundwater flow patterns. The thickness of cells in model layers can vary to reflect changes in thickness of subsurface formations, such as the thinning of water bearing formations that often occurs at the edges of aquifers.

Boundary conditions must be defined to characterize the patterns of flow into and out of the model domain, and MODFLOW provides a variety of special cell types for this purpose. River cells are used to represent subsurface flow between river reaches and the aquifer. Drain cells are used to represent aquifer discharge through springs. Constant flux cells are used to represent fixed amounts and patterns of subsurface flow into the aquifer from tributary valleys. Other special-purpose cells serve other functions.

Most of the cells in a MODFLOW model are general purpose cells. It is in these model cells that aquifer recharge from precipitation and irrigation, and aquifer withdrawals by pumping and evapo-transpiration, among other things, are represented. To carry out a groundwater flow simulation, it is first necessary to develop a water budget of aquifer inflows and outflows at each model cell and to develop, through calibration, estimates of parameters representing the aquifer characteristics at each cell.

4.2.2 General Structure of ESPAM2.1

Like its predecessors, the ESPAM2.1 is comprised of cells that are one mile square. This means that features having dimensions smaller than one mile cannot be explicitly represented in the model. However, considerable amounts of pertinent input data are not known at even this one-square mile level of spatial resolution. For example, subsurface geology on the ESPA is known with certainty only at outcrops or at locations where drilling logs are available. Crop distribution information on the ESPA is available only at a county level from annual agricultural statistics based on self-reported data. Detailed water distribution to lands within canal companies can be quite variable as shares are transferred between users; even if this information were readily available it is difficult to embody in model inputs. As a result of these latter data limitations, crop distributions in ESPAM2.1 are assumed to be uniform county-wide, and surface water distribution is assumed to be uniform across every parcel of served land within groups of canal companies.

The resolution of input data may not present a problem when doing a regional-scale analysis because local errors, if random, may effectively cancel each other in the larger context. However, the questions presented in the present delivery call are quite localized in nature and this “error cancelling” cannot simply be assumed to occur. Hinckley (2012) has illustrated some of the discrepancies that exist between the coarse simplifications of ESPAM2.1 and the details of Rangen-area hydrogeology.

Like its predecessors, ESPAM2.1 is comprised of a single layer of cells of uniform thickness. This means that substantial aquifer thinning, such as occurs in the Hagerman-Wendell, Burley-Pocatello, and Rigby Fan-Mud Lake areas (Whitehead, 1992), is not represented in the model. This is important because aquifer transmissivity (T) is a linear function of the hydraulic conductivity of the aquifer material (K) and the aquifer saturated thickness (b), as shown in the following equation:

$T = Kb$

As the aquifer material (in this case the Quaternary basalt) thins, the transmissivity is reduced and resistance to groundwater flow increases. Saturated thickness is also reduced by drawdown of the water table, e.g., by pumping or by spring discharge, resulting in a non-linear relationship between water level and flow. The ESPAM2.1 assumes constant transmissivity throughout the model domain. This assumption is made largely for reasons of computational convenience, as will be discussed later in this report, but may result in substantial misrepresentation of flow conditions in some parts of the aquifer, such as the Hagerman rim, where thinning occurs and preferential flow pathways become more restricted.

Like its predecessors, the ESPAM2.1 represents springs using special-purpose drain cells. As shown in Figure 4.2, discharge from a drain cell is a function of the difference in head (Δh) between the computed water level in the cell and the assumed elevation of the drain outlet, and a conductance parameter (C) that effectively acts as a throttle on the rate of discharge. The conductance parameter can be expressed in units of cubic feet per second (cfs) per foot of head difference. While it is a calibrated value in ESPAM2.1 (calibration is discussed in a later section), under certain conditions it can be estimated from field observations.

Like its predecessors, the ESPAM2.1 uses data from a variety of sources to represent the water budgets of the aquifer and of individual model cells. These data include precipitation, surface water diversions, subsurface inflows from tributary basins, stream gage records, county surveys of crop distributions, estimates of evapo-transpiration (ET), methods of irrigation water application, and assumptions about irrigation canal seepage, among others. With few exceptions, the data sources used in the ESPAM2.1 are the same as those used in its predecessors.

From the foregoing, it can be seen that the ESPAM2.1 should not be viewed as a new model of the ESPA but as a relatively modest refinement of earlier versions of ESPAM. It has the same conceptual formulation as its predecessors and relies on the same data sources as its predecessors. Its spatial resolution is the same as that of its predecessors. Like its predecessors it "…is a regional-scale model … best applied for regional-scale predictions." (IDWR, 2012).

4.2.3 Key Differences between ESPAM2.1 and Its Predecessors

The ESPAM2.1 utilizes a longer study period (1980-2008) than did ESPAM1.1 (1980-2002). The addition of six years to the study period means that more input data are used in the ESPAM2.1,

though the basic data sources used remain the same in both models. The ESPAM2.1 utilizes monthly stress periods where ESPAM1.1 used semi-annual stress periods; the increased number of stress periods also increased the amount of input data used in ESPAM2.1, since each formerly semi-annual data value was replaced with 6 monthly values. In some cases (e.g., precipitation, canal diversions) this allowed more accurate temporal representation of water budget terms, while in others (e.g., tributary underflow) it required further disaggregation of data for which only annual estimates are available.

Surface water conveyance and application efficiency are represented in more detail in the ESPAM2.1 than in ESPAM1.1. A greater number of leaky canals were explicitly represented in ESPAM2.1 (primarily in eastern portions of the plain), though canal seepage losses are still considered to be constant throughout the model study period. Farm irrigation efficiency is assumed to increase somewhat in water-short years in ESPAM2.1 through an "On-Farm Algorithm" that operates on model input data. Irrigated acreage is slightly higher in ESPAM2.1 due primarily to the use of better image processing methods than were used for ESPAM1.1 (Sukow, 2012).

The ESPAM2.1 is calibrated to a larger number of spring complexes in the Milner-King Hill reach of the Snake River than was ESPAM1.1. This stems largely from efforts to develop more complete data sets of spring discharges than were available for ESPAM1.1. In large part, these data sets are based on diversion and flow measurements reported by spring users, with extrapolation to fill missing data. The data sets were then used as targets for calibration of drain cells representing those spring complexes. Some spring complexes in ESPAM2.1 are represented by using two drains within the same model cell; in general, this was done to encompass the range of observed outlet elevations of springs falling within the cell, but in some cases the springs so represented may have little hydro-geologic relation to one another. Figure 4.3 shows the distribution of drain cells used to represent springs in the ESPAM2.1.

The more comprehensive representation of spring complexes in ESPAM2.1 necessitated the use of General Head Boundary (GHB) cells to represent observed river gains that were not accounted for in spring discharge data (Wylie, 2012 memo). These unaccounted for flows were implicit in ESPAM1.1 spring discharges. GHB cells work in a fashion similar to drain cells in that their discharge is a function of head difference and a calibrated conductance parameter. Figure 4.3 also shows the distribution of these GHB cells, some of which occur in cells already containing drains representing springs.

4.3 Rangen Area Representation in ESPAM2.1

While all the refinements made in ESPAM2.1 have some effect on simulated flows and impacts at the Rangen springs, two refinements bear directly on them. The first of these is the use of the Rangen springs as a specific calibration target in ESPAM2.1. Figure 4.4 shows a close-up of the ESPAM2.1 model grid in the area of the Rangen complex. In ESPAM1.1, flows at the Rangen springs were estimated as a percentage of overall spring discharge to the Thousand Springs - Malad subreach (the cells that comprised this reach are highlighted on Figure 4.4). In ESPAM2.1, historical diversions and Billingsley Creek flow measurements reported to the IDWR

by Rangen were used to derive estimates of monthly total discharge that were used as a calibration target. The discharges at Rangen are represented in ESPAM2.1 as a single drain, though discharges actually occur at multiple outlets. This single drain representation does not allow ESPAM2.1 to distinguish flows emanating from the Curren Tunnel from flows emanating from natural springs in the Rangen complex.

The second ESPAM2.1 refinement of particular consequence in the Rangen area is the elimination of the Hagerman Valley from the model domain. This was done at the recommendation of geologist Dennis Ralston, who studied the area and reported to the ESHMC that the Tertiary formations underlying the Valley were not connected to the ESPA (Ralston, 2008)[1]. As a result, the canyon rim became the westernmost extent of the model domain in the Hagerman area in ESPAM2.1. Figure 4.5 shows the changes in the model domain made with ESPAM2.1, highlighting the change in the Rangen area.

Later, after comparing the historical discharges of springs used for calibration targets with reach gains computed from river gages, it was discovered that the observed reach gains substantially exceeded, by roughly 25%, the sum of spring discharges used as calibration targets (Wylie, 2011; 2012 memo). To remedy this discrepancy, GHBs were defined through several reaches to account for the undocumented gains, or "baseflows." This at least partially undid the change in model domain, as the baseflows from the ESPA are now assumed to pass through Ralston's "unconnected formations" to reach the Snake River. As will be discussed later, this results in simulation of unrealistic groundwater flow patterns in the Rangen area.

4.4 Model Calibration Process

4.4.1 General Approach

After conceptual formulation and data development, the next step in groundwater model development is calibration. Calibration is a form of "history matching" wherein initial values of model parameters (such as transmissivity) are adjusted to achieve a better correspondence between historical targets (e.g., measured water levels and spring flows) and model-predictions. Ordinary least-squares regression may be the most familiar example of this process; in it, the parameters of the regression equation (slope, intercept) are adjusted to minimize the sum of the squared differences between the regression line and the data observations. In this context, the groundwater model can be viewed conceptually as a regression equation.

Because of the many parameters that must be adjusted (several for each model cell), groundwater model calibration is often done using special software programs that solve this "inverse problem", so called because its aim is to use observed behaviors to specify the model rather than to use the model to describe the behaviors. The software program used to calibrate

[1] In his mapping of the geohydrologic framework of the Eastern Snake River Plain, Whitehead (1992) also excluded the Hagerman Valley from the Quaternary basalt aquifer system.

all versions of ESPAM has been the model-independent Parameter ESTimation program (PEST) developed by John Doherty (Watermark, 2005).

To find the "best" solution to the inverse problem, PEST seeks to minimize an objective function that reflects the overall sum of squared differences (or "residuals") between historical aquifer observations, or "calibration targets", and model predictions. The ultimate goal of calibration is to determine the set of parameter values that produce the smallest overall value of this objective function. Historical calibration targets included observed aquifer water levels, reach gains and spring discharges over the period 1980-2008, though not all targets had continuous data over this period. While PEST produces quantitative measures of calibration success, it is ultimately a matter of judgement for the modeller to decide that a given calibration is "good enough" for the purpose at hand.

The objective function used in model calibration effectively aggregates, using weighting and indexing assumptions, all the residuals in the model calibration data set down to a single number. The weighting assumptions used in ESPAM2.1 calibration were based on judgement. Because the objective function is a single number, it is normal for PEST to identify a parameter set that provides a closer calibration to some targets than to others. As the desired use of the model focuses on ever more detailed locations and time periods, it becomes more and more important to examine calibration success in specific areas of the model.

While the calibration of models with large numbers of parameters (such as ESPAM2.1) allows consideration of more factors affecting aquifer conditions, it increases the risk that any given PEST solution (i.e., an "optimal" set of parameter values) is not unique (Watermark, 2005). This means that there may be many other combinations of parameter values could produce a similarly minimized value of overall model error. This non-uniqueness creates one dimension of overall model uncertainty, which is discussed in more detail in a later section.

4.4.2 Calibration of ESPAM2.1

The parameters that PEST was allowed to adjust in ESPAM2.1 included conventional aquifer parameters such as transmissivity, specific yield, and streambed, drain and GHB conductances. In addition, PEST was allowed to manipulate a number of terms in the aquifer water budget where precise values could not be known. For example, PEST was allowed to adjust tributary inflow estimates and surface water irrigation efficiency assumptions, among other things. Given the large number of active cells in the model and the many aquifer water budget terms considered at each cell, the number of adjustable parameters in ESPAM2.1 calibration is large.

Doherty (Watermark, 2005) cautions that "…increased parameterisation normally results in increased parameter non-uniqueness at the same time as any semblance of model linearity rapidly fades from view." As will be discussed later in this report, the assumption of linearity is fundamental to both IDWR and Rangen efforts to quantify the flow changes resulting from curtailment. The large number of parameters reflected in ESPAM2.1 increases the likelihood that the model is not linear.

Reach gain and spring discharge targets were given greater weight in the calibration of ESPAM2.1 due to the fact that there were a far greater number of calibration target values for aquifer water levels than there were for these discharges. Without preferential weighting, PEST would try to match all targets with similar accuracy, by default placing more emphasis on aquifer water level targets. The weighting applied to targets essentially determines the degree to which PEST "focuses" its effort on minimizing error in certain types of model behavior. PEST provides guidelines for such weighting, but it ultimately becomes a decision made by the modeller.

The ESPAM2.1 was calibrated under the assumption that aquifer transmissivity in any given cell is constant over the calibration period. This assumption is computationally convenient in part because it avoids iterative recalculation of transmissivity as simulated water levels change, but it can lead to overestimation of transmissivity in some areas of the model domain (Johnson, et.al., 2010). A common rule of thumb in determining whether this assumption is justified is that simulated changes in water level should not be greater than 10% of overall saturated thickness (Reilly, et al, 1987). Areas where this condition is most likely not to be met are those where the aquifer is thinnest, such as at its edges, as is the case in the present delivery call. Hinckley (2012) estimates that the saturated thickness of the ESPA in the vicinity of Rangen is on the order of 50 feet. Water level changes in wells near Rangen are on the order of 5 feet, making the assumption of constant transmissivity (and the convenient assumption of linearity that it allows) questionable. Compounding this is the fact that fractures and heterogeneities of a scale much smaller than one mile likely dominate flow hydraulics at the thin edges of the aquifer.

4.5 Calibration Results

Calibration success can be assessed in several ways besides the final objective function value produced by PEST, which is not by itself informative. The most commonly used methods for assessing calibration are visual and mathematical comparisons of simulated values and their corresponding targets. It is also useful to examine simulated and observed flow regimes to assess whether model performance reflects general observations and geological constraints that might not be represented explicitly.

4.5.1 Comparison with Calibration Targets in Rangen Area

Figure 4.6 shows the calibrated and target discharge for the Rangen spring complex from the ESPAM2.1 final calibration, along with other representations of calibration fit. In general, the broader patterns of observed discharge are reflected in the modeled values; multi-year cycles and trends are apparent in both, as are seasonal variations. However, the ESPAM2.1 systematically under-estimates discharge in the early years of the calibration period while over-estimating it in the later years.

This systematic error is more apparent by the analysis of residuals that is also shown in Figure 4.6. This analysis shows the error in monthly simulation relative to mean discharge. If simulation errors are random, this plot of residuals should vary randomly about the zero line over time. In fact, Figure 4.6 shows that that ESPAM2.1 consistently under-predicts (by as much as 15 cfs) the total flows from the Rangen complex in the early part of the calibration period and consistently

over-predicts (by as much as 15 cfs) these flows in the more recent part of the period. Since similar patterns are evident at other target springs in the area it raises the prospect of a more general problem with ESPAM2.1 representation of springs in the Hagerman area and suggests that curtailment analyses, which look forward from present conditions, may over-predict increases in spring discharge from curtailment.

Figure 4.7 shows a comparison between simulated and target water levels in calibration well #989 (7S14E29CDC1). There is no calibration well in the Rangen cell, but well #989 is in the model cell immediately northeast from the Rangen cell and is the closest well used in calibration. The simulated water level in this well is systematically more than 20 feet lower than observed level. Also shown on Figure 4.7 is a comparison between simulated and observed water levels in well 7S14E33BBB1. This well was identified as calibration well #992, but for unknown reasons was not included in the target calibration data set. Figure 4.7 shows that ESPAM2.1 also underpredicts the water level in this well.

In 2008 the IDWR completed a monitoring well (7S14E32SENW, aka the "Rangen Monitor Well") on the plain just above the Curren Tunnel (Farmer, 2009). Observations from this well could not be used in ESPAM2.1 calibration because measurements did not begin until the very end of the model calibration period. Nevertheless, the range of observed values reasonably can be compared to simulated water levels in the Rangen cell for the last few years of the calibration period. This comparison is shown in Figure 4.8. It can be seen that ESPAM2.1 predicts recent water levels in the Rangen cell that are substantially lower than what has been observed in the Rangen Monitor Well.

The underprediction of water levels near Rangen is partly a result of the fact that discharge targets were weighted more heavily than water level targets in the calibration process. If predicted water levels were too low, PEST could still meet the more important discharge target by increasing the drain conductance. This is problematic because it embodies, in the drain conductance parameter, a mischaracterization of the real physical relationship between water levels and flows at Rangen. This, in turn, results in mischaracterization of change in drain flow as a result of simulated change in water level due to curtailment. If the calibrated drain conductance parameter is too high, the benefits to Rangen from curtailment will be over-stated.

That the Rangen discharge calibration is as good as it is despite the underprediction of surrounding water levels illustrates another important modeling concept…that good calibration is not necessarily evidence of correct physical representation (Bredehoeft, 2005).

Table 4.1 lists the ESPAM2.1 drain parameters determined by PEST for target springs in the Billingsley Creek area. Drain elevation assumptions were generally chosen to reflect actual elevations, or a range of actual elevations where multiple drains were used. PEST was allowed to adjust drain conductances as needed to match spring discharge targets using simulated water levels. As can be seen in Table 4.1, the calibrated conductances range over 4 orders of magnitude. This extremely large variation suggests that the set of calibrated parameters is quite fragile and that PEST can readily find alternative parameter sets that provide acceptable calibrations.

4.5.2 Comparison to Observed Conditions in Rangen Area

The ESPAM2.1 posits a strictly linear relationship between water level in the Rangen cell and discharge from the Rangen drain. The ESPAM2.1 drain conductance has a calibrated value of 4.85 cfs/foot, meaning that a one foot increase in water level in the Rangen cell will result in a 4.85 cfs increase in drain discharge. The only water level observations close enough to Rangen to be considered within the Rangen cell are those from the Rangen Monitor Well. Hinckley (2012) demonstrates that Curren Tunnel discharge is not the simple linear function of nearby water level represented in ESPAM2.1, a fact that appears also to be acknowledged by Rangen experts (Brannon, 2009). If this relationship is in fact non-linear, the principle of superposition cannot be used to reliably determine the effects of curtailment on Rangen flows.

Even if a linear relationship were to be derived from Hinckley fig 19, it suggests that a one foot increase in nearby water level would cause a discharge increase of 1.37 cfs rather than the 4.85 cfs embodied in ESPAM2.1. In this case the ESPAM2.1 overstates the benefit from curtailment by nearly a factor of 4.

Observed water level in the Rangen monitor well varies over a range from about elevation 3151 ft to 3166 ft (msl). Farmer (2009) estimated the elevation of the outlet of the Curren Tunnel to be 3145 ft (msl) and the elevation of the lower springs to be about 3100 ft (msl). This suggests that the saturated thickness of the aquifer above the Tunnel outlet is not greater than 6-21 feet and that the saturated thickness of the aquifer above the lower springs is in the range of 50-65 feet. Water levels in the monitor well vary seasonally by about 5 feet, and predicted (by ESPAM2.1) water level change in the Rangen cell from curtailment is about 4 feet. These changes are nearly 100% of the saturated thickness above the Tunnel and about 10% of the thickness above the lower springs, further indicating that the requirements for superposition are not met at Rangen.

Hinckley (2012) has shown that for a given water level in the Rangen Monitor well, the discharge from the Curren Tunnel can vary by 4 cfs. In other words, with *no difference* in observed water level, observed discharge varies by 100% of its average value over the observation period. Similarly, Hinckley has shown that a given level of Rangen discharge can be associated with water levels that vary over a 2.5-foot range. This casts further doubt on the accuracy with which ESPAM2.1 can predict the benefit to Rangen from curtailment.

Figure 4.9 shows the ESPAM2.1 change in calibrated values of aquifer transmissivity in the vicinity of Rangen. Notable on this figure is the fact that transmissivities increase in magnitude closer to the canyon rim above Rangen. This is the opposite of what would be expected as the aquifer thins out and saturated thickness decreases. Some of this is undoubtedly a result of the higher weighting placed on discharge targets than on water level targets, but Johnson (2011) suggests it may be a result of calibration using the assumption of constant transmissivity. It is likely that fracture or conduit flow, more than porous media flow, dominates hydraulic behavior near springs in the rim area. These other flow paradigms are not reflected in any of the MODFLOW constructs used in ESPAM2.1.

Farmer (2009) describes a geological discontinuity in the vicinity of Rangen where the Quaternary basalt forming the main aquifer effectively ends at the canyon rim. The Quaternary basalt below the rim immediately west of Rangen is postulated to have flowed down a "ramp" from the southeast. Because of this discontinuity, groundwater entering this lower basalt flow has to come from the southeast rather than directly through the Rangen area. However, in ESPAM2.1 there is a simulated groundwater flow of 320 cfs across this discontinuity from the Rangen cell into the cell containing Tucker and Stewart Springs. As a result of this high flux, simulated water level in the Tucker/Stewart cell is very high (above actual ground surface) and causes a simulated groundwater gradient sloping to the south. Hinckley (2012) points out that the observed groundwater gradient in this area is in the opposite direction from that simulated by ESPAM2.1. These discrepancies reveal serious model misrepresentation of detailed aquifer behaviour in the Rangen area, and raise doubt as to the accuracy of model predictions there.

4.5.3 Comparison of ESPAM2.1 with Previous Versions of ESPAM

ESPAM1.1 and ESPAM2.0

The IDWR carried out a comparison of ESPAM1.1 and ESPAM2.0 performance (Sukow, 2012a) using the paradigm of the generic curtailment scenarios originally run by IWRRI for ESPAM1.1 (Contor, et al, 2004). This comparison utilized a steady-state version of the primary input file (the .wel file) in both the ESPAM1.1 and ESPAM2.0 and simulated the curtailment to 5 generic dates. Table 4.2 reproduces the results of this comparison for the generic curtailment date of January 1, 1961.

Table 4.2 makes two different comparisons. The first compares results from using the ESPAM1.1 input file in both the ESPAM1.1 and ESPAM2.0; this comparison illuminates the change in model results that can be attributed mainly to changes in model structure and parameters (which have been described above). The second compares results between the two models each using their own input file; this comparison illuminates the change in model results that can be attributed mainly to changes in input data. With respect to spring flows below Milner, the IDWR analysis found that flows due to 1961 curtailment increased from 352 cfs to 454 cfs using the ESPAM2. The analysis also concluded that roughly 75% of this change was the result of changes in model input data, primarily the use of more recent years for estimation of irrigated acreage and irrigation water requirements. This highlights the sensitivity of ESPAM2 results to conditions in particular years. Review of updated comparisons using ESPAM2.1 (Sukow, 2012b) leads to the same conclusion.

ESPAM2.0 and ESPAM2.1

Shortly after its release, an error was discovered in the input data for ESPAM2.0. The error arose in the calculation of the water budget in the Mud Lake area and caused an overestimate of aquifer recharge of approximately 89,000 acre-feet/year in that area of the model domain. The error was corrected and the model was recalibrated creating ESPAM2.1, which was made available on November 16th of this year.

The water budget error at Mud Lake was on the order of 1% of the overall ESPAM water budget. It was expected that the relatively small size of this error and its location at the far northeastern part of the model domain would not result in significant changes to the model at its western end.

Table 4.3 shows the change in calibrated values of drain conductance parameters in the Thousand Springs reach and Rangen area, between ESPAM2.0 and ESPAM2.1. As can be seen in Table 4.3, many of the conductances in the western end of the model domain changed by amounts substantially greater than the 1% change in water budget associated with the correction. The conductance for the Rangen drain decreased by about 4%, but some drain conductances in the area changed by nearly 1000%. Figure 4.9 shows how transmissivity values changed as a result of the error correction. Some cell transmissivities in the area near Rangen changed by as much as 500%. As will be discussed in a later section, these changes in conductance and transmissivity are carried directly into the superposition models used to calculate the flow changes resulting from curtailment. Large changes in calibrated parameter values suggest that ESPAM2.0 and ESPAM2.1 may be over-parameterized, and that other comparable calibration solutions easily can be reached with only minor perturbations in model assumptions. This substantially raises the level of uncertainty in model predictions, since other models can readily be found (by PEST) that are as well-calibrated but have very different parameter values in specific locations.

Further evidence of unexpectedly large changes in ESPAM2.1 is seen in Figure 4.10, which depicts the boundary of the 5% and 10% trimlines for Rangen using ESPAM2.0 and ESPAM2.1. Figure 4.10 shows that the area encompassed by the 5% trimline is substantially larger with ESPAM2.1, but that this expansion is mainly in areas on the opposite side of the Malad Gorge from Rangen. Given the fact that the Gorge severs the Quaternary basalts that form the aquifer (Hinckley, 2012), it is difficult to see why wells west of Bliss should now be viewed as having increased effect on Rangen flows simply because of a small data error at Mud Lake.

4.6 Model Uncertainty

The ESPAM2 is, like all models, a simplified representation of reality, and this leads to model uncertainty. When viewed from a distance, the generalizations and simplifications made to construct the model may be sufficient to support regional scale analyses. However, when called upon to represent highly localized conditions such as those governing discharge from specific outlets of a specific spring complex, the generalizations and simplifications can introduce significant error into model results. Actual subsurface conditions within the ESPA are understood only in specific locations where lithology has been observed (e.g., boreholes and outcrops) and where hydraulic characteristics have been measured (e.g., pump tests). Observations of ESPA geology suggest it is highly complex, comprised of overlapping fractured basalts interspersed with sedimentary formations, with hydraulic characteristics that can vary substantially over short distances (Lindholm, 1996; Hinckley, 2012).

4.6.1 Overview - General Dimensions of Model Uncertainty

Model uncertainty has several dimensions, and these have been described in various submittals to the ESHMC (e.g., Brendecke, 2009a,b; 2012). In a nutshell, the principal dimensions of model uncertainty are those associated with model conceptualization, with model input and with model calibration. While all of these dimensions are important, conceptual uncertainty is fundamental. No amount of data improvement, re-sampling or recalibration can correct errors stemming from incorrect (or simply incomplete) model conceptualization (Bredehoeft, 2005).

Model conceptualization involves the identification and adoption of a model framework that the modeller believes can properly represent the behavior of the underlying real system. At a practical level it is the selection of a modeling code (in the present case MODFLOW) and the formulation of the model structure (e.g., defining the domain, deciding whether to operate it as a confined or unconfined system, adopting cell sizes, layering, boundary conditions, etc.). Previously in this chapter we have examined how many of these conceptual aspects of ESPAM2.1 fail to reflect observed characteristics of the aquifer system in the Rangen area. These failures lead to conceptual uncertainty in the ESPAM2.1.

Rigorous evaluation of conceptual uncertainty is difficult. There may be a large number of plausible conceptual models of an aquifer system and these models can't be rigorously evaluated until they are built. As a result, this critical dimension of model uncertainty is often "swept under the rug" in favor of more constrained and tractable evaluations that focus on input data and calibration. In the case of ESPAM2.1, this conceptual uncertainty bears directly on its suitability in the present matter.

Once a conceptual model has been identified and formulated, it must be populated with input data reflective of the important aspects of the aquifer water budget. In the case of ESPAM2.1, these data include precipitation, tributary underflows, irrigated acreage, crop distributions, surface water supplies, water application methods and efficiencies, etc. Each of these input data types carries its own uncertainties that can stem from, among other things, the inability to measure a condition accurately (or at all) and from the spatial or temporal resolution of measurements. Sometimes these uncertainties can be reduced by further data collection efforts, though these may be time-consuming and expensive. The effects of input data uncertainty can sometimes be explored through sensitivity analysis or through Monte Carlo analysis, which seeks to translate probabilistic descriptions of model input data to probabilistic descriptions of model output.

Once the conceptual model has been populated with input data, it must be calibrated. The calibration process has been addressed previously in this section. Calibration uncertainty essentially reflects the fact that many combinations of model parameter values (which in the case of ESPAM2.1 include aspects of the aquifer water budget) may lead to equally well-calibrated models. The uncertainty arises because the predictions made by these equally well-calibrated models may be significantly different.

4.6.2 IDWR Uncertainty Analysis

The uncertainty of ESPAM2.0, and selected aspects of ESPAM2.1, have been explored by the IDWR using a technique called "Predictive Analysis" that is available as part of the PEST software (Watermark, 2005). Predictive Analysis is described in the PEST documentation as

> "… the task of calculating the effect of parameter uncertainty, as estimated through the calibration process, on predictive uncertainty."

Predictive analysis essentially answers the question "If I use slightly different values for selected model parameters, do I get different values for key model results?" The analysis requires assumptions about the meaning of "slightly different" and whether such differences are small enough that the model can still be considered calibrated. The analysis does not explore alternative conceptual representations of aquifer hydrogeology, although it can be used in a limited way to explore input data uncertainty.

Table 4.3 summarizes the predictive analysis carried out by the Department (Wylie, 2012c,d) for ESPAM2.0, showing updates for selected portions using ESPAM2.1. The analysis made several simplifying assumptions to make the work computationally more efficient; for example, it assumed that pumping stress for entire Water Districts could be applied at the centroid of each District without loss of accuracy. The predictive analysis was designed to be generic, and did not examine parameter sensitivity of predictions of Rangen discharge. The conclusion that can be drawn from Table 4.3 is that parameter uncertainty variable of the model domain (e.g., the relationship between pumping in Water District 34 and reach gains between Blackfoot and Minidoka is apparently larger than that between pumping in Water District 130). The important thing to remember with this analysis is that it relies on a single conceptual model and does not explore the uncertainty that arises from improper conceptualization of local geologic and hydraulic conditions that influence discharge of specific spring complexes, such as those at Rangen.

4.6.3 Rationale for alternative models

In the uncertainty evaluation carried out for the ESPAM2.1, the model and parameter structure are assumed fixed, as are many data inputs. This approach is valuable in illuminating those parameters for which further investigation might reduce the uncertainty of the chosen model (James, et. al., 2009), but does not address larger questions of model uncertainty described above. More exhaustive evaluation approaches, such as Monte Carlo simulation, may shed greater light on the probability distributions of model errors. However, unless such approaches address all the dimensions of model uncertainty, including conceptual uncertainty, they too will be incomplete.

Conceptual uncertainty can only be addressed by considering alternative models. The poor correspondence between ESPAM2.1 assumptions about hydrogeology and aquifer behavior in the Rangen area indicate that at the very least a refined version of ESPAM2.1 is required. One very preliminary set of refinements are discussed in a later section of this report.

4.7 Limitations of ESPAM2

While it is clearly an improvement over its predecessor, several important features are the same in ESPAM1.1 and ESPAM2.1. The two are still conceptually the same regional model. Differences between them are largely the result of differences in input data and in values of calibration parameters resulting from the use of that input data. Both models represent the details of the Rangen spring complex and the surrounding geology in highly simplified form, omitting several key features and that would make significant differences in predicted benefits of curtailment.

Particularly important to the present case is the fact that ESPAM2.1 systematically underestimates water levels in the Rangen area. Because simulated heads are too low in the cells above Rangen, the calibrated drain conductances have to be made higher in order to meet the discharge calibration targets. This means that the drains are overly-sensitive to small changes in head. This over-sensitivity is carried into the superposition model used for curtailment, with the result that changes in spring flows are substantially over-predicted.

For these reasons, the ESPAM2.1 is subject to the same general limitations as ESPAM1.1, despite the increased attention given to the use of springs as calibration targets. That ESPAM2.1 can fairly closely mimic the observed past behavior of a spring complex is not proof that it sufficiently represent hydrogeologic reality to accurately predict future behaviour of that complex, especially under aquifer water use conditions (e.g., curtailment of large amounts of junior groundwater pumping) that are radically different from those extant in the model calibration period.

The ESPAM2.1 documentation describes limitations on model usage, highlighting the facts that a number of simplifying assumptions had to be made and that many components of the model water budget were uncertain. The documentation cautioned that ESPAM2.1 is a regional ground-water model best used for broad-scale predictions.

5.0 SIMULATION OF CURTAILMENT OF JUNIOR GROUNDWATER RIGHTS

5.1 Background

IDWR practice has been to create superposition versions of the ESPA groundwater model for use in evaluating curtailment (and other) scenarios. Superposition models are used primarily for reasons of convenience; it is faster and easier to perform analyses with superposition models than it is with "fully populated" models. A fully populated model contains all the water budget (input) data and parameters used in model calibration; outputs from a fully populated model can reflect simulated values of characteristics that may be directly observable in the aquifer. However, to examine effects of changes in input data, such as reduced pumping withdrawals, it is necessary to make two runs of a fully populated model and then determine effects by differencing the results of the two runs. The use of a superposition model allows this differencing to be accomplished in a single model run.

A superposition model preserves the parameters of the flow relationships between model cells but sets the initial condition of the groundwater flow regime to one of zero flux. Existing fluxes are eliminated by setting all aquifer heads and elevation differences to zero. The aquifer is converted, conceptually, into a still pool but one in which all the water molecules preserve fixed, predetermined relationships to one another. The relationships that are preserved in a superposition model are embodied in the calibrated parameters governing flow rates and responses: transmissivity, specific yield, conductance (of drains, riverbeds, and general head boundaries) and seepage rates from canals. The effect of a selected model stress, such as a reduction in groundwater withdrawal, can then be evaluated with the superposition model simply by applying that incremental stress and examining how heads and fluxes (including reach gains and drain flows) have changed from their zero condition.

The principle of superposition relies on the assumption that the system being modeled behaves in a completely linear way…that is, that flow relationships are independent of flow magnitude. In a linear model, the rate of flow caused by a half-foot difference in water level between two cells will be the same whether the cells contain water 1 ft or 1000 ft deep. Superposition models perform identically at all levels of assumed stress change, even those outside their range of calibration. If the system being simulated exhibits important non-linear behaviors, such as those that have been described in preceding sections of this report, a superposition model can introduce significant error into the analysis of effects of stress changes.

The practice of the IDWR has been to define three superposition versions of the ESPAM, a steady state version (dubbed "SuperSS"), and two transient versions (dubbed "SuperTransient10yr_monthly" and "SuperTransient150yr"). The transient versions allow simulation of how assumed stress changes evolve over time, the former reflecting a repeated seasonal pattern of conditions and the latter reflecting a constant annual pattern. The constant annual pattern is used to assess the speed at which the aquifer reaches equilibrium (steady state) conditions after introduction of a change.

Simulation of curtailment of groundwater irrigation rights junior to Rangen's 1962 Curren Tunnel water right has been carried out with ESPAM2.0 by both the IDWR and by Rangen experts. Simulation of curtailment using ESPAM2.1 has been carried out in a generic sense by the IDWR (Sukow, 2012b) and for the Rangen water rights by AMEC. These simulations are briefly described and evaluated below.

5.2 IDWR Curtailment Analyses

5.2.1 Generic Curtailment Analysis

As part of the development of ESPAM2.1, the IDWR carried out a comparative analysis of the effects of curtailment as simulated by ESPAM1.1, ESPAM2.0 and ESPAM2.1. The simulated curtailments were those described by Contor, et.al. (2005) for ESPAM1.1. The curtailments did not reflect priority dates of any specific water rights nor were they limited spatially to the the Area of Common Groundwater defined in Rule 50 of the Conjunctive Management Rules. The curtailment dates used in the analyses were January 1 of the years 1870, 1949, 1961, 1973 and 1986. The January 1, 1870, curtailment date reflected curtailment of all groundwater use in the model domain except that occurring under tribal water right settlement agreements.

The January 1, 1961, curtailment is roughly comparable to that which would occur under the present delivery call for Rangen's July 13, 1962, water right. Table 4.2 in the preceding section showed the results of the hypothetical 1961 curtailment using ESPAM1.1 and ESPAM2.1.

5.2.2 Rangen Curtailment Analyses

In its document production of June 12, 2012, the IDWR produced model files containing results of curtailment analyses for the present Rangen delivery call. These files indicate that the Department evaluated the effects of July 13, 1962, curtailment with ESPAM2.0 using various "trimline" assumptions.

The "trimline" defines a zone of exclusion outside of which the benefits of curtailing a well are less than a threshold percentage of the amount of water use curtailed, as determined by the groundwater model. The trimline concept was originally adopted by former Director Karl Dreher in his 2005 Orders stemming from the delivery calls of Blue Lakes Trout, Clear Springs Foods, the Surface Water Coalition, Rangen, Inc., and others. Director Dreher adopted a 10% trimline and stated in hearing testimony that he viewed this as a minimum level of model uncertainty, noting that model uncertainty had not been quantified. He went on to say that:

> *"…I made the determination it was not appropriate to curtail such junior priority ground water use if, in fact, we didn't know whether curtailment would result in a meaningful amount of water reaching the calling senior right."* (Transcript at 1167: 4-80)

Table 5.1 summarizes the results of the IDWR curtailment analyses using ESPAM2.0. The analyses considered trimline thresholds between 0.2% and 10%, as well as trimlines limited only by the Rule 50 Area of Common Groundwater Supply and by the ESPAM2.0 model domain. As

the trimline threshold decreases the area encompassed by curtailment increases. As shown in Table 5.1, there are a total of 406 groundwater irrigated acres relying on rights junior to Rangen's 1962 priority within the 10% trimline; there are a total of 565,023 groundwater irrigated acres within the model domain relying on rights junior to Rangen's1962 priority.

Table 5.1 shows that curtailment of the junior groundwater rights within the 10% trimline would immediately eliminate 1,445 acre-feet of groundwater pumping and, at steady state, would cause total modeled flow at the Rangen springs to increase by 0.19 cfs (141 af/y assuming year around flow). This increase in modeled spring discharge represents 9.5% of the pumping foregone by the curtailed wells and, assuming a permitted groundwater diversion rate of 1 miners inch (1") per acre, 0.66% of the curtailed water rights. It would take somewhat less than a year for discharge to reach 90% of this modeled steady state increase.

Curtailment of the junior groundwater rights within the entire model domain would immediately eliminate 1.46 million acre-feet (MAF) of groundwater pumping and, at steady state, would cause modeled discharge from the Rangen spring complex to increase by 18.07 cfs. This increase represents 0.9% of the pumping foregone by the curtailed wells, and 0.06% of the curtailed water rights. It would take approximately 16 years for modeled discharge to reach 90% of this steady state increase.

Foregone groundwater use that is not simulated to accrue to Rangen would accrue to other connected river reaches, springs and baseflows, including those on which there are no water rights or diversions, those on which there are no delivery calls, those on which approved mitigation plans are already in place, and those on which diversions occur under water rights junior to those of the curtailed rights.

5.3 Rangen Analysis

In its December 13, 2011, delivery call Rangen included a curtailment analysis (Exhibit 11 to the petition) carried out by its experts (McGrane et.al., 2011). The details of this analysis were requested at the outset of discovery for this case, but were not produced by Rangen until November 28th of this year. Accordingly, the conclusions below are based primarily on a facial interpretation of Exhibit 11 and may be supplemented when time permits a more careful examination of Rangen's late production.

The Rangen analysis appears to be a transient analysis using average monthly stresses. The use of a transient, average monthly analysis permits the display of simulated seasonal effects of curtailment. It does not appear that the version of ESPAM2.0 used for the analysis is the final calibrated version. The analysis recommends against the use of the trimline concept and concludes with a recommendation that Rangen seek curtailment of all junior (to July 13, 1962) groundwater irrigation rights within the ESPAM2.0 domain. As noted above, this would immediately dry up 565,023 acres of groundwater irrigated land.

Figure 5.1 is reproduced from Exhibit 11 of the Rangen petition. It shows that curtailment would achieve a simulated annual average increase in total Rangen discharge of 17 cfs after 20-plus

years of curtailment. After twenty five (25) years of continuous curtailment, simulated minimum seasonal flows from the Rangen complex would increase by about 9 cfs.

Presumably the curtailed groundwater acreage and water use amounts implicit in the Rangen analysis are similar to those of the IDWR analysis with no trimline, and that similar conclusions could be drawn regarding the portion of curtailed use and water rights that would accrue to Rangen's benefit.

5.4 Rangen Curtailment Using ESPAM2.1

AMEC has carried out analyses of curtailment for Rangen's 1962 water right using ESPAM2.1. These analyses were carried out using the assumption of a 10% trimline. A 10% trimline assumption was adopted based on precedent; previous curtailment analyses and orders by the IDWR have used this assumption, which stems from Director Dreher's Orders in 2005.

AMEC compared the spatial extent of the 5% and 10% trimlines for ESPAM2.1 as defined based on steady-state response functions published by the IDWR (http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/model_files/Version_2.1_Current). Figure 4.10 shows the 10% and 5% trimlines for ESPAM2.0 and ESPAM2.1. The 10% trimline is the same for both models, but the 5% trimline for ESPAM2.1 encompasses a larger area than that for ESPAM2.0. This is presumably the result of recalibration due to correction of the Mud Lake data error described previously, though it is difficult to see why a small change in input data in the opposite end of the model domain would cause such a large change in the trimline. It is noteworthy that the extension of the trimline occurs in the area west of Bliss, which is separated from the Rangen area by the Malad Gorge.

Table 5.2 summarizes the steady state results of the 10% trimline curtailment using ESPAM2.1. Curtailment to the 10% trimline has results nearly identical to the ESPAM2.0 analysis done by the IDWR. This curtailment would immediately dry up 406 acres of groundwater irrigated land and eliminate 1,446 acre-feet of groundwater use. Total simulated flow at Rangen would increase 0.21 cfs, which is slightly higher than the 0.19 cfs predicted by the IDWR analysis. This small difference may be attributable to changes in the transmissivity distribution that occurred in recalibration of ESPAM2.1.

6.0 Alternative Conceptual Models

This section describes the development of two alternative conceptual models (labelled #1 and #2 below) of the ESPA in the immediate area of the Rangen complex. The aim of this effort is not to present a definitive reformulation of ESPAM2.1, but to illustrate how a few relatively minor changes to its conceptual structure, suggested by detailed hydro-geologic review, could result in significantly different conclusions from a curtailment analysis. In order for either of these alternative conceptual models to be fully developed, it would be necessary to perform similar analyses at other spring complexes as were presented in the foregoing sections of this report and to extend the reach of calibration from that used herein. Nevertheless, the results of these

preliminary steps at more realistic representation of local hydrogeology illustrate the potential for significant conceptual uncertainty in the application of ESPAM2.1 to localized problems.

6.1 Description of Modifications to ESPAM2.1

The alternative modeling effort focused on making small changes to the construction of ESPAM2.1 to explore what effect these changes have on simulated Rangen discharge and simulated water levels in the vicinity of Rangen. Concepts for these changes are based primarily in hydrogeologic analyses and interpretations presented in Ralston (2008), Farmer (2009) and Hinckley (2012) and on discussions with Neal Farmer on August 22, 2012.

6.1.1 Horizontal Flow Barrier

The main geologic formations that influence the groundwater flow and spring discharge near the Hagerman area are the Quaternary basalts that form the ESPA and the less permeable Tertiary formations (e.g., Glenns Ferry) that underlie it. Current geologic understanding of the Hagerman area is that the ESPA effectively terminates along the Hagerman rim and that the underlying formations restrict subsurface flow from it into the Hagerman Valley. At the south end of the rim, however, Quaternary basalt flows form a "ramp" (Farmer, 2009) creating a pathway to feed lower-elevation springs such as Tucker and Stewart as shown in Figure 6.1. Between this ramp and the rim is a geologic discontinuity, possibly faulting, that restricts groundwater movement directly from the rim to the lower elevation springs. Observed gradients indicate that groundwater flows into this lower area from the southeast rather than the northeast.

To reflect this geological feature, a horizontal flow barrier (Hsieh, 1993) was inserted between columns 12 and 13 for the cells in rows 42 and 43 of the model domain. For model #2, this barrier was shortened to only row 42, as shown in Figure 6.2. A horizontal flow barrier restricts groundwater flow between the cells for which the HFB is defined. With this barrier in place, the preponderance of flow moving southwest through the ESPA must go around the discontinuity to reach the lower springs.

6.1.2 Multiple Drains

Groundwater flows from the Rangen complex emerge at several locations. Farmer (2009) and personal observation note at least two discharge areas, the Curren Tunnel and a set of springs emerging from the slope below it. Farmer estimated the Tunnel to be at elevation 3145 ft (msl) and the lower springs to be at elevation 3100 ft. Koreny (2011) presented spring survey data indicating a Tunnel elevation of 3150 ft "plus or minus two feet." Covington and Weaver (1991) note an elevation of 3138 ft for the "Rangen spring." Elsewhere in the Thousand Springs reach, complexes with discharge points having a range of elevations have been represented using two drains. Given the range and uncertainty in elevations of discharges at Rangen, it seems appropriate to use the same multiple drain construct to represent Rangen as was used in other nearby locations.

Accordingly, another modification made to the alternative models was to represent the Rangen complex using two drains. A new upper drain (DRN218) was added to the Rangen cell, and to the CRIV group. In both models the lower drain was given an elevation of 3100 ft. In alternative model #1 the upper drain was given an elevation of 3152 ft, while in model #2 it was given an elevation of 3148 ft, thus bracketing the upper elevation estimates for the Tunnel presented by Koreny (2011).

6.1.3 Removal of GHB Cells

As noted in Section 4, the use of General Head Boundaries (GHBs) to reflect unmeasured flows from the ESPA to the Snake River effectively undid the removal of the Hagerman Valley from the model domain. Present geologic understanding is that the Hagerman Valley is not part of the ESPA, yet the use of GHBs along the Hagerman rim implies that the ESPA continues through the valley to the river.

It is conceivable that ESPA discharges could be made to the river at the northern and southern edges of the Hagerman Valley. Covington and Weaver note the presence of springs at river level downstream of Lower Salmon Falls dam. Low elevation springs and seeps also exist in the area of the Hagerman Fish Hatchery operated by the State of Idaho.

The third modification made in the alternative models was to remove four GHB cells immediately north of Rangen to prevent simulation of ESPA flows through the Hagerman Valley. This reconfiguration is shown on Figure 6.3. This removal forces baseflows in the Buhl to Lower Salmon Falls reach to move through the remaining GHB cells defined in ESPAM2.1.

6.1.4 Increased Weighting on Recent Rangen Flows

A notable feature of the ESPAM2.1 calibration and validation is the over-prediction of Rangen flows in recent years. Given that any management action would look forward from the present, it seems appropriate that greater emphasis should be placed on simulation of current aquifer behavior. Accordingly, a further modification undertaken in Alternate Model #2 was to assign increased calibration weight to Rangen flow observations after the year 2000. The aim of this modification was to improve the model simulation of Rangen discharge in recent years.

6.2 Calibration of Alternative Models

6.2.1 General Approach

The alternative models were calibrated using the PEST software. Calibration adjustments were limited to parameters in the CRIV group; no recalibration of model transmissivity or specific yield was done, nor were any water budget terms adjusted in the calibration.

Calibration targets for the alternative models were the same as those used in ESPAM2.1, except for the addition of water level targets for PEST well #992. This well, which lies immediately northeast of the Rangen cell, was listed as a target for ESPAM2.1 but was apparently never

used. This inclusion of well #992 added 166 additional target values to the calibration data set. These were given calibration weights the same as those used in ESPAM2.1 for other transient water level targets.

6.2.2 Calibration Results Model #1

Figure 6.4a shows the results of calibration of model #1 for the Rangen discharge and Figure 6.5a shows the results for water levels in wells 989 and 992.

In ESPAM2.1, modeled groundwater levels in calibration well 989 are 20 ft lower than observed levels, and in well 992 the modeled levels are around 2 to 8 ft lower than observed levels (well 992 was apparently not used in the ESPAM2.1 calibration).

In alternative model #1, simulated water levels are higher in both wells, matching observations better than in ESPAM2.1. The most marked improvement is in well 989, which was underpredicted by approximately 20 feet in ESPAM2.1; with model #1 the underprediction is about 10 feet. ESPAM2.1 underpredicted water levels in well 992 by about 5 feet, though somewhat less in more recent years; with model #1 there is good match to water levels in well 992, though there is a slight overprediction in recent years.

The simulated Rangen discharge in model #1 is nearly identical to ESPAM2.1. From the foregoing I would conclude that the calibration of model #1 in the Rangen area is at least as good as that of ESPAM2.1.

6.2.3 Calibration Results Model #2

Figure 6.4b shows the results of calibration of model #1 for the Rangen discharge and Figure 6.5b shows the results for water levels in wells 989 and 992.

In alternative model #2, simulated water levels are not as high as with model #1, but correspondence with well 989 is still improved over ESPAM 2.1. Calibration to flow at Rangen is somewhat poorer in the early years of the calibration than is ESPAM2.1, but calibration in recent years is much better. Model #2 appears to resolve the overprediction problem noted for ESPAM 2 ? in recent years.

6.3 Curtailment Analysis with Alternative Models

Both alternative models were run to simulate curtailment of junior groundwater uses within a 10% trimline. This trimline is consistent with past practice and with IDWR water rights transfer policy. The results of these runs are shown in Table 6.1. Also shown in this table are the results of the same curtailment analysis using ESPAM2.1.

It can be seen by this comparison that the relatively minor modifications made to ESPAM2.1 to better reflect local hydrogeology have substantial effect on simulated benefits to Rangen from curtailment. In the case of alternative model #1, the benefit from curtailment is roughly half that

predicted by ESPAM2.1. In the case of alternative model #2, the benefit is about 5% of that predicted by ESPAM2.1.

6.4 Conclusion

The foregoing alternative model simulations demonstrate how sensitive the predictions from ESPAM2.1 can be to the model representation of local hydro-geologic conditions. Relatively minor changes in ESPAM2.1 conceptualization, made to more closely reflect the local conditions at Rangen, result in model predictions that differ substantially from those of ESPAM2.1. The substantial differences in model predictions highlight the potential magnitude of conceptual uncertainty in ESPAM2.1, a dimension of uncertainty not addressed in the IDWR's predictive analysis.

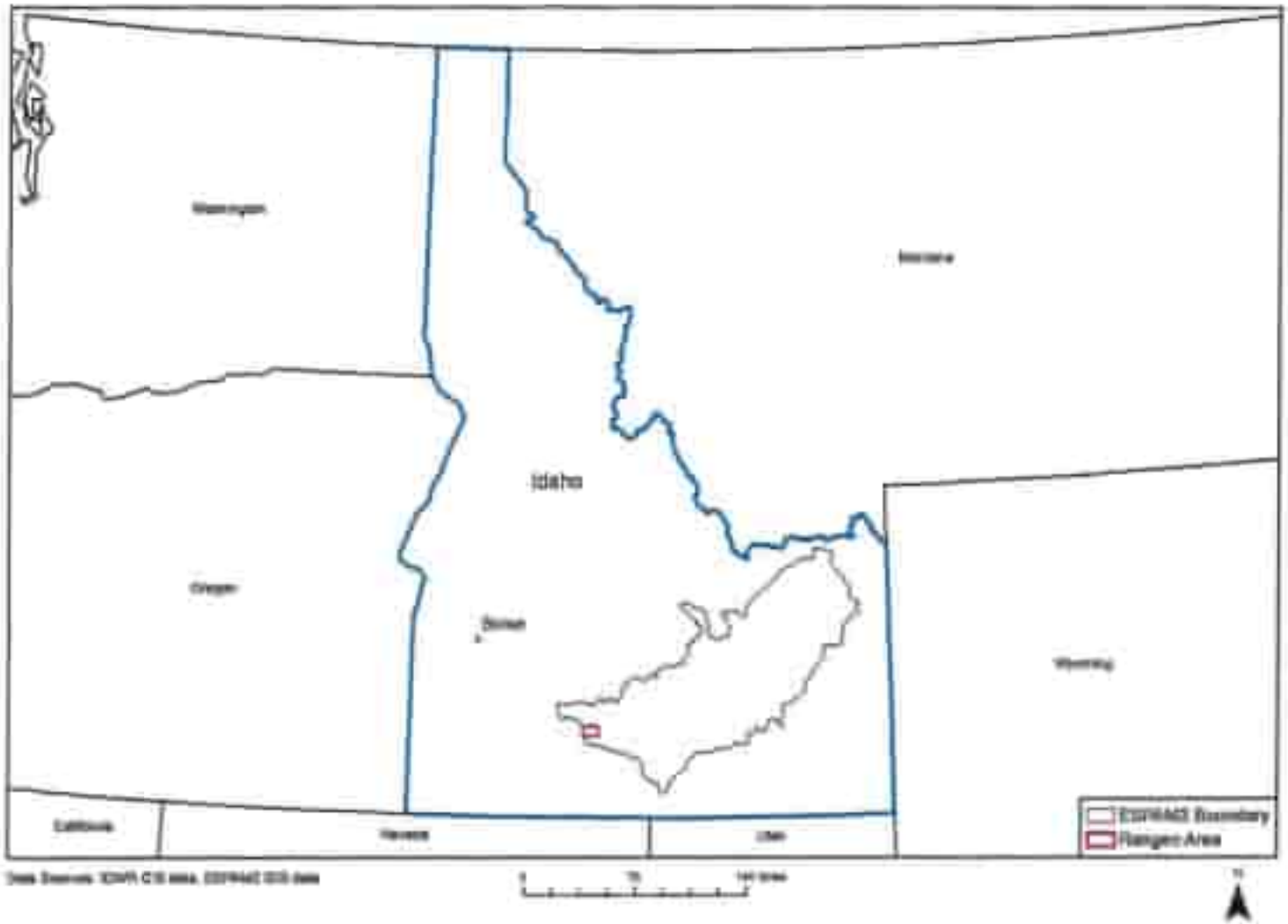


Figure 1.1: Location Map

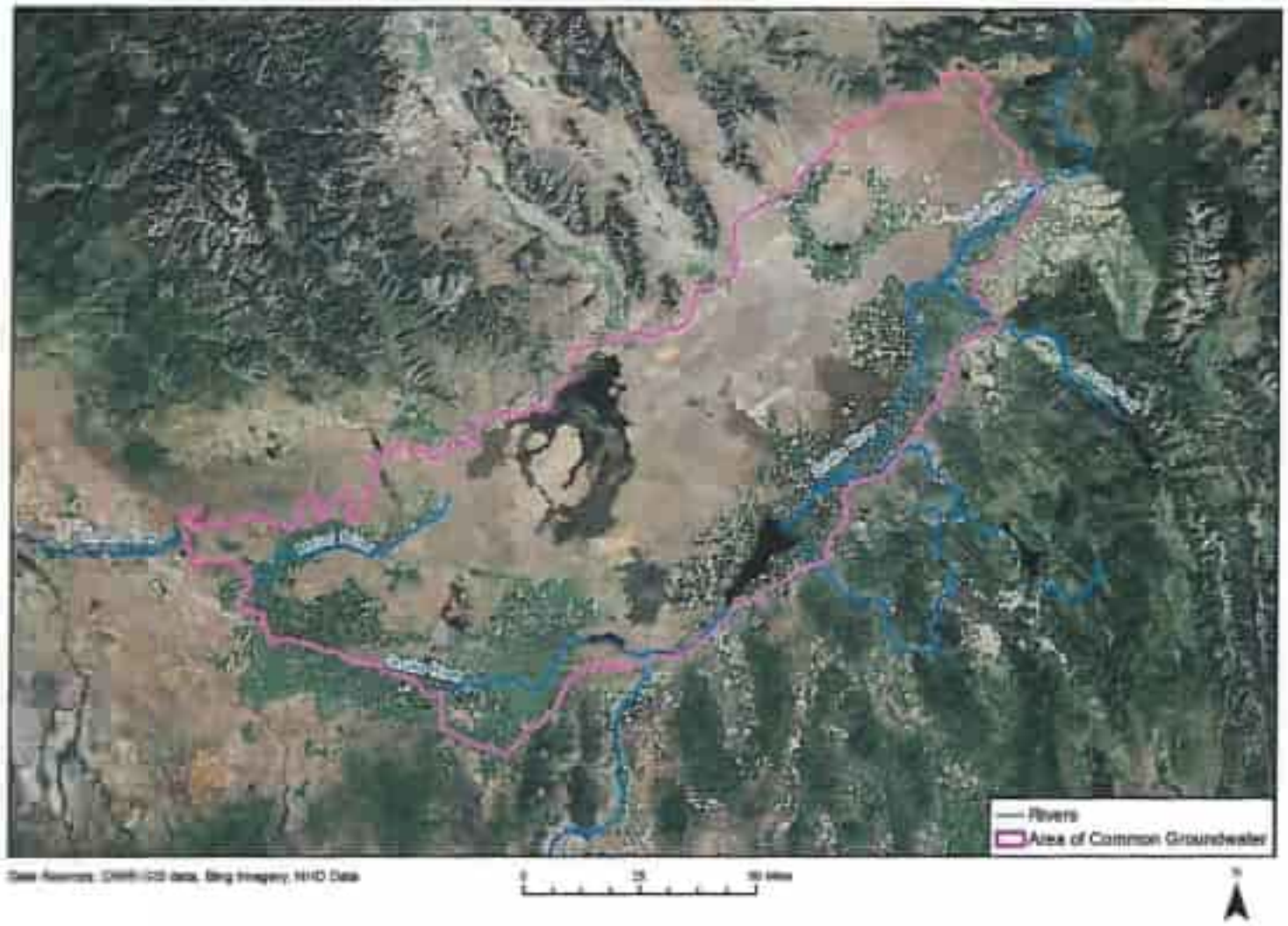


Figure 2.1: Eastern Snake Plain Aquifer

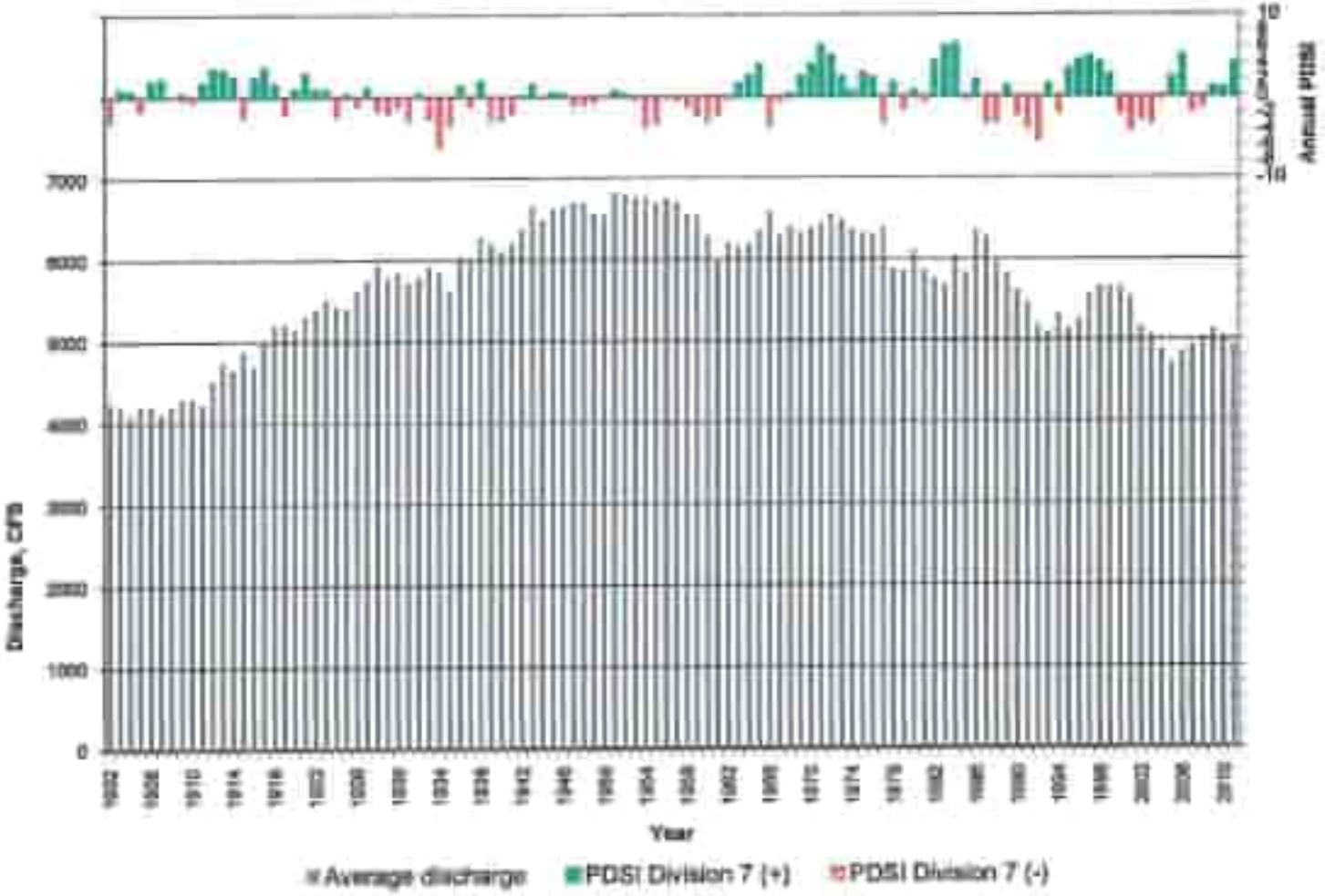


Figure 2.11: Average Annual Spring Discharge to Snake River between Milner and King Hill, 1902 to 2011

Source: IDWR, NOAA Earth System Research Laboratory Physical Sciences Division

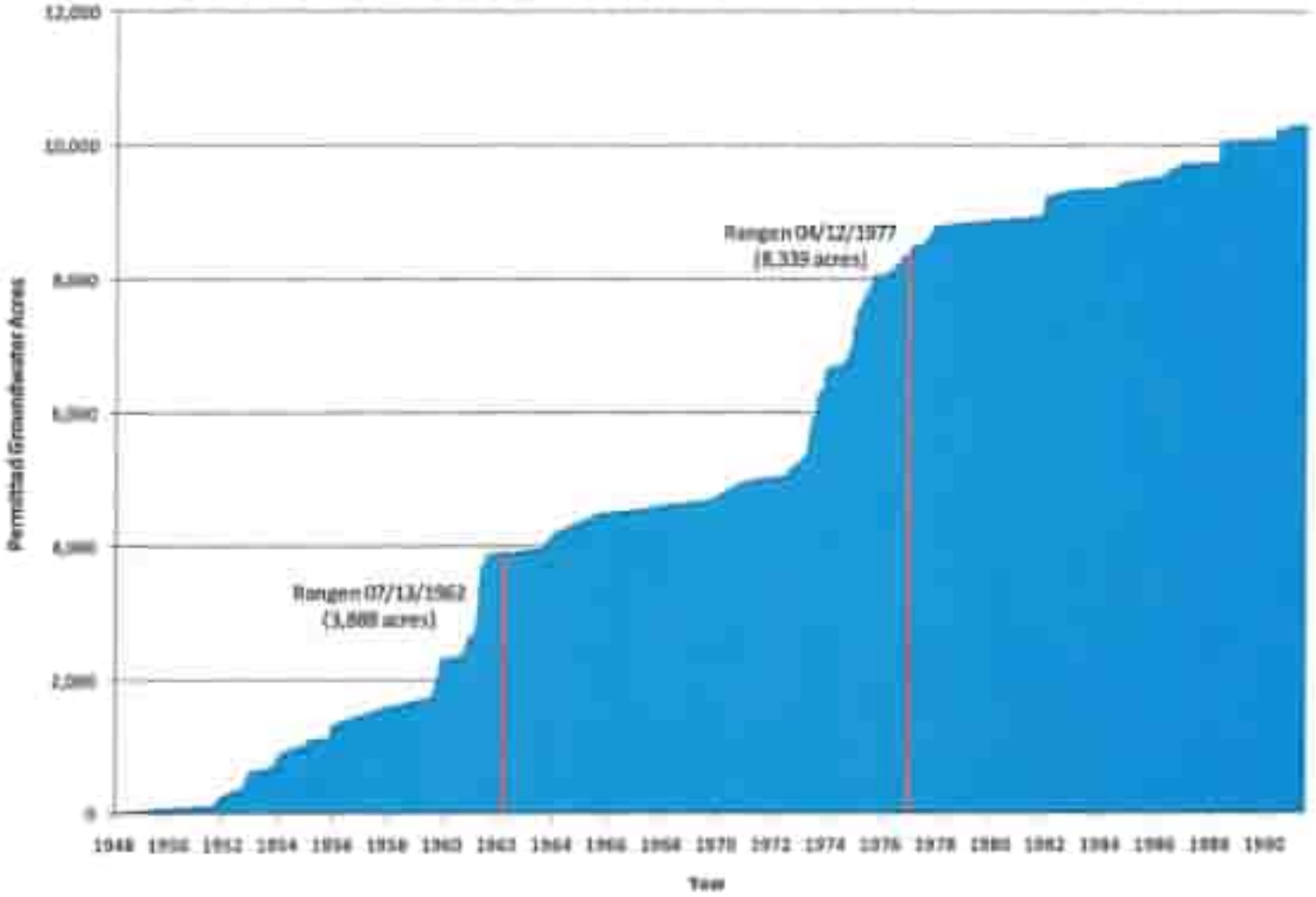


Figure 2.12: Cumulative Permitted Groundwater Acres in the Wendell Area

Source: IDWR GIS Data

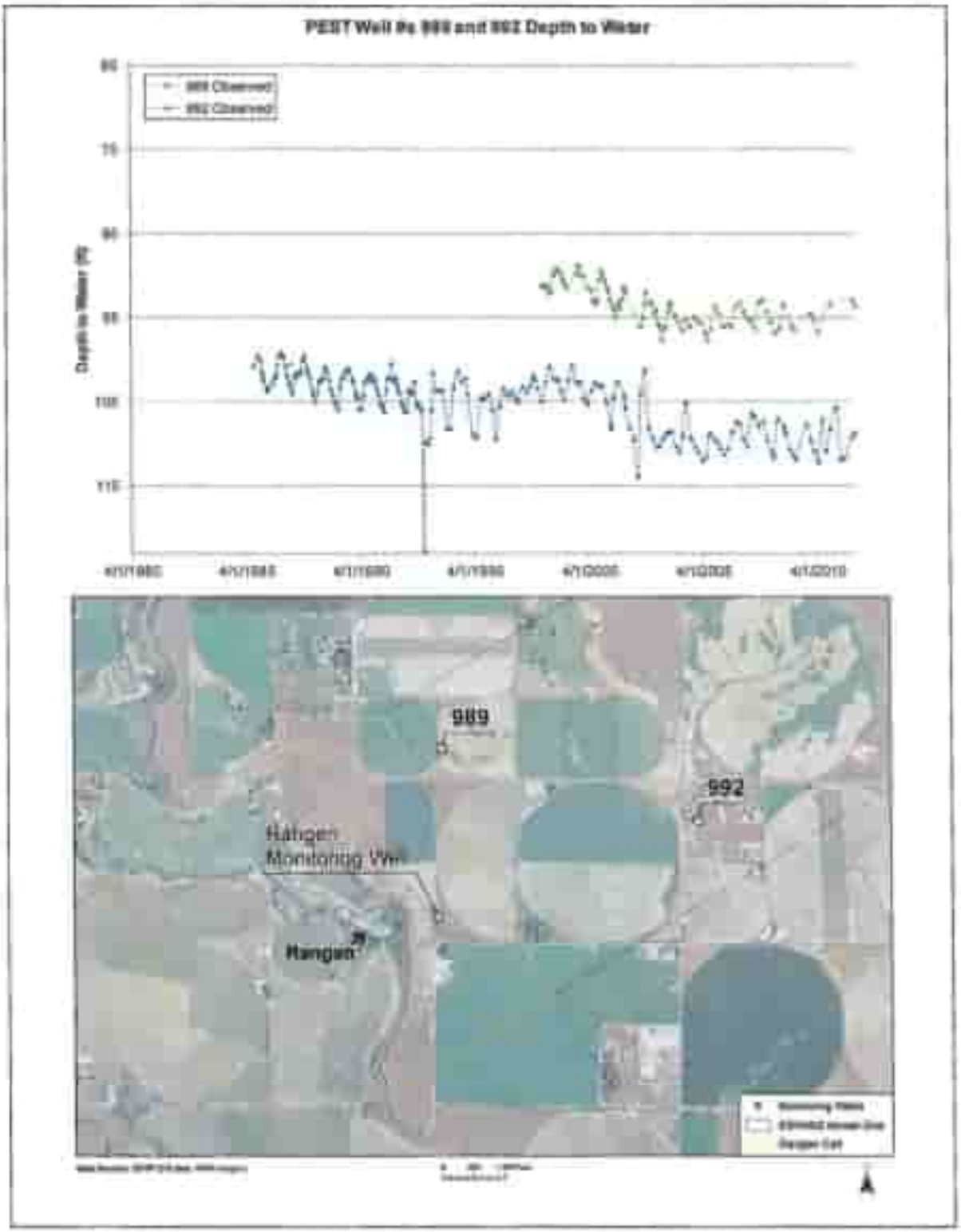
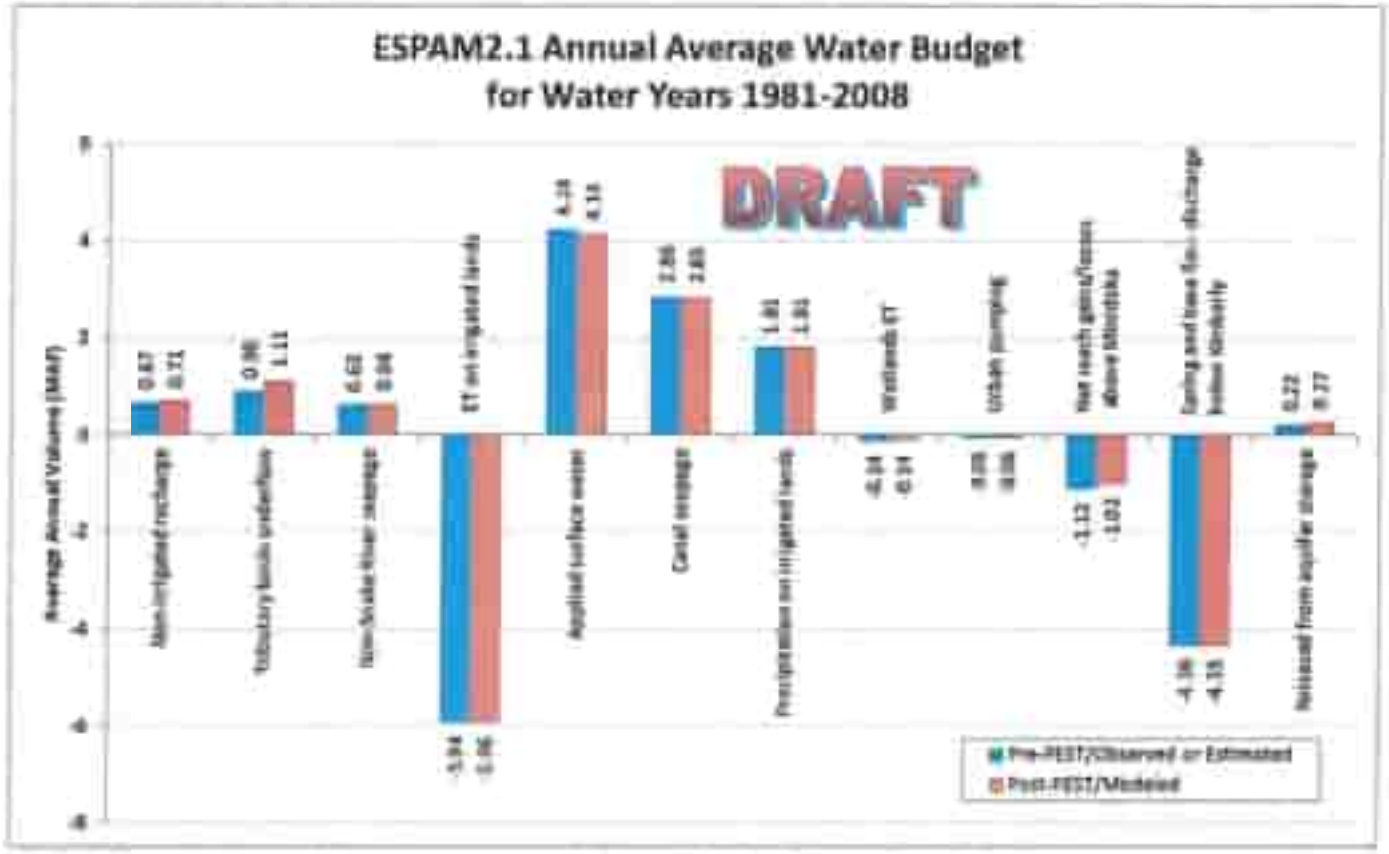


Figure 2.14: Observed Groundwater Levels in Select Wells



Notes: Positive values of aquifer storage represent water released from storage into the aquifer flow system. Negative values of aquifer storage represent water placed into storage. Applied surface water is defined as (Agricultural diversions – canal seepage – returns – offsite, exchange, and Mud Lake pumping). Precipitation on agricultural lands and urban pumping were not adjustable during model calibration.

Figure 2.2: Eastern Snake Plain Model Water Budget

Source: ESPAM2.1 Documentation

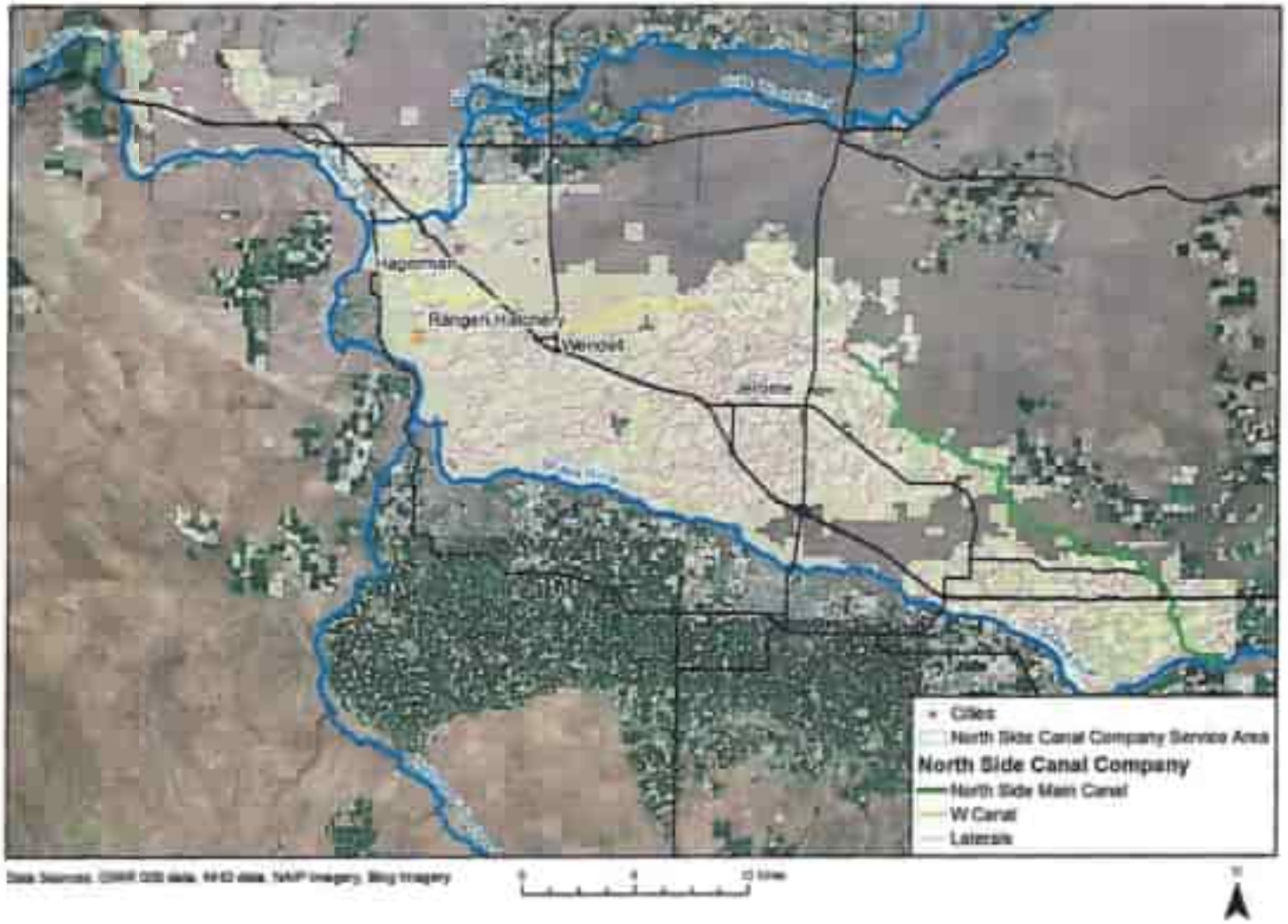
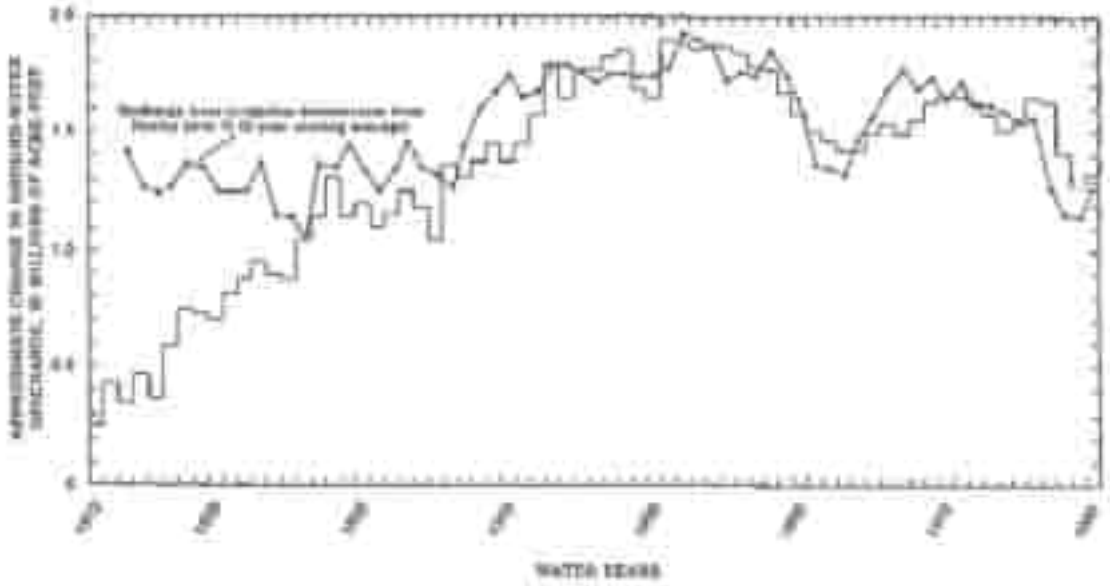
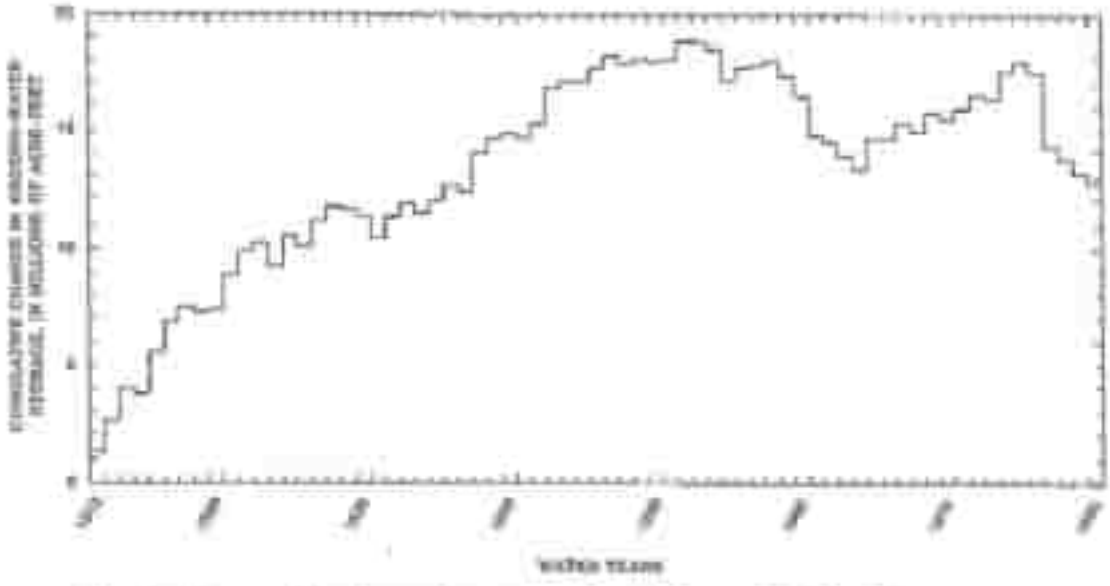


Figure 2.3: North Side Canal Company Service Area



(a)—



(b)—

Source:

Figure 2.4: Changes in Groundwater Storage on Spring Discharge, 1912 - 1980

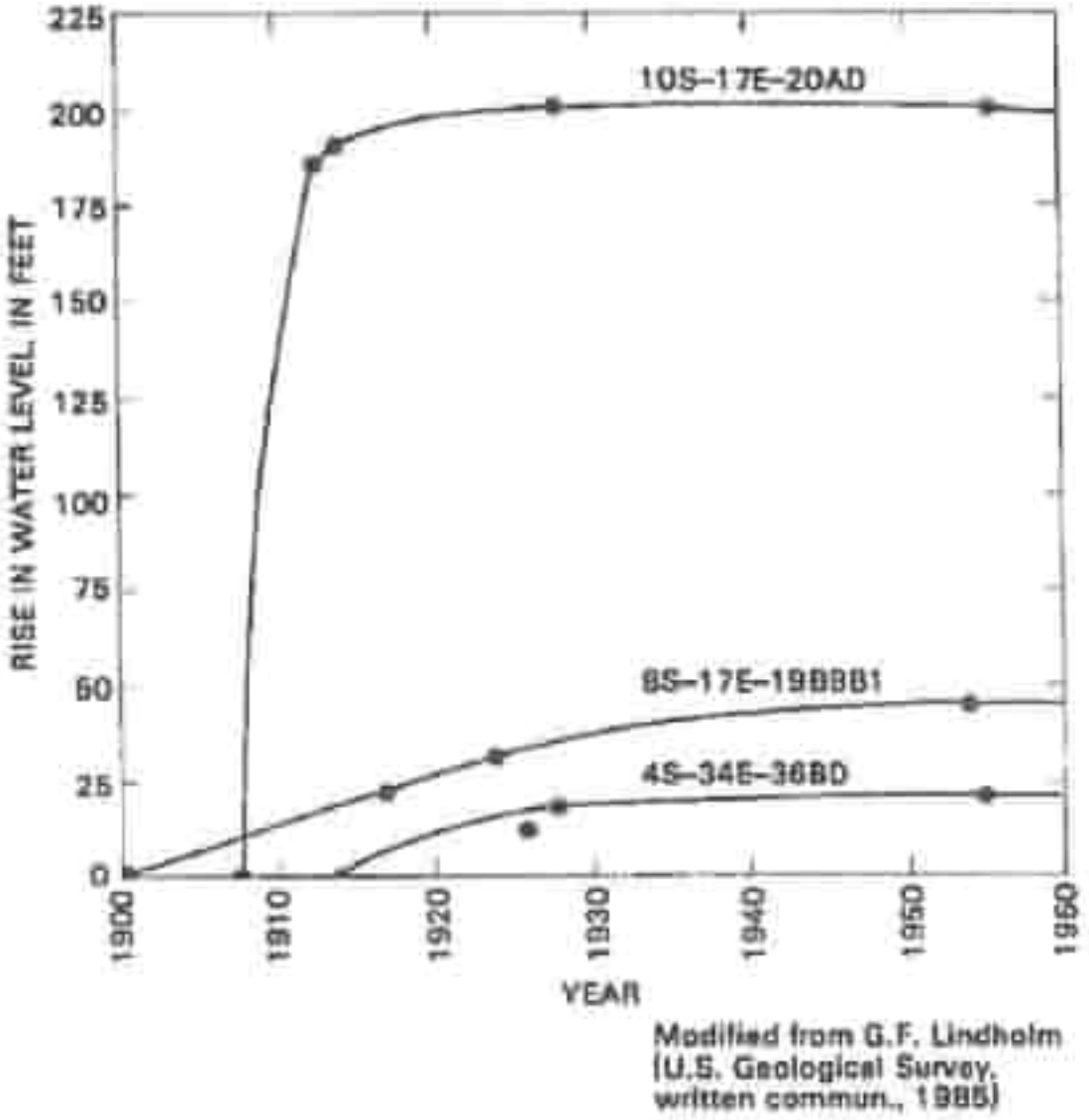


Figure 2.5: Water Level Rises in Three Observation Wells, 1900 – 1960

Source: Goodell, 1988



Figure 2.6: Locations of Three Observation Wells

Source: Goodell, 1988

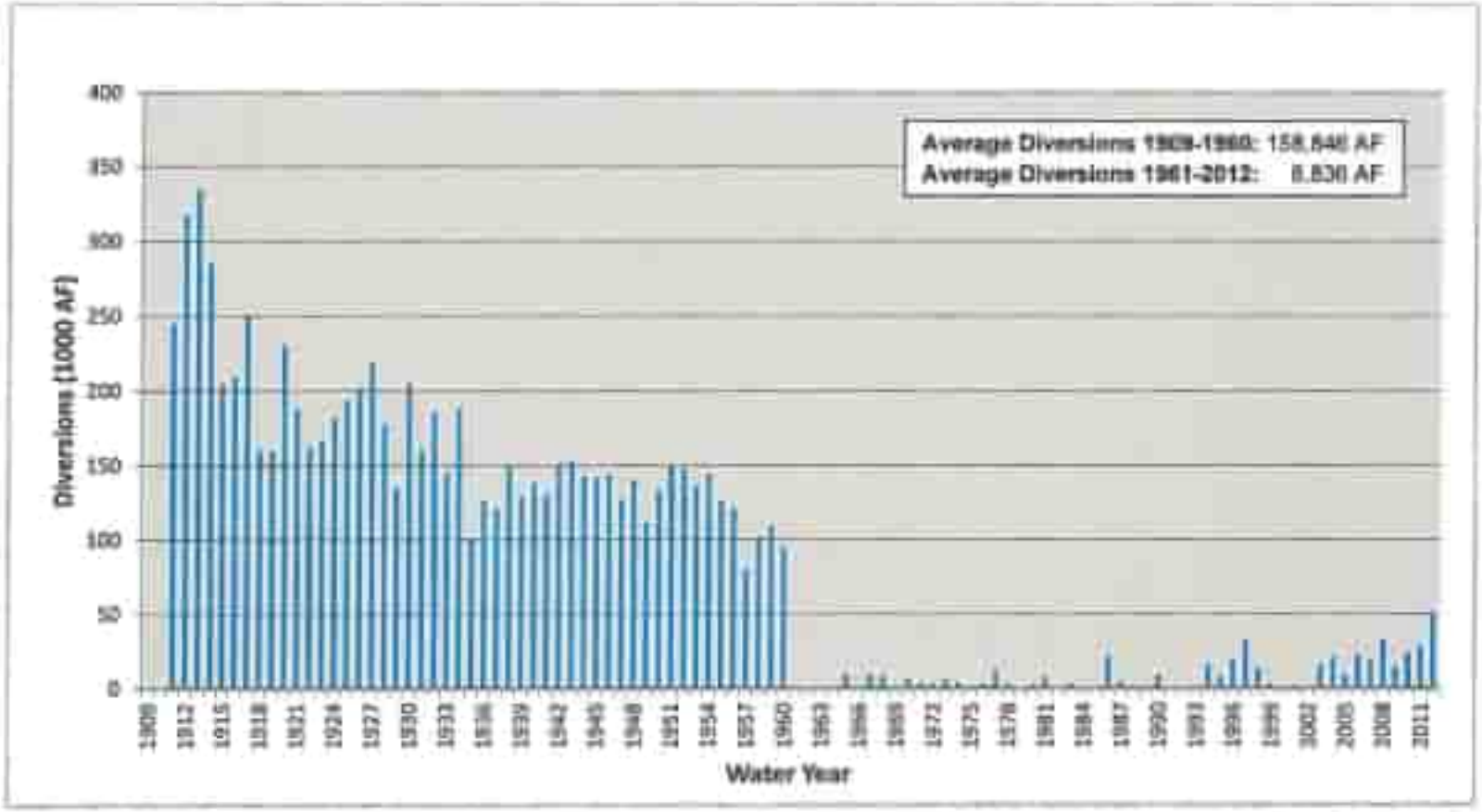


Figure 2.7: Historical Winter (Nov – Mar) Diversions, North Side Canal Company

Source: IDWR Water Rights Accounting, USGS

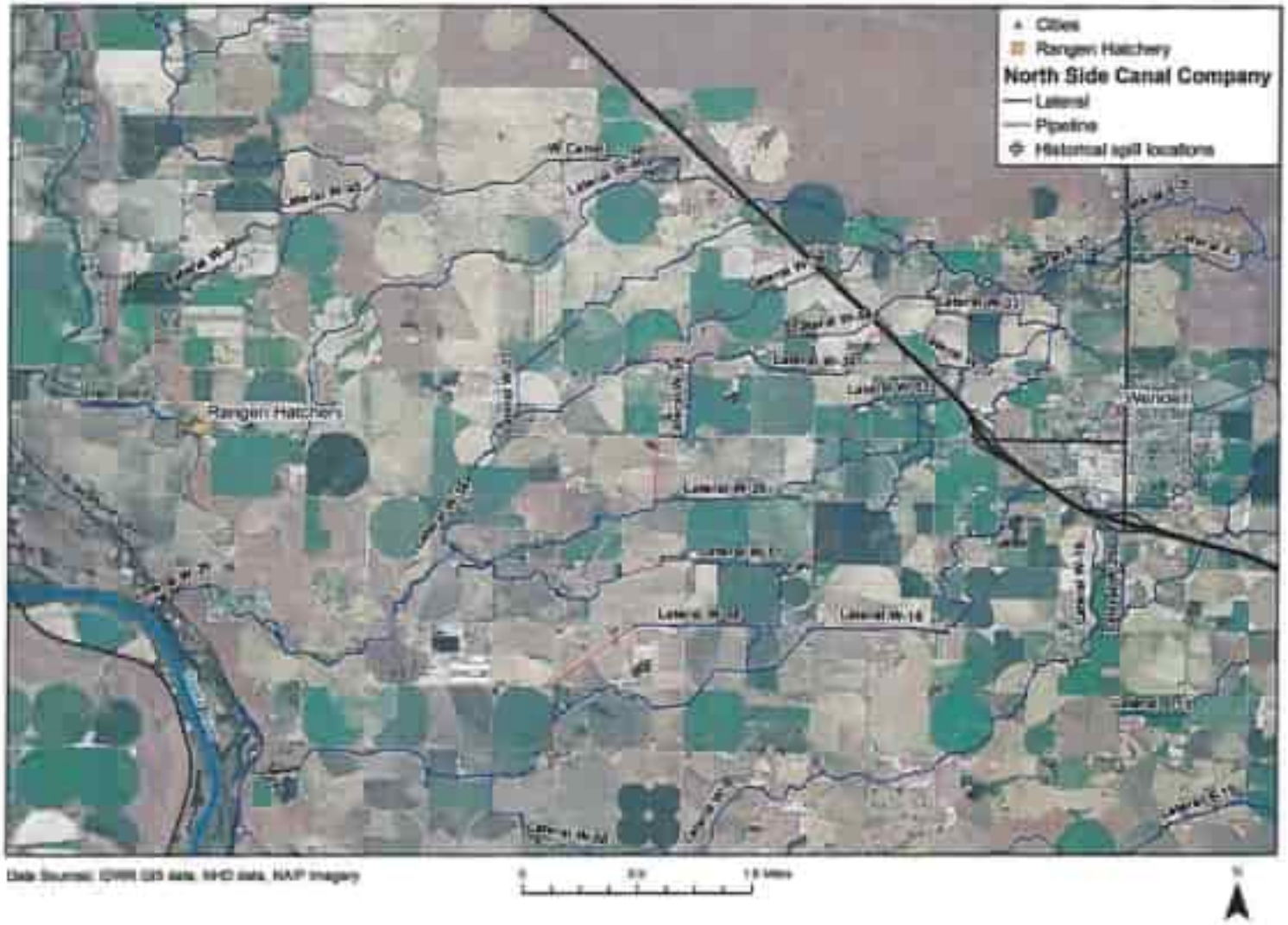


Figure 2.8: North Side Canal Company, Wendell Area Laterals and Spill Locations

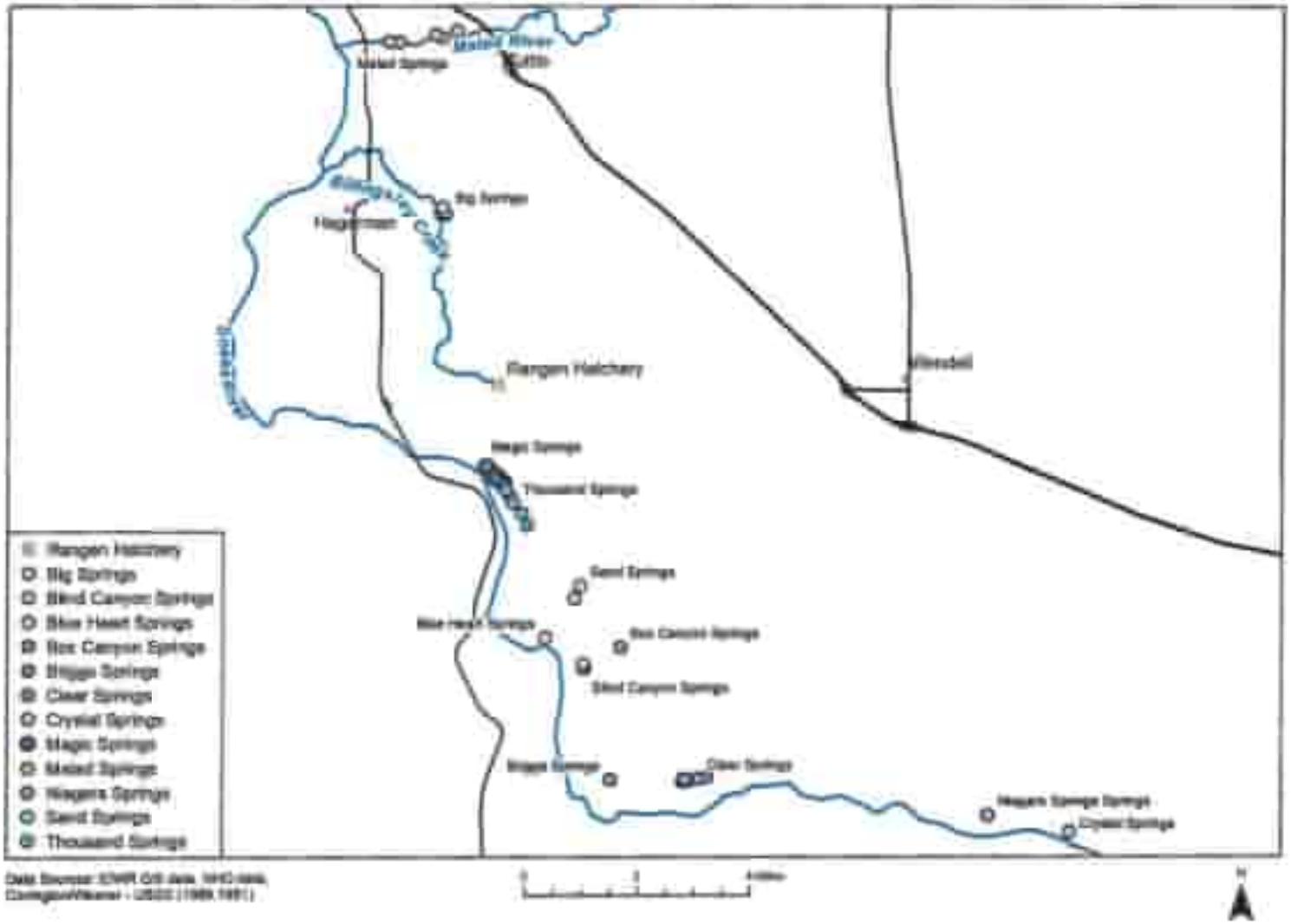


Figure 2.9 Major Spring Outlets in the Milner to King Hill Reach

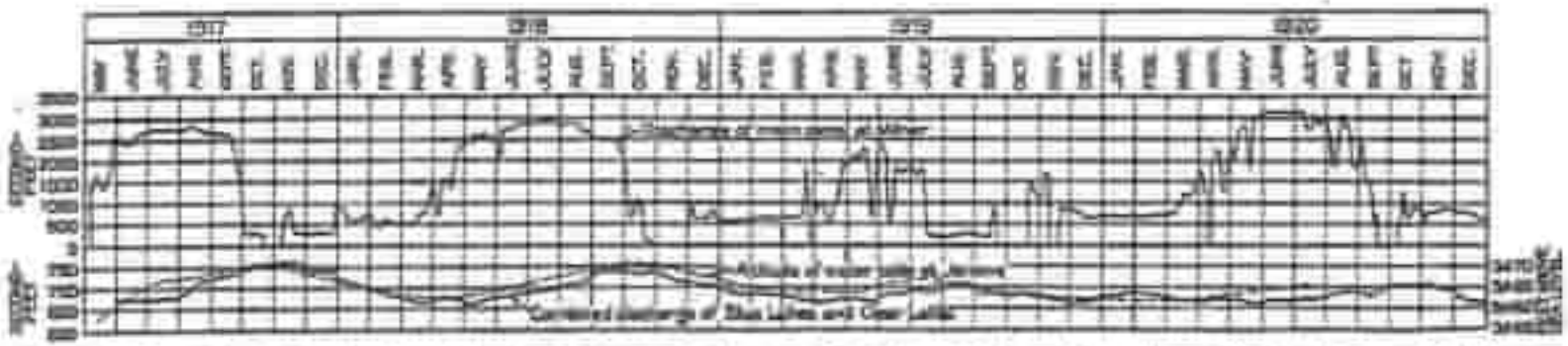


Figure 2.10: Fluctuations in the Discharge of Two Large Springs on Snake River, Idaho (Blue and Clear Lakes)

Source: Meinzer, 1927

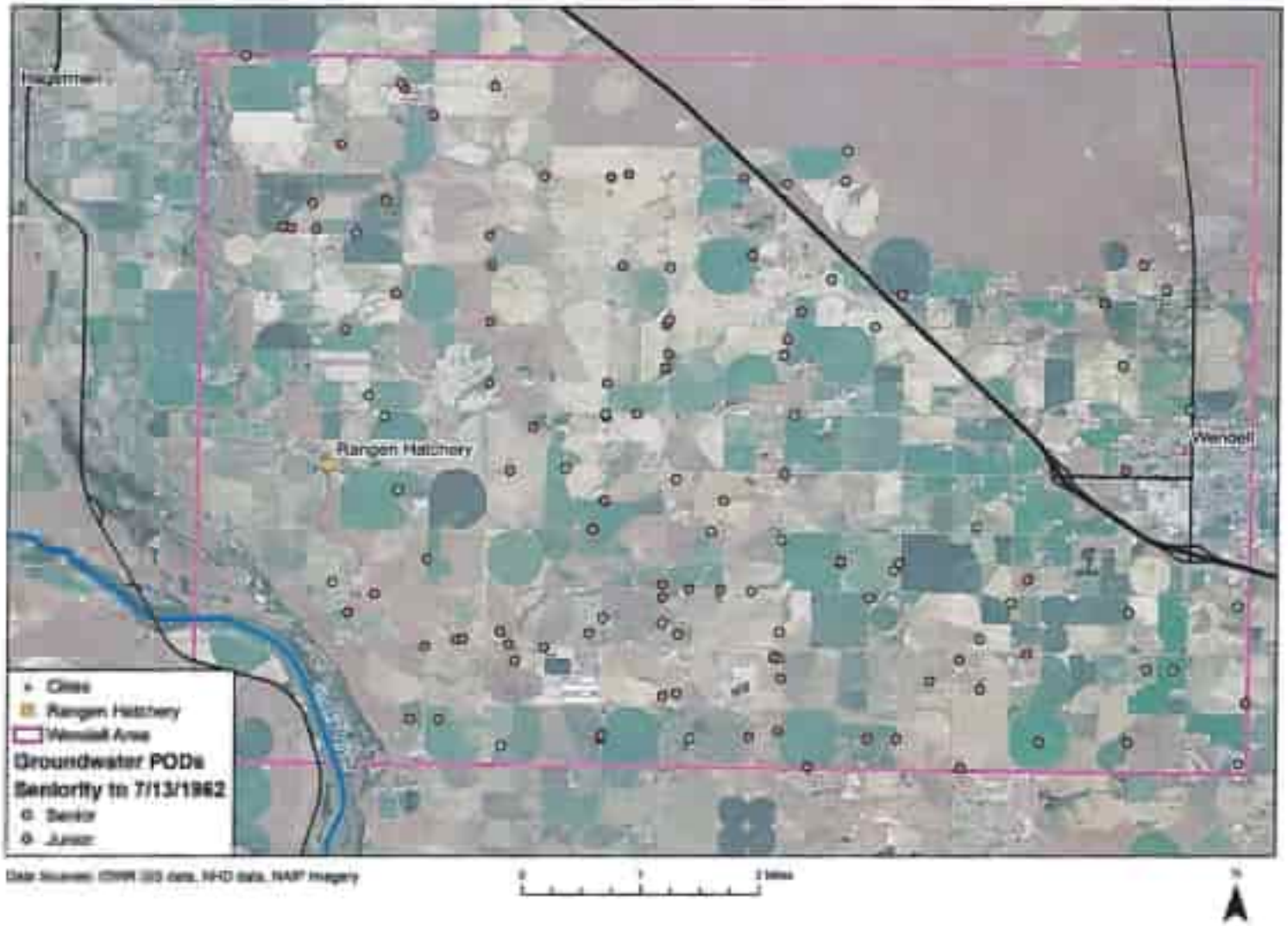


Figure 2.13: Wendell area Groundwater PODs



Figure 3.1: Billingsley Creek Area Selected Spring Discharge Points

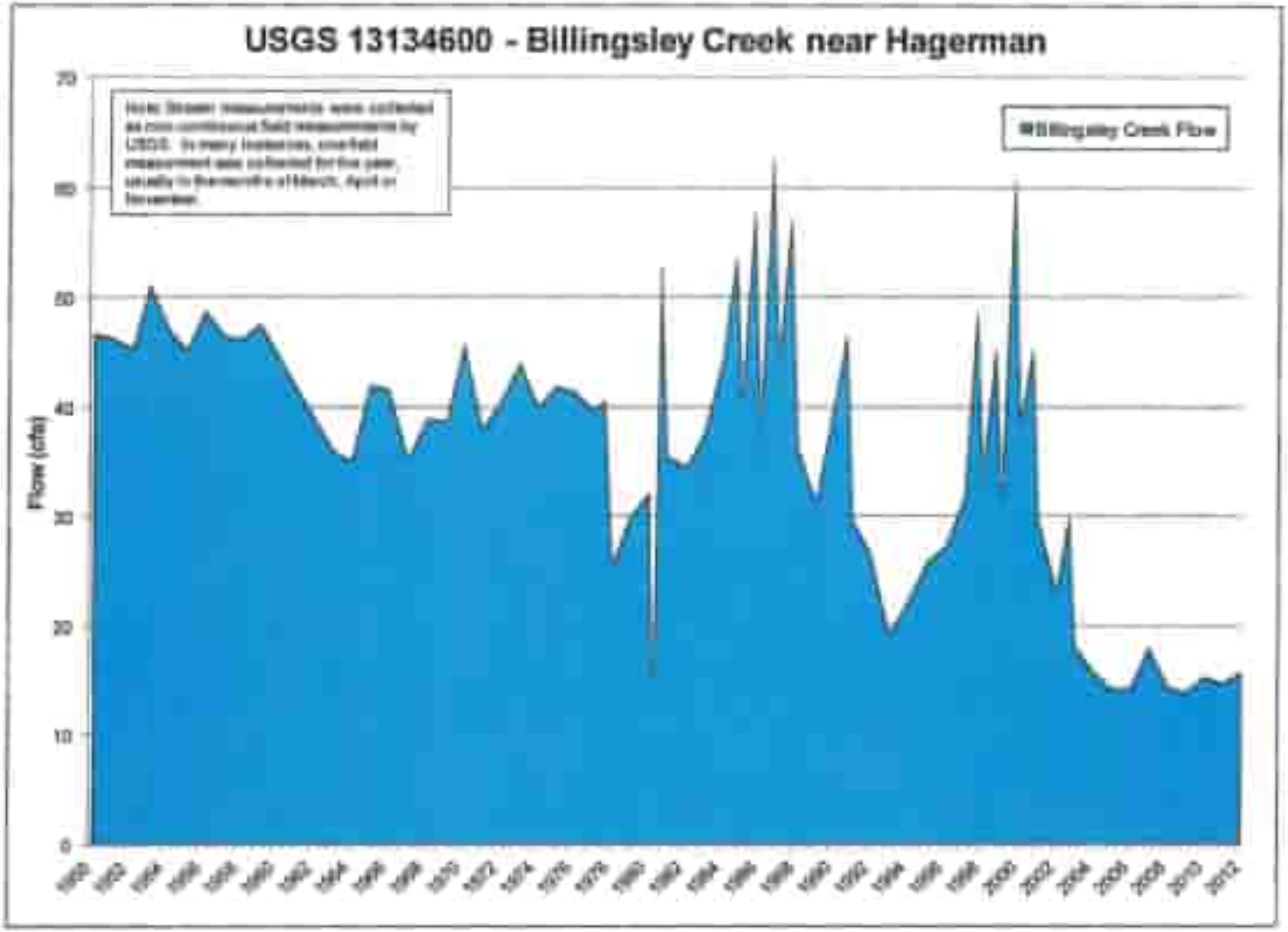


Figure 3.2: Billingsley Creek Flow

Source: USGS Gage Data



Figure 3.3: Rangen Site Map





Top photo: Water can be seen discharging from the Curren Tunnel to the Farmers Box. The Rangen 6-inch domestic pipeline can be seen exiting Curren Tunnel.
Bottom photo: Water discharges from the right side of the Farmers box to the Rangen box (not shown).

Figure 3.4: Farmers Box



Top photo: Water from the Curren Tunnel is diverted into the hatch house pipeline at the Rangen box.
Bottom photo: Water can spill from the Rangen box down the hillside to Billingsley Creek.

Figure 3.6: Rangen Box





Top photo: A view from upstream of the lodge dam on Billingsley Creek.
Bottom photo: A view from downstream of the lodge dam on Billingsley Creek.

Figure 3.6: Lodge Dam



Figure 3.7: Weir Measurement at Rangen Raceway 6

Source: "20120730 Rangen's First Discovery Request.pdf", Plaintiff's Exhibit 7a

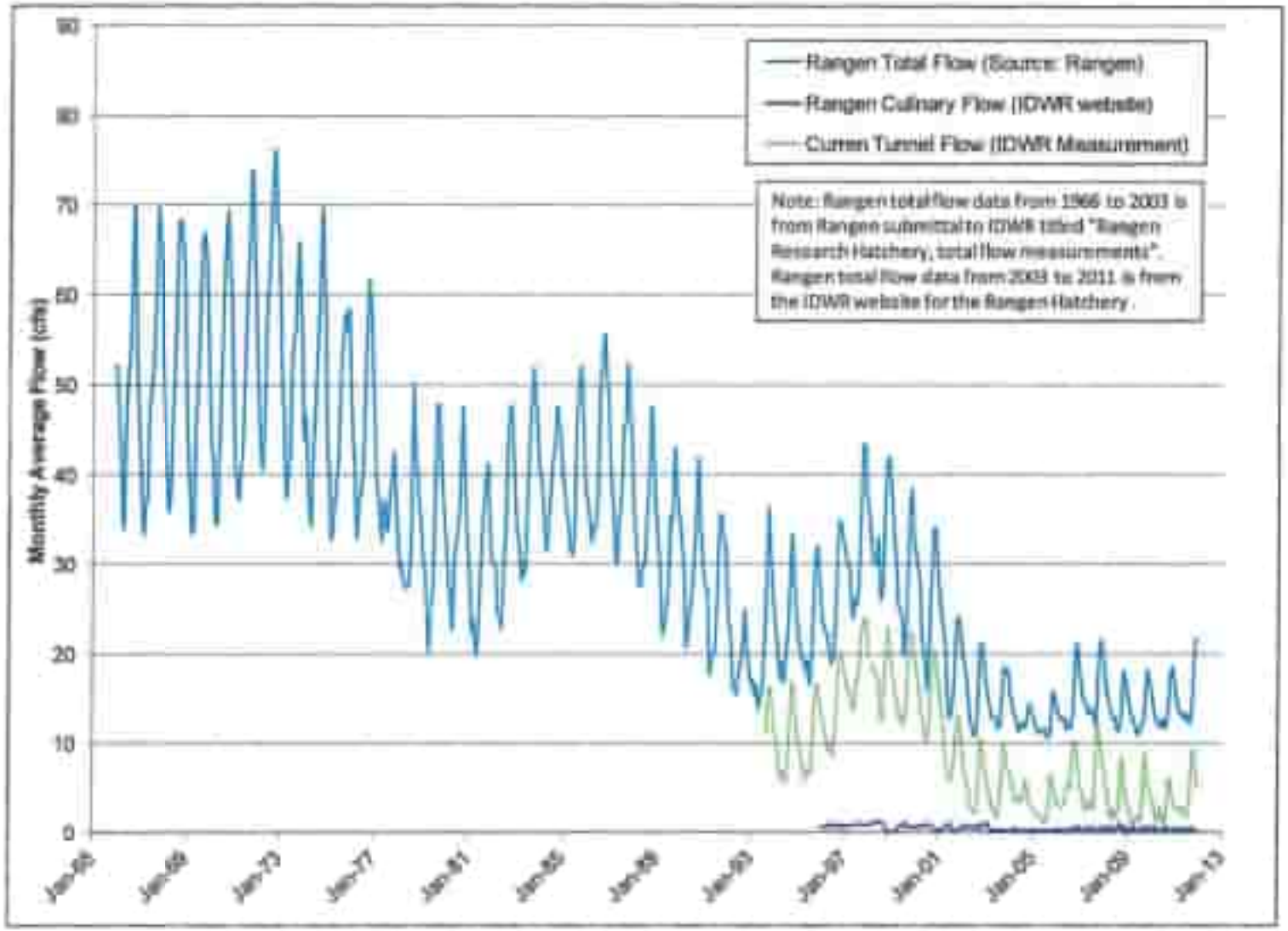


Figure 3.8: Historical Flows at Rangen Facility

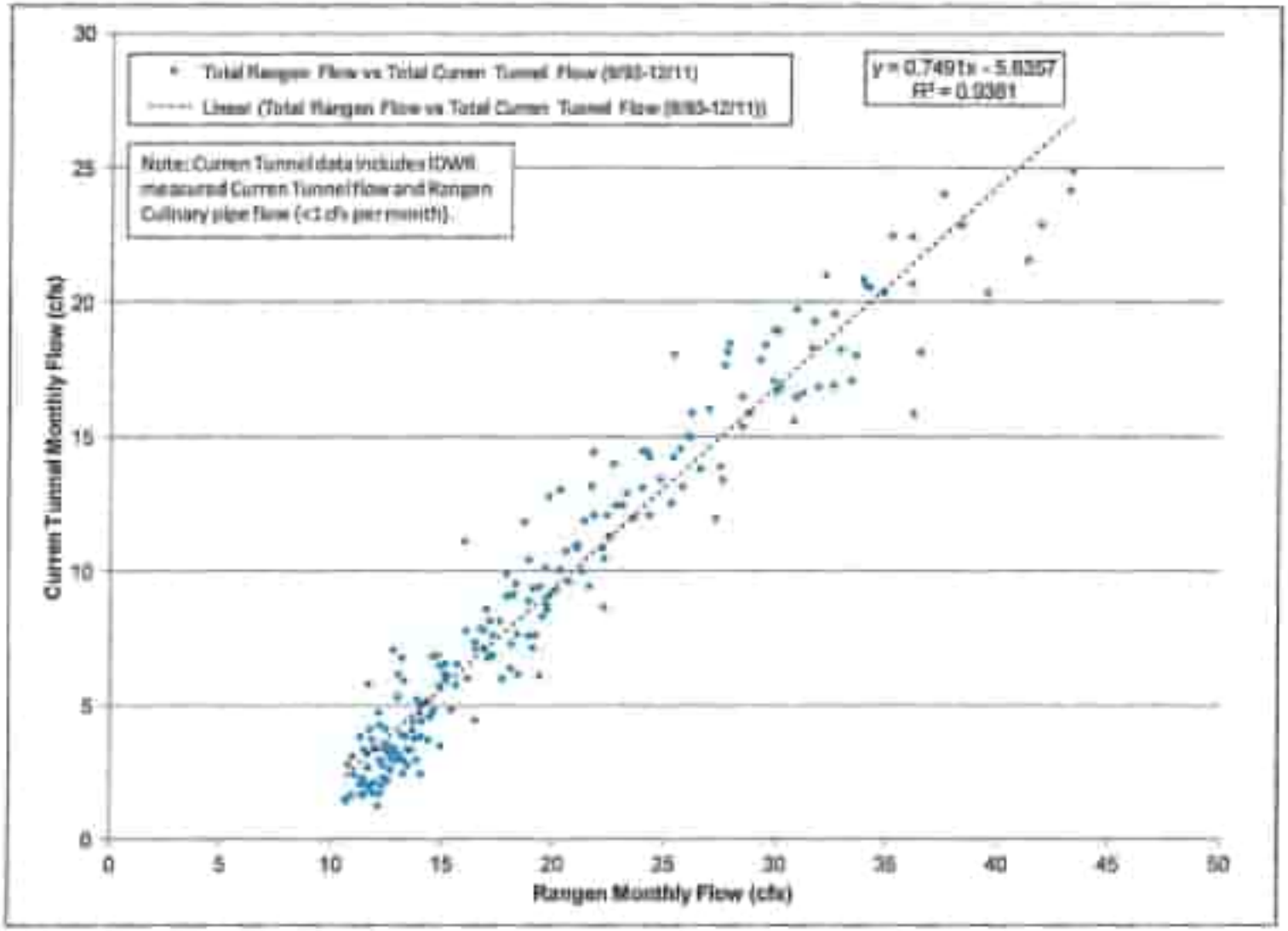


Figure 3.9: Linear Regression of Total Curren Tunnel Flow versus Total Rangen Flow

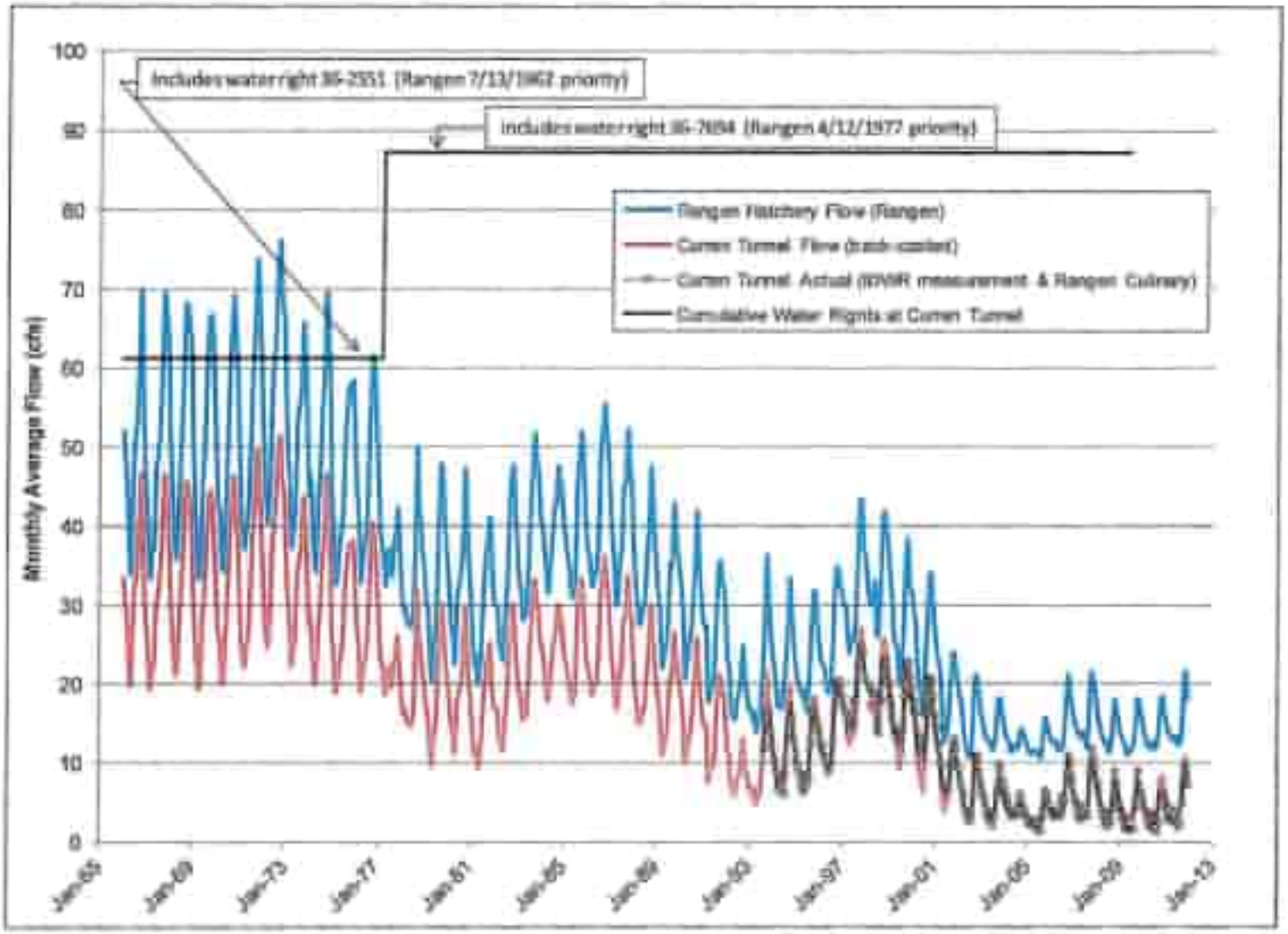


Figure 3.10: Back-casted Curren Tunnel Flow versus Total Rangen Flow

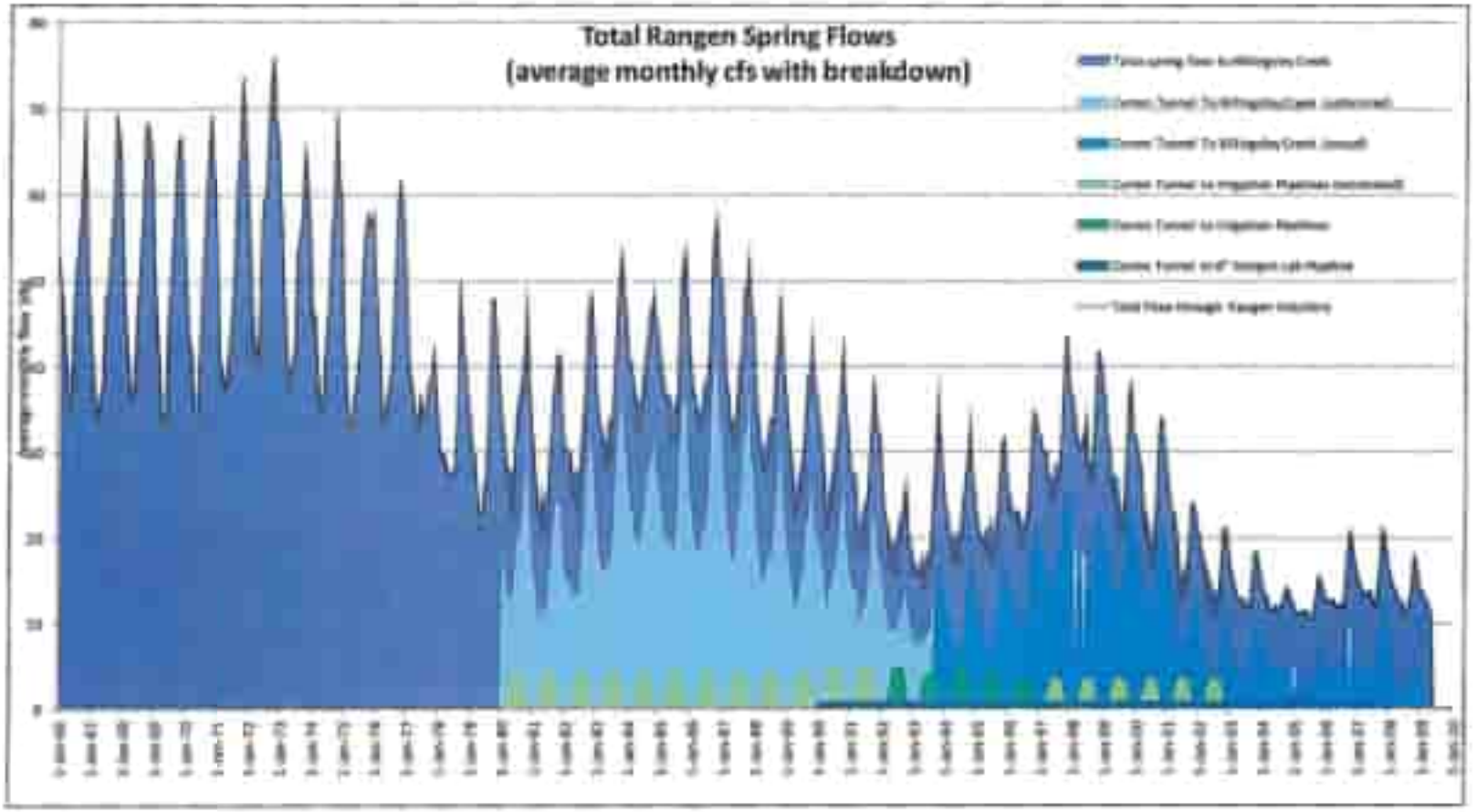


Figure 3.11: Brannon Decomposition and Back-cast of Rangen Flows

Source: Brannon, 2009. Reproduced from "Rangen Water History for IDWR.xlsx"

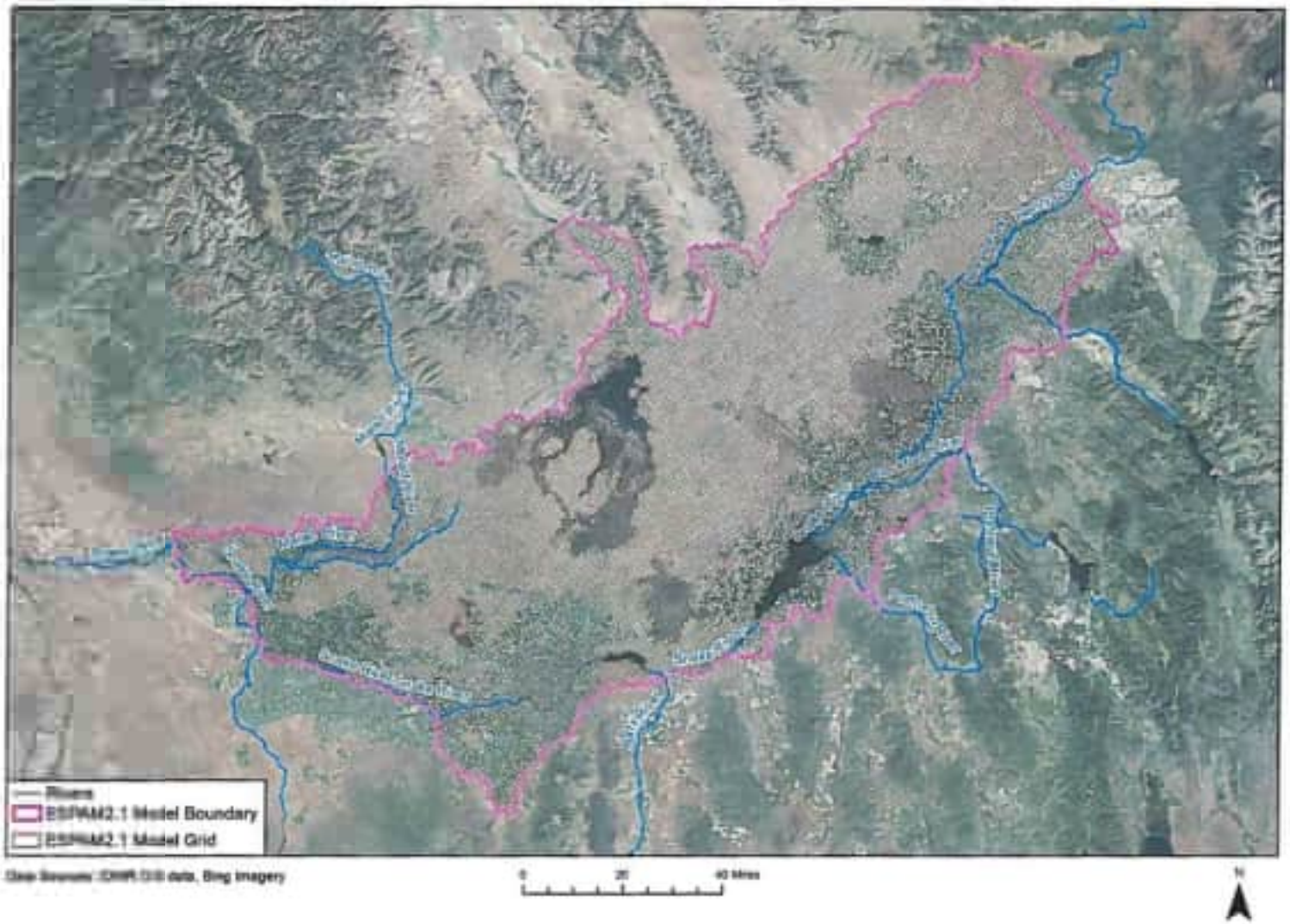


Figure 4.1: ESPAM2.1 Model Domain

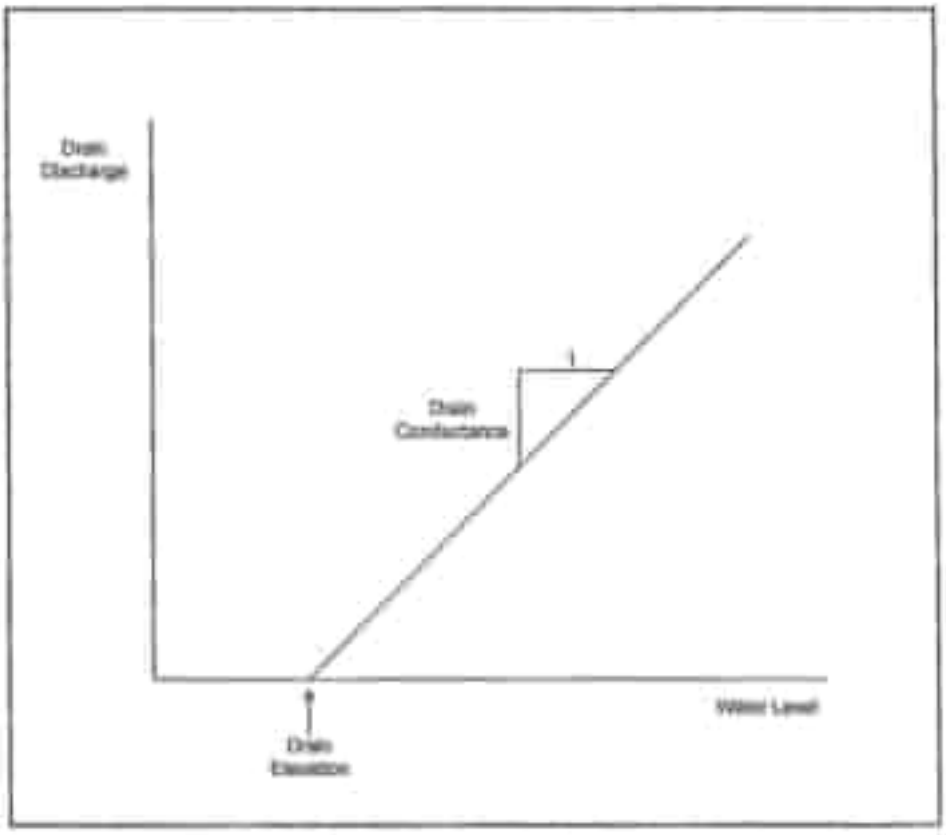


Figure 4.2: Drain Schematic

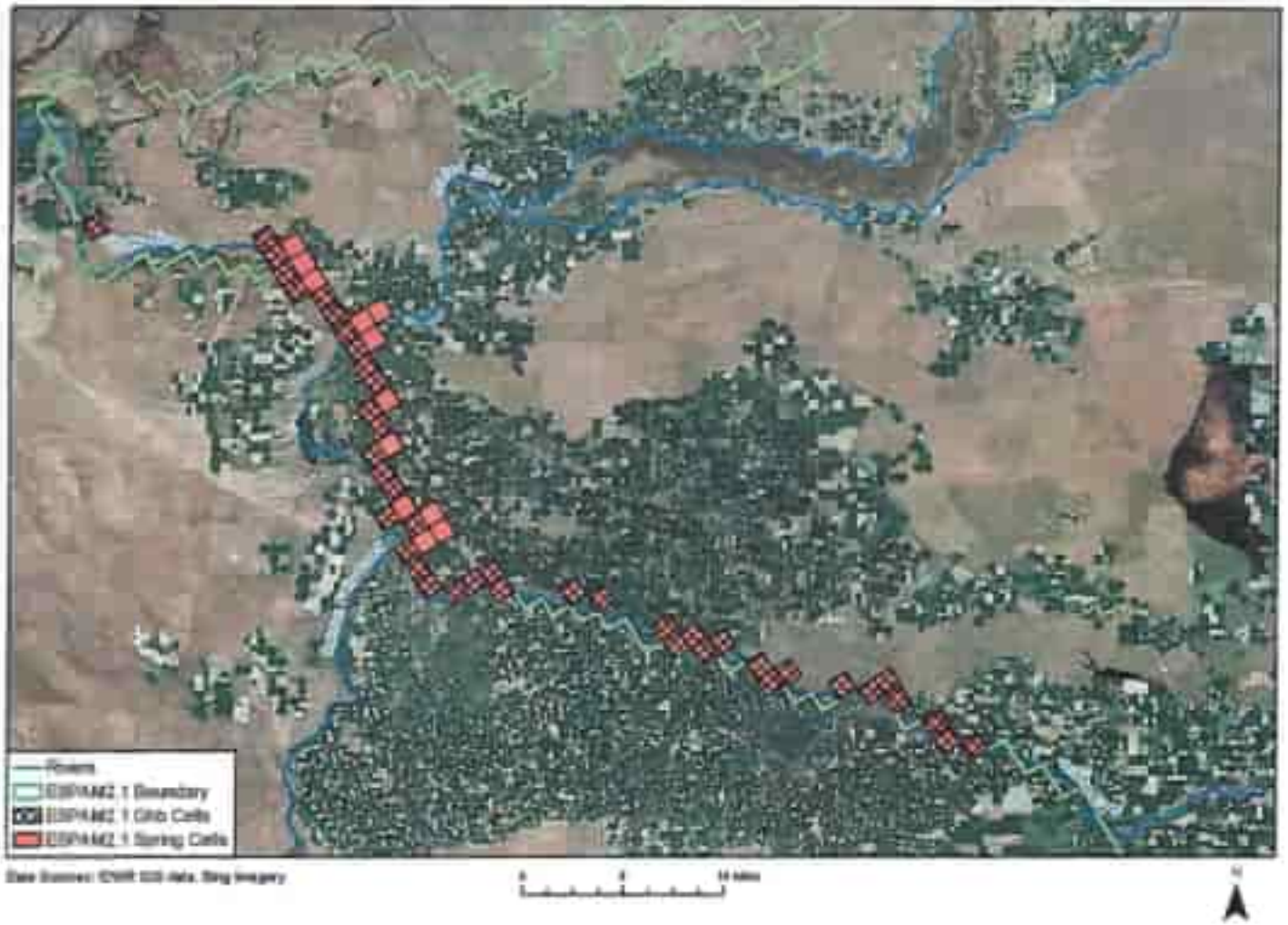


Figure 4.3: ESPAM2.1 Drain and GHB Cells

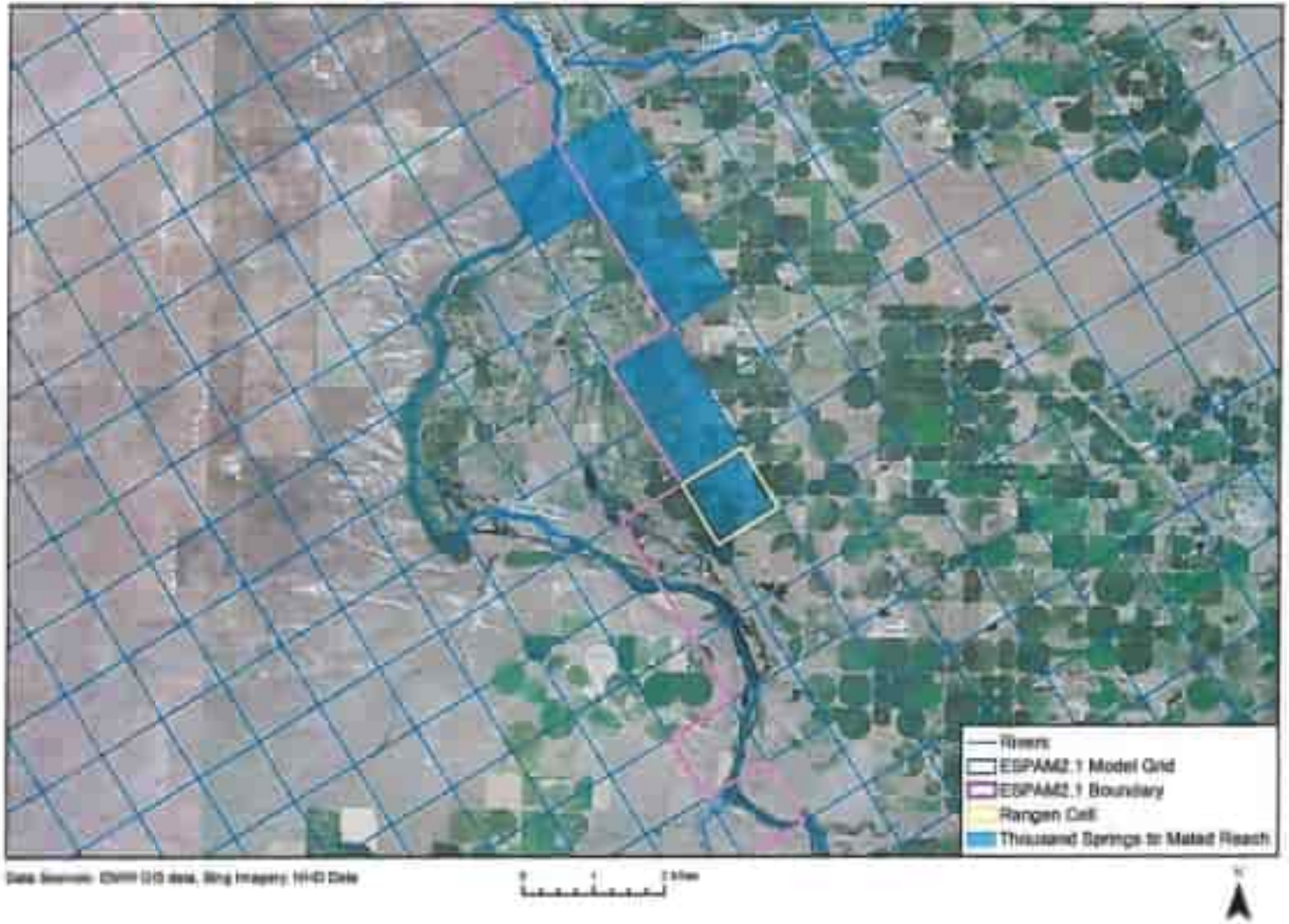


Figure 4.4: ESPAM2.1 Grid in Rangen Area

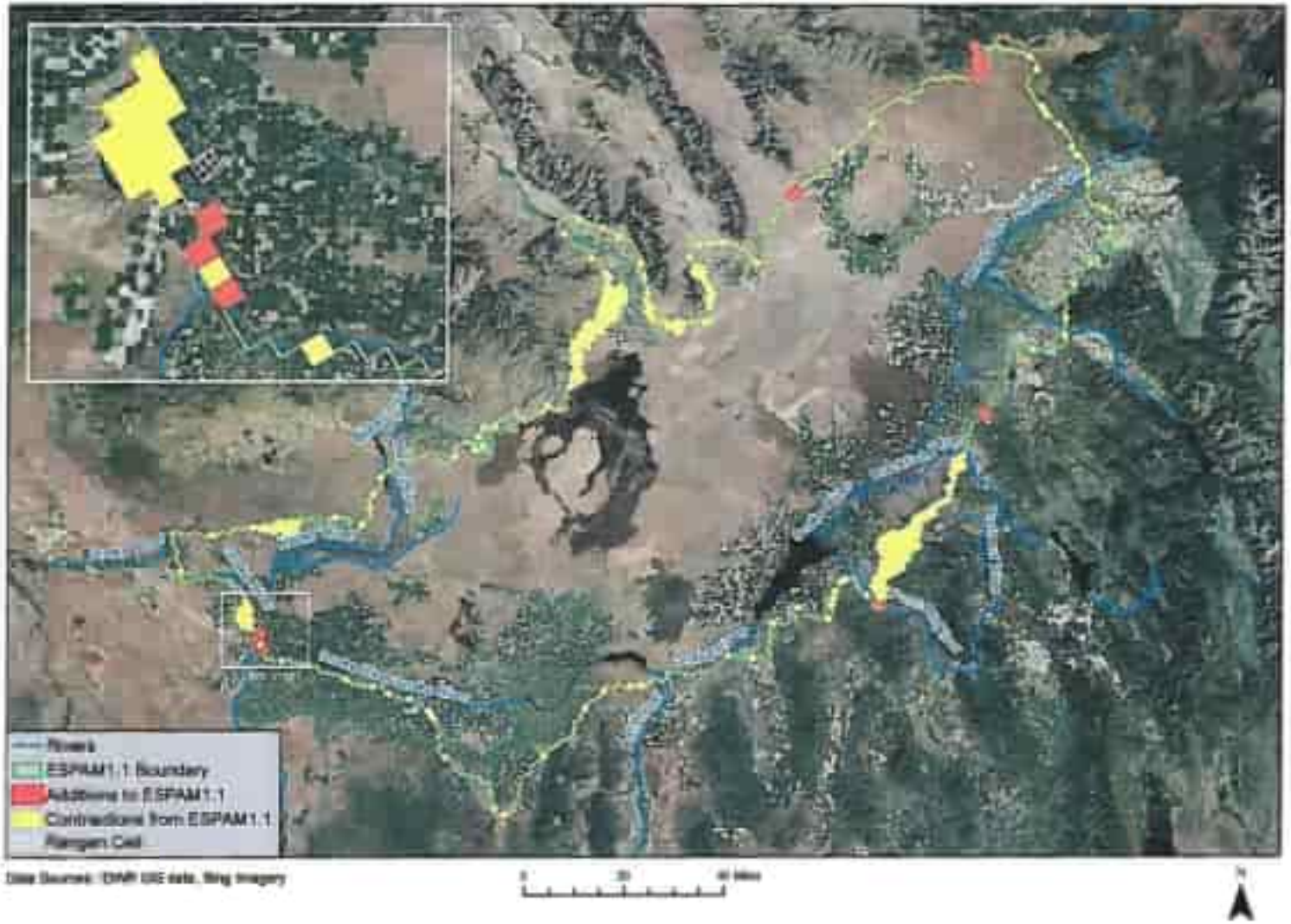


Figure 4.5: ESPAM1.1 and ESPAM2.1 Model Domain Comparison

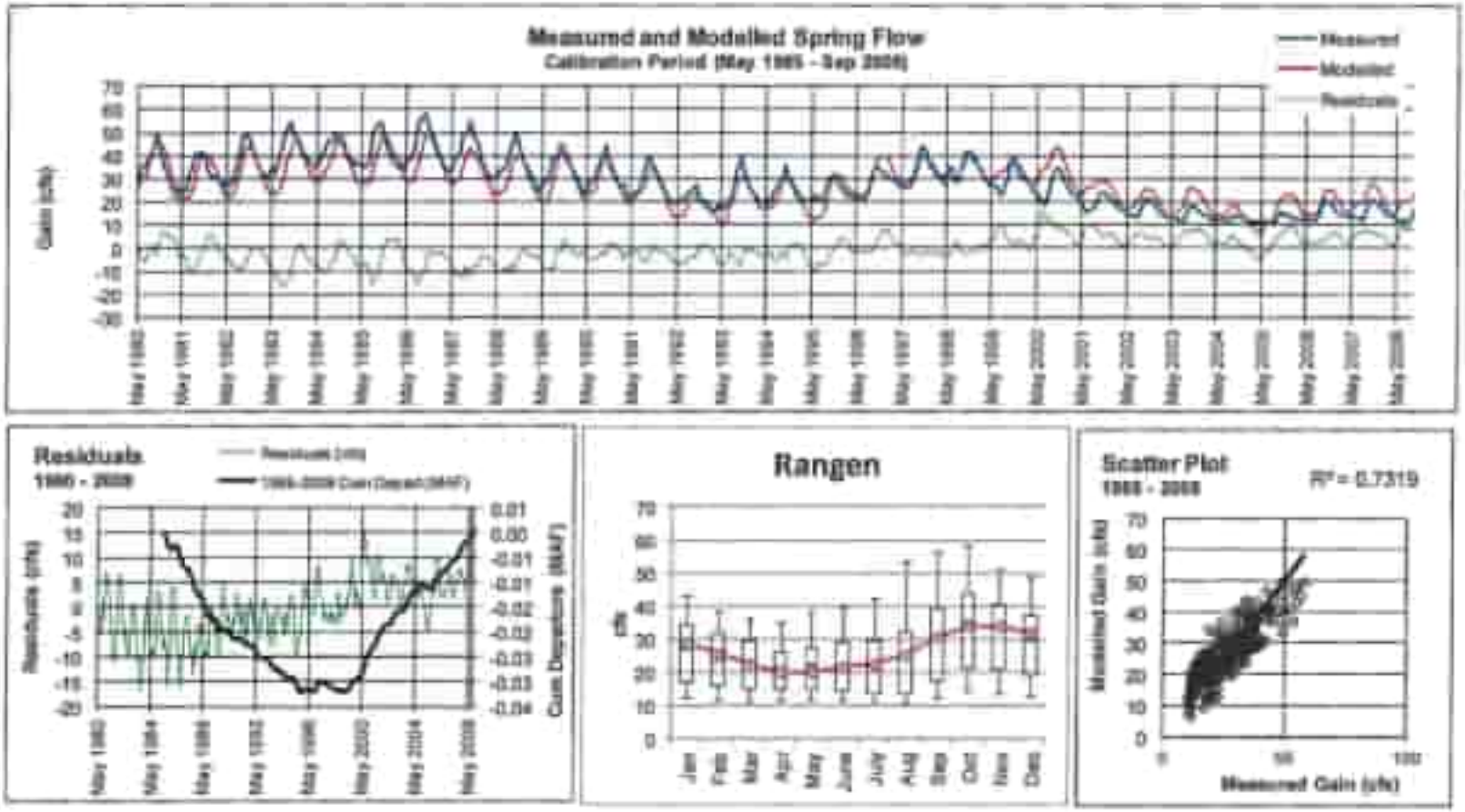


Figure 4.5: Calibrated and Target Discharge and Residuals for the Rangen Spring Complex from ESPAM2.1 Calibration

Source: ESPAM2.1 Documentation

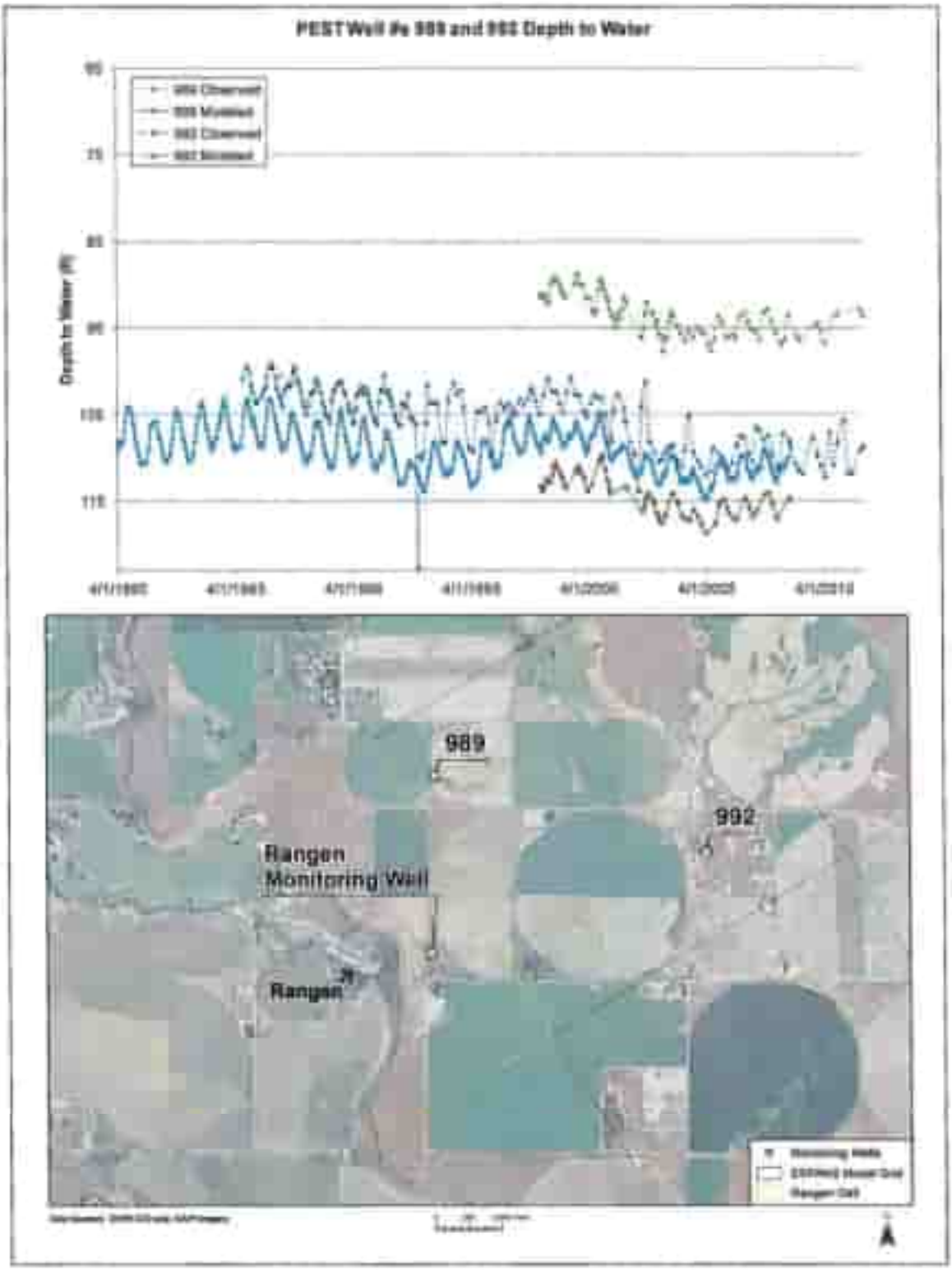


Figure 4.7: Simulated and Target Water Levels in Calibration Well #989 and #992

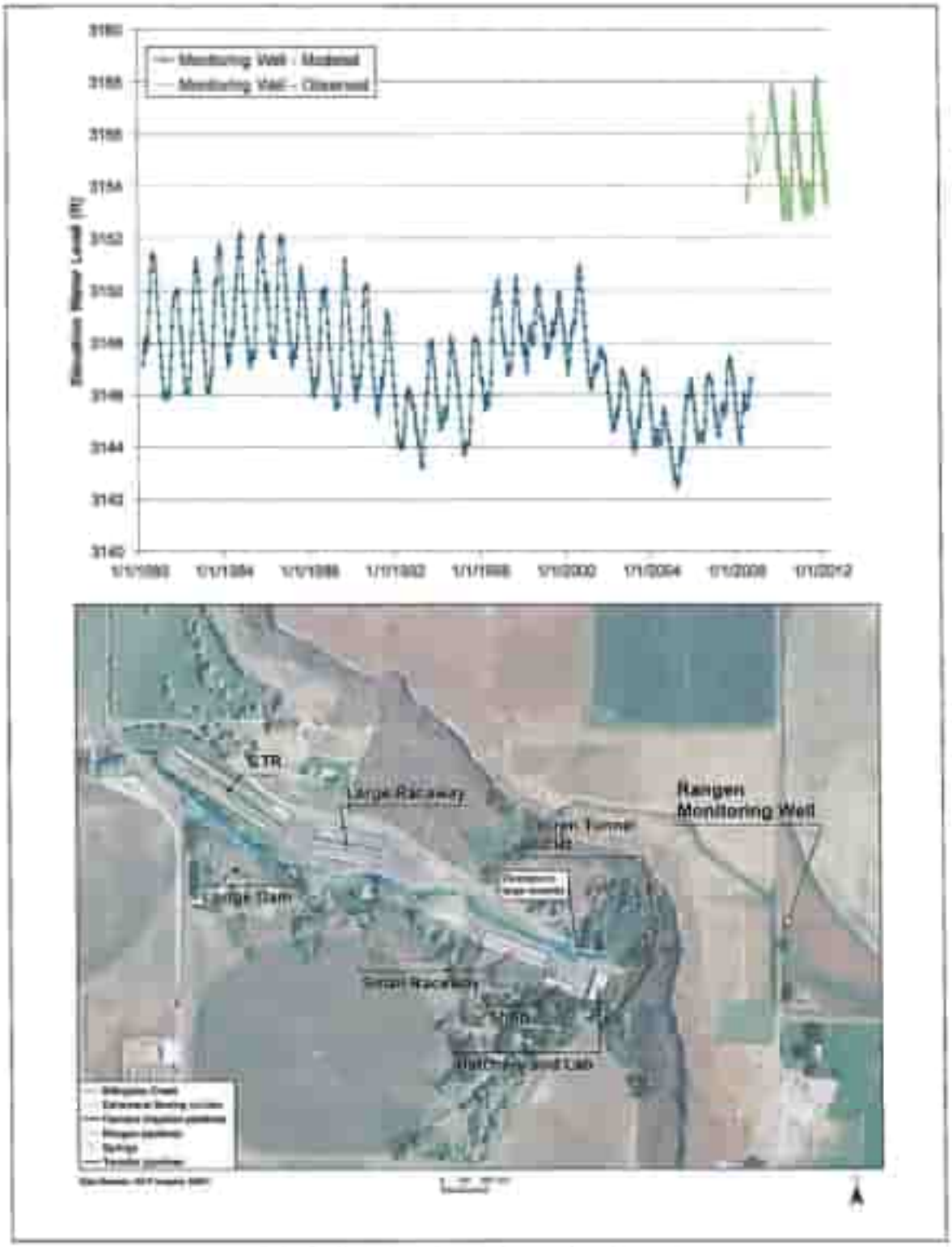


Figure 4.8: Rangen Monitoring Well Water Levels

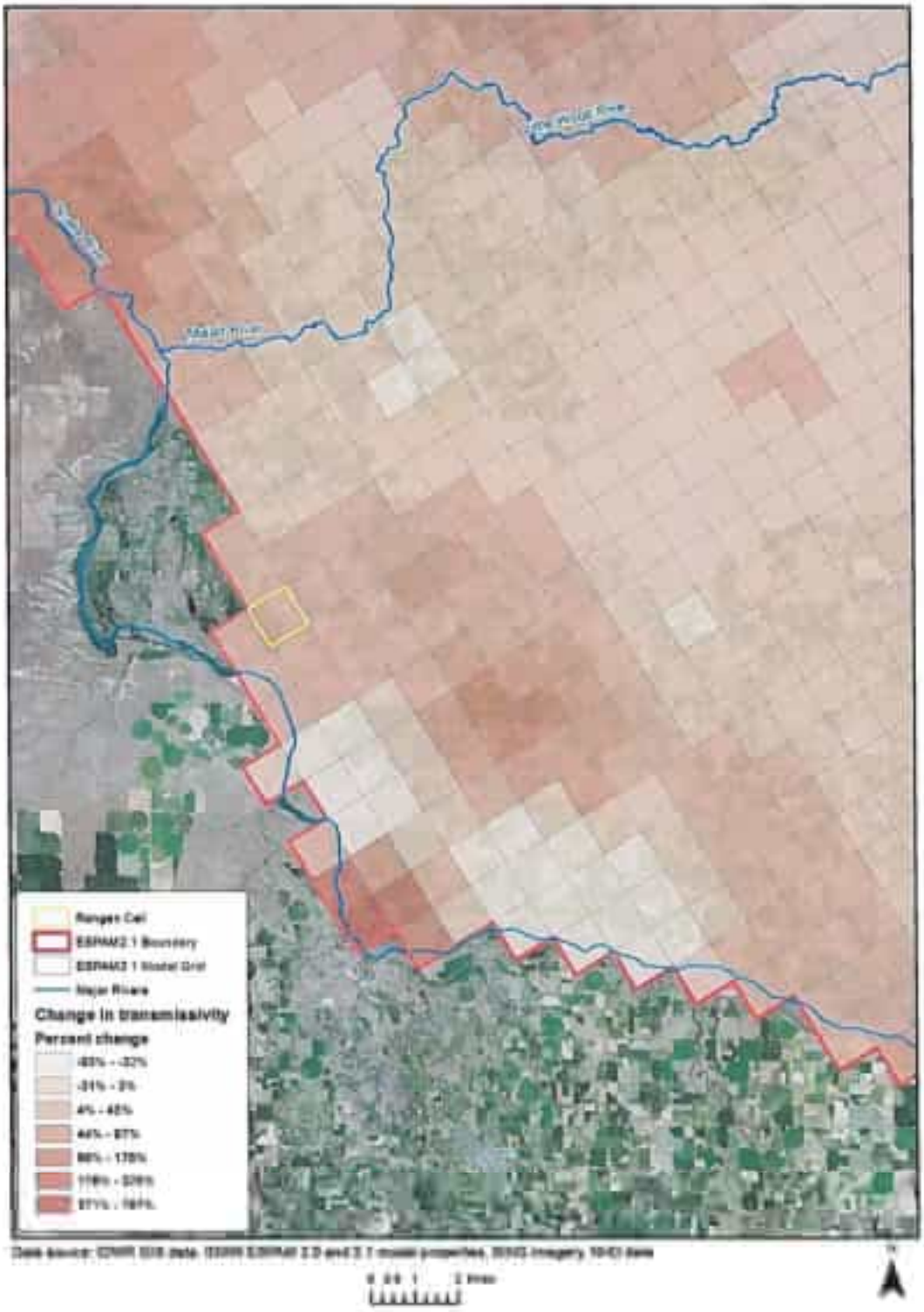


Figure 4.9: Changes in Transmissivity values in Rangen Area between ESPAM2 and 2.1
(positive % change indicates 2.1 transmissivity is greater)

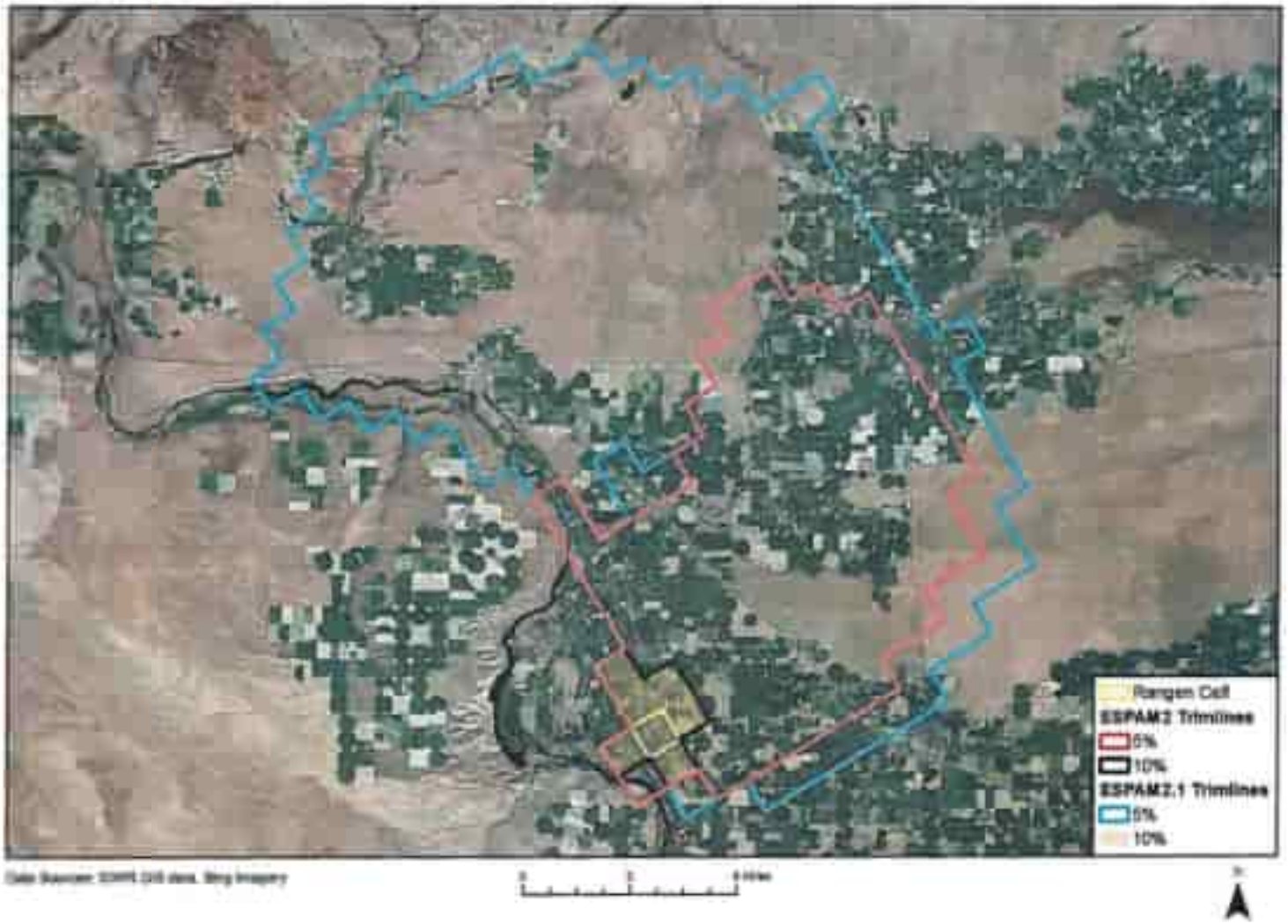


Figure 4.10: Trimline Comparisons ESPAM2.0 and 2.1

Table 5.1: Results of IDWR Curtailment Analysis using ESPAM2

Assumed Trimline Threshold	Change in Flow at Rangen Complex (cfs)	Groundwater Acres Curtailed	Curtailed Groundwater Use (afy)	Flow Increase as % of Curtailed Water Right*	Years to Reach 90% of Steady State Increase
(1)	(2)	(3)	(4)	(5)	(6)
None	18.07	565,023	1,460,653	0.06%	16
Rule 50 Boundary	17.13	479,199	1,293,018	0.07%	15
0.20%	16.3	258,000	732,419	0.11%	15
1.00%	14.8	159,584	477,823	0.15%	13
1.50%	14.51	152,682	458,530	0.16%	13
1.70%	12.3	109,594	332,754	0.18%	11
2.00%	9.55	66,913	214,962	0.22%	9
3.50%	5.74	25,429	87,799	0.33%	5
5.00%	3.35	11,285	39,329	0.43%	3
10.00%	0.19	406	1,445	0.66%	1

Notes:
Columns (1) through (4) from IDWR production of June 12, 2012. Columns (5) and (6) by AMEC.
*Assuming 1" per acre permit amount.

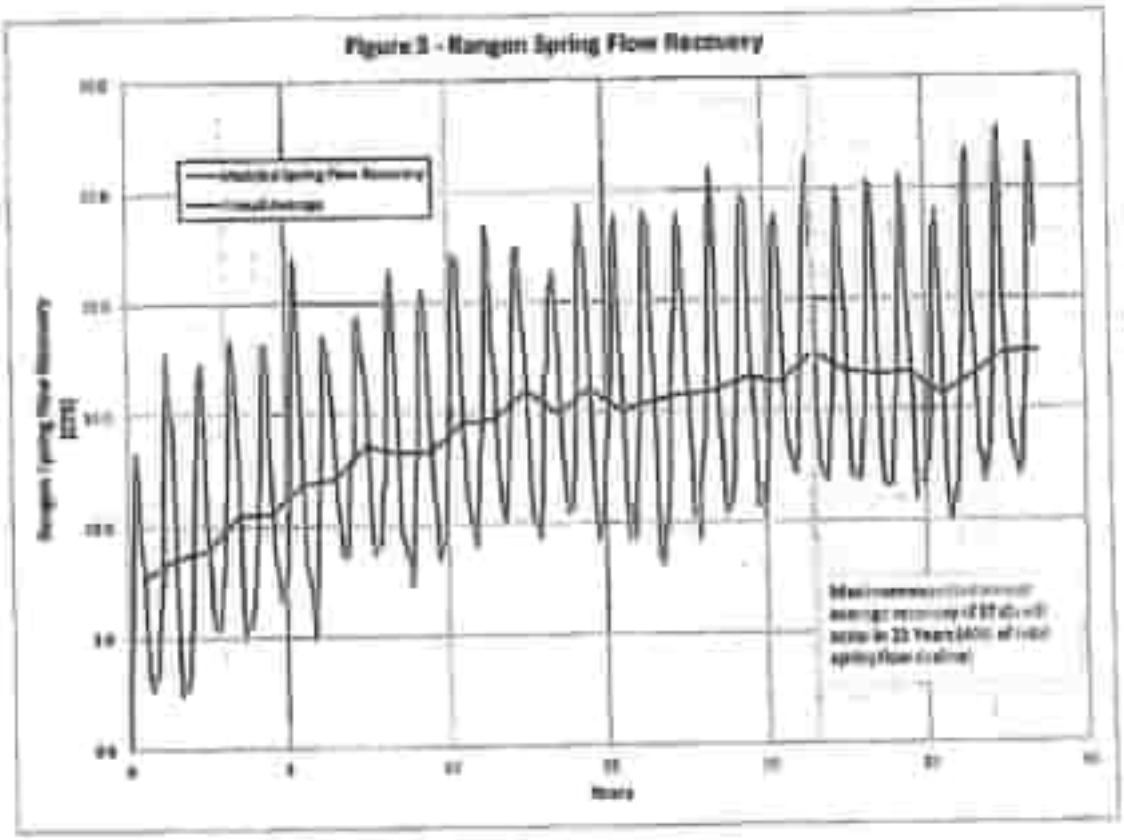


Figure 5.1: Reproduced Graph from Exhibit 11 of Rangen Petition
Source: Exhibit 11 from Rangen petition, Memorandum from Leonard Rice Engineers, Inc. to Rangen Inc., dated December 9, 2011.



Figure 6.1: "Ramp" Formation near Hagerman

Source: Farmer pdf, no pagination, part of IDWR production dated 6/12/2012.



Figure 6.2: HFB Added to Alternative Model



Figure 6.3: GBH Modification for Alternative Model

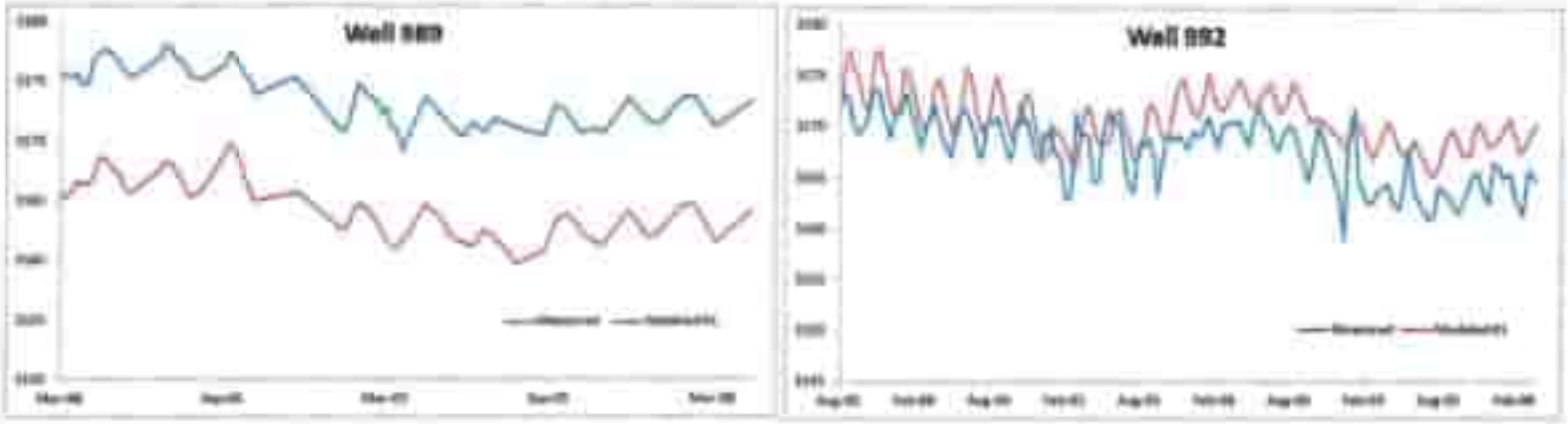


Figure 6.5a: Head Match in Wells 989 and 992 for Alternative Model #1

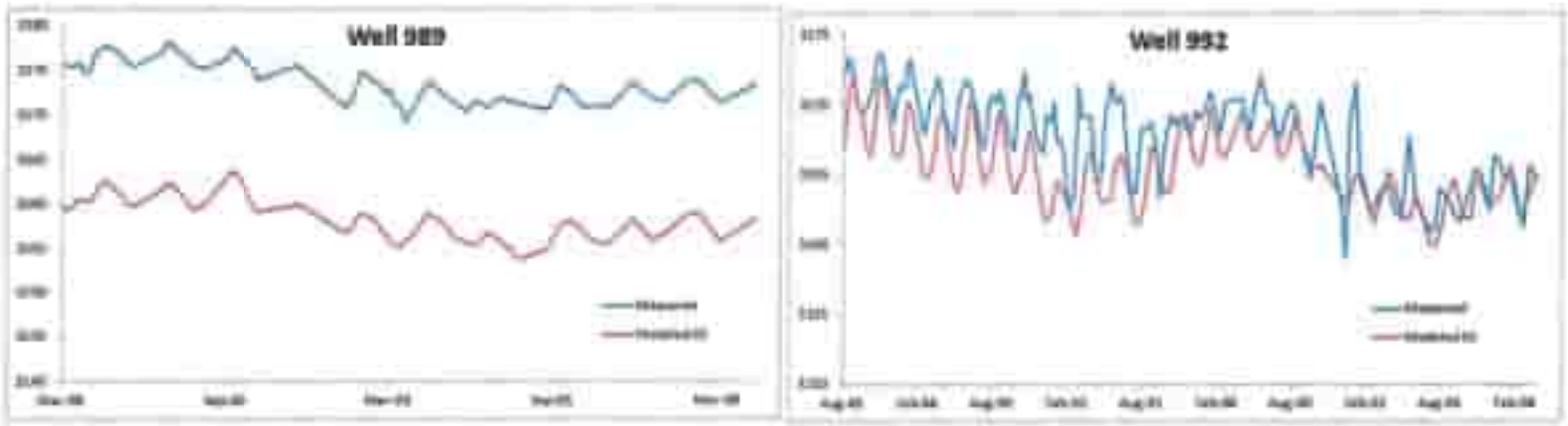


Figure 6.5b: Head Match in Wells 989 and 992 for Alternative Model #2

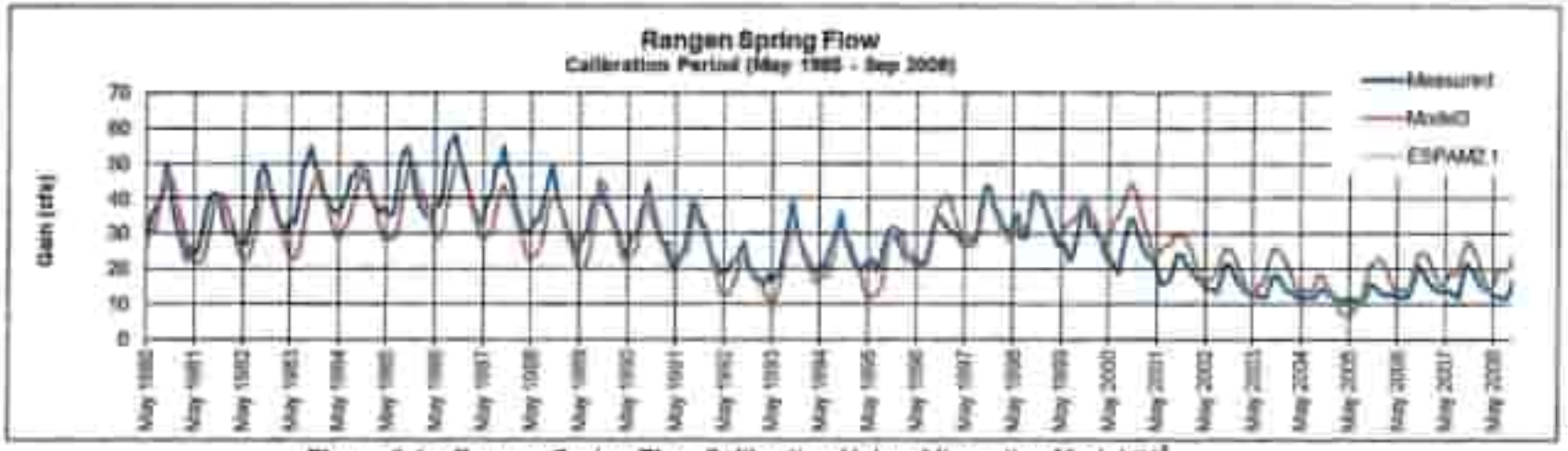


Figure 6.4a: Rangen Spring Flow Calibration Using Alternative Model #1[1]

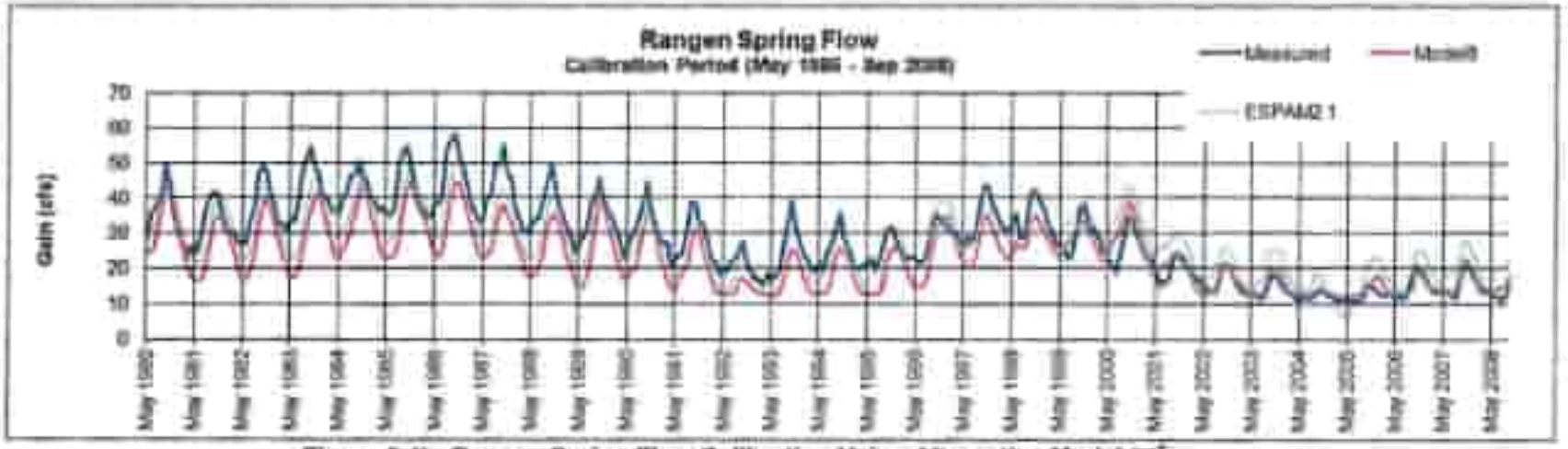


Figure 6.4b: Rangen Spring Flow Calibration Using Alternative Model #2[2]

[1] Referred to as "model #3" in supporting documentation
[2] Referred to as "model #8" in supporting documentation

Table 2.1: Irrigation Improvements in Response to 1977 Drought

Table 3.41. Have You Done Anything since 1977 that Would Help Deal with Future Droughts?

	Ada-Canyon Counties		Blaine-Lincoln Counties		Bingham-Bannock Counties		All Three Areas	
	#	%[1]	#	%	#	%	#	%
No Changes	37	52.9	12	27.9	17	44.7	66	43.7
Put In Wells	7	10.0	5	11.6	3	7.9	15	9.9
Put In Sprinklers	4	5.7	11	25.6	7	18.4	22	14.6
Added Gated Pipe	6	8.6	4	9.3	0	-	10	6.6
Lined Ditches	7	10.0	6	14.0	2	5.3	15	9.9
Land/Layout Improvements	5	7.1	3	7.0	8	21.1	16	10.6
Other	17	24.3	8	18.6	10	26.3	35	23.2
Total Reported Changes	83	-	50	-	40	-	173	-
Farmers Reporting Changes	33	47.1	31	72.1	21	55.3	85	56.3

[1] Percent of questionnaires.

Source: Hamilton, et al. 1981

Table 3.1: Water Rights at Head of Billingsley Creek

User Name	Water Right Number	Priority Date	Amount (cfs)	Source*	Use
Candy	36-134A	10/9/1884	0.48	Martin-Curren Tunnel	Domestic, Irrigation
Rangen, Inc.	36-134B	10/9/1884	0.09	Martin-Curren Tunnel	Irrigation and domestic use
Morris	36-134D	10/9/1884	1.58	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-134E	10/9/1884	0.82	Martin-Curren Tunnel	Irrigation, Stockwater
Musser	36-102	4/1/1892	4.1	Martin-Curren Tunnel	Domestic, Irrigation, Stockwater
Rangen, Inc.	36-135A	4/1/1908	0.05	Martin-Curren Tunnel	Irrigation and domestic use
Candy	36-135B	4/1/1908	0.51	Martin-Curren Tunnel	Irrigation
Morris	36-135D	4/1/1908	1.58	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-135E	4/1/1908	0.82	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-10141A	12/1/1908	0.82	Martin-Curren Tunnel	Irrigation, Stockwater
Morris	36-10141B	12/1/1908	0.43	Martin-Curren Tunnel	Irrigation, Stockwater
Rangen, Inc.	36-15501	7/1/1957	1.46	Martin-Curren Tunnel	Fish propagation use at the hatchery and research facility on Billingsley Creek.
Rangen, Inc.	36-2551	7/13/1962	46.54	Martin-Curren Tunnel	Fish propagation use at the hatchery and research facility on Billingsley Creek. (Includes 0.1 cfs for domestic use.)
Rangen, Inc.	36-7694**	4/12/1977	28.00	Martin-Curren Tunnel	Fish propagation use at the hatchery and research facility on Billingsley Creek.

* SRBA Partial Decree.

** According to a memorandum from Cindy Yenter to Karl Dreher dated December 15, 2003, Rangen's submitted historical flow numbers show that flows have not been available to support water right number 36-7694 since October 1972, which predates the priority year of the right by nearly 5 years. Additionally, during the water right development period flows did not exceed 50 cfs, which is the total of water rights 36-15501 and 36-2551.

Table 4.1: Changes in Drain Conductance

Name	Row	Column	ESPAM2.1 Drain Conductance	ESPAM2.0 Drain Conductance	Change in Drain Conductance	Percent Change in Drain Conductance (%)
White	37	14	1132.92	886.87	246.05	28%
White	37	14	1823.45	1825.01	-201.56	-11%
Birch	37	15	1259.36	1246.64	12.73	1%
	38	14	15341.51	13743.10	1598.41	12%
	38	14	1682.55	3982.81	-2300.36	-58%
Big Spg	39	14	102977.90	95434.60	7543.30	8%
Big Spg	39	14	19790.43	19441.73	348.70	2%
	40	13	1398.28	1356.85	41.43	3%
	40	13	120.39	64.08	56.31	88%
	40	14	548.53	581.12	-32.59	-6%
	40	14	13572.02	11443.99	2128.03	19%
3 Spgs	41	13	13886.21	1299.29	12586.92	969%
3 Spgs	41	13	232246.80	239273.20	-7026.40	-3%
Tucker	42	12	33531.50	34300.84	-768.34	-2%
Tucker	42	12	1219.83	1001.69	218.13	22%
Rangen	42	13	419036.20	437506.40	-18470.20	-4%
NFH	43	12	75008.54	99062.26	-24053.72	-24%
NFH	43	12	476786.10	577185.40	-100399.30	-17%
Thousand	44	12	820.37	802.42	17.95	2%
Thousand	44	12	3000000000.00	3000000000.00	0.00	0%
	45	11	70.22	94.58	-24.36	-26%
	45	12	816.74	840.81	-24.07	-3%
	45	12	1282.56	1114.83	167.73	15%
Sand	46	12	4.05	2.78	1.27	46%
Sand	46	13	655834.30	642687.80	13146.50	2%
	47	11	10848.44	7990.13	2858.31	36%
	47	12	8846.26	10054.27	-1208.01	-12%
Box	47	12	10447001.00	3331809.00	7115192.00	214%
Box	47	13	12761.19	17330.28	-4569.09	-26%
Banbury	48	11	257005.20	229321.50	27683.70	12%
Briggs	49	11	85472.96	86088.12	-615.16	-1%
Clr Lks	50	12	828.05	545.41	282.64	52%
Clr Lks	50	12	68061178.00	37714294.00	30346884.00	80%
Clr Lks	50	13	4551.97	1135.22	3416.75	301%
Clr Lks	50	13	362620.50	137821.40	224799.10	163%
	50	14	6.98	4.62	2.36	51%
	50	14	3.07	1.58	1.49	94%
	51	14	10.66	11.65	-0.79	-7%
	51	14	25.54	9.04	16.51	183%

Table 4.2: ESPAM1.1 versus ESPAM2.1 Simulated Curtailment Date of January 1, 1961

Reach Name	Curtailment junior to 1/1/1961					
	ESPAM2.1	ESPAM2.0	ESPAM1.1	Net change (ESPAM2.1 from ESPAM1.1)	Change ESPAM2.0 from ESPAM1.1	Change ESPAM2.1 from ESPAM2.0
Ashton to Rexburg	166	167	222	-54	-55	1
Heise to Shelley	228	224	141	87	83	-4
Sum above Shelley	394	401	363	33	38	-4
Shelley to near Blackfoot	259	255	240	19	15	-4
near Blackfoot to Neeley	260	255	193	167	162	-5
Neeley to Minidoka	24	40	84	-60	-44	-16
Sum Shelley to Milner	1043	1050	917	126	133	7
Devil's Washboard to Buhl	131	135	156	-25	-21	-3
Buhl to Thousand Springs	156	150	81	75	69	-6
Thousand Springs	72	68	54	18	14	-4
Thousand Springs to Malad	40	47	5.6	40	40	0
Sum Buhl to Lower Salmon Falls	373	385	181	133	123	10
Malad	50	51	47	3	4	-1
Malad to Bancroft	4	4	4	0	0	0
Sum Lower Salmon Falls to Kings Hill	54	55	51	3	4	-1
Sum of Springs below Milner	480	458	352	107	102	5
Kimberly to Buhl baseflow	11	10	--	--	--	1
Buhl to LSF baseflow	7	7	--	--	--	0
LSF to King Hill baseflow	3	3	--	--	--	0
Sum of baseflow below Milner	21	22	--	--	--	0
Total (cfs)	1921	1927	1631	288	294	-6
Acres curtailed	695,927	695,927	584,819	51,108	51,108	0
Curtailed consumptive use (AF/yr)	1,891,036	1,896,226	1,182,086	209,950	214,140	-4,190
Average consumptive use (ft/yr)	2.19	2.20	2.03	0.17	0.17	-0.03

Source: "Comparison ESPAM21 Appendix A: River and Spring Reach Location Maps"

Table 4.3: Predictive Analysis by IDWR

GW Use Area	Target Reach	Calibrated Impact	Maximized Impact	Minimized Impact	Range	Model Version
WD110	Clear Lakes	0.17%	0.17%	0.16%	0.000	E110712A001
WD110	nr Blackfoot-Minidoka	26.38%	26.68%	26.09%	0.006	E120116A008
WD120	Clear Lakes	0.46%	0.83%	0.39%	0.005	E110712A001
WD120	nr Blackfoot-Minidoka	86.52%	91.33%	55.02%	0.363	E120116A008
WD130	Clear Lakes	7.56%	7.84%	6.62%	0.012	E121025A001
WD130	nr Blackfoot-Minidoka	21.66%	21.67%	14.93%	0.067	E120116A008
WD130	Ashton-Rexburg	0.94%	0.96%	0.94%	0.000	E120116A008
WD34	Clear Lakes	2.73%	3.39%	0.44%	0.030	E110712A001
WD34	nr Blackfoot-Minidoka	49.19%	76.21%	43.09%	0.331	E121025A001
WD140	nr Blackfoot-Minidoka	34.86%	35.07%	34.74%	0.003	E120116A008
WD140	Clear Lakes	4.51%	4.65%	4.44%	0.002	E120116A008
WD33	Clear Lakes	0.55%	0.58%	0.53%	0.001	E120116A008
WD33	nr Blackfoot-Minidoka	61.19%	61.52%	60.60%	0.009	E120116A008
WD100	nr Blackfoot-Minidoka	19.81%	19.81%	19.78%	0.000	E120116A008
WD100	Clear Lakes	0.11%	0.12%	0.11%	0.000	E120116A008
WD99	Clear Lakes	0.11%	0.13%	0.08%	0.001	E120116A008
WD99	nr Blackfoot-Minidoka	16.44%	29.70%	3.02%	0.267	E120116A008

Source: ESPAM2 Uncertainty Analysis, IDWR

Table 8.2 - Curtailment Results Using ESPAM2.1

Assumed Trimline Threshold	Change in Flow at Rangen Complex (cfs)	Groundwater Acres Curtailed	Curtailed Groundwater Use (af/y)	Rangen Increase as % of Curtailed Water Right*	Months to Reach 90% of Steady State Increase
(1)	(2)	(3)	(4)	(5)	(6)
10.0%	0.21	406	1,446	2.58%	3

Notes:
* Calculated as (2)/[(3)*0.02], assuming 1" per acre of irrigation

Source: AMEC analysis using ESPAM 2.1 Superposition Steady State version.

Table 6.1: Curtailment Results Using Alternative Model

Alternative Model ID	Assumed Trimline Threshold	Change in Flow at Total Complex (cfs)	Groundwater Acres Curtailed	Curtailed Groundwater Use (af/y)	Increase as % of Curtailed Water Right**	Months to Reach 90% of Steady State Increase
	(1)	(2)	(3)	(4)	(5)	(6)
#1	10.0%	0.11	208	740	2.69%	5
#2	10.0%	0.01	24	85	2.92%	3
ESPAM2.1	10.0%	0.21	406	1,446	2.56%	3

Notes:
* Calculated as (2)/[(3)*0.02], assuming 1" per acre of irrigation

Source: AMEC analysis using Alternative Model #1 and #2, IDWR's ESPAM2.1.

ATTACHMENT E:

HYDROGEOLOGICAL ANALYSIS OF THE NEAR BLACKFOOT TO NEELEY REACH OF THE SNAKE RIVER (Ralston, 2008)

RHS Ralston Hydrologic Services, Inc.
GROUND WATER CONSULTING AND EDUCATION
1122 East B Street, Moscow, ID USA 83843
Voice and FAX 208-883-0533, E-mail ralston@moscow.com

HYDROGEOLOGIC ANALYSIS OF THE NEAR BLACKFOOT TO NEELEY REACH OF THE SNAKE RIVER





Prepared for the

Idaho Department of Water Resources
Boise, Idaho

March 2008

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INTRODUCTION

The Enhanced Snake Plain Aquifer Model (ESPAM) is an important tool used by the Idaho Department of Water Resources (IDWR) in estimating impacts between ground water use and surface water resources to support water management decisions (Cosgrove and others, 2006). A significant portion of the water that discharges from the aquifer is from springs that are located along the Snake River. The Near Blackfoot to Neeley reach of the Snake River (defined by two stream gauging stations) includes large springs that discharge into the Snake River and the Portneuf River (Figure 1).

The objectives of this report are as follows: 1) describe the hydrogeology in the general vicinity of the Near Blackfoot to Neeley reach of the Snake River, 2) describe how the model represents the hydrogeology of this area and 3) provide recommendations relative to model changes to better represent the field conditions. The report is based on a review of available reports (citations provided in the text), discussions with individuals who work for the IDWR, the University of Idaho (UI) and have worked with the U.S. Geological Survey (USGS) and field site visits in March and October of 2007.

OVERVIEW OF THE AREA

The Near Blackfoot to Neeley reach of the Snake River includes the American Falls Reservoir and is located adjacent to the south margin of the of the Snake River Plain of eastern Idaho. Mundorff (1967, page 7) describes the geologic setting of the area as follows.

> "The Snake River Plain is underlain by a thick sequence of basaltic lava flows, interbedded pyroclastics and sedimentary deposits. The sequence accumulated in a structural trough between much older rocks of the mountain ranges that flank the trough along the northwest and southeast. The total thickness of the fill in the trough is not known, but it is believed, on the basis of geophysical evidence, to exceed 10,000 feet in some places.…
>
> The central part of the plain is generally higher than the margins and contains many lava domes and cones, indicating that at least in the late stages of volcanism, the basalt spread from the central part of the plain towards the northwest and southeast flanks. In the process, the Snake River was crowded against the southeast flank of the plain. Sedimentary interbeds, deposited in stream channels, flood plains and lakes, are thick and extensive along and adjacent to the present course of the Snake River, whereas they are thin or absent toward the central part of the plain."

Mundorff (1967, pages 7-8) provides the following description of the ground-water system.

> "The uppermost few thousand feet of basalt flows, pyroclastics and sedimentary interbeds compose the Snake River Group. These rocks form a great aquifer system – the Snake Plain aquifer – that stores and transmits large amounts of water … Chief sources of recharge to the aquifer are percolation from the channels of the Snake River, Henrys Fork and other streams; percolation from canals and irrigated tracts; and underflow from peripheral valleys and highlands…. The margin of the Snake Plain aquifer is the contact between the

basalt and the consolidated rocks or the sedimentary deposits of lower permeability….The aquifer discharges to the Snake River chiefly in two reaches: between the mouth of the Blackfoot River and American Falls (American Falls Reservoir reach), and between Milner Dam and Bliss (Hagerman Valley reach). Discharge in these two reaches is caused by the specific spatial relationships of the aquifer to aquitards (geologic units of low permeability) in the reach. In the Hagerman Valley reach, the contact between the aquifer and the underlying aquitard intersects the canyon of the Snake River at an altitude generally 100-200 feet above river level, and springs issue at or above that contact. In the American Falls Reservoir reach the contact is generally 20-45 feet above maximum reservoir level."

GEOLOGIC SETTING

Regional Geologic Setting

The Near Blackfoot to Neeley reach of the Snake River including the American Falls Reservoir is underlain mostly by sediments with a large mass of basalt located to the north and northwest. Figure 2 is a geologic map of the area taken from Whitehead (1992) that shows the sediments as alluvium (Qa), wind blown deposits (Qw) and older alluvium (Qts). The basalt shown northwest of the river is identified as younger basalt (Qb) or basalt (Qtb). The general relationship between basalt and sediment is shown on two figures taken from Whitehead (1992). Figure 3 shows the thickness of Quaternary basalt whereas Figure 4 shows the thickness of sedimentary rocks. The two figures show the transition from a basalt-dominated subsurface in the center of the Snake Plain to a sedimentary-dominated subsurface in the vicinity of American Falls Reservoir. In addition, Figure 3 shows that the thickness of Quaternary basalt is greater northeast of the American Falls Reservoir than in the immediate vicinity of the reservoir.

Local Geologic Setting

The local geologic setting includes Tertiary and Quaternary basalt, mostly fine-grained sediments associated with deposition in a lacustrine environment (Raft Formation and American Falls lake beds) and gravel deposits associated with the Snake and Portneuf Rivers. Information on the local geologic setting is provided from four primary papers. Trimble and Carr (1961) describe the geology of the southern portion of the American Falls Reservoir and the surrounding area. Mundorff (1967) provides geologic cross sections and a description of ground water conditions within an area that includes the southern portion of the reservoir. Pierce and Scott (1982) describe alluvial-gravel deposition along the Snake River northeast of the reservoir. Houser (1992) describes the Quaternary stratigraphy of the area northeast of the reservoir and includes a plan map and cross sections.

The geologic history provided by Trimble and Carr (1961) provides an understanding of the relationship of geologic units in the vicinity of the American Falls Reservoir.

"Rocks exposed along the Snake River include rhyolitic and welded tuff of Pliocene age; basalt and basaltic tuff of probable early Pleistocene age; clay silt, sand and gravel of middle to late Pleistocene age, mostly lucustrine and fluvial;

basalt of middle to late Pleistocene age; and alluvium and dune sand of Recent age" (page 1741).

"The oldest rocks prominently exposed in the Snake River canyon are the Pliocene Neeley Lake Beds … and the Walcott Tuff… These two conformable formations crop out mainly along the south side of the Snake River from American Falls southwestward to Rock Creek" (page 1741).

"The next youngest formation… is named the Raft Formation…. The Raft is mainly light-colored poorly bedded to nearly massive silt in the upper part and tan and gray clay, silt and fine sand in the lower part" (page 1742).

"Above the Raft, but possibly intertonguing with it, is a widespread group of nearly contemporaneous basalt flows from several vents northwest of the Snake River. These flows are restricted to the northwest side of the Snake River valley… These basalts are part of what has been mapped as Snake River Basalt… Cedar Butte Basalt..., which is younger than most of the Snake River Basalt, … occurs in an area about 8 or 10 miles long by 4 or 5 miles wide, almost entirely west of the present Snake River Canyon" (page 1742).

"The American Falls Lake Beds, which were deposited immediately after emplacement of the Cedar Butte Basalt, overlie the Snake River Basalt or the Raft Formation … where the basalt is absent… Above the American Falls Lake Beds are deltaic sand and gravel deposits, and several terrace deposits of silt, sand and gravel, all mainly north and east of American Falls" (pages 1742 - 1743).

Mundorff (1967) depicts the subsurface geology of the southwestern portion of the American Falls area, based on information from water wells, in a series of cross-sections that he combined into a fence diagram. A location map and selected portions of the fence diagram are presented in Figures 5a, 5b and 5c. The following points can be drawn from the Mundorff (1967) cross sections.

- The wells in Township 7 South Range 30 East (T7S R30E 29aa1, 20da1 and 20ab1) penetrate a considerable thickness of basalt overlying sediments, shown as the Raft Formation (Figure 5b). The basalt thins considerably to the southeast as is shown by wells 7S 30E 23cc1. The American Falls Lake Beds directly overlie the Raft Formation in this area.
- The basalt penetrated in wells along the northwest side of the reservoir is thinner with basalt flows interlayered with the American Falls Lake Beds and the Raft Formation as shown by well 7S 30E 11aa1 (Figure 5c). Only limited basalt was penetrated by well 6S 31E 32cd1 near the shore of the reservoir.
- Only thin basalt layers are penetrated by wells on the southeast side of American Falls Reservoir (not shown on Figure 5).
- The Mundorff (1967) fence diagram shows that the basalt, which is thick to the northwest in the center of the plain, thins and interfingered with mostly fine-grained sediments (Raft Formation and American Falls Lake Beds) near and likely under at least the southern portion of the reservoir.

Houser (1992) provides the most complete understanding of the subsurface geologic setting of the northeast portion of the American Falls area. Lithologic logs from 240 water wells were analyzed as part of the study and used to prepare a plan map and a number of cross sections. The geologic map prepared by Houser (Figure 6) shows the mapped surface geology and the well locations. The geologic notation used by Houser (1992) is as follows: 1) the American Falls Lake beds is noted as Ql with the Raft Formation as Qr; 2) Pleistocene basalt is noted as Qby or Qb with Snake River Gravel units identified as Qb; and 3) Tertiary basalt is shown as Tb The geologic map (Figure 6) shows the locations of ten cross sections (A-A' through J-J') The geologic cross sections are based on lithologic information from well logs. Selected cross sections are reproduced as Figures 7a, 7b, 7c and 7d. The following points can be drawn from the Houser (1992) map and cross sections.

- The geologic map (Figure 6) shows that the American Falls Lake Beds (Ql) outcrops in a discontinuous pattern over a large area northeast of the reservoir and north of the Snake River.
- The northeast maximum extent of the Raft Formation in the subsurface (subcrop) is shown on Figure 6. This line trends mostly west-northeast across the Fort Hall Bottoms past the town of Springfield. Houser (1992) did not identify the Raft Formation in the subsurface any further to the northeast.
- Geologic cross sections A-A' and B-B' are oriented approximately north-south and extend into the reservoir. The cross sections show that the American Falls Lake Beds (Ql) are present near land surface over much of the area (Figure 7a). The Raft Formation sediments (Qr) underlie the American Fall Lake beds, separated in places by a basalt layer. Either gravel (Qg) or basalt (Qb) underlies the Raft Formation (Qr). The low hydraulic conductivity units, particularly the Raft Formation, are important because they likely limit the hydraulic connection between deeper ground-water flow systems and shallow ground water and the reservoir.
- Cross-sections D-D' and E-E' are oriented northwest-southeast and are located northeast of the reservoir. In cross section D-D' (Figure 7b), the Raft Formation is depicted as extending continuously under the northeast end of the reservoir, the Snake River and the southwest portion of the Fort Hall bottoms. Cross section E-E' shows the Raft Formation as laterally continuous over the area but thinner. Either gravel (Qg) or basalt (Qb) is shown as both underlying and overlying the Raft Formation in sections D-D' and E-E'. The American Falls Lake Beds is a thin, near-surface unit in both of these sections
- Cross sections F-F' and G-G' are parallel to sections D-D' and E-E' but are located up river to the northeast. The American Falls Lake beds are still present as a near-surface unit but the Raft Formation unit is missing (Figure 7c). In section F-F', the Snake River and Fort Hall Bottoms are shown to be underlain by Snake River Gravel deposits (Qg).
- Cross section I-I' trends in a southwest-northeast direction from the northeastern corner of the reservoir to north of Ferry Butte. Cross section J-J' trends from

south-southwest to north-northeast on the east side of Ferry Butte (Figure 6). Cross section I-I' shows that a thick section of the Raft Formation is present under American Falls Reservoir but missing to the northeast (Figure 7d). Houser (1992) shows that a thin clay layer is present between the Quaternary basalt (Qb) and the gravel over about half of the section. Cross section J-J' shows a thinner section of the Raft Formation in the southwest with a considerable thickness of gravel (Qb) overlying Tertiary basalt in much of the area.

- Houser (1992) shows the presence of Tertiary basalt (Tb) under the Snake River Gravel (Qb) at the southwestern (right) end of the four east-west cross sections (D-D', E-E', F-F' and G-G'). The Tertiary basalt is also shown over most of the length of cross section J-J'.
- The Houser (1992) study shows that the fine-grained sedimentary units (American Falls Lake Beds and the Raft Formation) likely are present under the northeast end of the American Falls Reservoir. The Raft Formation is not present in the surbsurface northeast of a line roughly half way between the reservoir and Ferry Butte. The gravel and basalt units likely act as unconfined aquifers northeast of the subcrop line for the Raft Formation and as confined aquifers where they are overlain by the Raft Formation.

Pierce and Scott (1982) provide a description of gravel deposits along the Snake River northeast of the American Falls Reservoir. Their plan view map is reproduced as Figure 8.

> "An extensive gravel deposit of late Pleistocene age, about 15 kilometers wide and at least 10 meters thick, occurs along the Snake River from St. Anthony to American Falls Reservoir (see Figure 8)… Two complimentary effects fostered its accumulation. First, American Falls Lake was dammed by the Cedar Butte Basalt 72,000 +/- 14,000 years ago, resulting in elevated base levels upstream until about 14,000 to 15,000 years ago when the Bonneville Flood drained the lake… Second, conditions that favored deposition in other areas of nonglacial and glacial gravels at this time also existed along the Snake River… Following the drainage of American Falls Lake and the change in stream regimen between late Pleistocene and Holocene time, this gravel fill was incised by the Snake River and its tributaries" (page 695).

The shallow gravel zones shown in the Houser (1992) cross sections near the Snake River and underlying the Fort Hall Bottoms likely are the gravel deposits described by Pierce and Scott (1982). Figure 8 shows that gravel deposits are present northeast of the American Falls Reservoir for a considerable distance beyond Blackfoot.

Summary of Geologic Setting

Four aspects of the geologic setting of the Near Blackfoot to Neely Reach of the Snake River are of particular importance with respect to ground-water flow and the hydraulic interconnection of ground water and surface water.

- The general area of the American Falls Reservoir is underlain by basalt layered with fine-grained sediments. The deposition of fine-grained sediments in this area resulted from damming of the ancestral Snake River by basalt in Quaternary time.

The spatial distribution of the fine-grained sediments, particularly the Raft Formation, provides important control on ground-water flow. The Raft Formation thins generally to the east and northeast and can be identified in the subsurface only to a line approximately half way between the upper end of the reservoir and Ferry Butte. Upward ground-water flow from basalt aquifers into the American Falls Reservoir is likely limited by the presence of the fine-grained sediments of the Raft Formation and the American Falls Lake Beds.

- Gravel associated with the Snake River is present in the subsurface approximately along the present alignment of the river starting above Idaho Falls and continuing down river to thin and terminate against fine-grained sediments near the upper end of the American Falls Reservoir. The fine-grained sediments (Raft Formation and American Falls Lake Beds) in this area effectively block southwestward movement of ground water in the shallow sediments and result in ground-water discharge in the form of springs and river gains, generally northeast of the subcrop of the Raft Formation.
- The presence of the fine-grained sediments at depth in the vicinity of the American Falls Reservoir likely also limits southwestward flow of ground water in the deeper basalt units. This results in upward ground-water flow and discharge of water in the form of springs and river gains.
- The presence of Tertiary basalt at shallow depths in the vicinity of Ferry Butte may also be important relative to controlling ground-water flow. The Tertiary basalt, if less permeable than Quaternary basalt or Quaternary gravel, would be an additional impediment to ground-water flow. Knowledge of the hydraulic properties of the Tertiary basalt is limited.

HYDROGEOLOGIC CONCEPTUAL MODEL

The Quaternary basalt near the center of the Snake Plain generally is considered to host a single, unconfined aquifer. Water producing zones within the Quaternary basalt occur mostly at flow contacts which are present at depth intervals of about 15 to 20 feet. The average hydraulic conductivity of the basalt is extremely high.

The inter-fingering of Quaternary basalt flows with fine-grained sediments in the general vicinity of the American Falls Reservoir likely creates a subsurface environment composed of individual aquifers and confining units (aquitards). The transmissivity of the subsurface in the vicinity of the American Falls Reservoir is postulated to be much lower than the transmissivity of the aquifer to the northwest where fine-grained sediments generally are absent. The hydrogeologic environment in the area northeast of the reservoir is complicated by the presence of a shallow gravel unit roughly parallel to the Snake River. An additional complication is the presence of what is mapped as Tertiary basalt underlying the Quaternary gravel in the vicinity of Ferry Butte. The role that the Tertiary basalt plays in controlling ground-water flow patterns is unknown.

The presence of the fine-grained sediments in the subsurface (Raft Formation and American Falls Lake Beds) likely acts as a restriction for southwestward ground-water flow in both the basalt and the gravel along the Snake River. This results in upward hydraulic gradients and ground-water discharge in the form of springs and river gains.

As noted by previous investigators, most of the ground-water discharge occurs in areas northeast of the reservoir above maximum reservoir level. The sedimentary units likely are present under all but the southwestern end of the American Falls Reservoir. The amount of ground water moving vertically upward through the fine-grained sediments to discharge into the reservoir is believed to be small. The southwestern end of the reservoir is believed to act as a recharge source for ground water. Leakage likely is occurring through basalt that is present in this area.

Two major sources of information are available to combine with the hydrogeologic conceptual model to develop an improved understanding of the ground-water surface water interconnection in the Near Blackfoot to Neeley reach of the Snake River: 1) the locations and temporal variations of ground water discharges (i.e. springs, reach gains) to the river; and 2) the spatial and temporal variations in ground-water levels. Information on ground-water discharges and ground-water levels is described in the following sections.

GROUND-WATER DISCHARGE CHARACTERISTICS

Ground water discharge to the Snake River in the Near Blackfoot to Neeley reach occurs both in the form of identified springs and in the form of river gains that have not been attributed to specific springs. Information on ground-water discharge in the Near Blackfoot to Neeley reach is available from a number of different sources. The following sections provide a summary of information from each specific source.

Stearns and Others (1938)

The springs in the Fort Hall bottoms are described by Stearns and others (1938, pages 137-139) as follows.

> "Springs rise at intervals for a distance of 10 miles or more along the Fort Hall bottoms and adjacent to the Portneuf River near its mouth. Most of these springs rise on the valley floor at heights of 10 to 15 feet above the river. They have a fairly uniform aggregate discharge of about 1,400 second-feet (cfs), and most of them issue from basalt which underlies the alluvium in this area. The flow and the names of 30 of the larger springs in vicinity of the American Falls Reservoir are given below (given in this report in Table 1). The locations of the stations where the flow from these springs were measured are shown in figure … (given in this report as Figure 9)."

> "The ground-water contours … indicate that the springs bordering the Fort Hall bottoms should be divided into two groups. Batise Spring, Fish Hatchery Spring, and Wide Creek, in the Portneuf Valley form one group, and Big Spring Creek, Clear Creek, and Kinney Creek, the waters of which come from the valley of the Snake River north and east of Fort Hall, form the other group."

> "In addition to these springs, 230 second-feet (cfs) of water is discharged by 13 springs in the Aberdeen-Springfield area. These springs issue from the basalt of Gibson Butte, which collects the water from under the irrigated areas to the northeast and from seepage from the Snake River. At most of the spring vents this basalt is overlain by the American Falls lake beds or by alluvium…"

"The Portneuf and Snake Rivers are also augmented by smaller springs and by inflow rising in the stream channels themselves.…. The Snake River between the mouth of the Blackfoot River and American Falls, a distance of about 30 miles, has a total gain, exclusive of surface run-off from the upper Portneuf of about 2,500 second-feet (cfs), nearly all of which is supplied by springs."

Table 1 Spring Discharge Values Reported by Stearns and others (1938)

Number	Name	Discharge		Number	Name	Discharge
1	Rich	18.6		16	Artesian	5.5
2	Johannes	7.2		17	Sterling	6.2
3	Thorn	20.2		18	Colburn	3.2
4	Log Cabin	34.9		19	Ruger	23.9
5	Indian No. 1	47.4		20	Davis	
6	Indian No. 2	21.9		21	Franklin	
7	Indian No. 3	163.5		22	Big Jimmy	37.6
8	Indian No. 4	3.8		23	Big Spring	448.0
9	Indian No. 5	19.3		24	Kinney	29.3
10	Pyle	14.0		25	Clear	130.0
11	McTucker	26.4		26	Ford	7.4
12	Hull	7.1		27	Pocatello City	
13	Tanner	2.2		28	Batise	50.0
14	Crystal	32.8		29	Fish Hatchery	75.0
15	Danielson	51.1		30	Wide	60.0

Stearns and others (1938) discuss the possible sources of inflow to the Snake River in the reach in question. Approximate water balances are prepared for the three identified sources: 1) ground-water flow down the valley of the Portneuf, 2) precipitation on the lava beds north of the Snake River and 3) underflow along the Snake River. Stearns and others (1938, pages 141 and 142) note the following.

"Thus it appears evident that the springs in the Fort Hall bottoms are mainly supplied by this great underflow of the Snake River Valley. Coarse clean gravel deposits and basalt suitable for the accumulation of ground water underlie the river and the irrigated tracts upstream from the springs, but near Blackfoot the gravel deposits grade into relatively impermeable lake-bed silts and clays of the American Falls Basin. As a consequence the ground water that is carried by the gravel deposits tends to be forced into the basalt, which is the only available material of sufficient permeability, and practically all the springs issue from basalt."

Mundorff (1967)

Mundorff (1967) spends a number of pages dealing with a water-budget analysis of the American Falls reservoir reach. He reports the following relative to early flow measurements of the inflow (page 24).

> "Continuous records of flow in the Snake river at the two gaging stations used in the analysis are available only since 1911. Spring inflow at earlier dates can be obtained only by analysis of earlier miscellaneous records. Discharge measurements were made at different places along the Snake River in the vicinity of the American Falls Reservoir reach between 1902 and 1910. By estimating inflow from some tributaries, gains and losses in several reaches, and evapotranspiration losses from the reservoir reach, rough estimates of spring discharge were made for a period in August in three different years. These estimates are 2,000 cfs …in 1902; 1,840 cfs … in 1905 and 1,830 cfs in 1908. Although the records are incomplete and the quantities determined may be considerably in error, the records do indicate that spring inflow in the reach was considerably less before 1908 than in the years since 1911."

Mundorff (1967) presents calculated ground-water inflow to the American Falls reach of the Snake River on an annual basis from 1911 through 1960. The variability in his calculated inflow rates is small with a maximum of 2,055 cfs in 1952 and a minimum of 1,654 in 1916. The range in values from 1940 to 1960 is smaller with a minimum of 1,830 in 1956. Mundorff (1967, page 28) shows that a positive correlation exists between the calculated ground-water inflow to the American Falls reach and the 5-year progressive average of irrigation diversions to the area above American Falls Dam. Mundorff (1967, page 45) states the following in his conclusions.

> "Ground-water inflow in the American Falls Reservoir reach was probably about 1.2-1.4 million acre-feet a year (1,700-1,900 cfs) before irrigation began in eastern Idaho. Inflow increased with the increasing diversions of surface water to land adjoining the Snake River and in the late forties and early fifties averaged about 1.95 million acre-feet annually (2,600 cfs). About 1952 increased withdrawals of ground water apparently became large enough to prevent further increases of ground-water inflow. Between 1922 and 1952 the ground water inflow increased roughly 2.5 acre-feet for every 10 acre-feet of surface water diverted to lands on the Snake River Plain upstream from American Falls Dam."

Mundorff (1967) shows that his calculated monthly ground-water inflow to the American Falls reach correlates reasonably well in the period of 1952 to 1960 with water levels in a shallow well (46-feet deep) located in section 27 of township 5 south and range 31 east. A well driller's report for this well is not available on the IDWR website but other wells in this section penetrate basalt in the depth range of about 20 to about 60 feet.

Balmer and Noble (1979)

Balmer and Noble (1979) present an analysis of the water resources of the Fort Hall Indian Reservation. The study included measurement of water levels in wells and discharge from springs in the Fort Hall Bottoms. The mean flow of major springs on the

Fort Hall Bottoms, as compiled by Balmer and Noble (1979, page 17) is presented in Table 2. Some of the springs identified in Table 2 are the same as included in Table 1 from Stearns and others (1938). It is impossible to know whether flow measurements were taken at the same locations.

Table 2 Discharge of Major Springs on the Fort Hall Bottoms (Balmer and Noble, 1979)

Station	Mean flow in cfs
Hatchery Springs	103
Diggie Creek	263
Jeff Cabin Creek	21.1
Spring Creek	466
Big Jimmy Creek	30.5
Clear Creek	134
Kinney Creek	28.1
Wide Creek	57.4
Jimmy Drinks - East	103
Jimmy Drinks - West	35.4
Ross Fork	58.4

The Balmer and Noble (1979) study includes development of a water budget for the Fort Hall Bottoms. The graphical depictions of their water budget are reproduced as Figures 10A and 10B, a Snake River portion and a Portneuf River portion.

- The Snake River discharge of 4,800 cfs below the Blackfoot River (Near Blackfoot gage) increases to 5,450 cfs where it discharges into the American Falls Reservoir (Figure 10A). About 184 cfs of the total gain of about 650 cfs is noted as “groundwater to channel”. The remaining gain is from identified sources with the largest being Diggie Creek at 263 cfs.
- The Portneuf River flow increased from 270 cfs at the USGS Pocatello gage to 1,744 cfs where it discharges into the American Falls Reservoir (Figure 10B). Specific springs and creeks make up much of the gain. The combined flow of Spring Creek and Jimmie Creek (496 cfs), Clear Creek (134 cfs), Ross Fork (55 cfs), Jimmie Drinks (103 and 35 cfs) plus Wide Creek (57 cfs) is 880 cfs. Unmeasured ground-water inflow makes up an additional 428 cfs.
- Balmer and Noble (1979, page 18) note that the total identified gain to the rivers is about 2,100 cfs. Almost 70 percent of this gain is discharge to the Portneuf River with slightly less than 30 percent of the gain discharging into the Snake River.

Balmer and Noble (1979, page 156) established several temporary gaging stations to quantify inflow to the lower Portneuf River. One station was established at the Michaud Pumping Station near Siphon Road with a second station about one-half mile below Jimmy Drinks East Branch. The approximate locations of these stations are shown on Figure 10B. Six sets of measurements were obtained (dates not given). The river gain was about 619 cfs in this reach with 398 cfs accountable by individual spring inflows. Several measurements near the mouth of the Portneuf River were made during the low water period of 1977 (September 29 and November 1). The measurements indicated river gains of 671 and 637 cfs in the reach below Jimmy Drinks East Branch and the mouth. Discounting the flows in the three measured springs, the unaccounted for gain was 156 and 120 cfs for the two dates.

Kjelstrom (1995)

Kjelstrom (1995, page C17) provides the following summary of information on the gain between the Near Blackfoot and Neeley gages.

> "The Snake River gained about 1.9 million acre-ft of ground-water, largely from springs, between the gaging stations near Blackfoot and Neeley … in water year 1980. Annual streamflow gains in the reach varied little during water years 1912-80… The mean gain from ground water from 1912 to 1980 was 1.8 million acre-ft, or 2,540 ft^3/s; the standard deviation was 80,000 acre-ft, or 110 ft^3/s."

The reservoir was drawn down for dam reconstruction in 1977, providing an opportunity for measurement of the Snake and Portneuf Rivers upstream and downstream from major springs. Kjelstrom (1995, page C18) reports that the total streamflow gain from ground water in the Blackfoot to Neeley reach was estimated to be 2,560 cfs and 2,570 cfs on September 8 and 28, 1977 respectively.

Kjelstrom (1995, page C18) notes that ground-water discharge to the natural channel of the Portneuf River is about 65 percent of the total ground-water discharge to the Blackfoot to Neeley reach. He describes field measurements as follows.

> "Streamflow measurements of the Portneuf River at Pocatello and upstream from Bannock Creek were made on September 9 and 17, 1977. After these measurements adjusted for a measured diversion and estimated surface-water inflow, the average difference between outflow (measured at the downstream gage) and inflow was 1,650 ft^3/s (assumed to be ground-water discharge)".

Kjelstrom (1995), page C21) says that springs issuing from basalt north of the Snake River and American Falls Reservoir discharge about 200 cfs. The largest of these springs is tributary to Danielson Creek. Kjelstrom (1995, page C23) shows that temporal variations in discharge in Danielson Creek correlate well with water-level elevations in well 5S 31E 27aba1 (using data from 1980-81). This is the same well that Mundorff (1967) used to correlate with his calculated ground-water discharge to the American Falls Reservoir reach.

Hortness and Vidmar (2003)

Hortness and Vidmar (2003) present the results of seepage studies that were conducted jointly by the U.S. Geological Survey and the Idaho Power Company for three reaches of the Snake River: 1) lower reach from Minidoka to King Hill, 2) middle reach

from Shelley to Minidoka and 3) upper reach from Ashton to the mouth of the Henrys Fork and Snake River from Heise to Shelley. The seepage studies were conducted in 2001 and 2002. The approach used by Hortness and Vidmar (2003) is described below.

> "Data collected in each reach included discharge values from the USGS and/or IPCo (Idaho Power Company) gaging stations, discharge values at several intermediate locations obtained using acoustic Doppler instrumentation … and measured and/or inspected discharge values for several miscellaneous inflows (mostly tributaries) along the entire length of each reach obtained by field personnel" (page 1).

The Near Blackfoot to Neeley portion of the middle reach of the Snake River was divided into three subreaches using four gaging sites (Figure 11). Station M9 at the upper end of the reach is the USGS stream gaging station entitled Snake River near Blackfoot. Station M12 at the lower end of the reach is the USGS stream gaging station entitled Snake River at Neeley. Acoustic Doppler discharge measurement data were taken at two intermediate stations: M10 – Snake River near Pingree; and M11 – Snake River above McTucker Creek near Pingree. Additionally, measurements or observations were taken at a number of tributaries within the reach. The seepage studies were done twice in 2001 and three times in 2002.

Appendix B of the Hortness and Vidmar (2003) report include tables of discharge data for each of the four stations (discharge readings were not obtained from stations M10 and M11 for all of the seepage runs) plus estimates of selected inflows between the stations and changes in storage in American Falls Reservoir. Table 3 provides a summary of the seepage run results in cfs. Figure 11 shows the seepage run results for the April 9-10, 2002 data collection effort.

Figure 11 show a gain of 460 cfs from station M9 (Near Blackfoot gage) to M11 (head of the reservoir) with a 1,232 cfs gain over the length of the reservoir (station M12 minus station M11). The Hortness and Vidmar (2003) data in Table 3 show a range of stream flow gains of 1,390 to 2,186 cfs from the Near Blackfoot gage (M9) and Neeley gage (M12). The largest calculated gain was in November 2002 with the smallest in July 2002.

The study results shown on Table 3 are different from the results provided in the Hortness and Vidmar (2003) because two errors were discovered in the original document. The first error is in the calculated inflow between stations M11 and M12 for the July 23-24, 2002 seepage run. Two sites are included in estimated inflow for the July 2002 calculations that are not included in analysis of the other four seepage runs. The inflow for the other four seepage runs between stations M11 and M12 is the sum of discharge at the following sites (Hortness and Vidmar 2003, Table B20).

- Portneuf River near Tyhee
- Bannock Creek near Michaud
- Aberdeen Waste Drain near Aberdeen
- Tarter Waster near American Falls
- Seagull Bay near American Falls
- Falls Irrigation Pump near American Falls

Table 3 Summary of Seepage Run Results (cfs) (Hortness and Vidmar, 2003)

Station	April 3-6, 2001	Oct 31-Nov 1, 2001	April 9-10, 2002	July23-24, 2002	Nov 5-6, 2002
M9	2,190	1,810	1,750	3,960	2,060
Est. Inflow	0	0	0	0	0
Est. Outflow	0	0	0	0	0
M10	2,520	2,410			2,430
Est. Inflow	0	0	0	0	0
Est. Outflow	0	0	0	0	0
M11	2,820		2,190		2,550
Est. Inflow	588	481	538	246	421
Est. Outflow	0	0	0	96	0
Res. Storage	800	4,000	2,300	-4,900	4,300
M12	3,920	354	1,660	10,400	367
M10-M9	**330**	**600**			**370**
M11-M10	**300**				**120**
M12-M11	**1,312**		**1,232**		**1,696**
M12-M10	**1,612**	**1,463**			**1,816**
M12-M9	**1,942**	**2,063**	**1,672**	**1,390**	**2,186**

The following two additional sites are included by Hortness and Vidmar (2003) in the calculated inflow between stations M11 and M12 for the July 23-24, 2002 seepage run.

- McTucker Creek Springfield
- Danielson Creek near Springfield

The calculated inflow for the July 23-24, 2002 seepage run is reported in Table B13 of Hortness and Vidmar (2003) is 246 cfs rather than 506 cfs if the two additional stations are not included (see Table 3). Table B13 and Figure B5 in Hortness and Vidmar (2003) show a streamflow gain of 1,131 cfs from the Near Blackfoot gage to the Neeley Gage (M9 to M12). This number is not comparable to the other reach gains presented in the

report because of the inclusion of the two additional sites in the calculated inflow between stations M11 and M12. The corrected calculated gain is 1,390 cfs.

The second error is in the calculated reach gain from M11 to M12 for the November 5-6, 2002 seepage run. As is shown on Table 3, the gain between the Near Blackfoot and the Neeley gaging stations (M9 and M12) was 2,186 cfs. Table B17 and Figure B5 of the Hortness and Vidmar (2003) report show this gain as occurring between M11 and M12 rather than M9 and M12. The correct gain across the American Falls Reservoir (M12-M11) for the November 2002 seepage run is 1,696 cfs.

Hortness and Vidmar (2003) obtained flow measurements at 18 surface water sites that discharge directly into the American Falls Reservoir. Seven of the sites, including the Portneuf River and Bannock Creek, are included in their inflows in the M11 to M12 reach (Table 3). The total discharge of these seven sites ranges from a low of 246 cfs in July 2002 to a high of 588 cfs in April 2001. The eleven remaining surface water sites are: 1) Ross Fork, 2) Clear Creek, 3) Spring Creek, 4) McTucker Creek, 5) Danielson Creek, 6) Sterling Waste, 7) Spring #1 Sterling, 8) Crystal Spring, 9) Spring #2 Sterling, 10) Spring #3 Sterling and 11) Spring Hallow. The combined discharge of these sites was 541.5 cfs in October-November 2001, 634 cfs in July 2002 and 604 cfs in November 2002. Not all of the sites were measured in April 2001 and April 2002. Table 3 shows that the calculated gain across the American Falls Reservoir (M12-M11) was 1,696 cfs in November 2002. Thus, the eleven additional measured inflows to the reservoir (604 cfs) account for about 36 percent of the calculated gain in the American Falls Reservoir reach in November 2002. Most of the remainder of the calculated gain likely is discharge from the spring-fed creeks described by Balmer and Noble (1979) and Kjelstrom (1995) that discharge to the lower Portneuf River. The presence of the sedimentary formations (American Falls Lake Bed and Raft Formation) makes it difficult for large quantities of water to discharge directly into the bottom of the reservoir.

IDWR Reach Gain/Loss Program (2006)

The IDWR Reach Gain/Loss Program is used to develop estimates of historical river gains and losses for various reaches. Cosgrove and others (2006) describe the program as follows.

> "The Reach Gain/Loss Program uses gaged reach inflows and outflows, measured diversions and estimated irrigation returns and reservoir storage and evaporation to calculate a (monthly) water balance for the reach. The residual of the water balance is the estimated river reach gain from or loss to the aquifer" (page 92).

Most of the ground-water discharge to the Snake River occurs in two reaches: 1) Milner to King Hill and 2) Near Blackfoot to Neeley. Cosgrove and others (2006) present calculated average annual river gains in these reaches starting in the early 1900's. A plot of these data is presented in Figure 12. Their description of the temporal pattern of discharge in these two locations is presented below.

> "Natural discharge from the Snake River Plain aquifer is primarily to the Snake River along two reaches: Kimberly to King Hill and Near Blackfoot to Neeley … Spring discharge has varied in response to changes in precipitation, irrigated acreage, and irrigation practices. Overall, discharge in the Kimberly to King Hill

reach appears to have been impacted more than in the Near Blackfoot to Neeley reach…Historically, aquifer water levels and corresponding discharges to the Snake River rose significantly at the onset of surface water irrigation. This is particularly apparent in the historic discharge in the Milner to King Hill reach… Aquifer water levels peaked about 1950 and have been declining since that time. The declines are attributed to the onset of ground-water irrigation, more efficient surface water irrigation practices such as conversion to sprinkler irrigation and canal lining, and the recent seven years of drought. Historic discharge in the Near Blackfoot to Neeley reach shows a less dramatic response to historic changes in irrigation practices, however the reach does exhibit more dramatic seasonal variation since the 1950s" (pages 15-16).

Monthly average river gains, calculated using the IDWR Reach Gain/Loss Program, were obtained from Wylie (2007). The calculated monthly river gains from Near Blackfoot to Neeley results (Figure 13) show a greater data scatter than the annual gains shown on Figure 12. There are some longer-term trends in the river gain with a high in about 1987, a low in about 1995, a high in about 2000 and a low in 2006 that continues into 2007. The average calculated river gain for the reach decreases with time as follows: 2,559 cfs for the period of January 1970 through August 2007, 2,341 cfs for the period of January 2000 through August 2007 and 2,104 cfs for the period of January 2001 through August 2007.

TEMPORAL WATER-LEVEL PATTERNS IN WELLS

The comparison of temporal water-level data from wells from within the basalt-dominated portion of the Snake Plain aquifer to wells near the Near Blackfoot to Neeley reach of the river provides information of hydraulic connection of the ground-water systems. The water-level data were obtained from the U.S. Geological Survey web site.

Hydrographs for selected single completion wells (Figure 14) are presented in Figures 15 through 19. The order of presentation starts with wells completed in basalt north of American Falls Reservoir followed by wells located nearer the reservoir.

- Wells 2N 31E 35dcc1 and 1S 30E 15bca1 (Figure 15) have similar hydrographs and represent the temporal water-level pattern that is typical of the basalt portion of the Snake Plain aquifer northwest of the Near Blackfoot to Neeley reach. Both wells are deep (636 and 751 feet) and the static depth to water is considerably below land surface (594 and 721 feet in 2007). Both wells show a downward overall water-level trend with recent highs in November 1984 and January 1999 and recent lows in August 1981 and August 1994. The water-level rise between August 1981 and November 1984 was about six feet. The seasonal water-level changes in both wells were generally less than two feet with seasonal lows in late spring or summer and seasonal highs in late fall or winter.
- Wells 2S 32E 23bbb1 and 4S 31E 20bbb1 (Figure 16) show a similar water-level pattern as the previous pair of wells. These two wells are 194 and 201 feet deep and have water levels about 171 and 127 feet below land surface. The water-level rise between August 1981 and November 1984 was about five feet in both wells. There is more seasonal scatter in the data points in these wells as compared to wells to the north, probably related to pumping and irrigation application. The

seasonal water-level changes in both wells were generally less than two feet with seasonal lows in spring and seasonal highs in fall.

- Wells 4S 31E 36aba1 and 5S 31E 27aba1 (Figure 17) are both shallow (17 and 51 feet) located in areas irrigated using surface water. The wells show a rapid response to surface water irrigation practices. There is considerable scatter to water-level in both wells with lower water levels in the spring and higher water levels in the fall. The water-level rise from 1981 to 1984, noted in the wells to the north, is not evident in the data from these two shallow wells. The water-level elevation in both wells was lowest in the period of record in 2004-2005.
    - For well 4S 31E 36aba1, the annual water level fluctuation was five to seven feet with no long-term pattern of water-level change from the start of records through the mid 1970's. There is a significant change in the water-level pattern in well 36aba1 starting in about 1978 with lower water level highs and less annual water-level change. Care must be taken to differentiate changes in water-level patterns from apparent changes caused by decreases in frequency of measurement or changes in dates when measurements were taken. The data show a pattern of water-level decline with several multi-year trends (low in 1993 and high in 1999). The water level pattern seen in well 36aba1 is a reflection of change in surface water irrigation practices in the area (such as change from gravity to sprinkler irrigation or lining of canals) and possibly the impacts from ground-water pumping.
    - The overall pattern of the hydrograph for well 5S 31E 27aba1 is similar to well 4S 31E 36aba1 except for larger annual water-level fluctuations. The annual water-level fluctuation was up to 15 feet in the 1950's and 1960's. The range in annual water-level changes lessened (less than nine feet) in the mid 1970's and 1980's with both lower highs and higher lows. Again, some of the change in water-level pattern is from changes in the frequency and/or timing of measurements. An overall downward trend in water levels is evident in the record starting in the early 1980's. The water-level pattern in this shallow well likely is a combination of impacts from changes in surface water irrigation practices and possible impacts from ground-water pumping.
- Well 6S 31E 16bab1 (Figure 18) is located near the northwest shore of American Falls Reservoir. The hydrograph for this 134-foot well has characteristics of the nearby two shallow wells (Figure 17) and the deeper wells to the north (Figures 15 and 16). Seasonal water-level changes were less than about five feet in the 1950's and 1960's, except for scattered low water level readings. According to the USGS record for this well, the pump in the well was operating when the scattered low water-level readings were taken.
- Well 2S 34E 33bba1 (Figure 19) is located near the Aberdeen-Springfield Canal northeast of the American Falls Reservoir. This is 40 feet deep and has high water levels in the fall and low water levels in the spring, which is typical of surface water irrigated areas. The seasonal water-level change generally is five to

six feet. The hydrograph for well 33bba1 is similar to the shallow wells shown on Figure 17. The most likely causes for the water-level pattern in well 33bba1 are changes in surface water irrigation practices in the area and possible impacts from ground-water pumping.

A number of locations have clusters of wells completed to different depths. These wells allow characterization of vertical hydraulic gradients and temporal changes in water-level elevation with depth. Water-level data are available for these wells since about 1980. The locations of the wells are shown on Figure 14.

- Wells 4S 32E 1cba1, 1cba2, 1cba3 and 1cba4 are constructed to depths of 90, 53, 242 and 433 feet respectively and are located near the Aberdeen-Springfield Canal at a site north of the northeast end of the American Falls Reservoir (Figure 14). The water-level patterns for the two shallow wells (Figure 20) are similar with seasonal changes of about 7 to 9 feet and lows in the spring and highs in the fall. The seasonal changes are likely from surface-water irrigation activities. The two deeper wells have much smaller seasonal changes. Figure 20 shows that there was an upward hydraulic gradient between the two deeper completions from the start of the record through about 2002 when the wells had about the same water-level elevation. The scatter in data for the 242-foot well starting in 2005 is difficult to explain. The overall water-level pattern, evident in the three wells with long-term records likely stems from a combination of changes in surface-water irrigation practices in the area and impacts from ground-water pumping.
- Wells 4S 33E 20cbb1, 20cbb2, 20cbb3 and 20cbb4 are located northeast of American Falls Reservoir near the Snake River and are completed at depths of 62, 108, 365 and 738 feet (Figure 14). An upward vertical gradient is evident from the water-level data from all four of these wells (Figure 21). The water-level elevation in the 108-foot well is about 10 feet higher than in the 62-foot deep well. These data indicate an upward vertical gradient of about 0.2 ft/ft. The upward gradient persists deeper in the section but is smaller. The long-term water-level pattern in the 738-foot well is typical of the basalt aquifer to the northwest. This well has one to two feet of seasonal water-level changes with water-level highs generally in early winter and water-level lows in July. This well likely reflects the seasonal impacts of ground-water pumping. The long-term water-level pattern in the 365-foot well is dissimilar from any of the other hydrographs in the area with a high water-level elevation in November 1989 and very small seasonal fluctuations. Reasons for the uniqueness of the hydrograph for the 365-foot well are unknown. The hydrograph for the 108-foot completion has considerable seasonal variation but does not fit the seasonal patterns of other shallow wells in areas of irrigation by surface water. Several significant water level changes (such as 4.5-foot drop between January and March 1992 and a 3.7-foot drop between January and March 1998) are difficult to explain. There are about two-feet of seasonal water-level change in the 62-foot completion well; water-level highs are either in May or September, probably reflecting high river conditions in May and surface-water irrigation impacts in September.
- Wells 4S 33E 25ddb1-2 and 4S 34E 8dbd1-3 are located south of the Snake River and between Ferry Butte and the American Falls Reservoir (Figure 14). Wells

25dbb1 and 25dbb2 have completions at depths of 21 and 117 feet and are located is down gradient (southwest) of wells 8dbd1, 8dbd2 and 8dbd3 which have completions at depths of 38, 99 and 232 feet. Water-level data for these wells are only available during the period of 1985 to 1994 (Figure 22). The water-level data from the 21 and 117-foot completions at 4S 33E 25ddb show an upward vertical gradient of about 0.2 ft/ft with a greater rate of decline during the period of record in the 117-foot completion than in the 21-foot completion. The three completions at 4S 34E 8dbd also show upward ground-water flow but the vertical gradient is smaller (about 0.05 ft/ft). The declining water-level trend in all five of these wells is consistent with this period of record for other wells in the area. The 232-foot completion at 25dbb has a consistent seasonal water-level pattern with low levels in late spring and a high in early winter. A consistent seasonal trend is not as identifiable in the other wells.

- Wells 3S 34E 22dab1 and 22dab2 are located northeast of Ferry Butte and are completed at depths of 85 and 569 feet (Figure 14). Limited water-level data for the 569-foot well are similar in pattern to the 85-foot well with a small downward hydraulic gradient (Figure 23). The overall water-level pattern in both wells is similar to that found in the Snake Plain aquifer to the northwest. The 569-foot well has a seasonal fluctuation of about two to three feet with low water levels in the winter and spring and high water levels in the fall. The 85-foot well has a similar seasonal range in water levels with high water levels generally in the fall.
- Wells 2S 35E 11ddd1-4 are located north-northeast of the City of Blackfoot and are completed at depths of 97, 376, 570 and 682 feet (Figure 14). Note that the scale on the right side of the Figure 24 is for well 11ddd1 (97-foot completion) is three times the range for the other three wells. The hydrograph for the 97-foot well (11ddd1) shows very large seasonal water-level changes (35 to 50 feet), water-level highs and lows that are consistent with surface-water irrigation effects and does not have long-term pattern of water-level decline. There is a downward hydraulic gradient of about 0.18 ft/ft from the 97-foot well to the 376-foot well. The deeper wells at this site have a water-level pattern that is similar to wells located north of American Falls Reservoir with a fairly large seasonal water-level change (three to seven feet). An upward hydraulic gradient was present from the 682-foot completion to the 376-foot completion in the early 1980's. However, these two wells show a downward hydraulic gradient based on the few data points in 2001 and 2002.

Mundorff (1967) notes that shallow wells respond to the large annual range in lake stage only near the southwest end of the American Falls Reservoir. The locations of wells identified by Mundorff (1967) as responding to reservoir stage are shown on Figure 25. A temporal plot of reservoir stage and water-level elevations for one of the wells (7S 30E 24ddc1) for a period of time in the 1960's is presented in Figure 26. The plot shows that the water-level in the well is lower than the surface water at high reservoir stage and higher than the surface water at low reservoir stage. Leakage of water from the west end of the reservoir is likely related to basalt present near land surface in this area.

Geologic Controls for Ground-Water Discharge

Ground water discharges in an area northeast of the American Falls Reservoir because of changes in geology that result in lower aquifer transmissivity in this area. The gravel zone that hosts a shallow ground-water flow system along the Snake River essentially terminates against the fine-grained sediments of the American Falls Lake Beds and the Raft Formation. In the same way, basalt that makes up most of the Snake Plain aquifer occurs only as individual flows within a sequence of mostly fine-grained sediment. The lower transmissivity in the immediate vicinity of the American Falls Reservoir acts similar to a subsurface dam and results in ground-water levels at or above ground surface in shallow aquifers northeast of the reservoir. Springs occur in these areas. There is also a significant upward hydraulic gradient which indicates ground-water flow occurs from deeper aquifers to shallow aquifers and then to discharge locations.

Studies by Balmer and Noble (1979) and Kjelstrom (1995) plus other authors are sufficient to conclude that the vast majority of ground-water discharge occurs upstream of the American Falls Reservoir, probably controlled by the subcrop of the Raft Formation. The amount of ground-water discharge directly into the bottom of the reservoir is unknown but believed to be small.

Estimation of Ground-Water Discharge

The amount of ground-water that discharges to the Snake River in the Near Blackfoot to Neeley reach has been estimated by a number of investigators using a variety of direct measurement and mass balance approaches. The mass balance approach involves measurement of the flow in the river at an upstream site (often the Near Blackfoot site) and subtracting that number from the flow in the river at a downstream site (often below the American Falls Dam at the Neeley site) and adjusting for known inputs and known outputs. Changes in storage within the American Falls Reservoir are also taken into account. The accuracy of the calculated river gain depends on the accuracy of flow measurements and the detail taken in accounting for all inputs and outputs and the change in storage in the reservoir.

The following sections describe the results of the selected investigation efforts.

- Studies conducted by Balmer and Noble (1979) are particularly important because flow measurements were obtained on a large number of springs and tributary streams near the northeast end of the reservoir. Their studies, conducted in the late 1970's, indicate that the Snake River gains about 650 cfs from the Near Blackfoot gage to the reservoir with about 70 percent of the gain from documented sources (individual springs and creeks) and 30 percent from ground-water discharge to the channel. Balmer and Noble (1979) calculated a gain in the Portneuf River from the Pocatello gage to the reservoir of about 1,470 cfs with about 70 percent from documented sources and about 30 percent from ground-water discharge to the channel. This gives a total gain to the rivers of about 2,100 cfs (rounded to two significant digits). Kjelstrom (1995, page C21) says that springs issuing from basalt north of the Snake River and American Falls

Reservoir discharge about 200 cfs. The largest of these springs is tributary to Danielson Creek. Combining the two sources of information, the estimated ground-water discharge to the Snake River in the Near Blackfoot to Neeley reach in the late 1970's was about 2,300 cfs.

- Kjelstrom (1995, page C17) used data from U.S. Geologic Survey stations, measurements of diversions and return flows and changes in reservoir storage to calculate ground-water discharge in the reach using the mass balance approach. He reports the mean gain from ground water between the Near Blackfoot and Neeley from 1912 to 1980 was 2,540 cfs with a standard deviation of 110 ft^3/s.
- The Hortness and Vidmar (2003) seepage run data in a mass balance approach show a range of streamflow gains of 1,390 to 2,186 cfs from the Near Blackfoot gage (M9) and Neeley gage (M12). The largest calculated gain was in November 2002 with the smallest in July 2002.
- The average calculated river gains for the reach for different time periods using the IDWR Reach Gain/Loss Program are as follows: 1) 2,559 cfs for the period of January 1970 through August 2007, 2) 2,341 cfs for the period of January 2000 through August 2007 and 3) 2,104 cfs for the period of January 2001 through August 2007. These values show that the calculated river gains have decreased with time.

Relationship of Ground-Water Levels and Ground-Water Discharge

As with any ground-water system, temporal variations in the discharge from springs in the Near Blackfoot to Neeley reach of the Snake River are related to water-level changes in the source aquifer. Higher discharge from the springs occurs because of higher ground-water levels. The converse is also true. The relationship of ground-water levels to ground-water discharge is described in this section using a well located near Aberdeen and several wells located northeast of the reservoir as compared to calculated ground-water inflow and the discharge of Spring Creek.

Mundorff (1967) compared his calculated monthly values of ground-water inflow to American Falls Reservoir to well 5S 31E 27ab1, located north of Aberdeen (Figure 14). As Mundorff shows (Figure 27), the water-level pattern in the well, which responds to surface irrigation in the area, is similar to the temporal pattern of calculated ground-water inflow to the reservoir.

Water-level data from well 5S 31E 27aba1 (the same well used by Mundorff) are plotted with the monthly reach gains calculated using the IDWR Reach Gain/Loss Program in Figure 28. The seasonal range in water levels in the well was about 15 feet in the 1950's and 1960's and decreased to less than nine in the mid 1970's and 1980's with both lower highs and higher lows. The seasonal range in water levels has been less than seven feet since about 1990. An overall downward trend in water levels is evident in the record starting in the mid 1980's although the frequency of measurement also decreased starting in the late 1980's. Ground-water levels in well 5S 31E 27aba1 show a similar pattern as the calculated reach gain starting about 1990. The drop in water level in the well after about 1998 is very similar to the decrease in the calculated river gain in the same period. The water-level pattern in this shallow well likely is a combination of

impacts from changes in surface water irrigation practices and possible impacts from ground-water pumping. This suggests that the decrease in calculated gains using the IDWR Reach Gain/Loss Program also is a result of the combined impacts of changes in surface water irrigation practices and possible impacts from ground-water pumping.

The analysis of the discharge of Spring Creek with ground-water levels in the area provides an additional opportunity to understand the relationship between ground-water levels and ground-water discharge. Spring Creek heads in a group of springs located west of Ferry Butte and is fed nearly all from ground-water discharge. According to Nathan Jacobson of the U.S. Geological Survey (Jacobson, 2008), the contribution of irrigation return flow to Spring Creek during the irrigation season is a small part (less than 5%) of the total flow. Figure 29 shows the locations of the gaging station on Spring Creek, the springs near Ferry Butte that are the primary source for the stream flow and the locations of nearby observation wells.

The temporal pattern of the discharge of Spring Creek is shown in Figure 30 along with water-level elevations in well 4S 33E 20cbb1. Well 4S 33E 20cbb1 is the shallowest (62 feet) of four wells of various depths that are located about four miles west-northwest of the gaging station location on Spring Creek and about seven miles southwest of the primary springs that feed the stream near Ferry Butte. Daily discharge data are available from the U.S. Geological Survey station Spring Creek at Sheepskin Road starting in the early 1980's. The multi-year temporal changes in the Spring Creek discharge are very similar to the long-term hydrograph for well 20cbb1. There is a high in the mid 1980's, a low in the mid 1990's, a high in the late 1990's and then the lowest discharge and water level in the period of record in 2004-2005. The seasonal features in the two records are harder to correlate, in part because of the different frequency of data points (daily for the creek and every other month for the well). In Figure 30, well 4S 33E 20cbb1 has a seasonal change of about two feet for most of the period of record with highest water levels in the fall. The seasonal water-level pattern in the well appears to change significantly in the period of March 2001 to March 2003 (almost no seasonal water level changes). Reasons for this change are unknown.

The discharge pattern for Spring Creek is compared with hydrographs of two clusters of wells located on the southeast side of the Snake River (the nearest observation wells with temporal records to the gaging station and springs) in Figure 31. Wells 4S 33E 25ddb1 and 25ddb2 are located less than a mile southeast of the Spring Creek gaging station (Figure 29). Both wells are shallow with depths of 117 and 21 feet. Wells 4S 34E 8dbd1, 8dbd2 and 8dbd3 are located south of Ferry Butte and about one mile from the springs that are the primary source of water for Spring Creek. Well depths are 232 feet, 98 feet and 38 feet respectively. Water-level data for these wells are available only from 1985 to 1994. The seasonal change in water levels is small in all five of these wells. The lack of significant seasonal water-level changes fits with the locations of the wells away from irrigated lands and near a ground-water discharge area. The downward water-level trend in the wells is similar to that shown for well 4S 33E 20cbb1 on Figure 30 and correlates with the discharge record from Spring Creek.

The variations in discharge pattern of Spring Creek during on a calendar-year basis over the period of record provide important information relative to ground-water levels and possible causes for changes in both ground-water levels and spring discharge.

Complete year discharge records are available for Spring Creek for the years 1981 through 2007. Figure 32 presents the flow data as average discharge for five-year periods (1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005) and the average of years 2006 and 2007. The entire discharge record for Spring Creek is shown on Figure 30.

- The calendar-year plot of average daily flow of Spring Creek during the period of 1981-1985 (Figure 32) shows a low of 344 cfs on January 1st and July 9th and a high of 414 cfs on October 11th. The discharge steadily increased from the low in July to the high in October with a gradual decrease through the end of the year.
- The average daily flow of Spring Creek during the period of 1986-1990 varied from a low flow of 340 cfs on July 7th to high flows of 390 cfs on May 31st and 387 on October 6th (Figure 32). The flow-rate pattern in 1986-1990 is similar to 1981-1985 except for the lack of a higher peak in the fall.
- The pattern of average daily flows of Spring Creek in 1991-1995 was similar to previous five-year periods only the discharge magnitude was considerably lower. The low flow was 301 cfs on July 9th with high flow rates of 354 cfs on June 6th and 356 cfs on October 7th.
- The 1996-2000 time period includes several years of higher stream flow including the peak flow in the period of record at 605 cfs on June 8, 1998 (Figure 30). The average daily flows of Spring Creek for the 1996-2000 time period (Figure 32) were similar to the 1981-1985 and 1986-1990 periods in shape and magnitude except for the spring high flow period. The average daily high flow value was 419 cfs on June 8th with an average daily low of 337 on July 25th.
- The 2001-2005 time period has much lower average daily discharges than any of the four preceding five-year periods. The average daily high flow was 314 cfs on January 1st with an average daily low flow of 253 cfs on July 3rd.
- The average daily flow of Spring Creek during calendar years 2006 and 2007 are lower than any of the preceding five-year averages with the exception of several short periods. The average daily high flow was 302 cfs on May 5th and October 10th. The average daily low flow was 239 cfs on June 30th.

The average daily discharge plots for Spring Creek, presented in Figure 32, may be used to identify several patterns that are reasonably consistent over the 27 years of record. First, the lowest average daily flow generally occurs in July with a range from June 30th to July 25th. Second, the highest average daily flow mostly occurs either in the spring (May or June) or in October (from 6th to 11th). Third, the July low flow is followed by an October high flow reflects a combination of the impacts of surface water irrigation and the impacts from cessation of ground-water pumping.

Relationship of Surface Water Irrigation and Ground-Water Discharge

Irrigation using both ground water and surface water occurs in the Near Blackfoot to Neeley reach of the Snake River. Figure 33, taken from Cosgrove and others (2006) shows irrigated ground from three sources: 1) ground water, 2) mixed ground water and surface water and 3) surface water.

The Aberdeen-Springfield Canal is the major supply source for surface-water irrigation on the northwest side of the Snake River in the Near-Blackfoot to Neeley reach. As such, the canal diversion records, presented in Figure 34, provide a general temporal view of this water supply source (diversion data obtained from B.A. Contor, 2007). Figure 34 shows an increase in annual diversion per water year from the 1930's into the early 1970's with a peak diversion of about 406,000 acre feet in the 1969 water year. A decrease in diversion rate occurred starting in the 1975 water year with most years less than 350,000 acre-feet per water year. Diversions during the 2000 water year were an exception to the decreasing trend with about 400,000 acre-feet diverted. The diversions during the 2001 through 2005 water years were all less than 300,000 acre feet.

The relationship between annual canal diversions and ground-water levels in a portion of the service area of the Aberdeen-Springfield Canal also is shown on Figure 34. The average annual (taken on a water-year basis) water-level elevations in well 5S 31E 27aba1 are shown along with canal diversions. Water-level data from this well have been presented three times previously in this report: 1) on Figure 17 to represent shallow ground water conditions north of the reservoir; 2) on Figure 27 to show Mundorff's (1967) relationship between calculated river gains and ground-water levels; and 3) on Figure 28 to show the relationship of ground-water levels to river gains calculated using the IDWR Reach Gain-Loss Program. Water-level data from well 5S 31E 27aba1 are presented in Figure 34 as an average over each water year (October 1 through the following September 30). The average values are based on a range in number of data points (weekly measurements in some years ranging to quarterly measurement after 1988). Figure 34 shows that average annual ground-water levels were in the range of 4,380 to 4,383 feet for the period of record up through 1988. With the exception of 1998, all of the average ground-water levels were lower than 4,380 feet. The lowest average ground-water level was 4,375 feet in 2004.

The ground-water levels in well 5S 31E 27aba1 do not immediately follow the decline in diversions in the canal that occurred starting in 1975. The general increase in diversions (with the exception of 1993) that occurred from 1984 to 2000 is also not directly replicated in the ground-water data. There are a number of possible reasons for the differences noted between canal diversion rates and shallow ground-water levels in a portion of the service area. These are: 1) changes in surface water application rates across the service area and in the general vicinity of the well; 2) changes in leakage rates from water delivery systems across the service area and in the general vicinity of the well; and 3) impacts from ground water pumping in the general vicinity of the well. Information is not available at the time of preparation of this report to develop a more detailed cause-effect relationship between canal diversions and ground-water levels in this single well. Sufficient data are available to say with certainty that changes in surface water irrigation practices in the general vicinity of the well 5S 31E 27aba1 have impacted shallow ground-water levels. It is likely that at least a portion of the water-level decline evident in the well hydrograph on Figure 34 is a result of ground-water pumping.

Relationship of Ground-Water Pumping and Ground-Water Discharge

Ground-water pumping from the Snake Plain aquifer is a major portion of the regional water budget. Figure 35, taken from Cosgrove and others (2006), shows that large areas are irrigated using ground water west and north of the Near Blackfoot to

Neeley reach. Other major ground-water pumping centers are located further west, southwest and northeast within the aquifer. The cumulative ground-water irrigation rights on the aquifer, as presented by Contor and others (2006) are presented in Figure 36. This plot shows a dramatic increase in ground-water irrigation rights starting in the 1950's and ending in the 1990's.

The seasonal hydrograph signature for a ground-water pumping area is a water-level high in the spring prior to the starting of pumping and a water-level low in the fall at the end of the pumping season. This is opposite to the signature of a surface-water irrigated area where ground-water levels are low in the spring prior to the start of irrigation and high in the fall at the end of the irrigation season.

None of the observation wells presented and discussed in the report section entitled *"Temporal Water-level Patterns in Wells"* has a seasonal ground-water pumping signature in the water-level record. The presence of the large tracts of land irrigated with surface water between the ground-water pumping areas and the Near Blackfoot to Neeley reach of the river appears to mask out any seasonal water-level changes from pumping wells. However, long-term water level trends such as those shown for wells 2N 31E 35dcc1 and 1S 30E 15bca1 on Figure 15 are detectable in deep wells in the area of interest. Examples are well 4S 33E 20cbb4 which is 738 feet deep (Figure 21) and well 3S 34E 22 dab2 which is 569 feet deep (Figure 23).

Ground-water pumping can impact ground-water discharge in the area northeast of the American Falls Reservoir via the following steps. First, there is a documented upward hydraulic gradient and thus upward ground-water flow from deep zones to shallow zones in the ground-water discharge area. An example of the upward hydraulic gradient is shown on Figure 21. Second, pumping impacts from throughout the aquifer are propagated through the aquifer to the discharge area. Deep wells near the discharge area have hydrographs similar to those near the center of the plain. Third, a decreased upward hydraulic gradient occurs because of greater water-level decline in the deeper zones than in the shallow zones. This is shown on Figure 21 by the comparison of the hydrographs for 4S 33E 20cbb1 at a depth of 62 feet to 20cbb4 at a depth of 738 feet. Fourth, the decreased upward hydraulic gradient results in a reduction in spring discharge.

The magnitude of upward ground-water flow from deep zones to shallow zones and then to discharge areas (such as springs) has not been directly estimated by any of the previous investigators. The magnitude of upward ground-water flow depends on the hydraulic gradient (for which some data are available) and the vertical hydraulic conductivity of the basalt and sediments in the area (for which essentially no data are available). The impacts of ground-water pumping on ground-water discharge also have not been estimated by any of the previous investigators except for model predictions presented in Cosgrove and others (2006).

MODEL REPRESENTATION OF THE HYDROGEOLOGIC SETTING

Characteristics of the ESPAM

ESPAM is a single layer, fixed transmissivity model with 104 rows and 209 columns constructed using the MODFLOW code (Cosgrove and others, 2006). All model cells are 1 mile x 1 mile with a 31.4 degree counter-clockwise rotation relative to east-west. Several types of boundaries were used in the model: 1) no flow, 2) specified flux and 3) head dependent.

The Snake River in the Near Blackfoot to Neeley reach is represented using the River Package. Cosgrove and others (2006) describe the function of river cells as follows.

> "Flow between the aquifer and river or drain cells is governed by equations which are based on Darcy's law (discharge is equal to the product of hydraulic conductivity times cross-sectional area times hydraulic gradient).. In a numerical model, for both river and drain cells, the hydraulic conductivity term represents the conductivity of the river-bed or drain sediments which controls the flow between the river/drain and the aquifer. The gradient … represents the head differential between river stage … and aquifer level" (pages 20-21).
>
> "The flow between the aquifer and a hydraulically connected surface water body is governed by (Darcy's Law)… In the MODFLOW River Package, (Darcy's Law) is implemented in terms of a) stage of the surface water body, b) aquifer water level and c) a conductance term describing the hydraulic conductivity of the riverbed … sediments and the wetted areas of the river bed. The user specifies river stage, elevation of the bottom of the river sediments and conductance of the riverbed sediments. As long as the water level in the aquifer is above the elevation of the bottom of the river sediments, the discharge to (or from) the river is calculated as (discharge is equal to the conductance multiplied by the difference of the river water-level elevation and the aquifer water-level elevation)… (page 30).
>
> "Since riverbed conductance is a lumped parameter (i.e. It represents multiple physical attributes) and impossible to measure, it is commonly estimated during model calibration" (page 32).

The area of the river and reservoir in the Near Blackfoot to Neeley reach is represented using river cells as is shown on Figure 37. Cosgrove and others (2006, Table 3) provide the following information for each of the river cells: 1) row and column (location in the model), 2) stage (for river or reservoir), 3) riverbed conductance in units of square feet per day and 4) riverbed elevation in feet. The stage information was given to represent field conditions. The riverbed elevation was in the range of about 39 to 53 feet lower than stage elevation. The riverbed conductance was held at 99,000 square feet per day for all of the river cells in the reach. As a comparison, the conductance term was set at 157,000 square feet per day for the cells in the Shelley to Near Blackfoot reach and 35,100 square feet per day for the cells in the Neeley to Minidoka reach.

The calibrated transmissivity values for the nodes in the portion of the model near the Near Blackfoot to Neeley reach were obtained from IDWR (Wylie, personal communication, 2008). Figure 38 shows transmissivity values for this portion of the

model in terms of ranges of values. The map shows that high transmissivity values (> 10,000,000 ft^2/day) are included in the model to represent aquifer characteristics north of the east end the American Falls Reservoir.

Calibration of the model was done using automated parameter estimation tools. Cosgrove and others (2006, page 90) describe the process as follows.

> "The goal of model calibration was to adjust model parameters (transmissivity, aquifer storage, riverbed conductance and drain conductance and elevation) until model-predicted values of aquifer water levels and discharges to the river matched observed values. The calibration was done in two steps. An initial steady state calibration was done to establish initial aquifer transmissivity and riverbed and drain conductance. After the initial steady state calibration, a coupled steady state and transient calibration was done. During the coupled steady state and transient calibration, the parameter estimation software would adjust aquifer storage and drain elevation during the transient portion, followed by a check of the steady state model fit. This forced the transient calibration to not only provide a 'best fit' to the transient data but to also honor the steady state observations. Changes to the transmissivity field and riverbed and drain conductance were allowed during the coupled steady state/transient calibration."

Cosgrove and others (2006) show comparisons of model predicted ground water levels as compared to field data. They also show model predicted river gains or losses in comparison to observed or calculated river gains or losses. Model output was compared to ground-water levels in selected wells and to calculated or measured reach gains or losses. The comparison of model predicted gain to calculated gain for the Near Blackfoot to Neeley reach is presented in Figure 39. The model predicted gains are a reasonable representation of the calculated gains over time, although with slightly less variability.

Model Representation of Site Hydrogeology

The Snake Plain aquifer model is of necessity a simplification of a complex ground-water flow system with complex interactions with surface water systems. The primary question is whether changes in the model are needed to make it better represent field conditions. Three topics are presented relative to representation of the Near Blackfoot to Neeley hydrogeology within the model.

- The general construction of the model in the vicinity of the Near Blackfoot to Neeley reach is appropriate for the intended uses of the model. However, construction of a single layer model with one-square mile node spacing does not allow assessment of vertical flow within the aquifer or discharge characteristics of individual springs or stream-gain areas.
- Representation of the Snake River including the American Falls Reservoir using the River Package is appropriate. Hydrogeologic conditions are such that higher riverbed conductance values should be applied to the area between the northeastern end of the reservoir and the Near Blackfoot gage than are applied for the body of the reservoir. The conductance value assigned for the reservoir should be low enough relative to the conductance value for the upper portion of the reach to limit direct discharge into the reservoir to a small value.

- The transmissivity array used in the model does not fit the general hydrogeologic setting of a basalt and gravel dominated system north and northeast of the American Falls Reservoir transitioning into a fine-grained, sedimentary-dominated system under the reservoir. Consideration should be given to making changes in model calibration to achieve a transmissivity array that better fits the hydrogeologic conceptual model. Care must be taken in that the transmissivity values of the single layer model need to represent not just the near-surface sediments and basalt but also the deeper basalt units.
- Consideration of multiple layers for the model should be taken carefully. A multiple layer model can provide an improved representation of areas such as upstream of the American Falls Reservoir where vertical hydraulic gradients are present. However, adding multiple layers increases complexity and thus increased uncertainty in model predictions. Also, data may not be currently available to support the construction and application of a multiple layer model.

CONCLUSIONS AND RECOMMENDATIONS

There is little doubt that ground water discharges to the Snake River in the Near Blackfoot to Neeley reach because the transmissivity in the general vicinity of the American Falls Reservoir is lower than in upstream areas. The gravel zone that hosts a shallow ground-water flow system along the Snake River essentially terminates against the fine-grained sediments of the American Falls Lake Beds and the Raft Formation. In the same way, basalt that makes up most of the Snake Plain aquifer occurs only as individual flows within a sequence of mostly fine-grained sediment. The lower transmissivity in the immediate vicinity of the American Falls Reservoir acts similar to a subsurface dam and results in ground-water levels in shallow and deep aquifers northeast of the reservoir at or above ground surface. The springs occur in these areas. There is a significant upward hydraulic gradient which indicates ground-water flows from deeper aquifers to shallow aquifers and then discharges as springs and stream gains.

The majority of ground-water discharge occurs upstream of the American Falls Reservoir, probably controlled dominantly by the subcrop of the Raft Formation. The amount of ground-water discharge directly into the bottom of the reservoir is unknown but believed to be small.

The ground water that discharges to the Snake River in the Near Blackfoot to Neeley reach is a combination of water from the shallow aquifer in gravel zones along the Snake River and upward flow from deeper aquifers that are hydraulically connected to the basalt system of the main Snake Plain aquifer. The percentage of the discharge that originates from the shallow gravel aquifer likely is higher than the percentage that originates from the deeper aquifer, but the relative amounts are unknown.

As with any ground-water system, temporal variations in the ground-water discharge in the Near Blackfoot to Neeley reach of the Snake River are related to water-level changes in the source aquifer. Higher discharge from the springs occurs because of higher ground-water levels. The converse is also true.

Changes in surface-water irrigation practices in recent years have decreased ground-water levels in shallow aquifers and thus have resulted in reduced ground-water

discharge in the Near Blackfoot to Neeley reach. Ground-water pumping has caused ground-water level declines in the main Snake Plain aquifer and is also a factor in reduced ground-water discharge in the Near Blackfoot to Neeley reach. The well hydrographs and the discharge hydrograph for Spring Creek represent a multiple overlay of impacts from changes in surface water irrigation practices combined with the impacts from ground-water pumping.

The Enhanced Snake Plain Aquifer Model (ESPAM) is a work in progress. Model construction and operation and then modification and improvement are part of a repetitive process that is tied to improved data collection and analysis. Specific recommendations with respect to the model include the following.

- Modify the transmissivity array in the Near Blackfoot to Neeley reach to better represent the subsurface hydrogeologic conditions. The changes should be made with the objective of forcing ground-water discharge from the model to occur primarily in the area between the American Falls Reservoir and Ferry Butte.
- Modify the ground-water conductance such that ground-water discharge occurs upstream from the northeast end of the reservoir and little discharge occurs directly to the American Falls Reservoir. The conductance can be modified to allow leakage from the southwestern end of the reservoir.
- To the extent possible, ground-water discharge to the Portneuf River should be represented in the model.

A revision to the existing water resource data collection network is needed in order to provide an improved basis for understanding the interaction of surface and ground-water systems in the Near Blackfoot to Neeley reach of the Snake River. Suggested improvements to the data collection network are noted below.

- Long-term discharge monitoring stations should be established on one or more additional spring/stream sites upstream from the American Falls Reservoir that have no direct impacts from irrigation return flows or diversions. Data analysis should include comparison to data from the Spring Creek station.
- Routine water-level measurement should be reinitiated on observations wells 4S 33E 25ddb and 4S 34E 8dbd. The measurement program should include either monthly measurements or preferably installation of data loggers.
- Additional collection of water-level data from shallow wells in the immediate vicinity of the Snake and Portneuf Rivers and near major springs is needed to develop a better understanding of ground-water levels and spring discharge and/or river gains.

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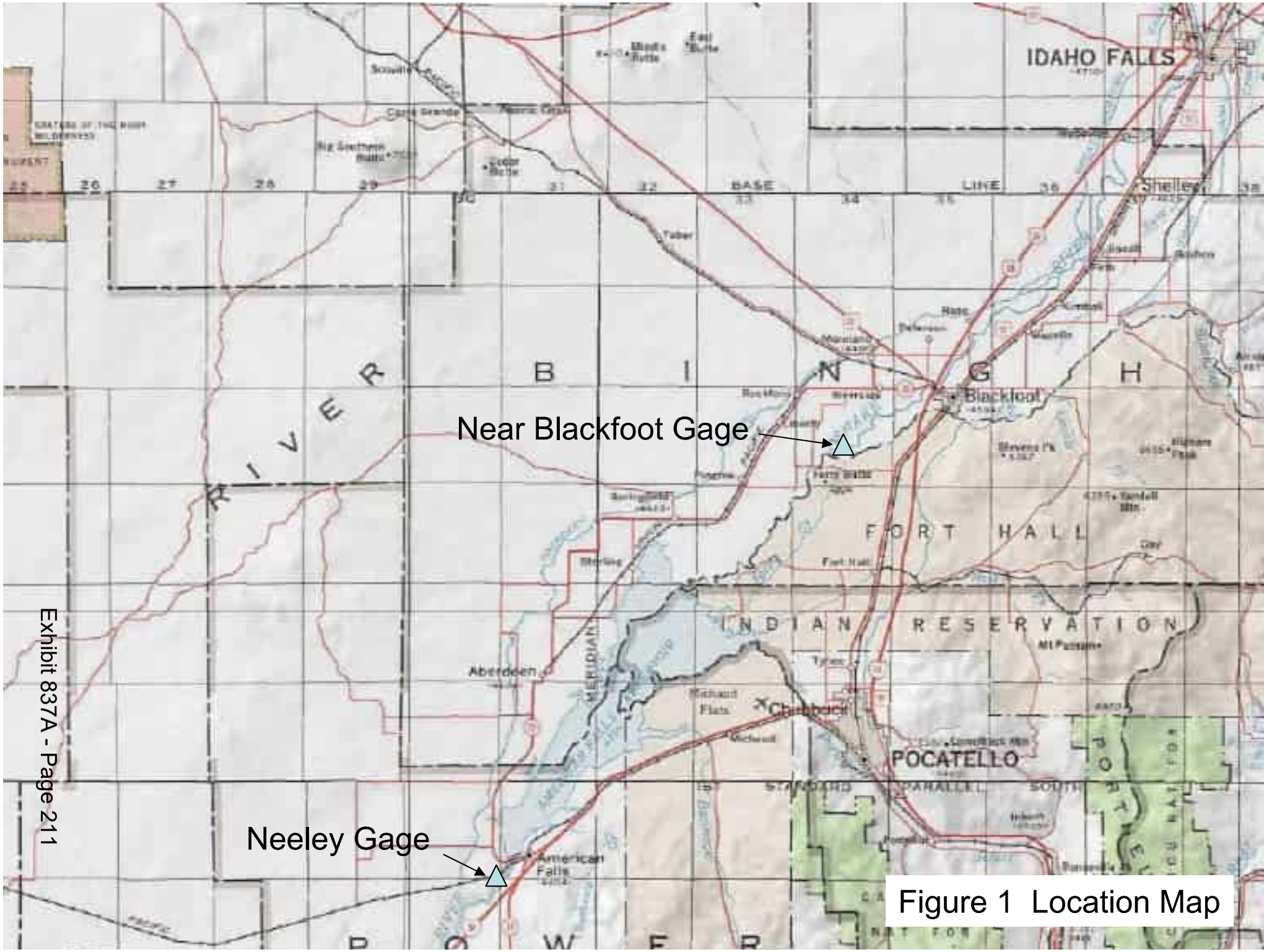
IDAHO FALLS
Shelley
Blackfoot
Near Blackfoot Gage
RIVER
BINGH
FORT HALL
INDIAN RESERVATION
Aberdeen
Chubbuck
POCATELLO
Neeley Gage
American Falls
Figure 1 Location Map

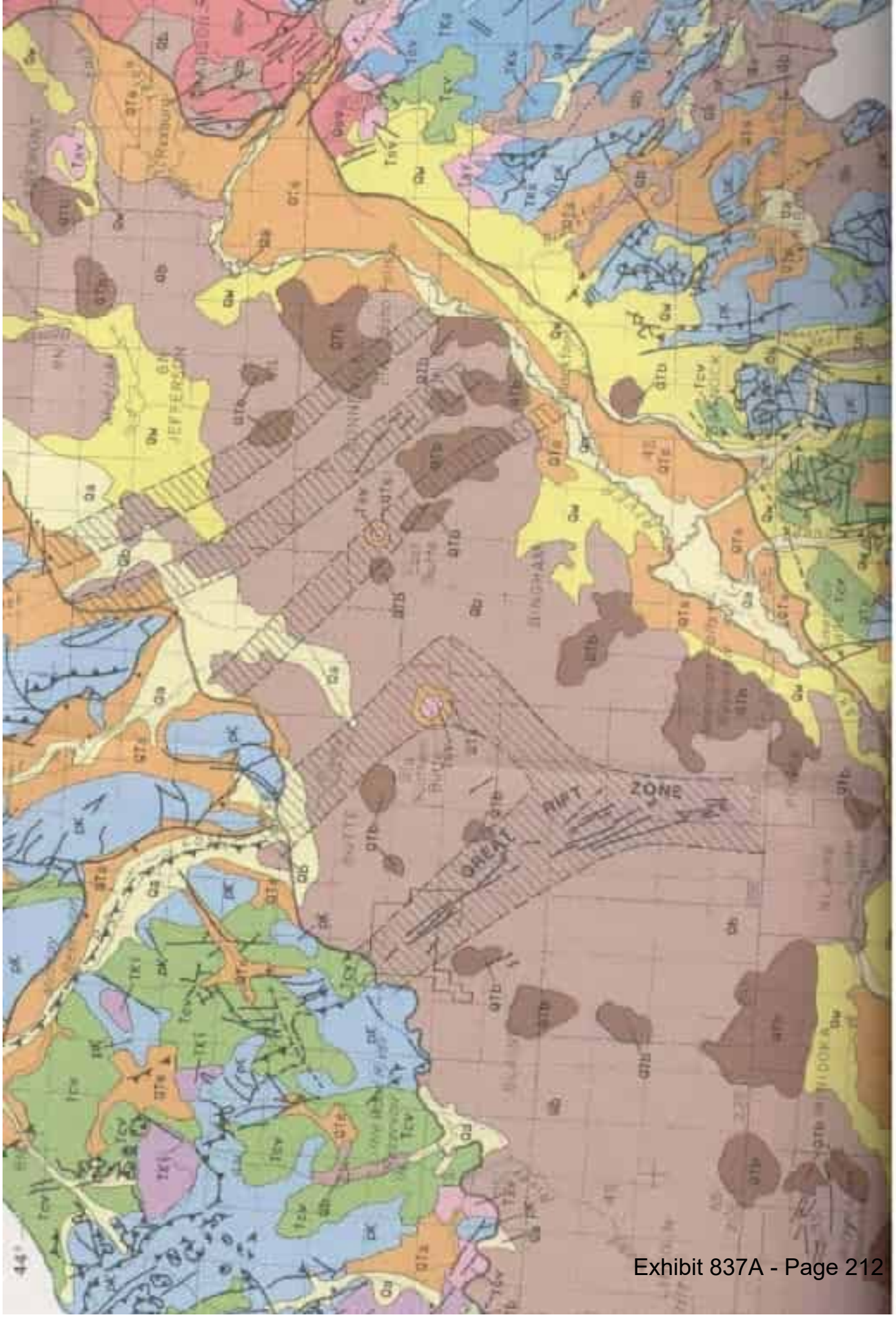

Figure 2a Regional Geologic Map (Whitehead, 1992)

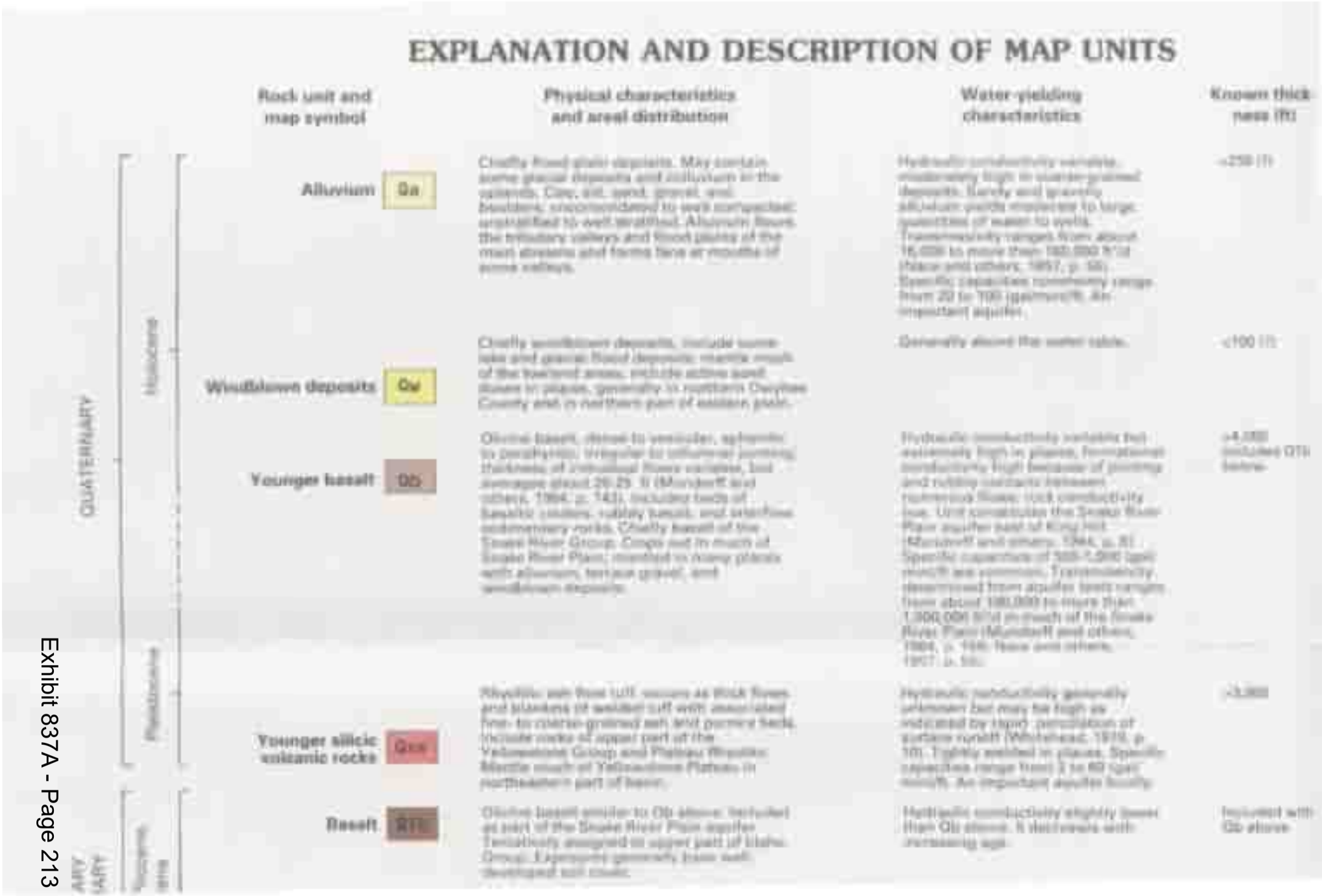

Figure 2b Regional Geologic Map (Whitehead, 1992)

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Figure 2c Regional Geologic Map (Whitehead, 1992)

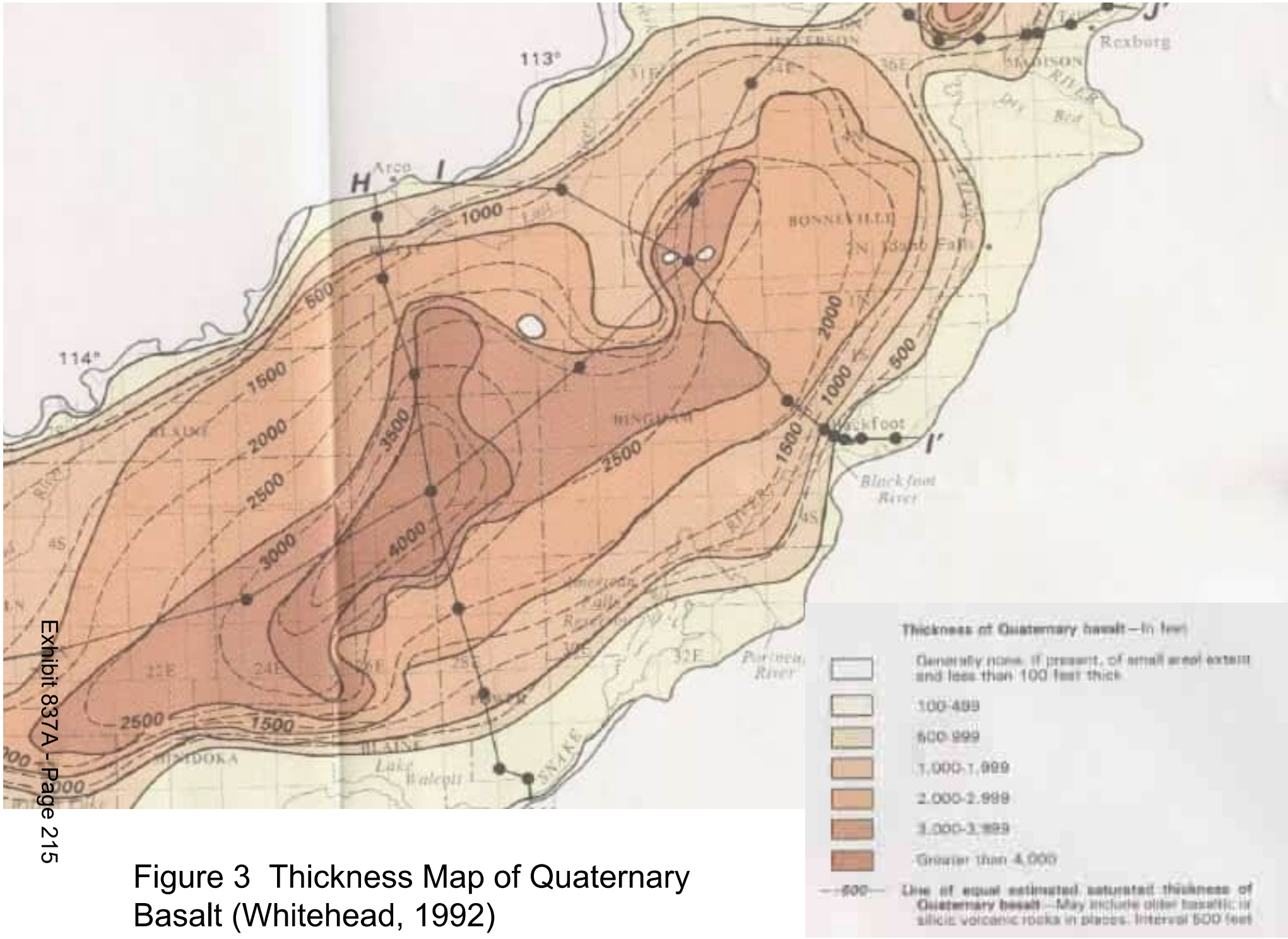

Figure 3 Thickness Map of Quaternary Basalt (Whitehead, 1992)

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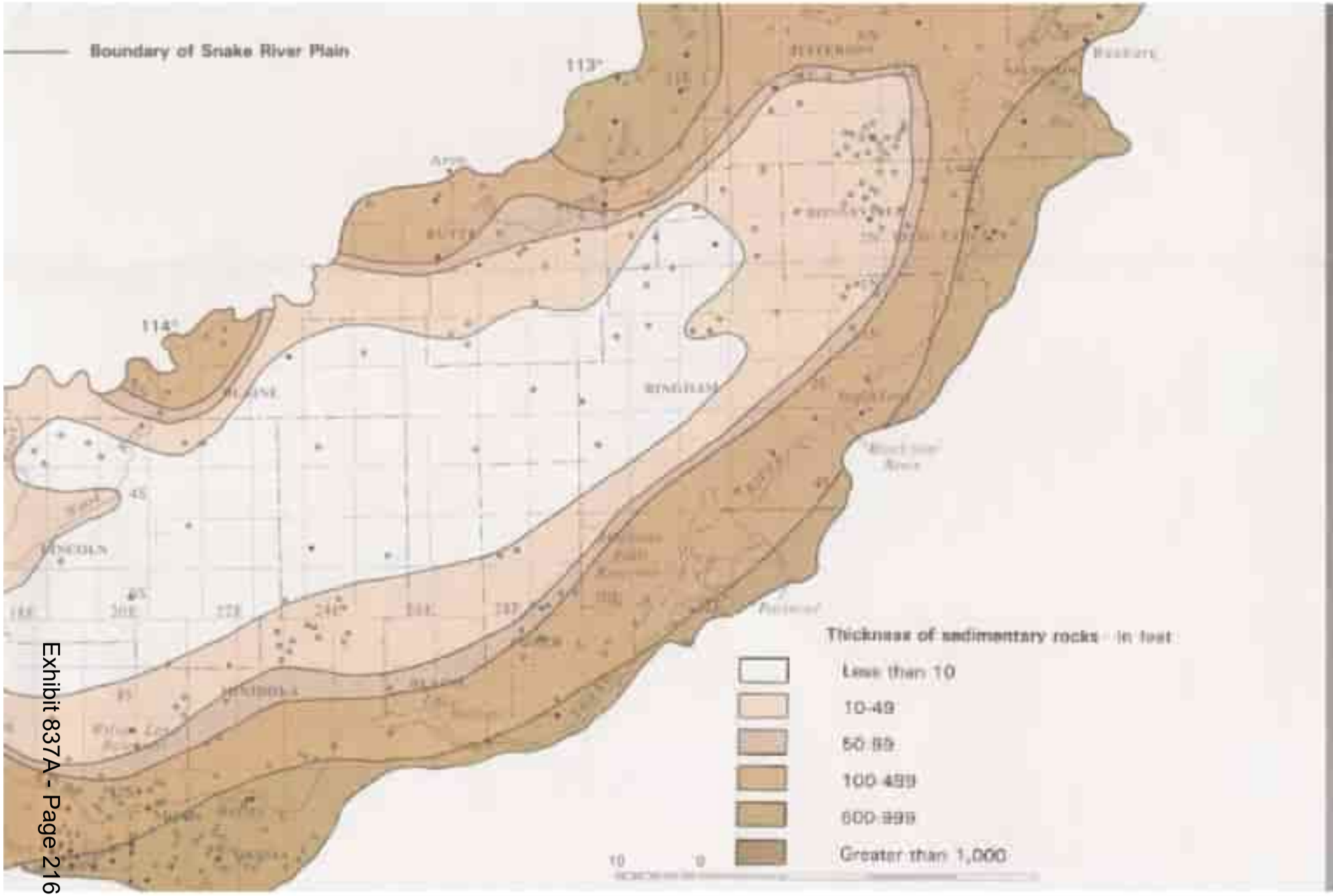


Figure 4 Thickness Map of Sediment (Whitehead, 1992)

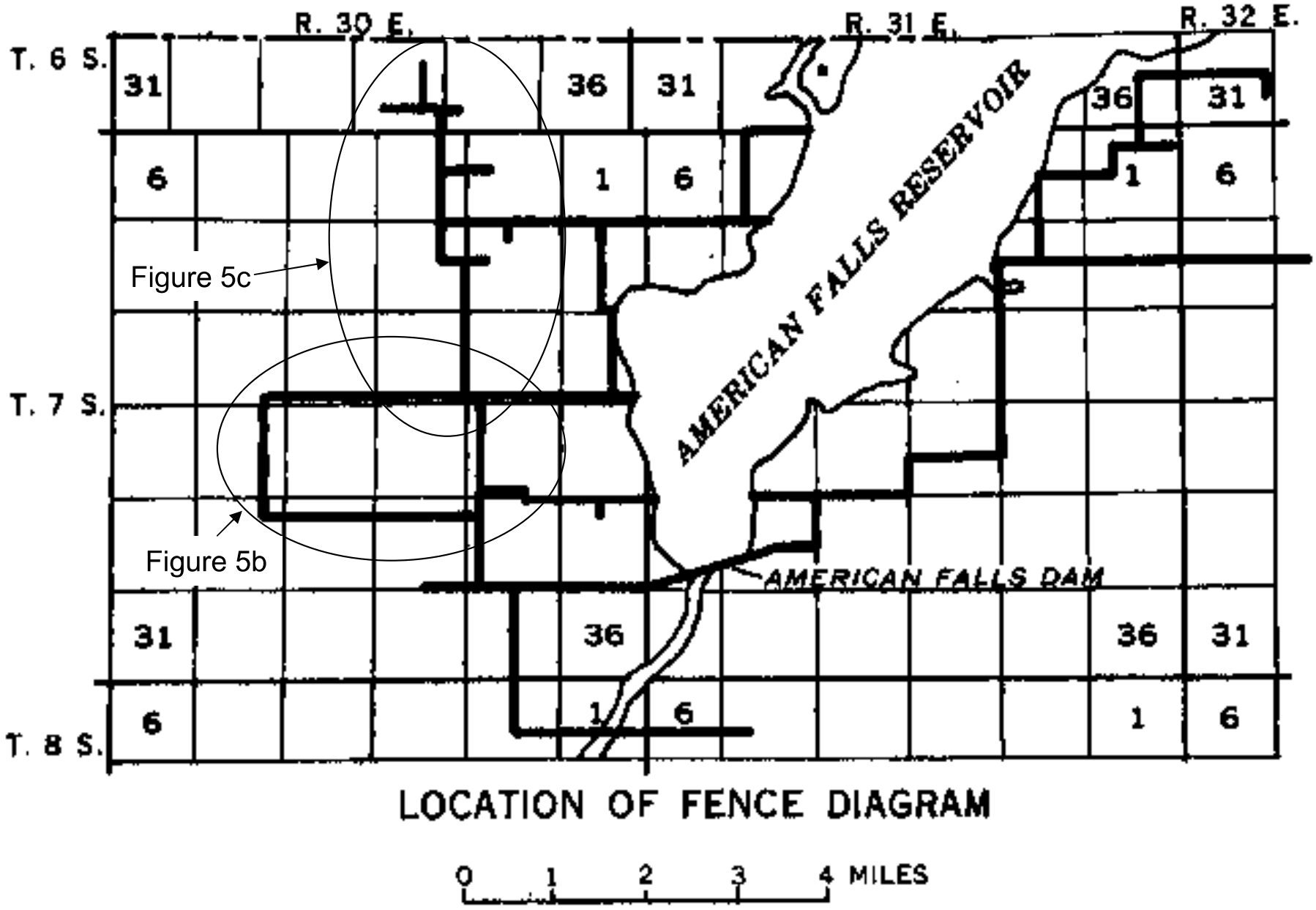


Figure 5a Fence Diagram – Location Map (Mundorff, 1967)

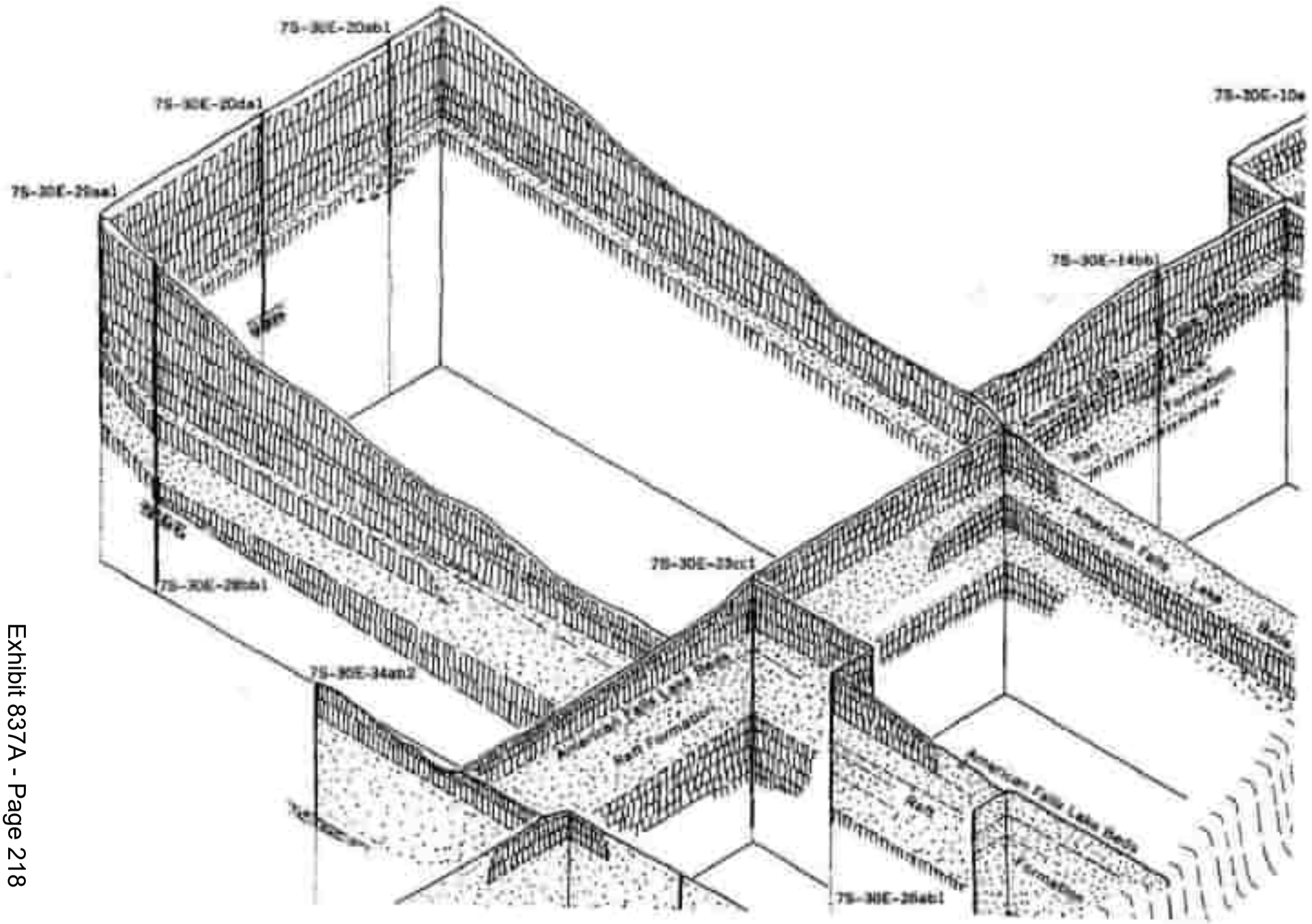


Figure 5b Fence Diagram – West Portion (Mundorff, 1967)

002879

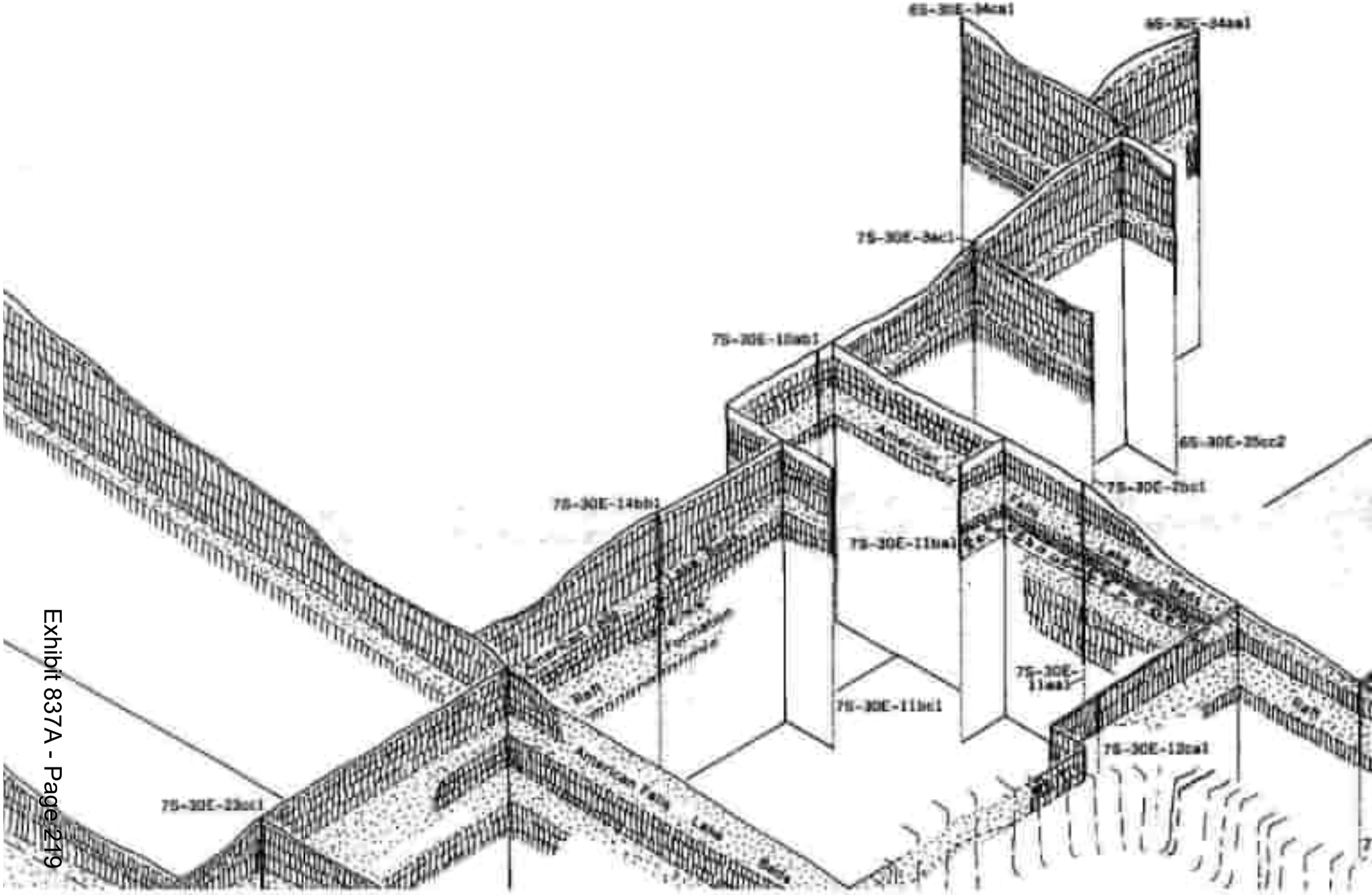


Figure 5c Fence Diagram – Northwest Portion (Mundorff, 1967)

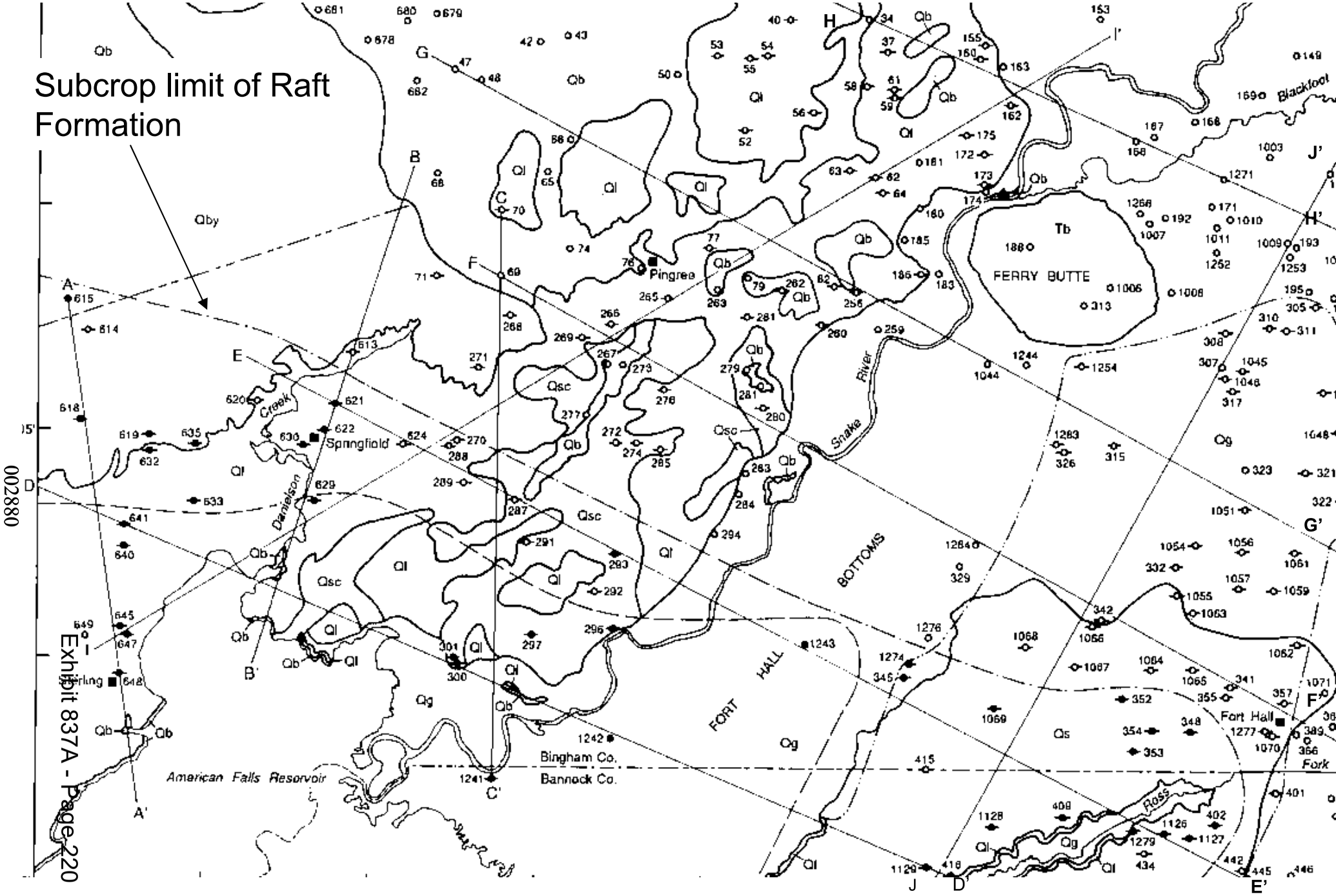
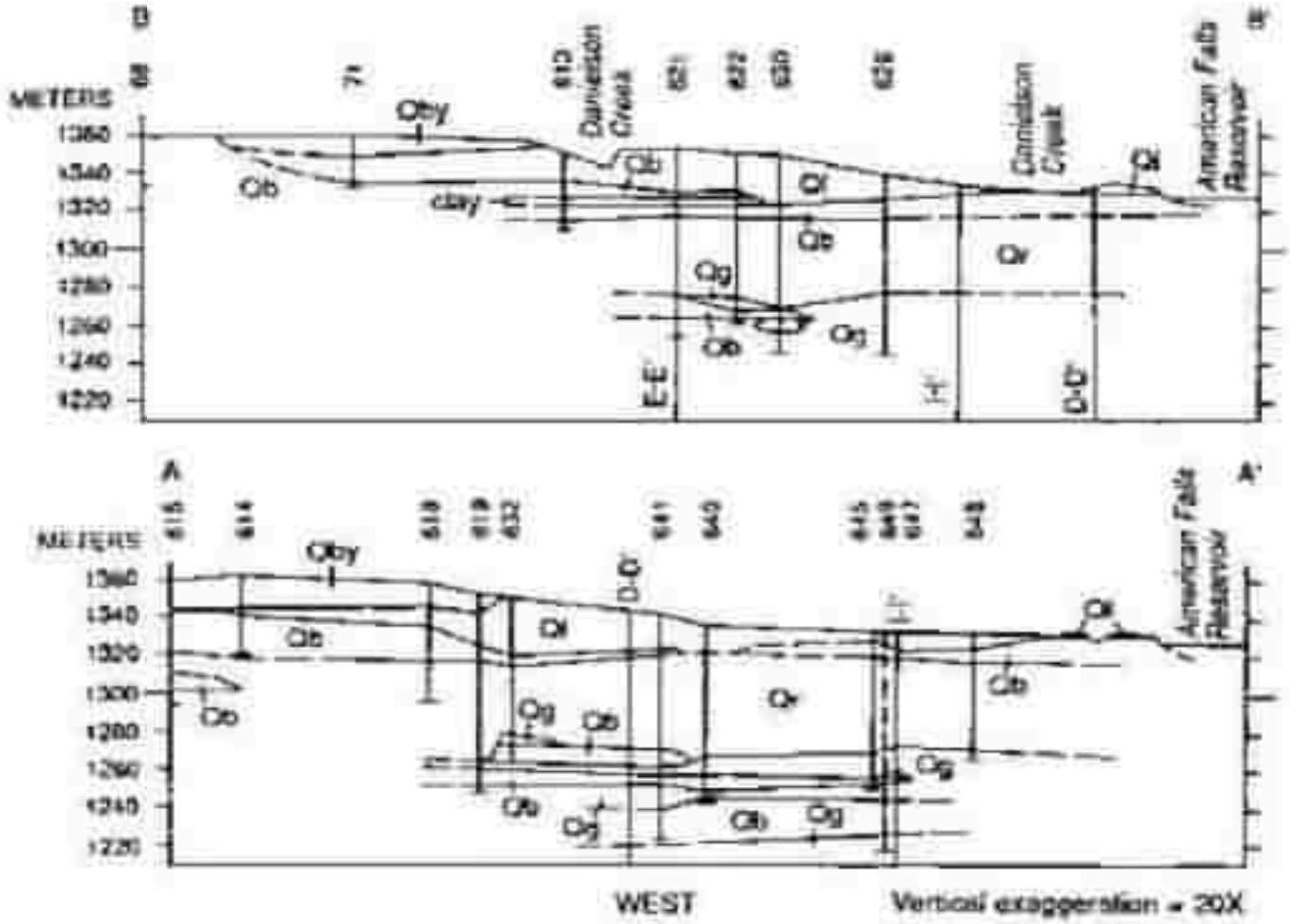


Figure 6 Geologic Map of Area Northeast of American Falls Reservoir Showing Locations of Cross Sections (Houser, 1992)



Qal Alluvial fan deposits (Holocene and Pleistocene)
Qsr Snake River gravel deposits (Holocene and Pleistocene)
Qsc Scabland deposits (upper Pleistocene)
Qs Sand (upper Pleistocene)
Qr American Falls Lake Beds (upper Pleistocene)
Qby Young basalt (upper Pleistocene)
Qb Basalt (Pleistocene)
Qg Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb Basalt of Buckskin Basin (Pliocene)
Tvu Undifferentiated volcanic rocks (Miocene)

Figure 7a Geologic Cross Sections A-A' and B-B' (Houser, 1992)

002881
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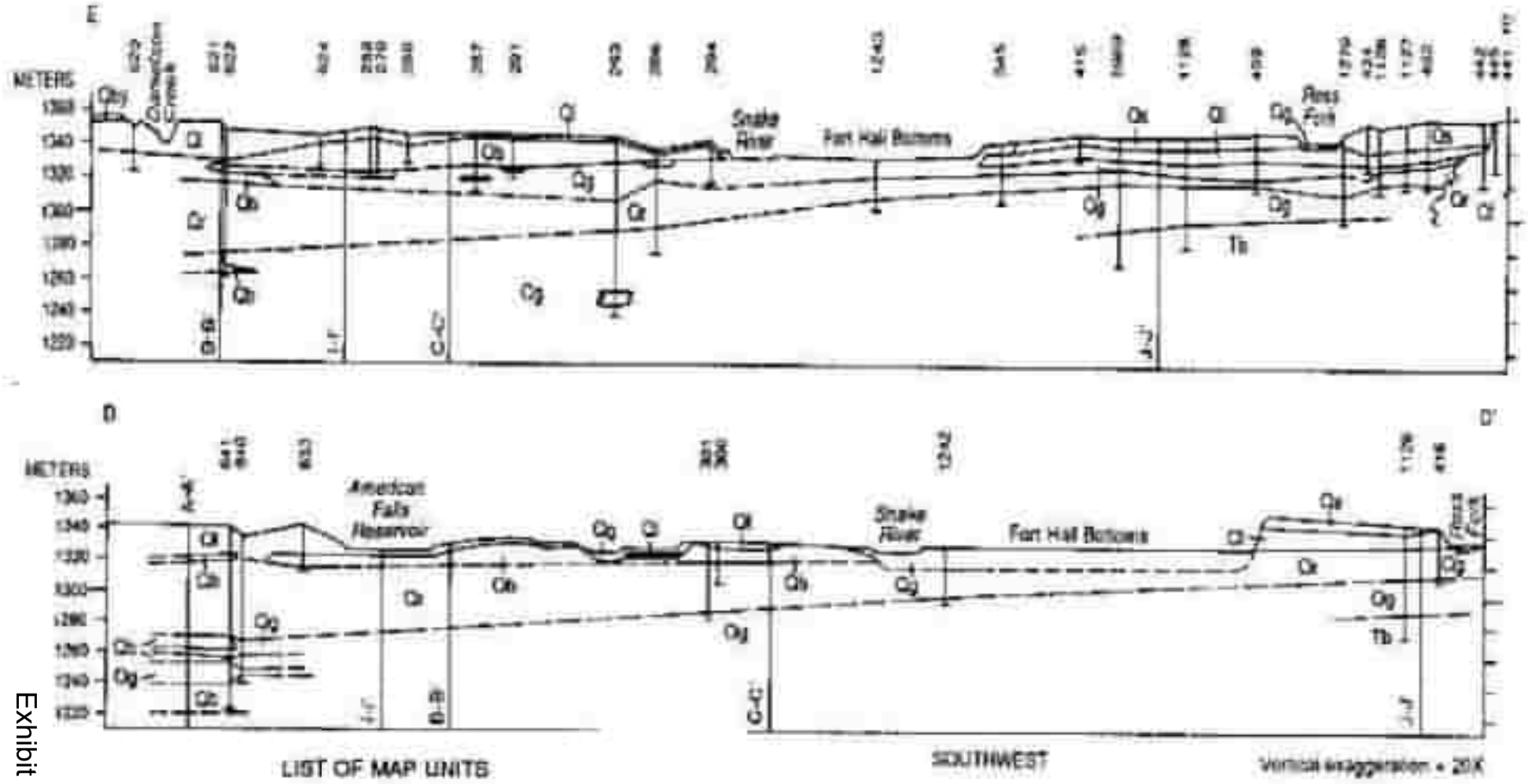

LIST OF MAP UNITS

Qf	Alluvial fan deposits (Holocene and Pleistocene)
Qg	Snake River gravel deposits (Holocene and Pleistocene)
Qsc	Scabland deposits (upper Pleistocene)
Qs	Sand (upper Pleistocene)
Ql	American Falls Lake Beds (upper Pleistocene)
Qby	Young basalt (upper Pleistocene)
Qb	Basalt (Pleistocene)
Qr	Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb	Basalt of Buckskin Basin (Pliocene)
Tvu	Undifferentiated volcanic rocks (Miocene)

Figure 7b Geologic Cross Sections D-D' and E-E' (Houser, 1992)

002882

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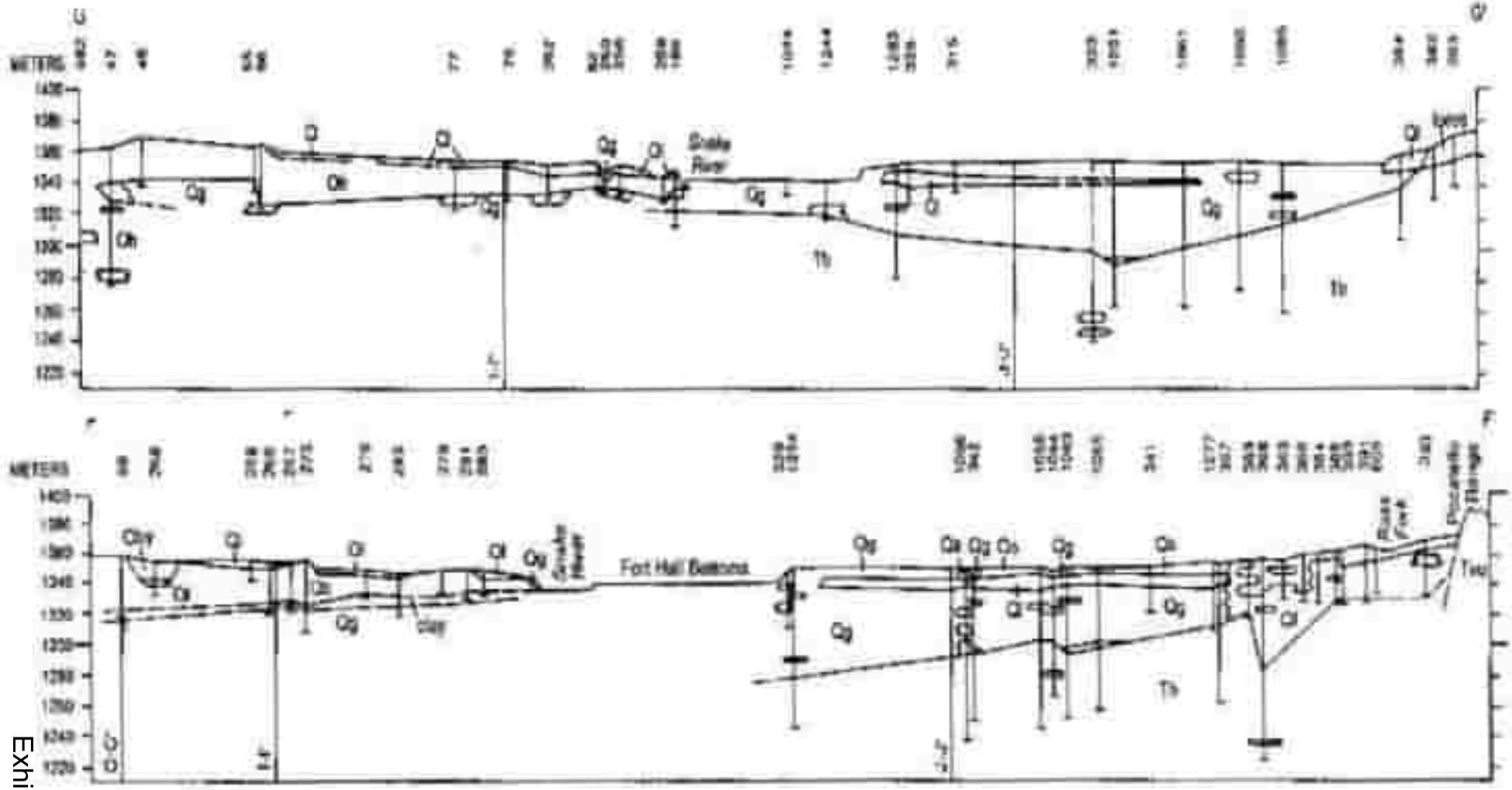

LIST OF MAP UNITS

Qt	Alluvial fan deposits (Holocene and Pleistocene)
Qs	Snake River gravel deposits (Holocene and Pleistocene)
Qsc	Scabland deposits (upper Pleistocene)
Qs	Sand (upper Pleistocene)
Ql	American Falls Lake Beds (upper Pleistocene)
Qby	Young basalt (upper Pleistocene)
Qb	Basalt (Pleistocene)
Qr	Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb	Basalt of Buckskin Basin (Pliocene)
Tvu	Undifferentiated volcanic rocks (Miocene)

Figure 7c Geologic Cross Sections F-F' and G-G' (Houser, 1992)

002883

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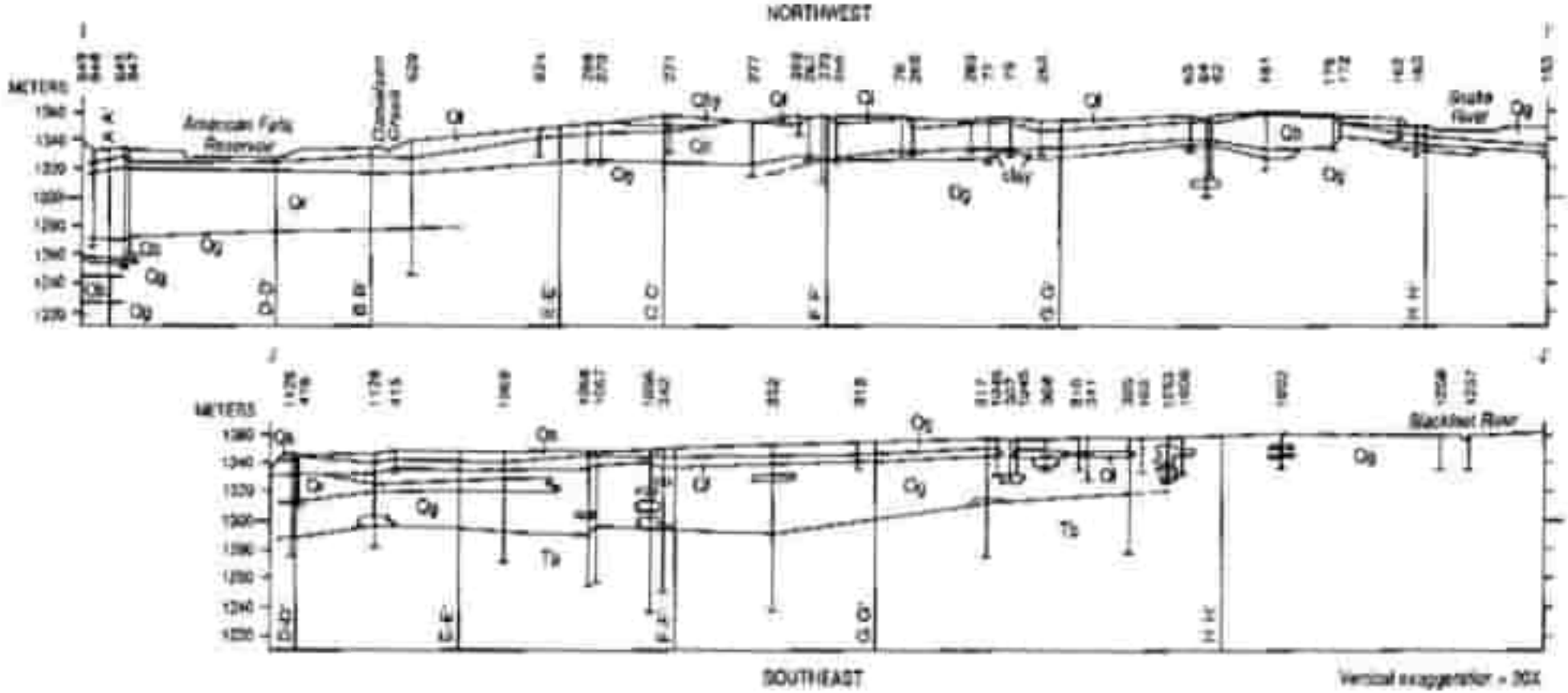

LIST OF MAP UNITS

Qf	Alluvial fan deposits (Holocene and Pleistocene)
Qg	Snake River gravel deposits (Holocene and Pleistocene)
Qsc	Scabland deposits (upper Pleistocene)
Qs	Sand (upper Pleistocene)
Qr	American Falls Lake Beds (upper Pleistocene)
Qby	Young basalt (upper Pleistocene)
Qb	Basalt (Pleistocene)
Qr	Raft Formation (middle and lower? Pleistocene) - cross sections only
Tb	Basalt of Bucklin Basin (Pliocene)
Tvu	Undifferentiated volcanic rocks (Miocene)

Figure 7d Geologic Cross Sections I-I' and J-J' (Houser, 1992)

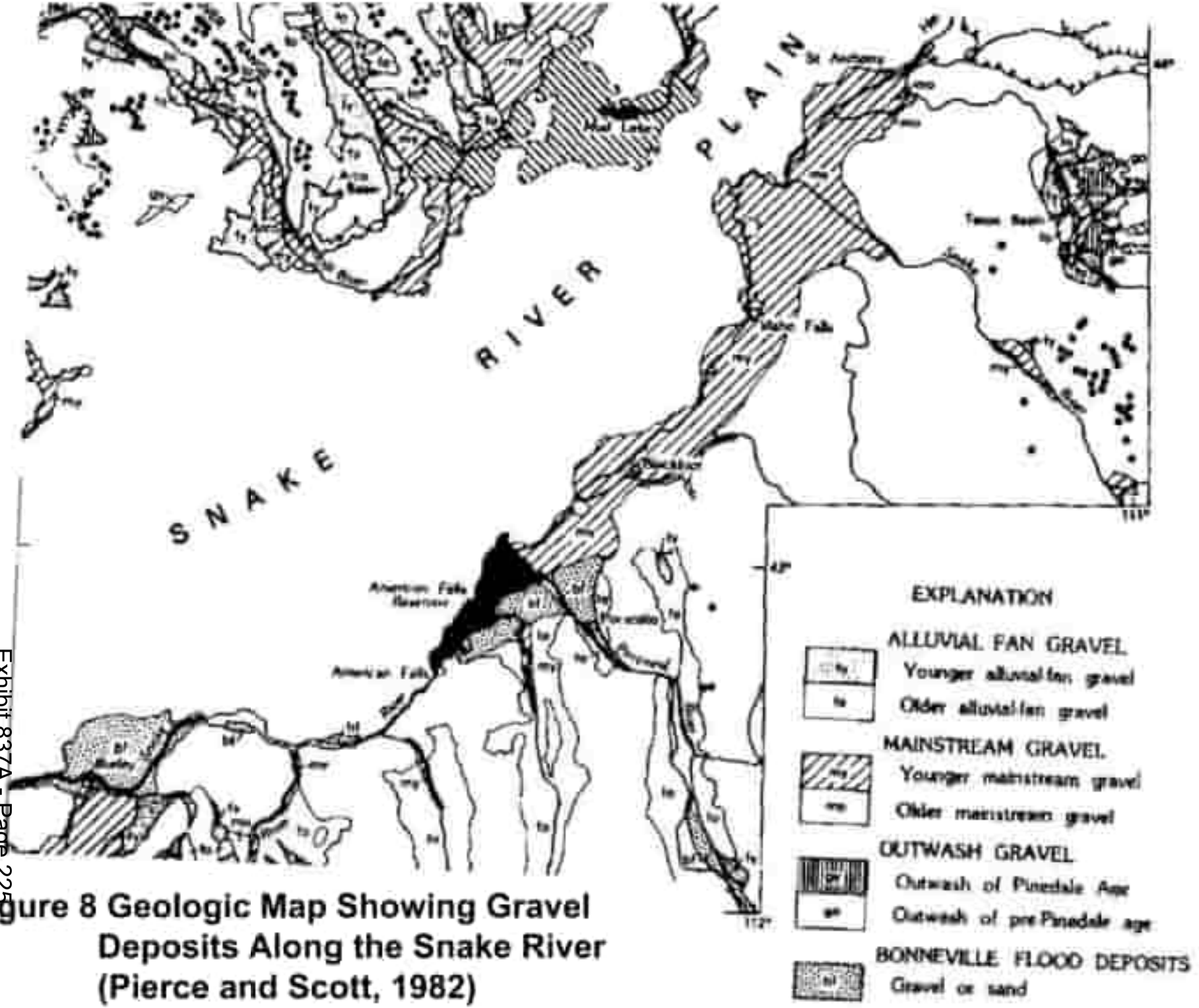

Figure 8 Geologic Map Showing Gravel Deposits Along the Snake River (Pierce and Scott, 1982)

002885

Figure 9 Spring Location Map From Stearns and Others (1938)

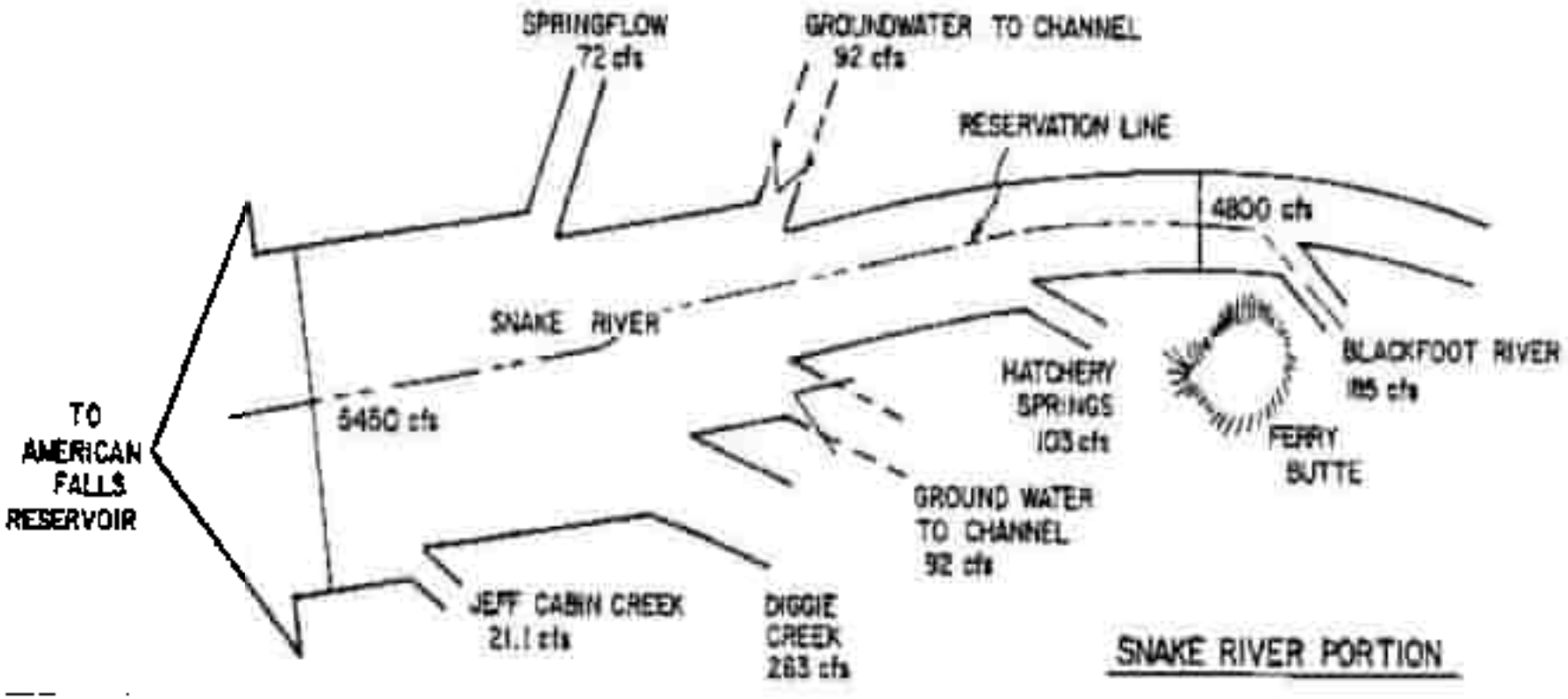

Figure 10A Fort Hall Bottoms Water Budget –Snake River Portion
(Balmer and Noble, 1979)

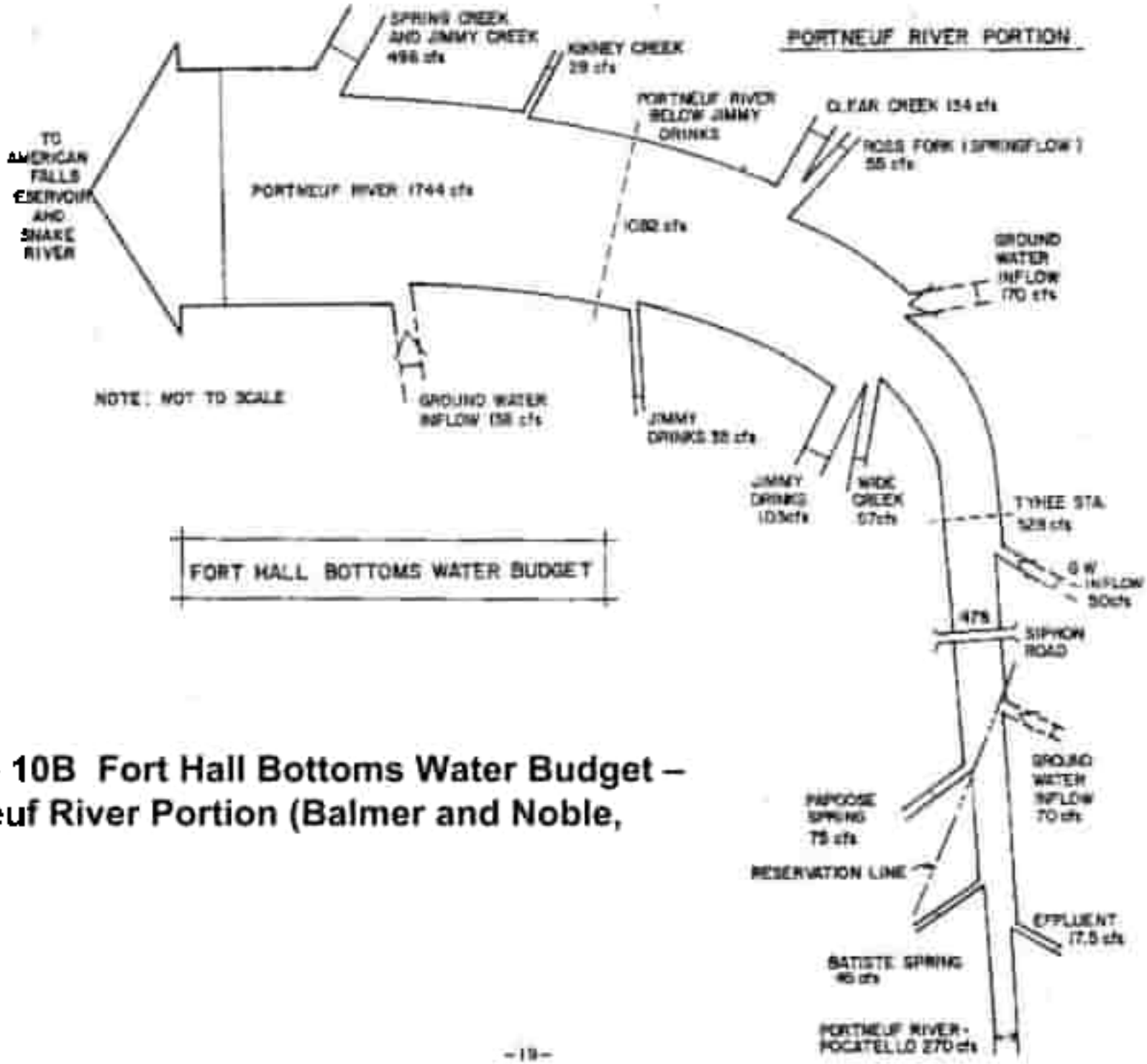

Figure 10B Fort Hall Bottoms Water Budget – Portneuf River Portion (Balmer and Noble, 1979)

002888

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Figure 11 Seepage Run Results for April 2002 (Hortness and Vidmar, 2003)

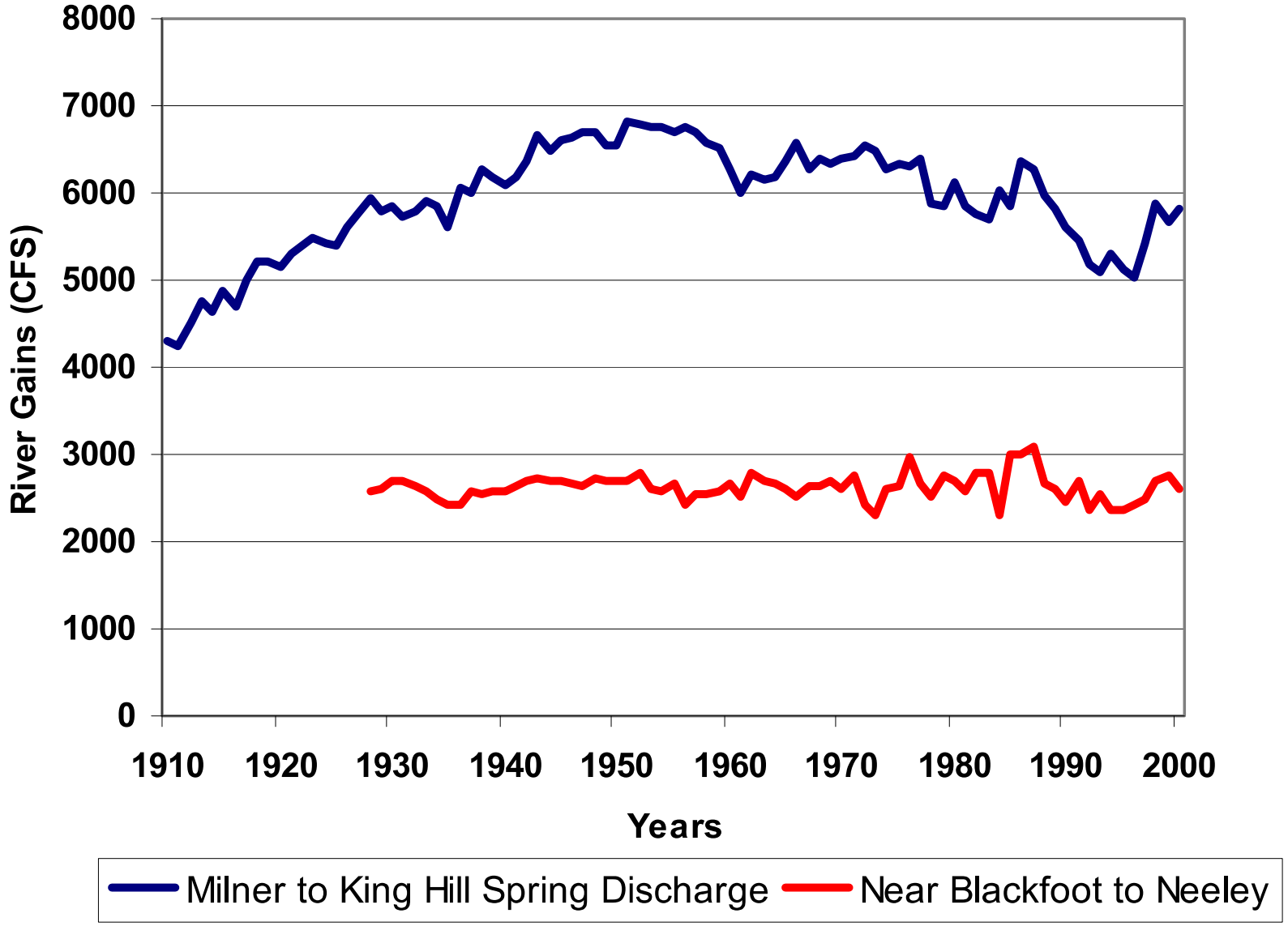

Figure 12 Average Annual River Gains from Near Blackfoot to Neeley Calculated by the IDWR Reach Gain/Loss Program (from Cosgrove and others 2006)

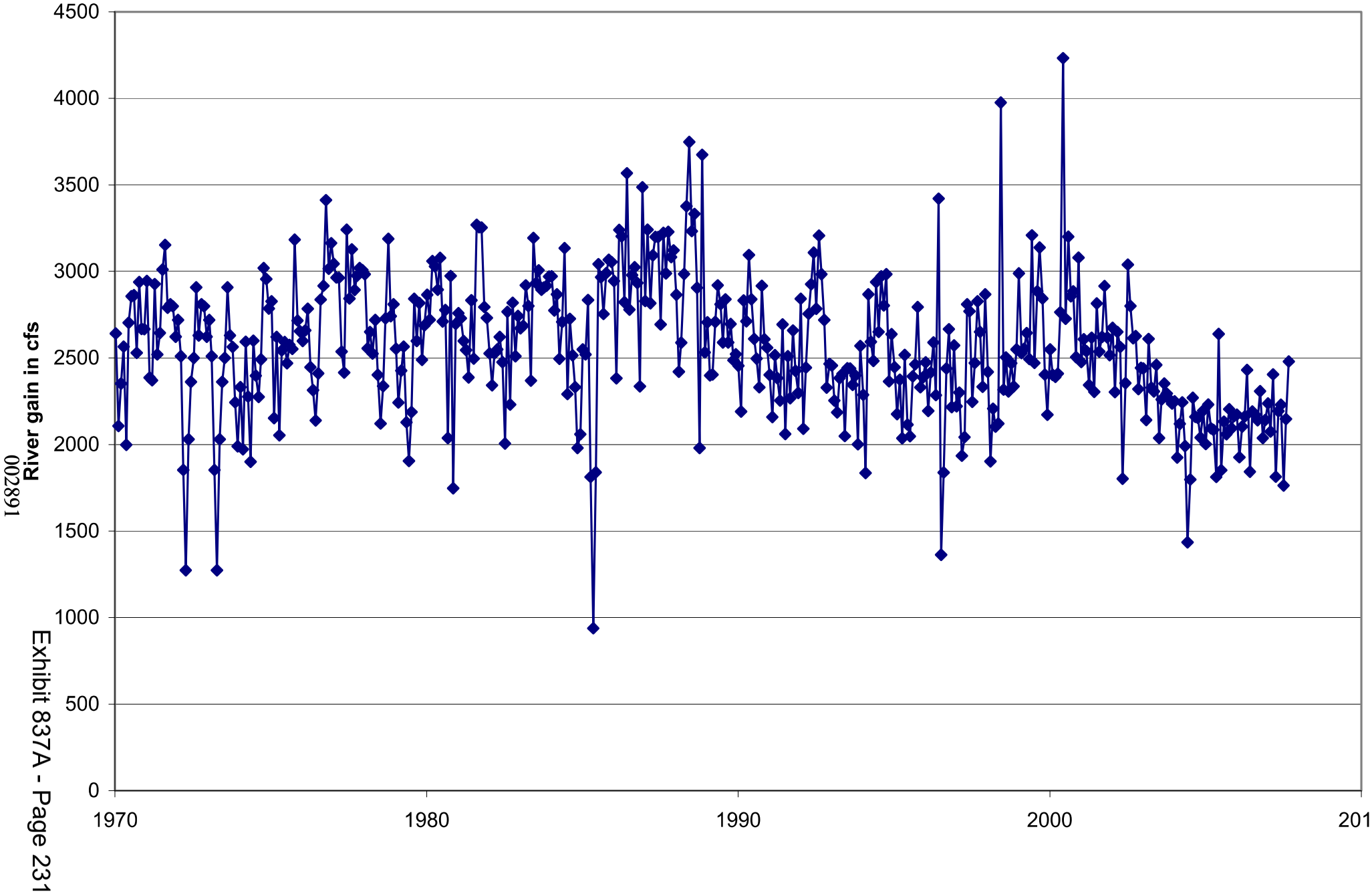

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Figure 13 Average Monthly Calculated Snake River Gain -- Near Blackfoot to Neeley Reach

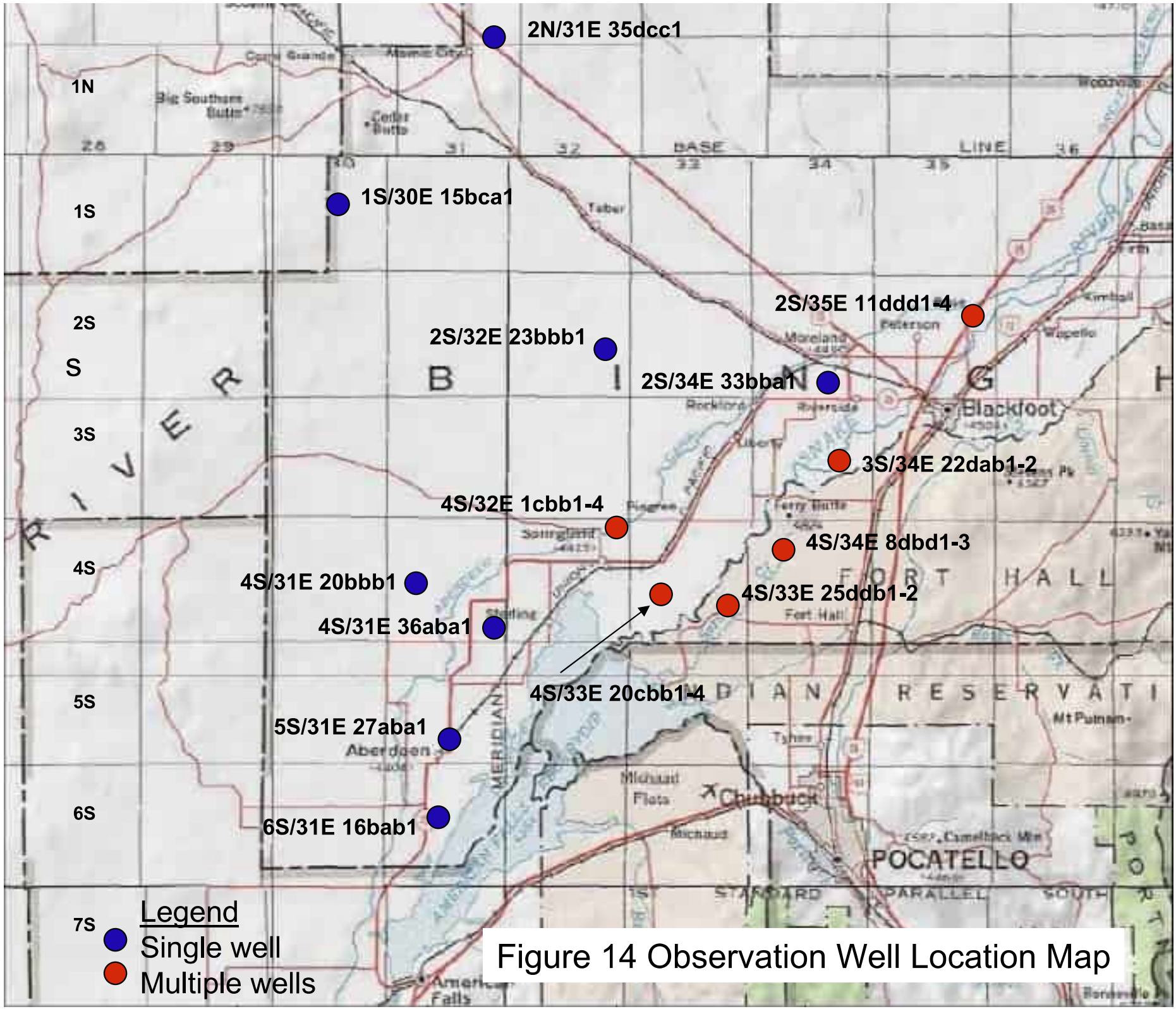

Figure 14 Observation Well Location Map

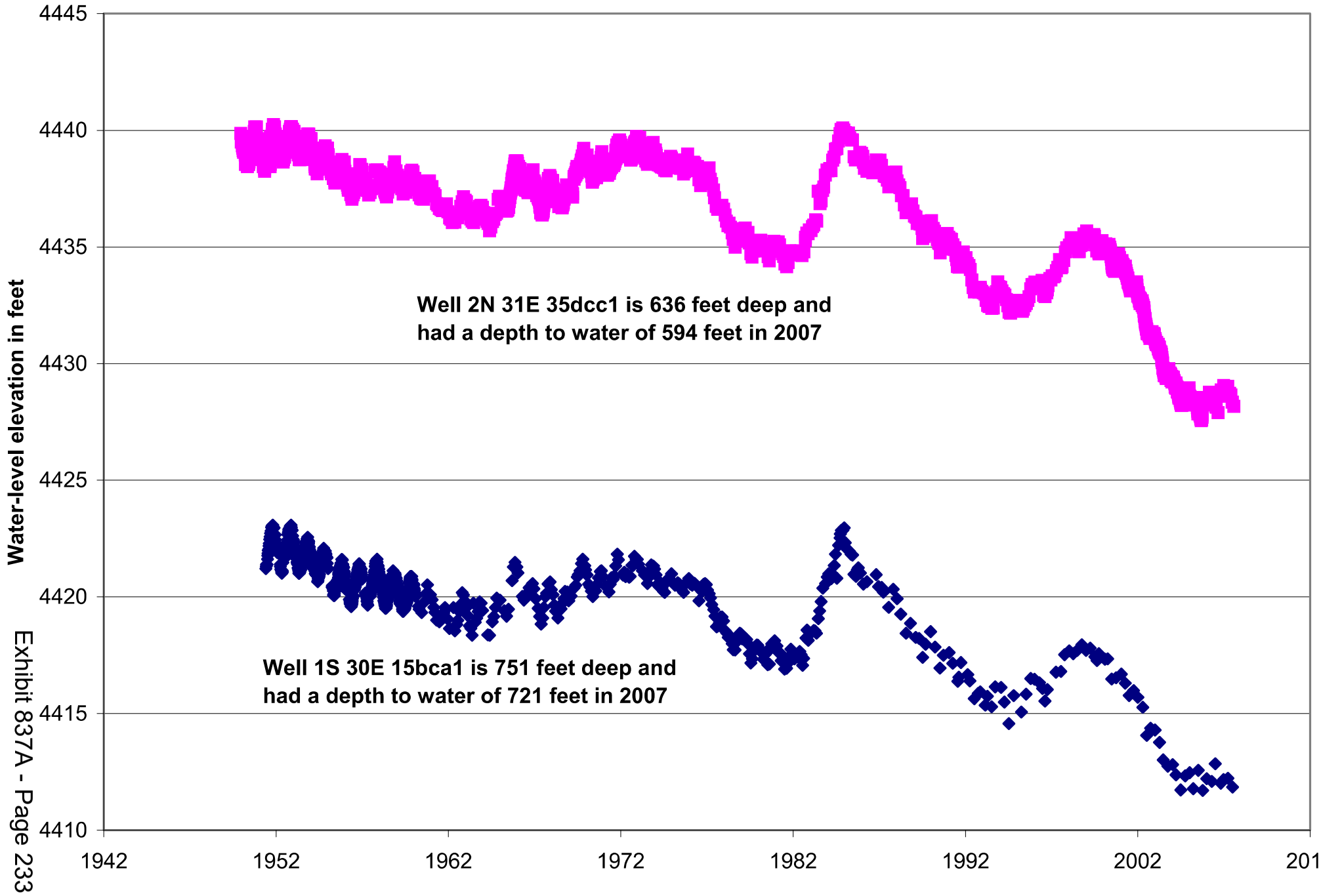

Figure 15 Hydrographs for Wells 2N 31E 35dcc1 and 1S 30E 15bca1

002893
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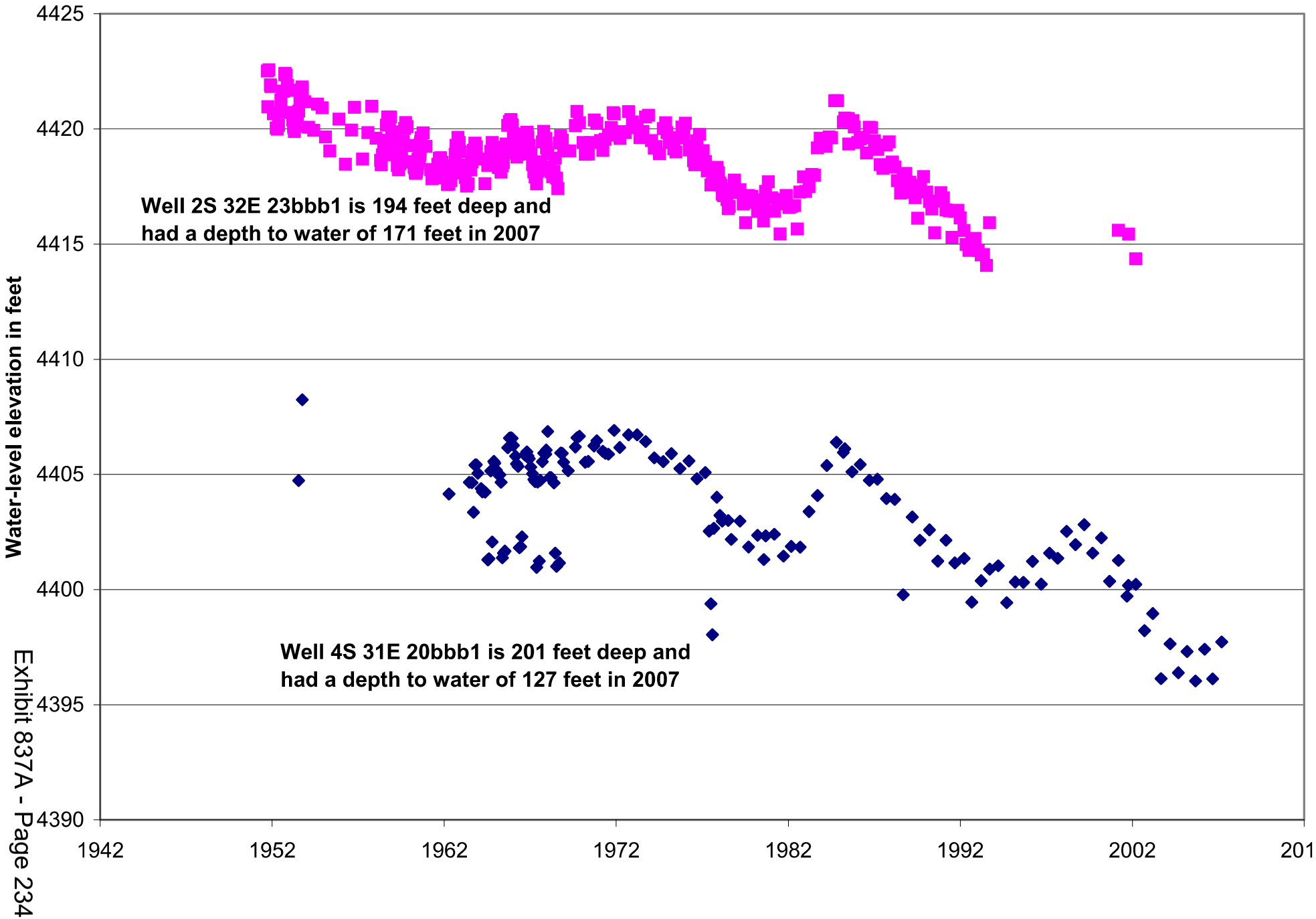

Figure 16 Hydrographs for Wells 2S 32E 23bbb1 and 4S 31E 20bbb1

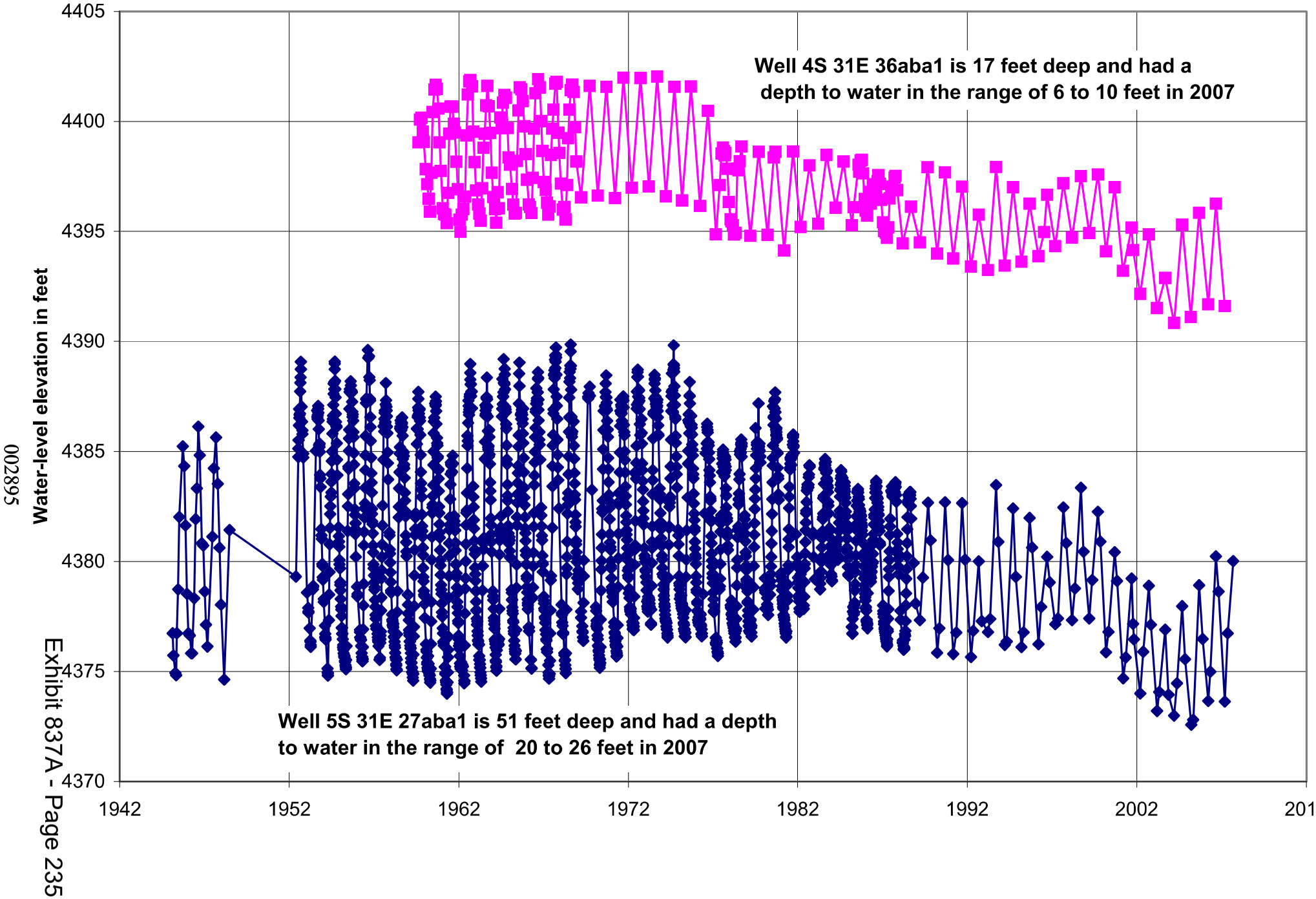

Figure 17 Hydrographs for Wells 4S 31E 36aba1 and 5S 31E 27aba1

002895

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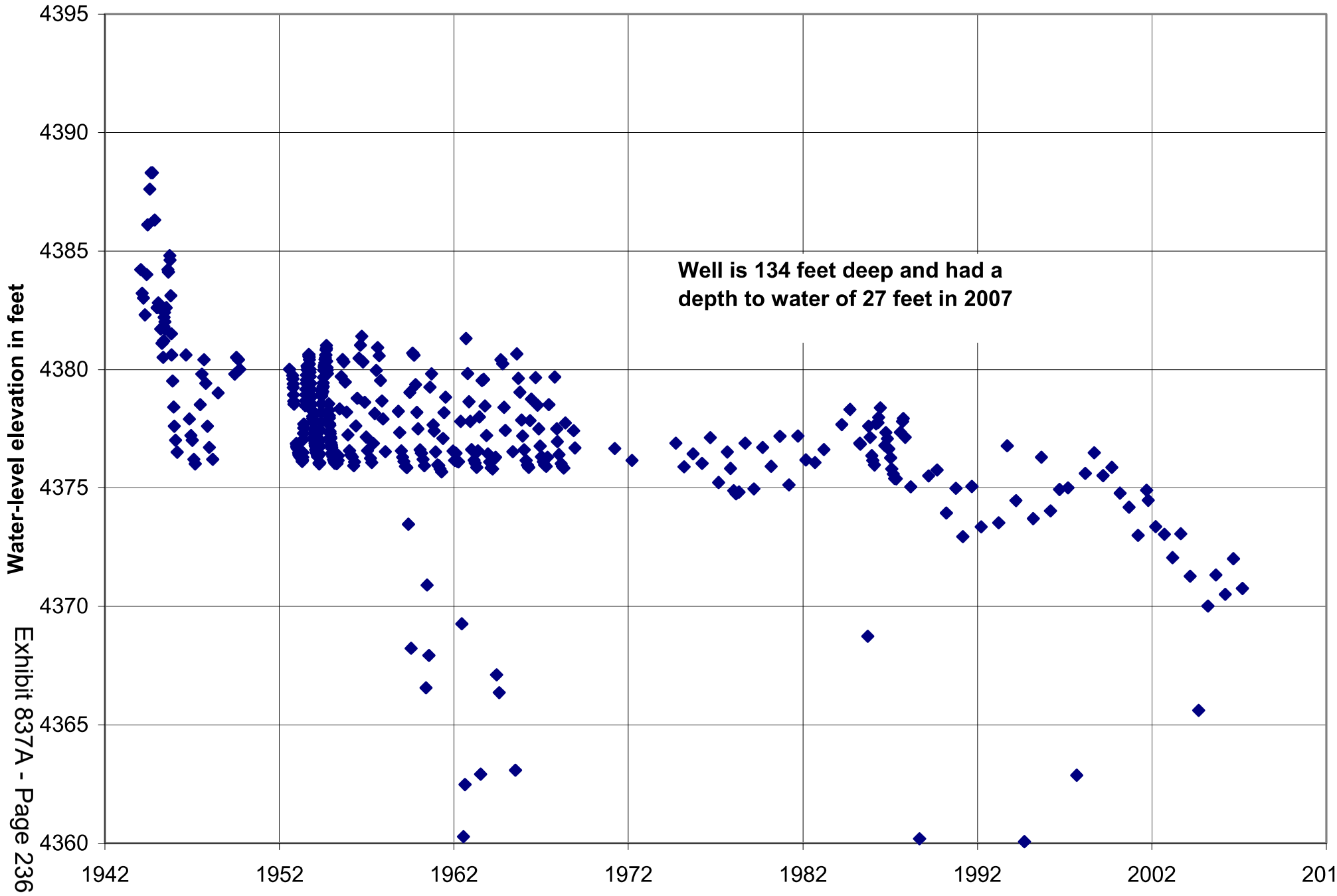

002896

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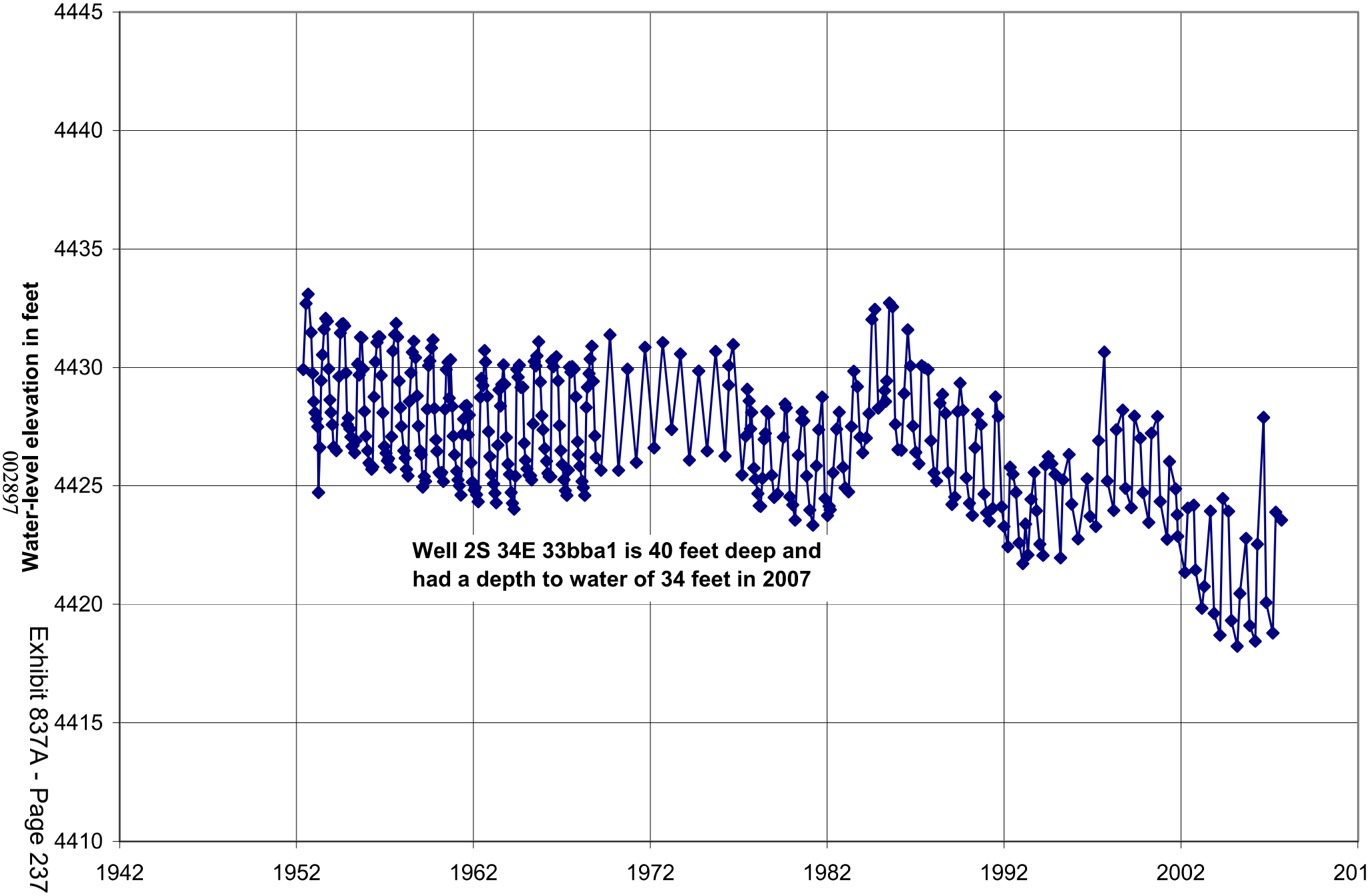
Figure 18 Hydrograph for Well 6S 31E 16bab1



002897

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Figure 19 Hydrograph for Well 2S 34E 33bba1

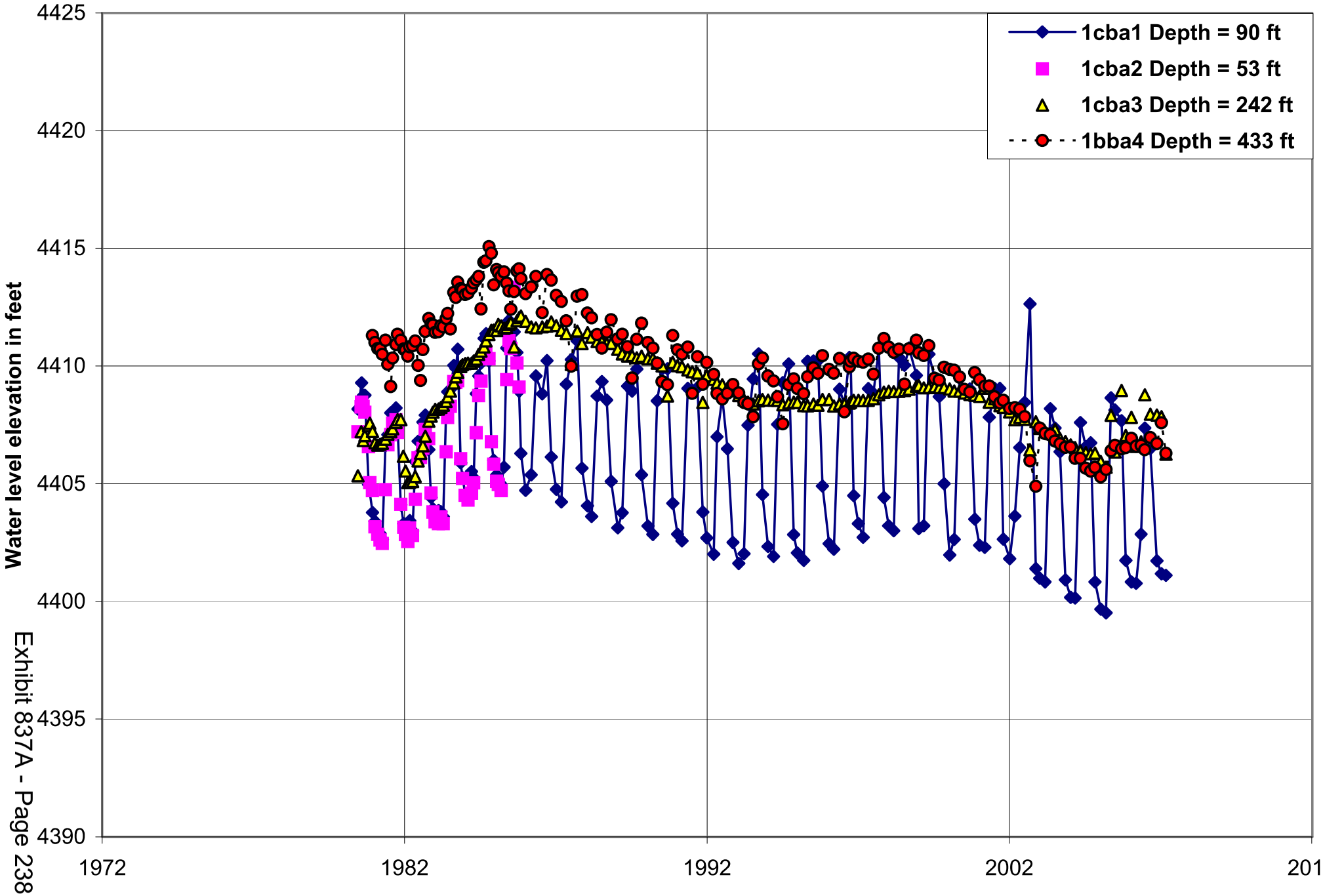

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Figure 20 Hydrographs for Wells 4S 32E 1cba1-4

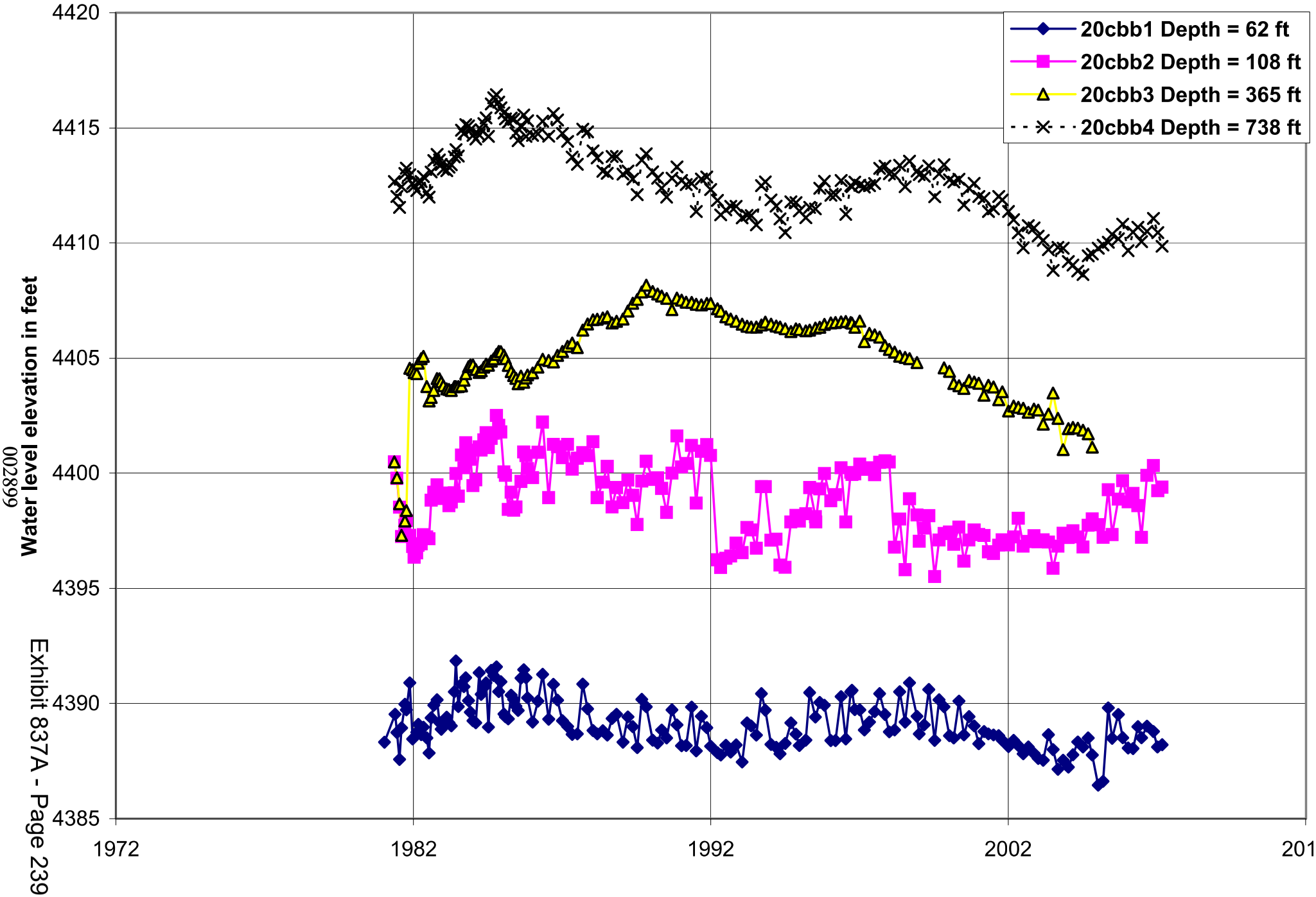

Figure 21 Hydrographs for Wells 4S 33E 20cbb1-4

002899
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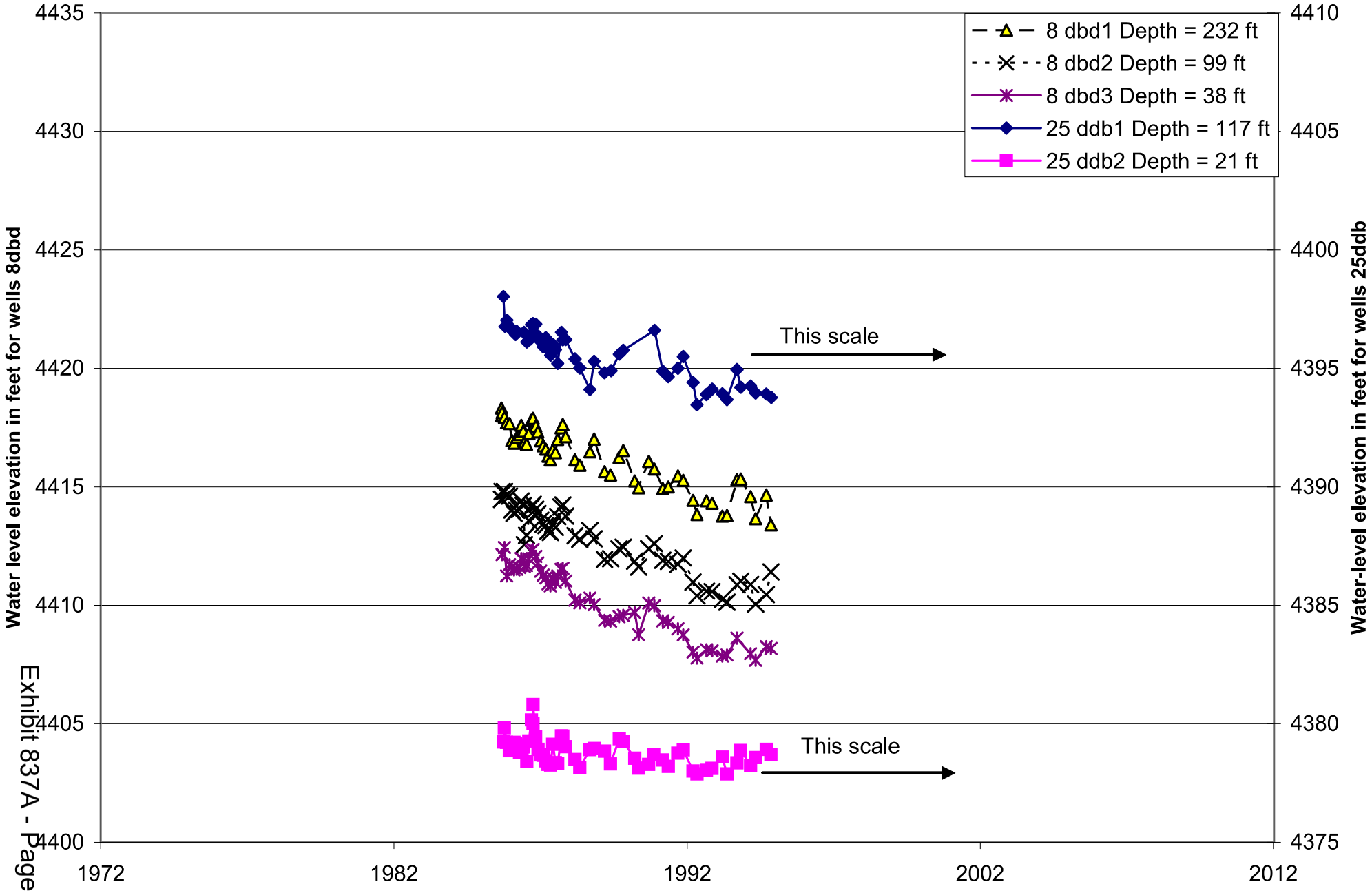
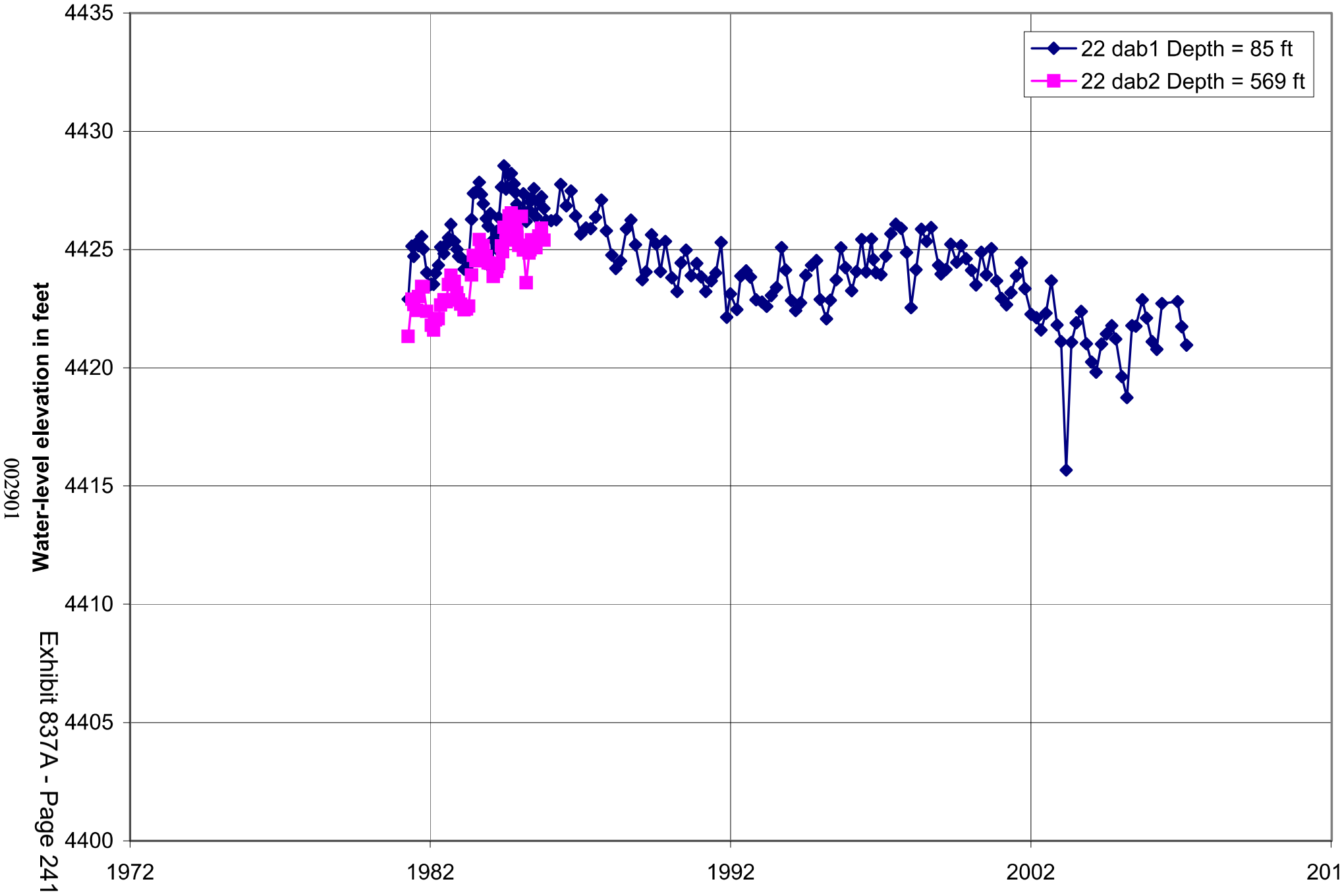


Figure 22 Hydrographs for Wells 4S 33E 25ddb1-2 and 4S 34E 8dbd1-3



002901

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Figure 23 Hydrographs for Wells 3S 34E 22dab1-2

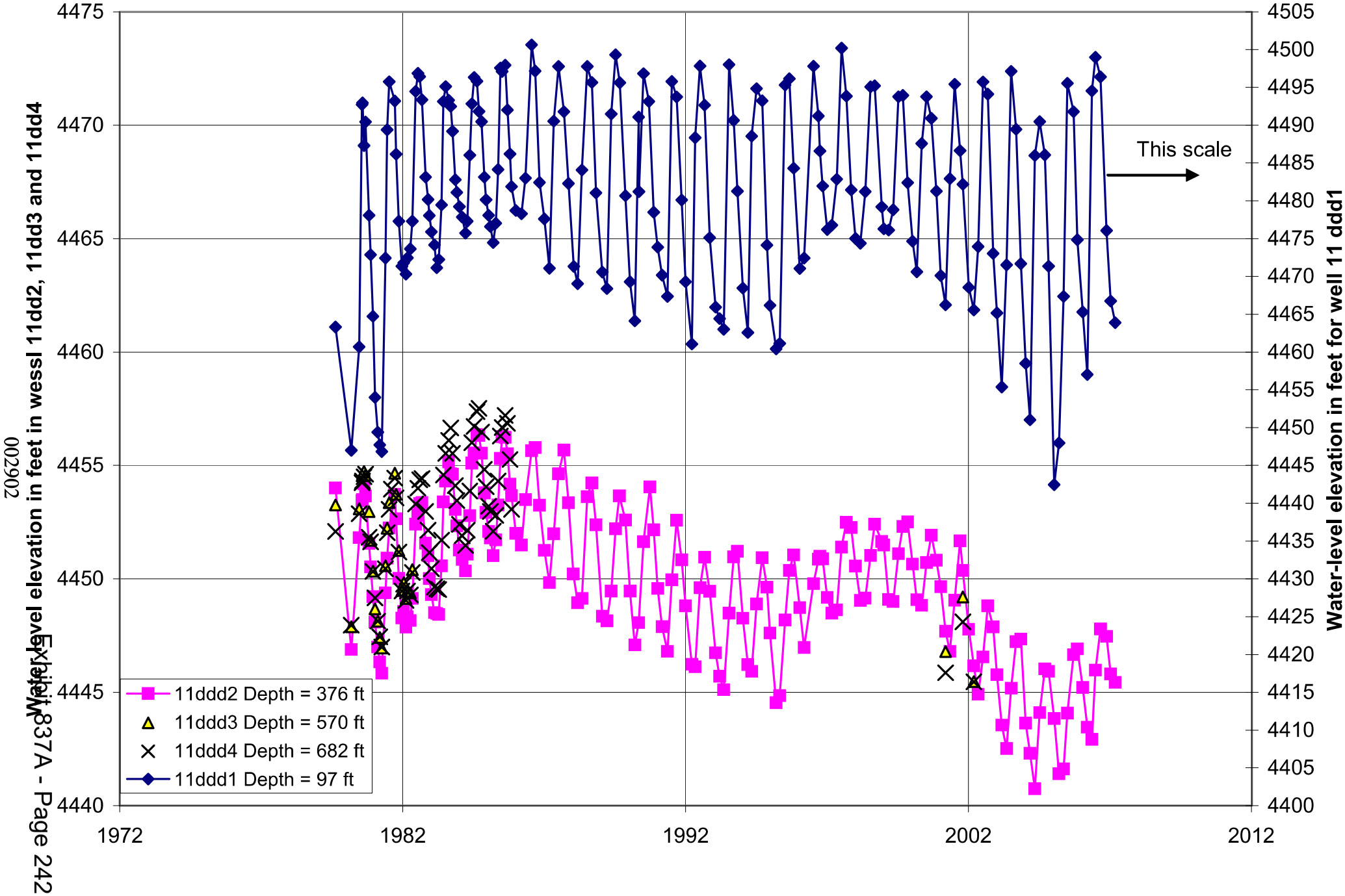

Figure 24 Hydrographs for Wells 2S 35E 11ddd1-4

002902
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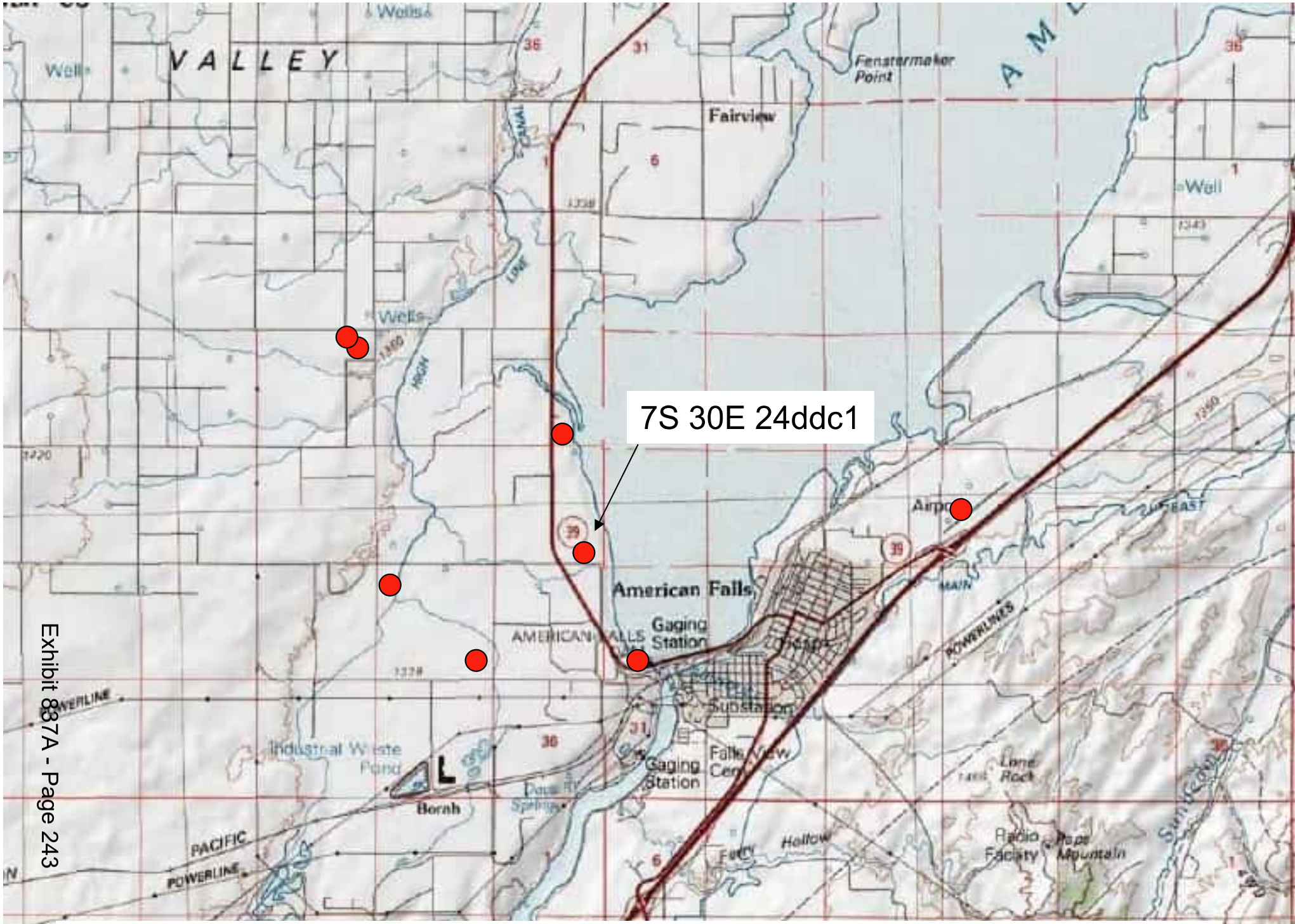
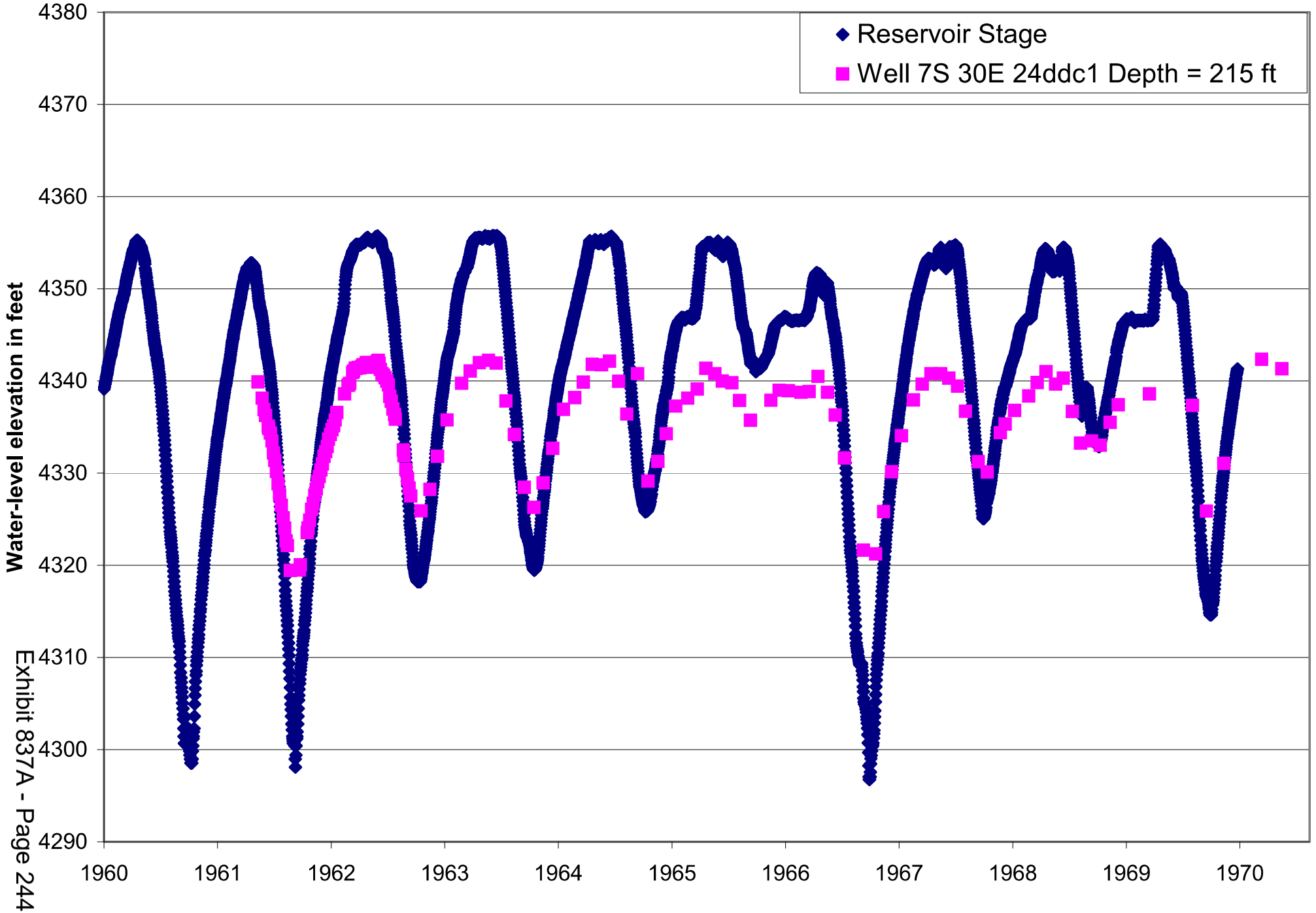


Figure 25 Locations of Wells That Respond to Stage Changes in the Reservoir



002904

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Figure 26 Comparison of Reservoir Stage and Water Level in Well 7S 30E 24ddc1

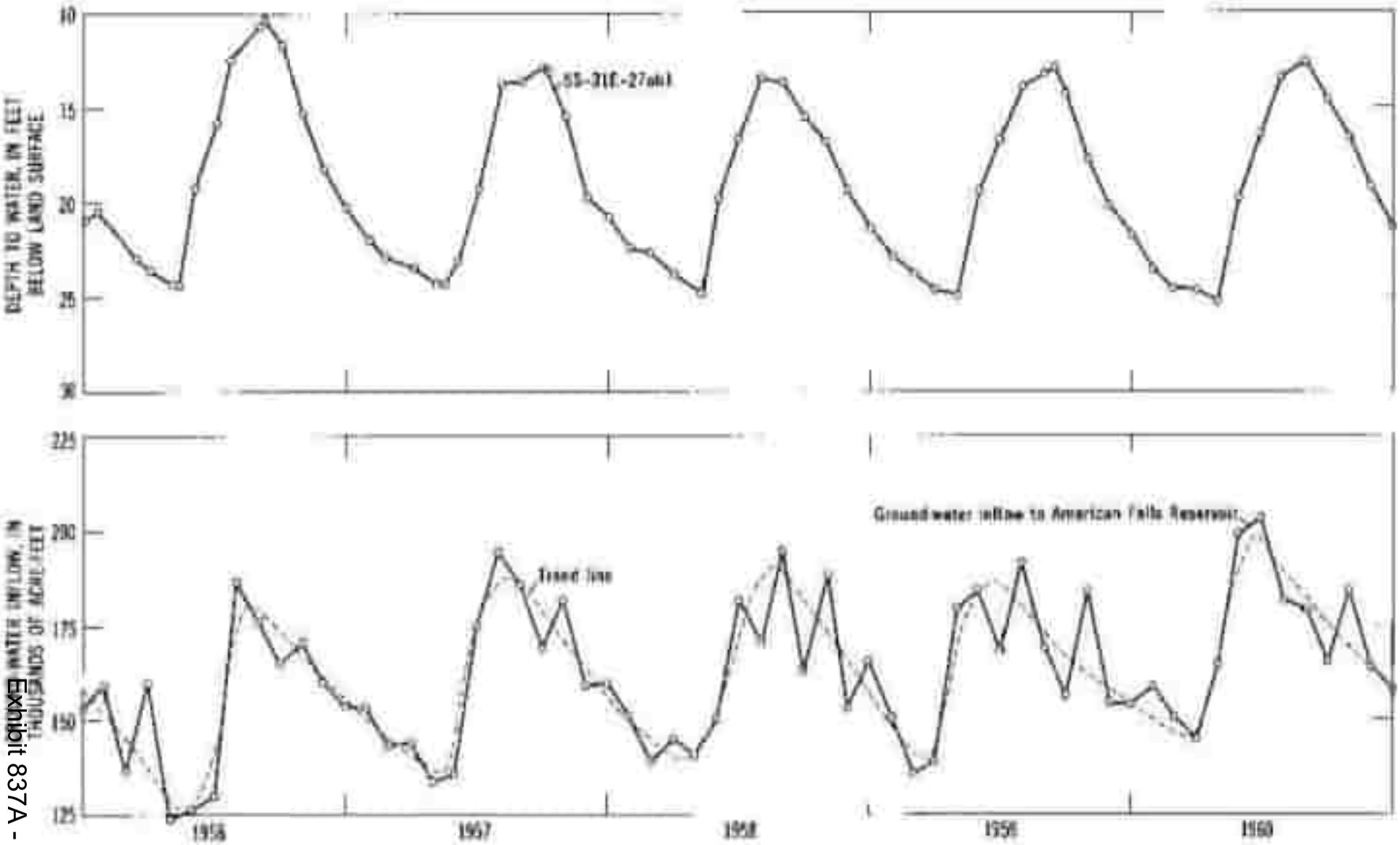

Figure 27 Comparison of Water-Level Patterns in Well 5S 31E 27ab1 to Ground-Water Inflow to American Falls Reservoir (Mundorff, 1967, page 33)

002905
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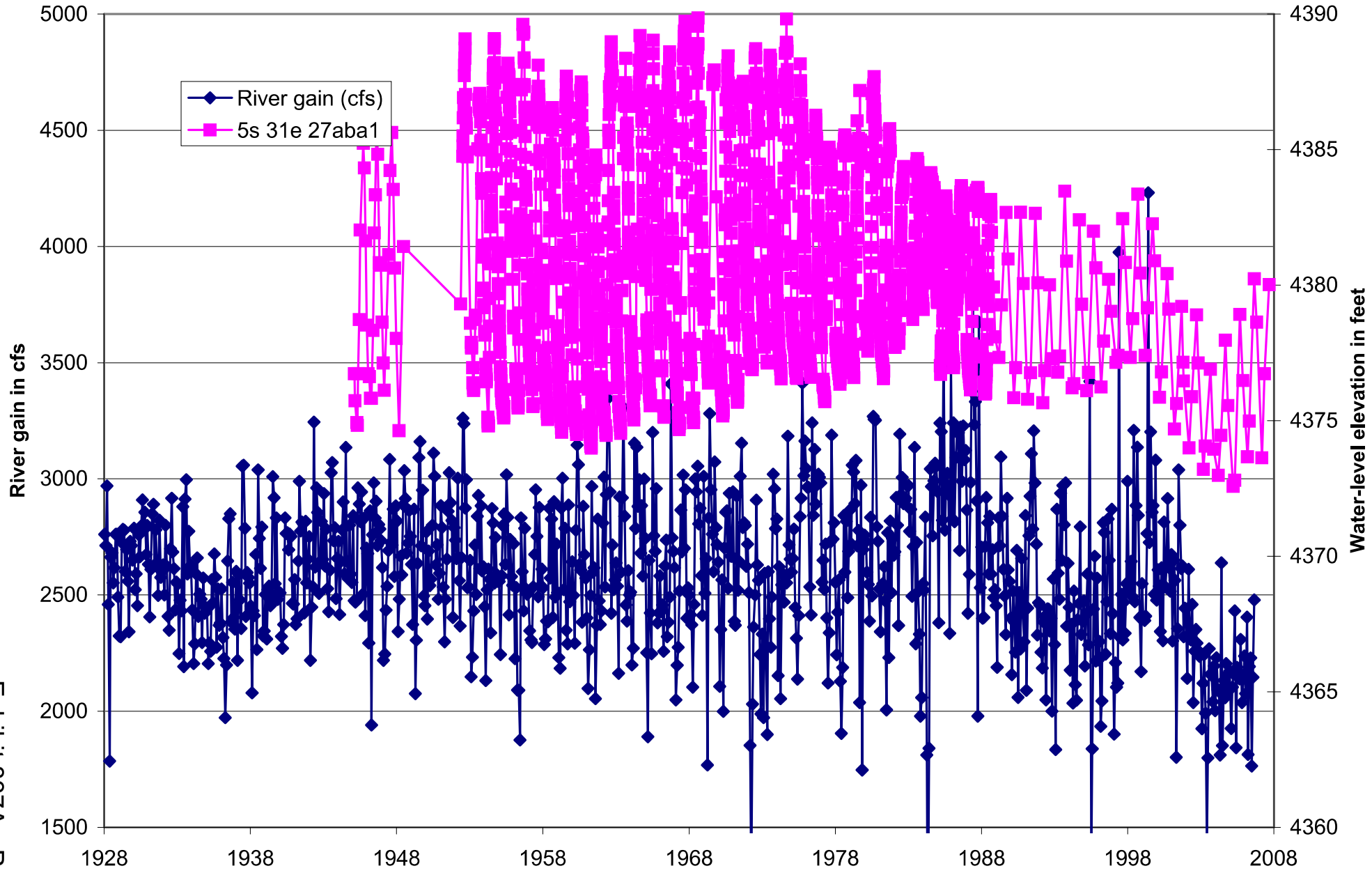

Figure 28 Plot of Calculated River Gain and Water-Level Elevation in Well 5S 31E 27aba1

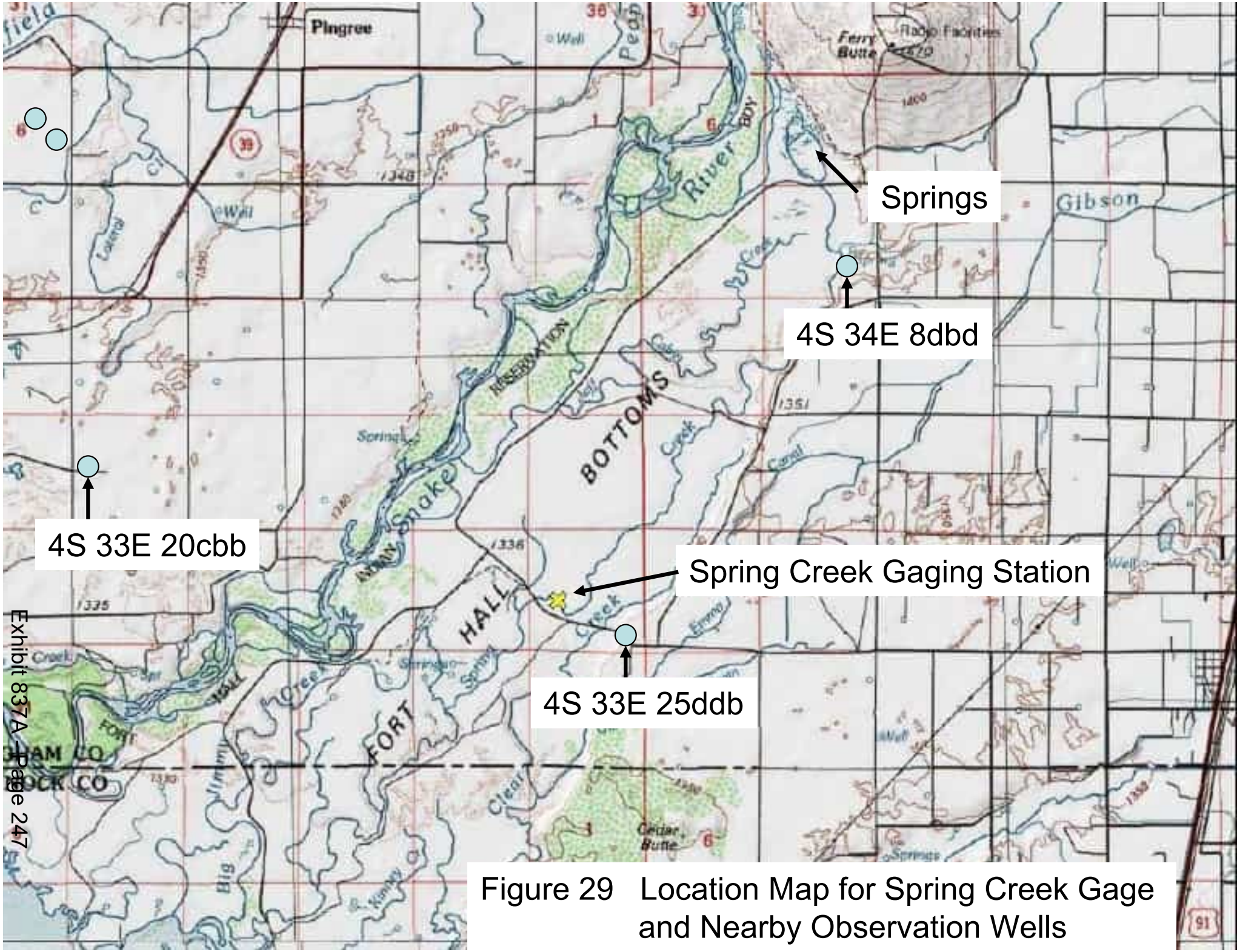

Figure 29 Location Map for Spring Creek Gage and Nearby Observation Wells

002907
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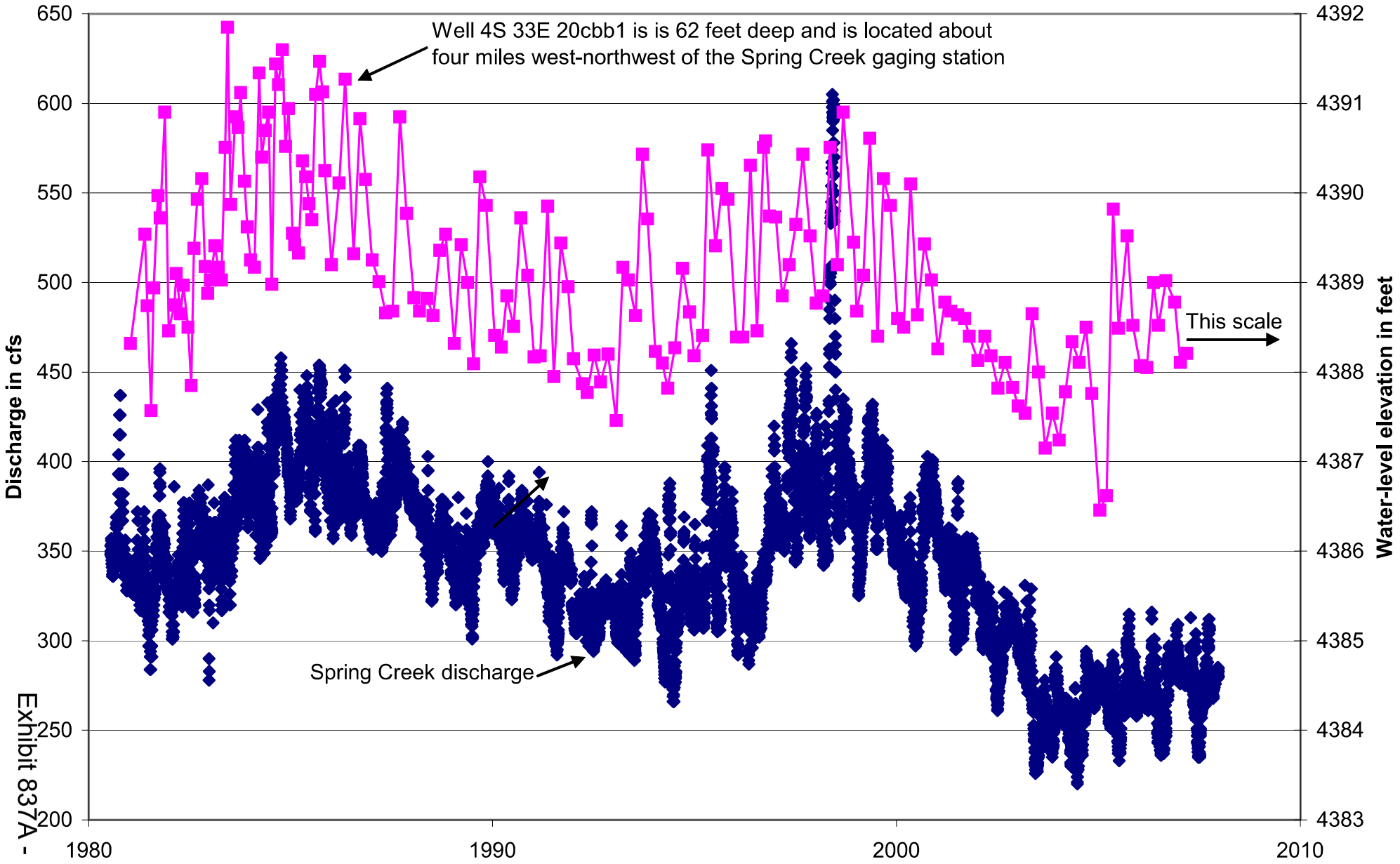

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Figure 30 Discharge Plot for Spring Creek and Hydrograph for Well 4S 33E 20cbb1

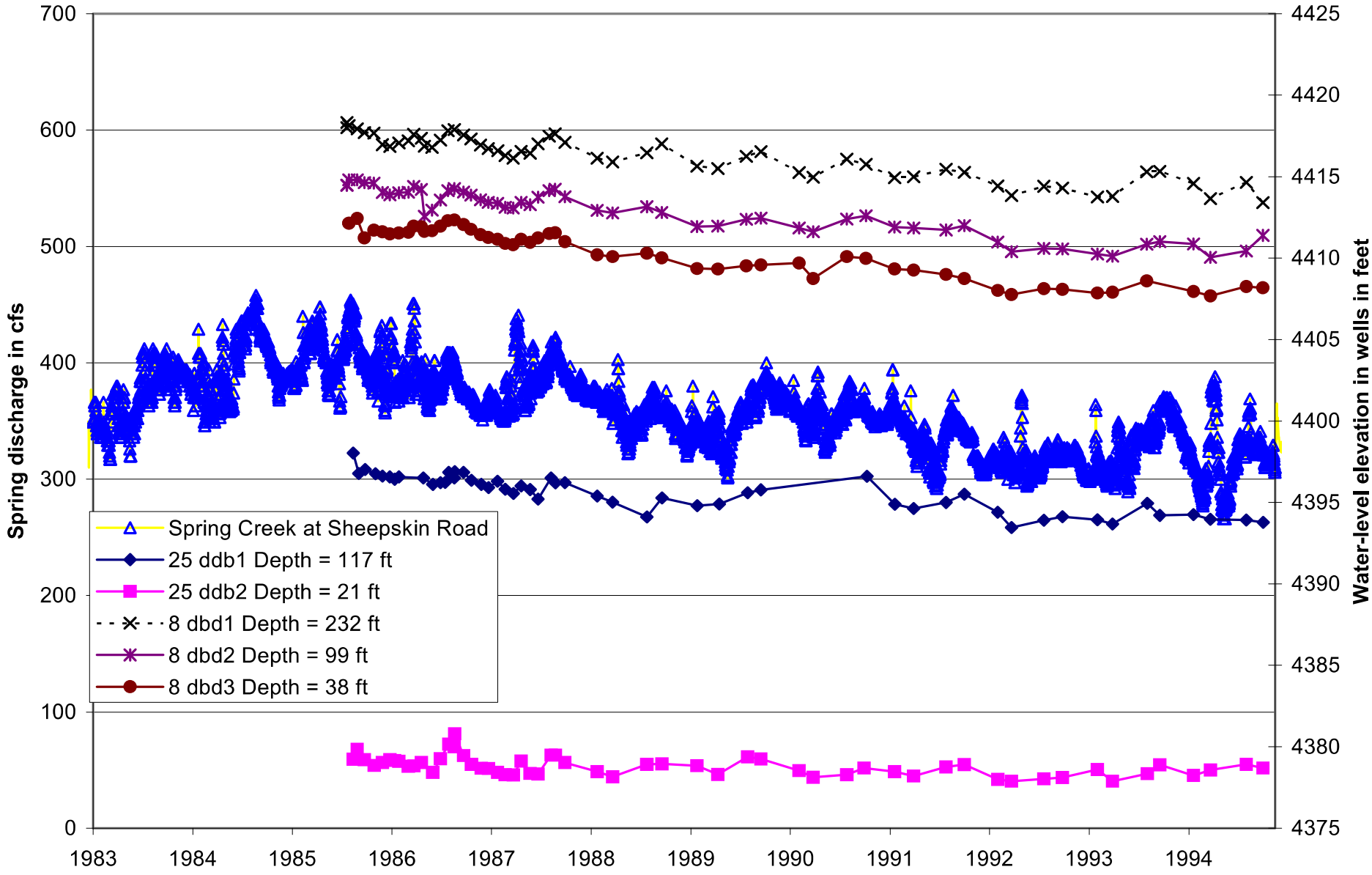
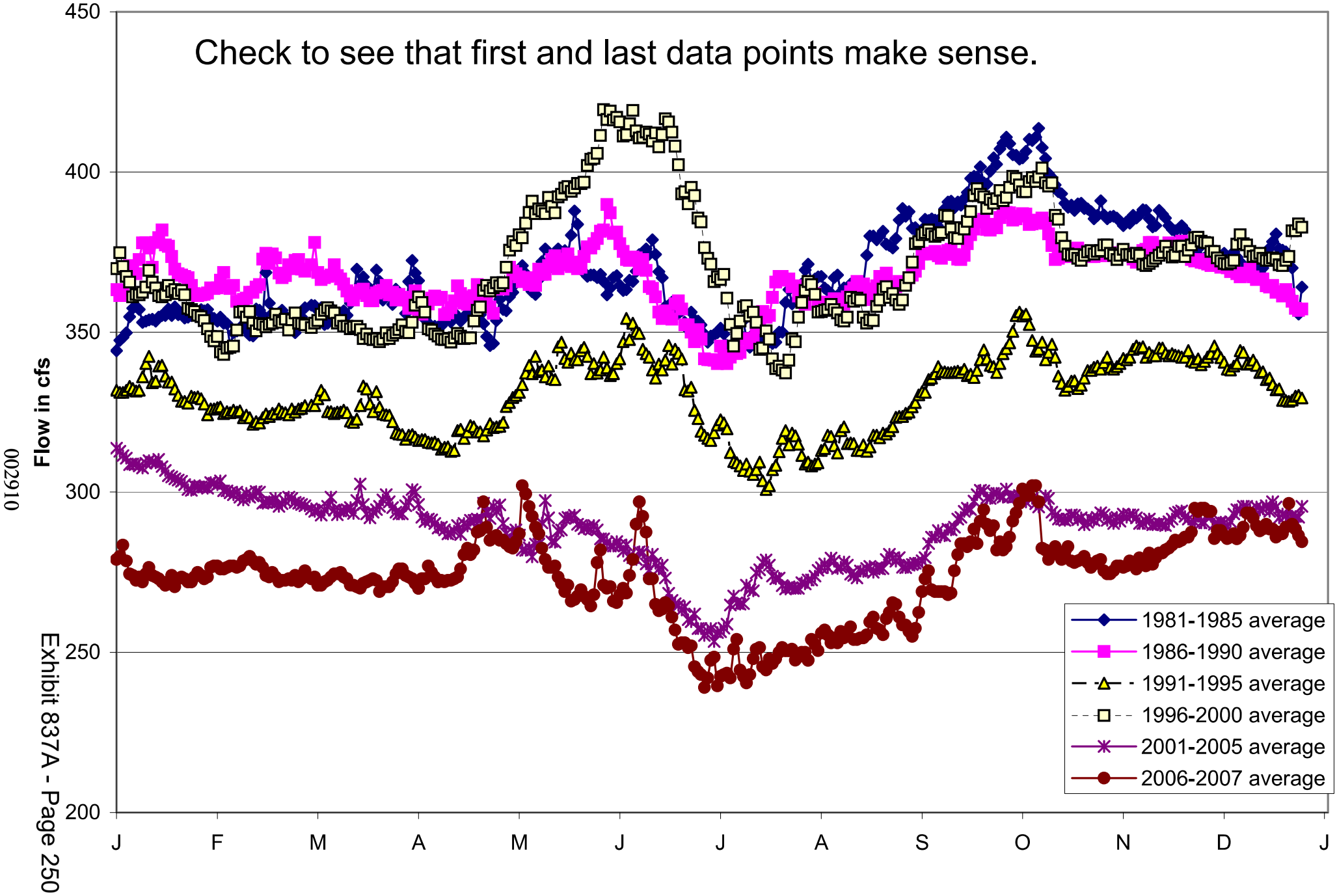


Figure 31 Discharge Plot for Spring Creek and Hydrographs for Nearby Wells



002910

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Figure 32 Spring Creek Average Flow Patterns

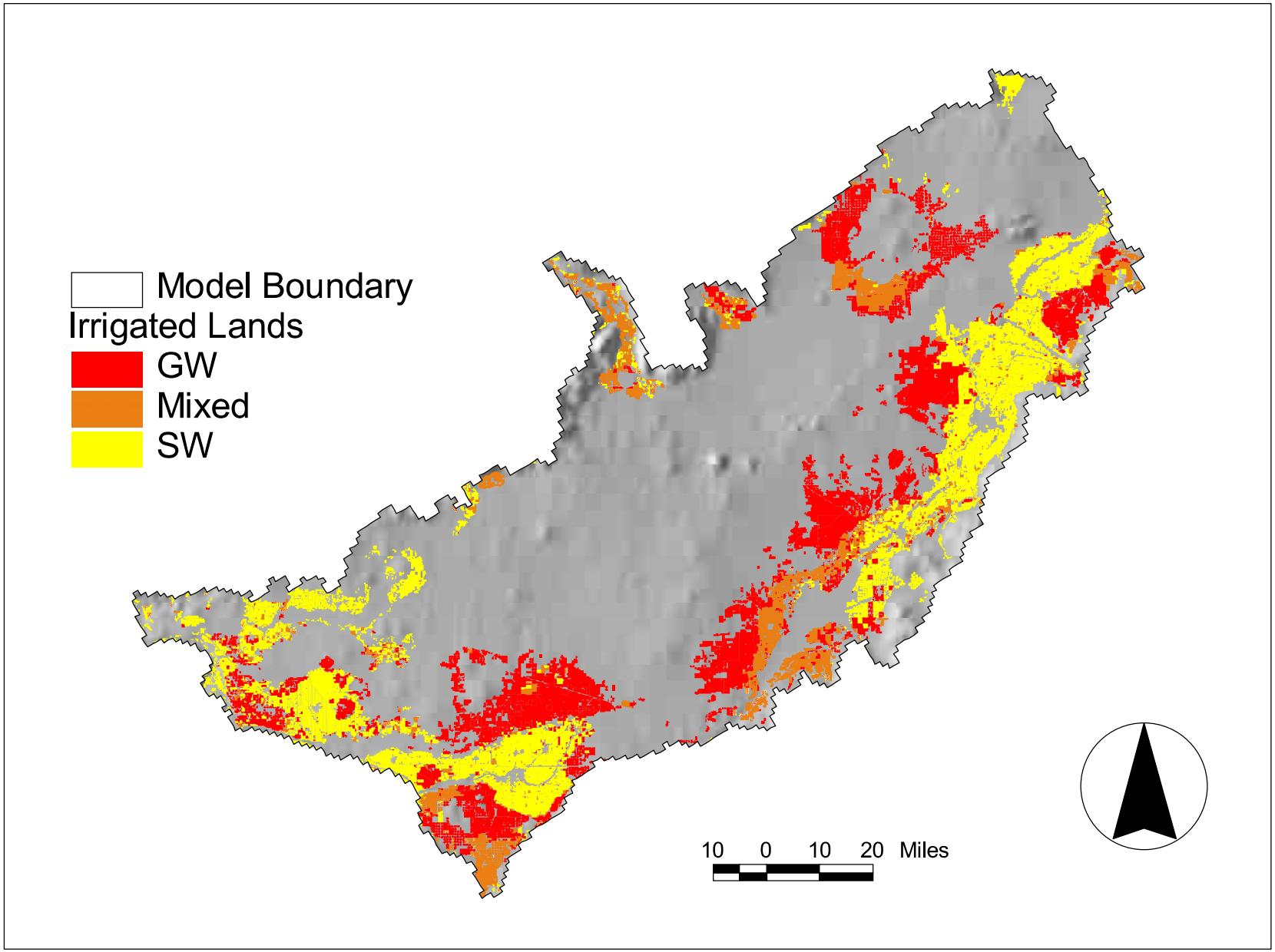

Figure 33 Irrigation Water Source Determined from Adjudication Data (from Cosgrove and others, 2006)

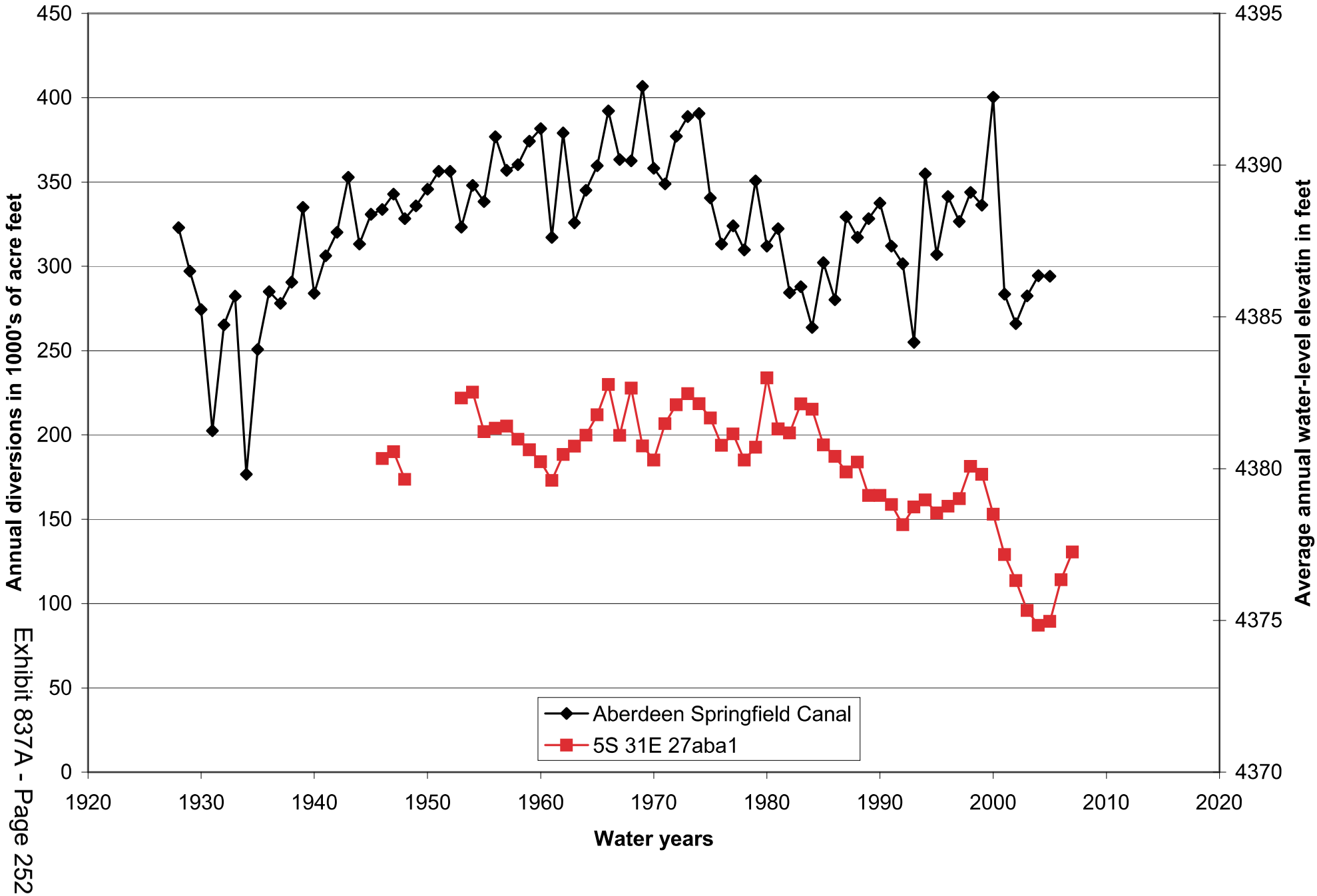

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Figure 34 Aberdeen Springfield Canal Annual Diversions and Average Annual Water-Level Elevation in Well 5S 31E 27aba1

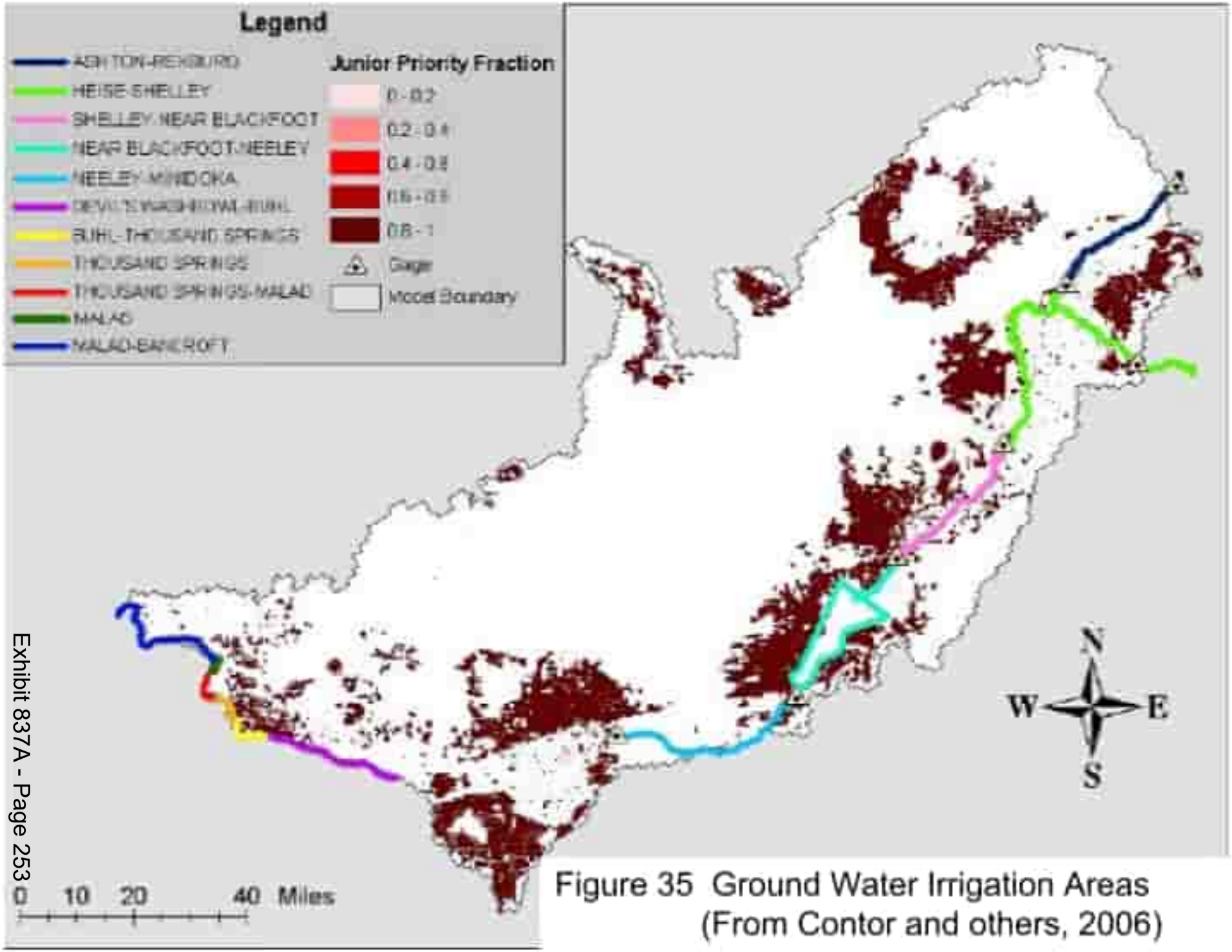

Figure 35 Ground Water Irrigation Areas
(From Contor and others, 2006)

002913

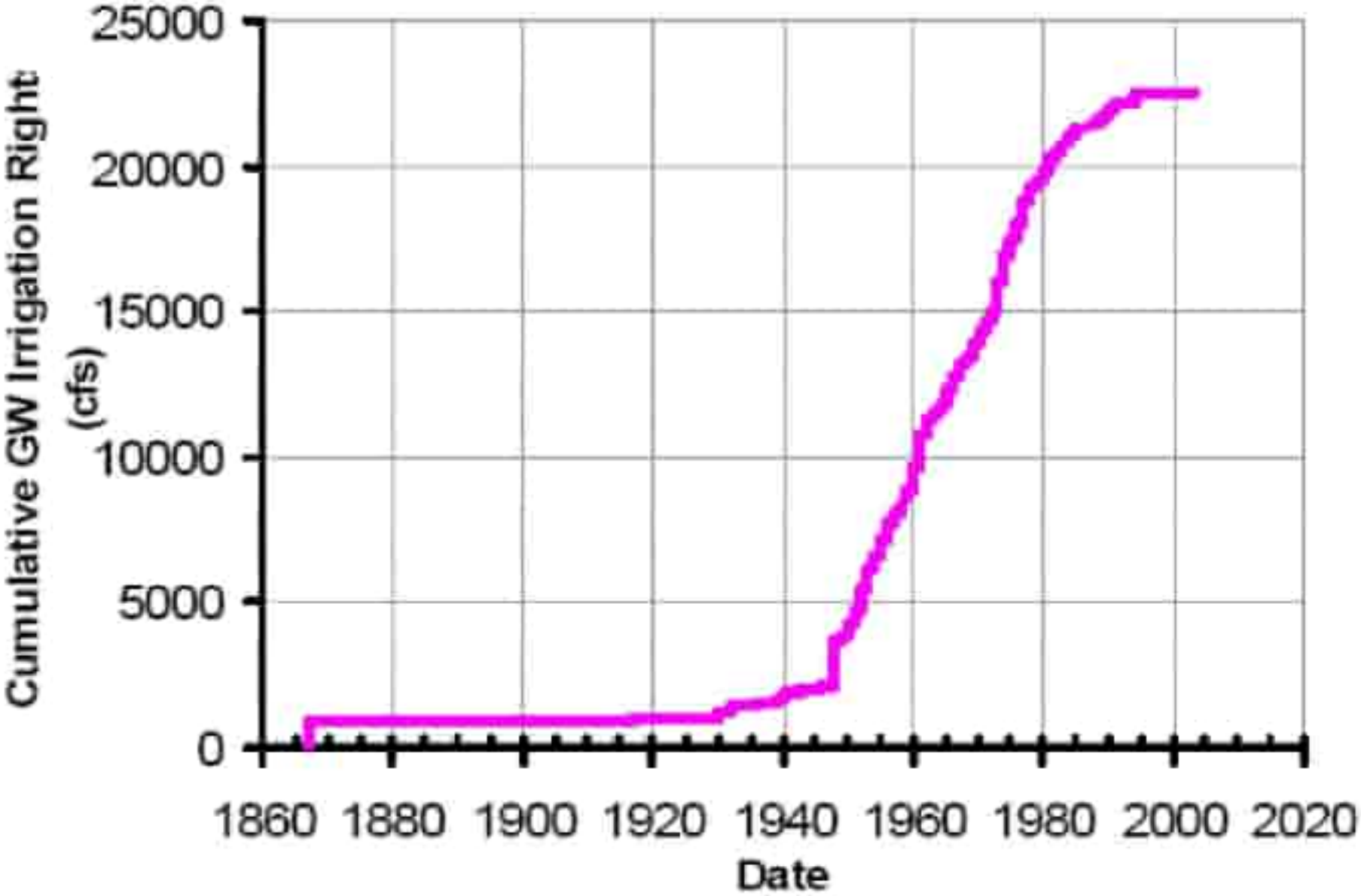

Figure 36 Ground-Water Priorities on the Eastern Snake River Plain (from Contor and others, 2006)

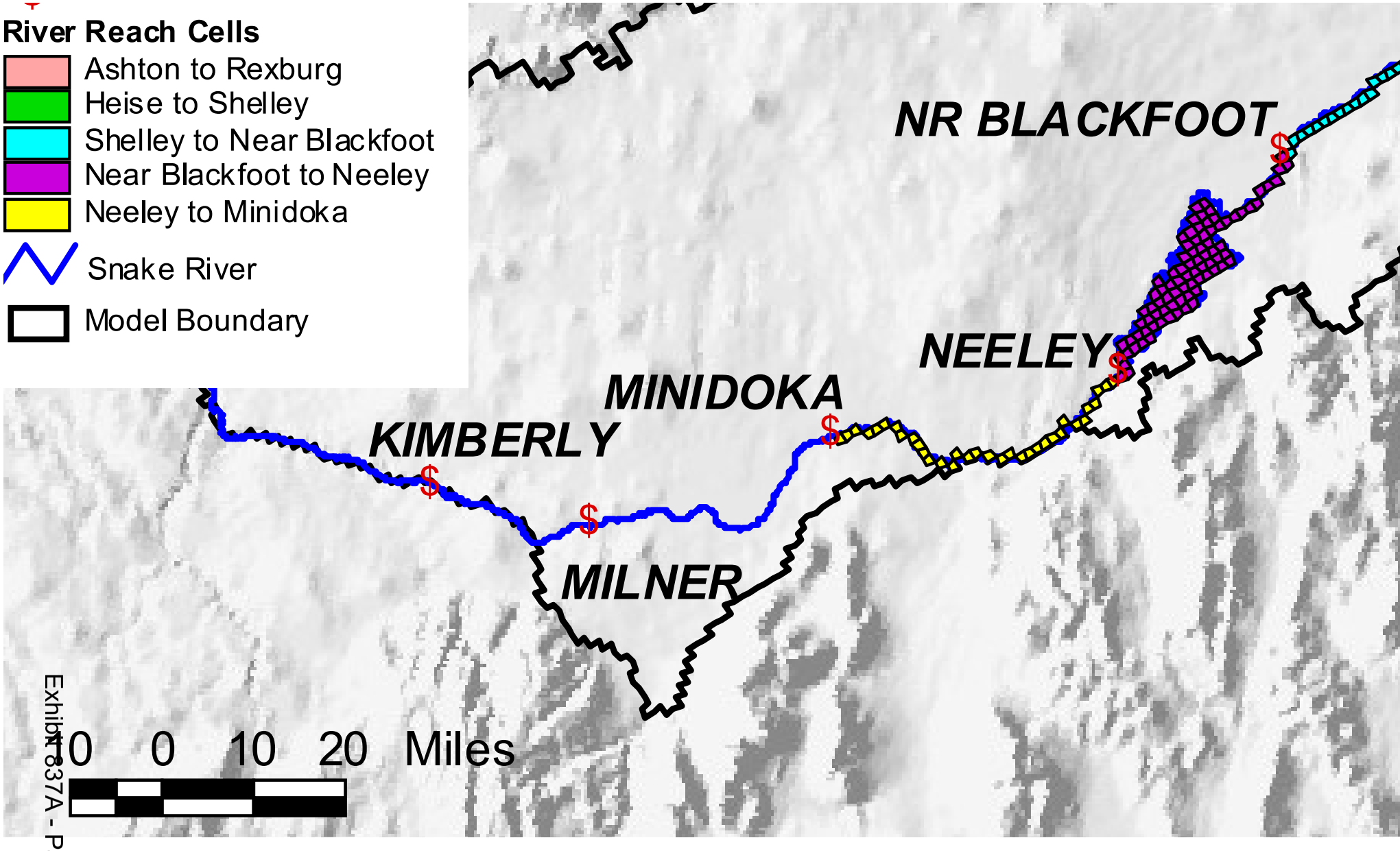

Figure 37 Location Map for River Reach Cells in the Near Blackfoot to Neeley Reach (from Cosgrove and others 2006)

002915
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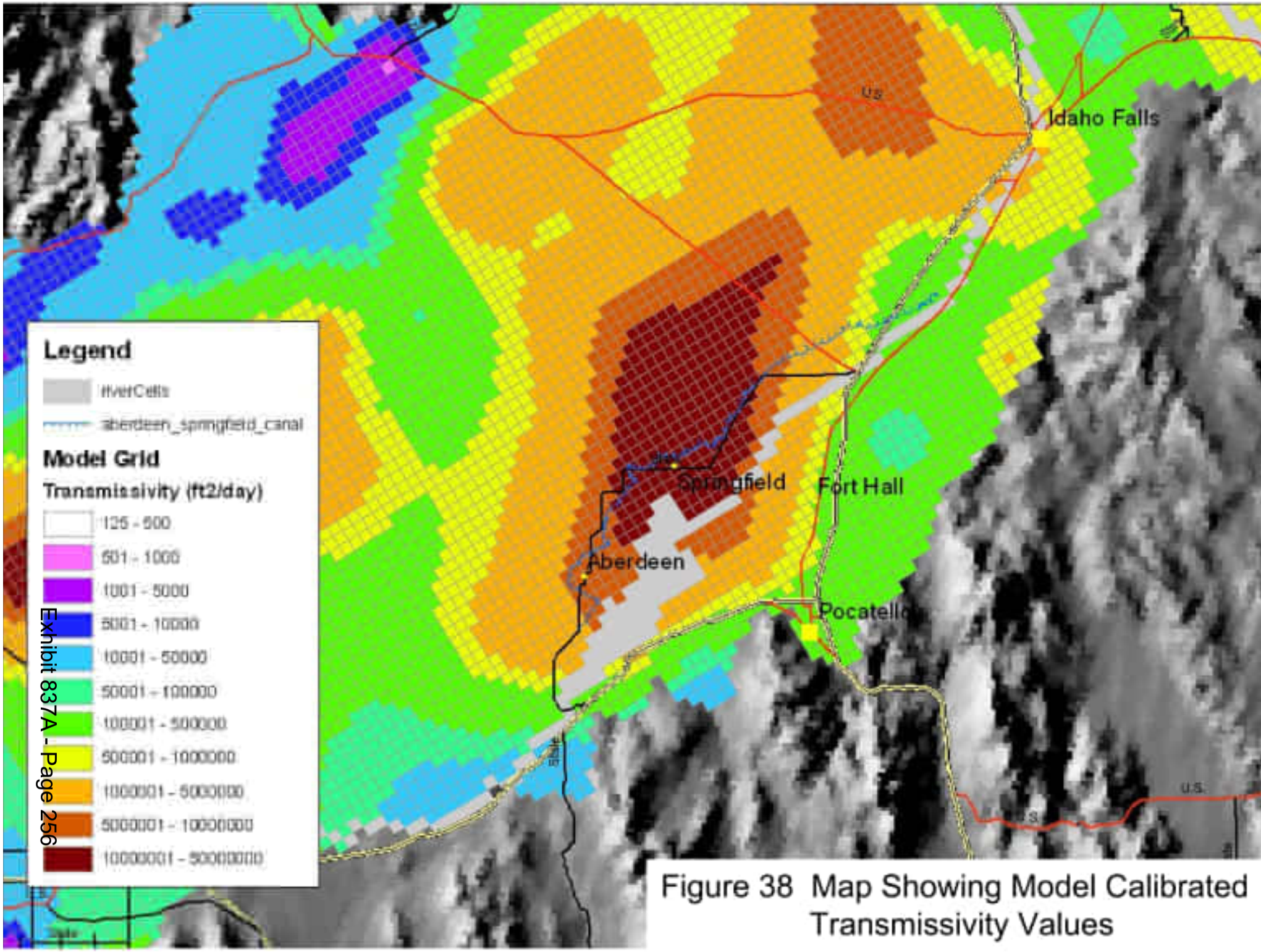

Figure 38 Map Showing Model Calibrated Transmissivity Values

002916
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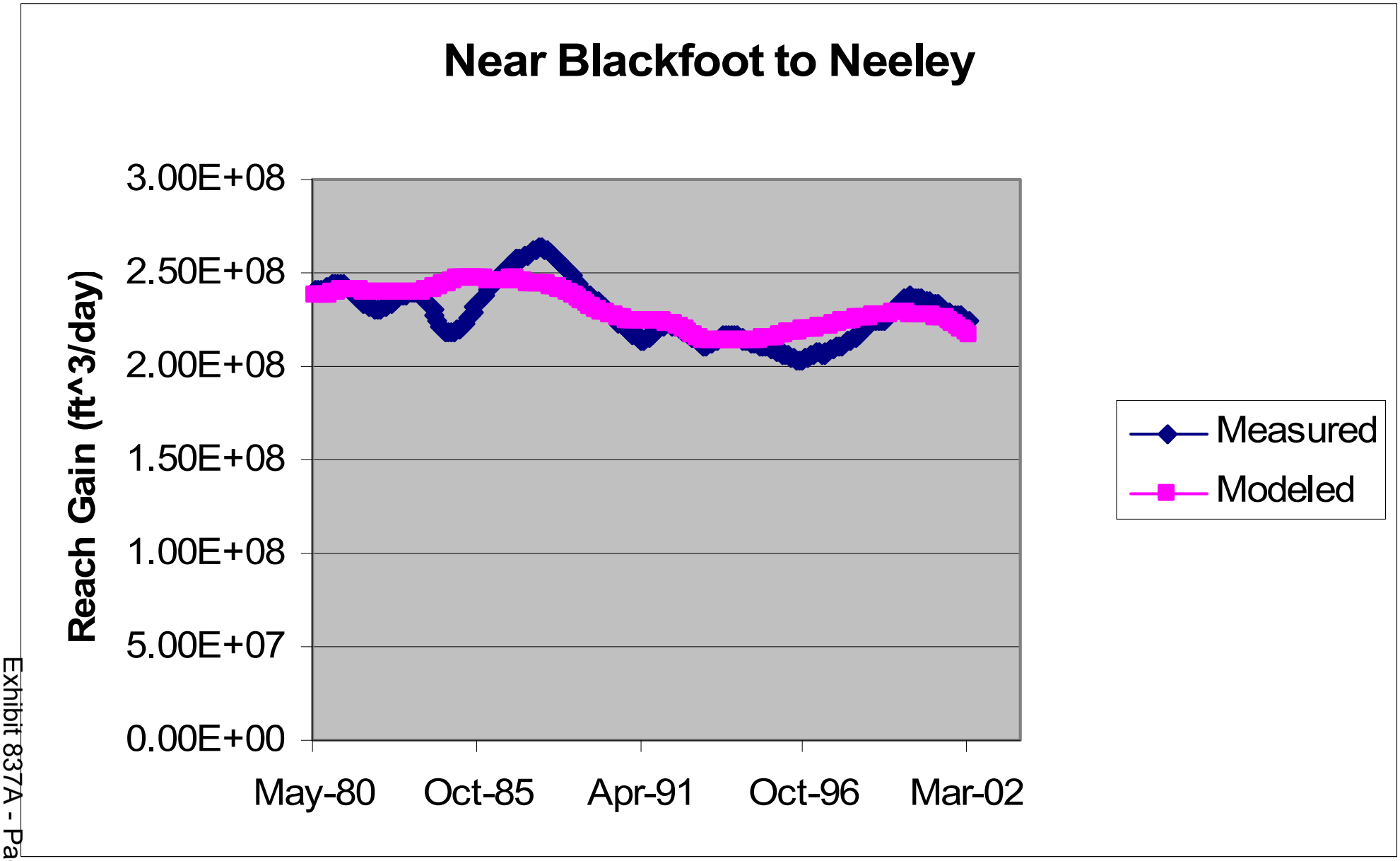

Figure 39 Modeled Versus Observed Gain for the Near Blackfoot to Neeley Reach (from Cosgrove and others 2006)

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Pamela W. Eckhardt, Clerk of the Court
By: Brandee Cammack, Deputy Clerk

CV06-26-1801

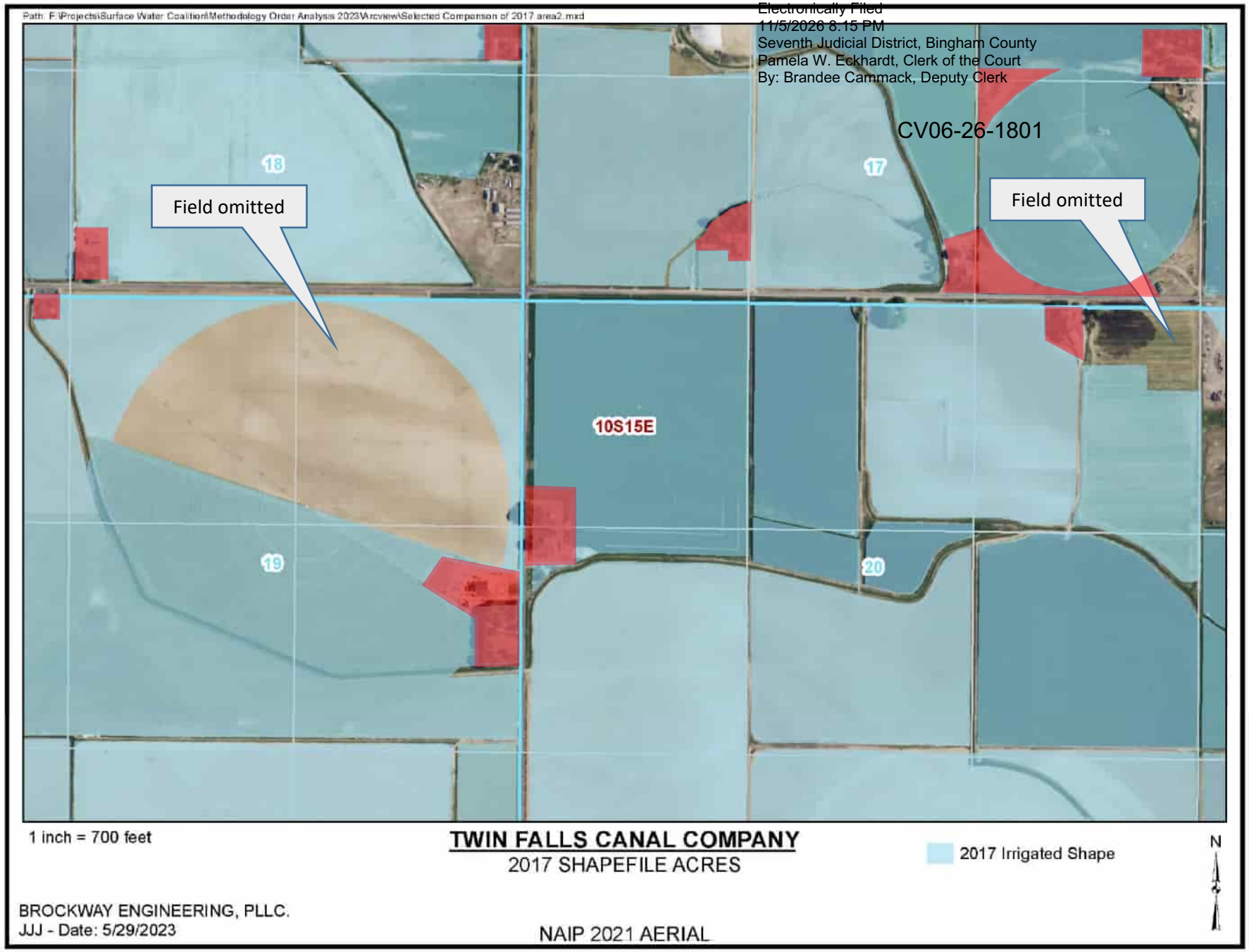

Figure 2. Example of irrigated fields omitted in IDWR's 2017 irrigated lands shape file.

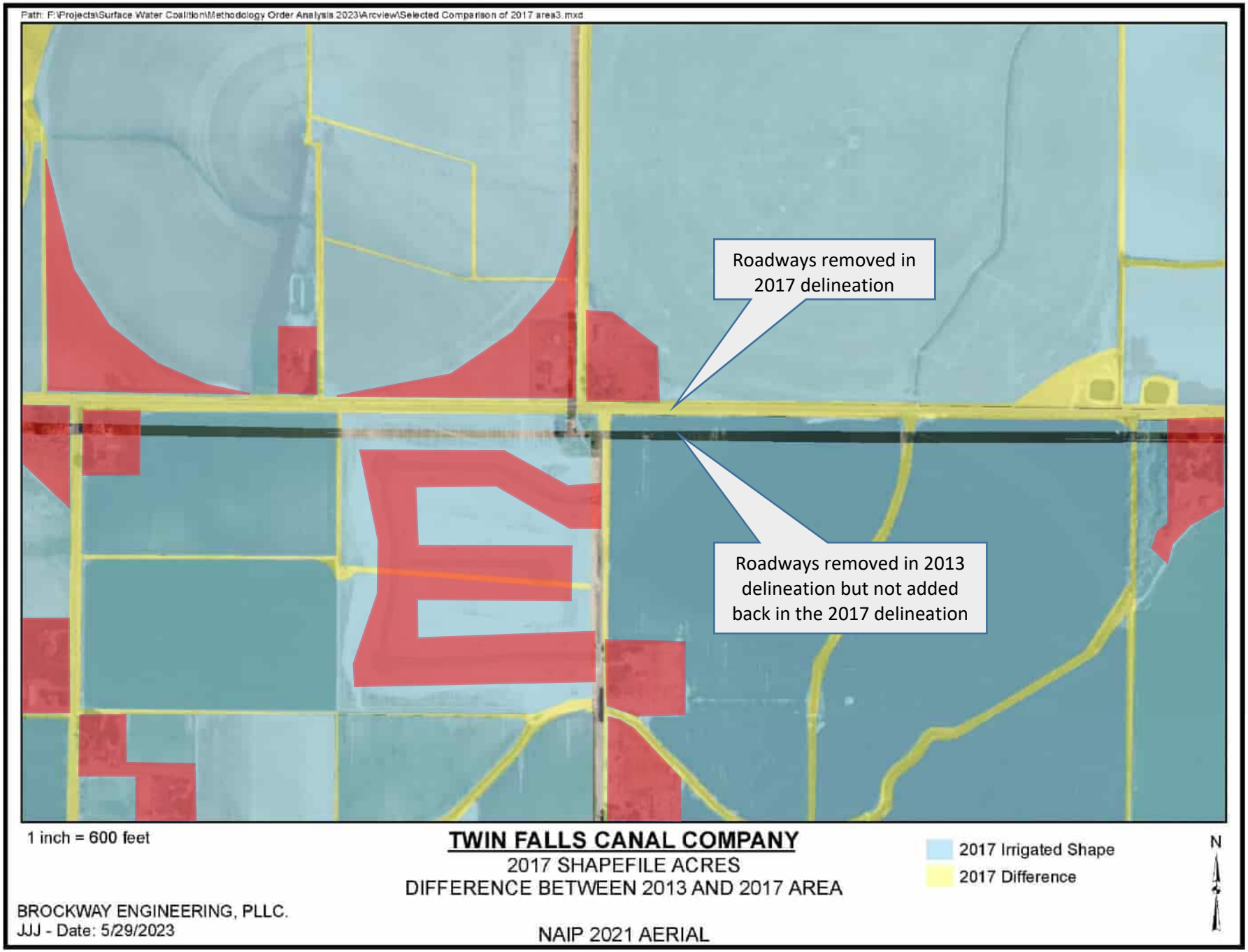

Figure 3. Example of PLSS registration difference that results in over-counting of acreage removed.

IDAHO Department of Water Resources

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Overview of the Surface Water Coalition Methodology For Determining Material Injury To Reasonable In-Season Demand and Reasonable Carryover

Presented by: Matt Anders & Kara Ferguson

Date: 11/16/2022

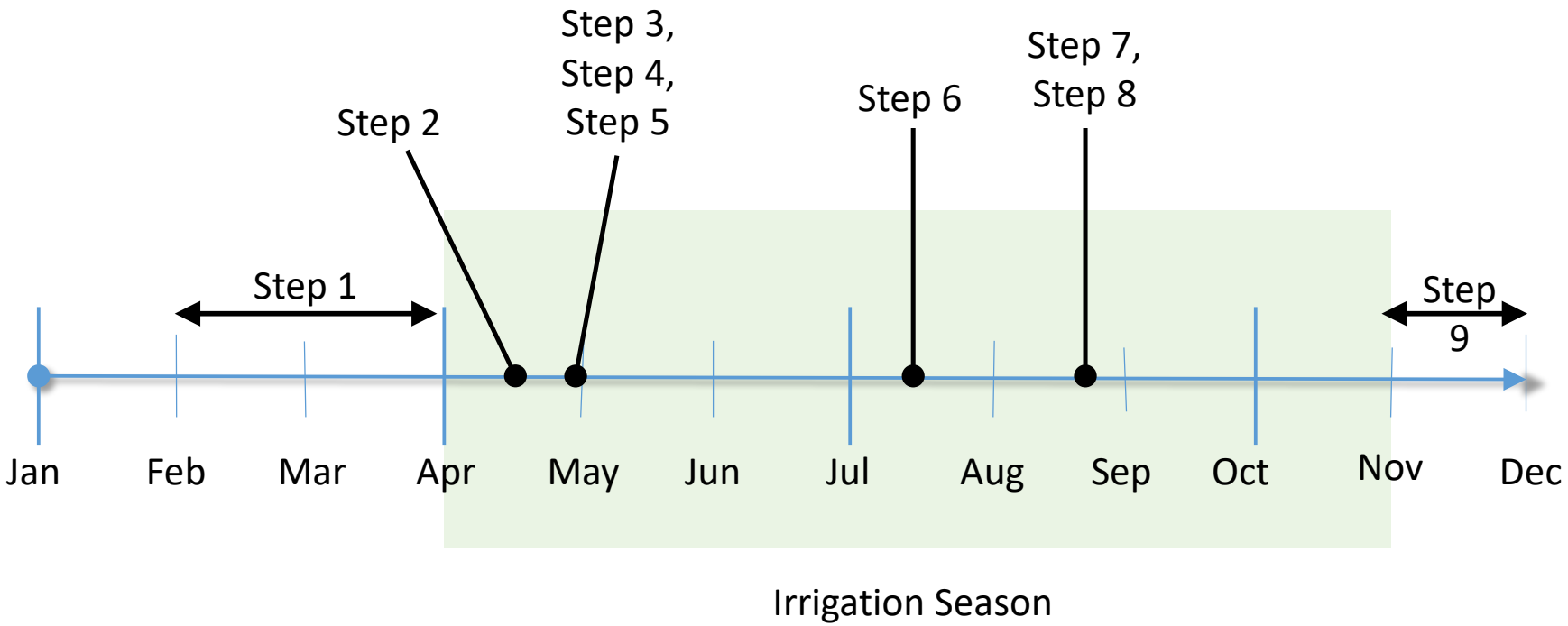
Methodology – Overview

- Delivery Call 1/14/2005
  - Filed under IDAPA 37.03.11 - *Rules for Conjunctive Management of Surface and Ground Water Sources*

- Final Order 9/05/2008
- Second Amended Methodology Order 6/23/2010
- Third Amended Methodology Order 4/16/2015
- Fourth Amended Methodology Order 4/19/2016

- Injury is based on the water supply for the current year
  - In-season injury
  - Reasonable carryover injury
- The water supply changes from year to year…so does the injury obligation

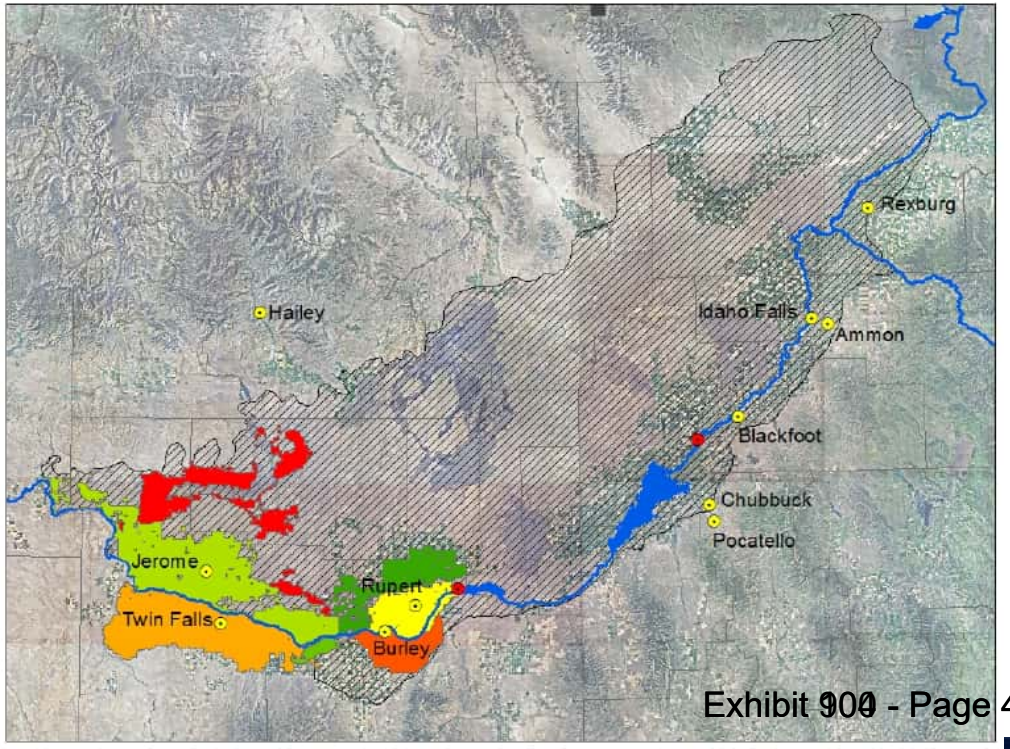
Methodology – Overview



Methodology – Step 1

- By April 1, members of the SWC will submit electronic shape files to the Department delineating the total anticipated irrigated acres for the upcoming year within their water delivery boundary or confirm in writing that the existing electronic shape file submitted by SWC has not varied by more than five percent.

AFRD2	62,361 acres
NSCC	154,067 acres
TFCC	194,732 acres
Minidoka	75,340 acres
A&B	15,924 acres
Burley	46,035 acres
Milner	13,335 acres



Methodology – Step 2

- Completed in April
- Within fourteen (14) days after issuance of the Joint Forecast, the Director will issue a final order predicting the April Forecast Supply for the water year for each SWC entity.
- The Director will compare the April Forecast Supply for each SWC entity to the Baseline Demand for each SWC entity to determine if a demand shortfall is anticipated for the upcoming irrigation season.

Methodology – Step 2

Milestone	Supply	Reasonable In-Season Demand (RISD)
April	Forecast Natural Flow (Apr-Oct) • Regression Equations Predicted Storage Allocation • Analogous year or years	Predicted Demand (Apr-Oct) • Historical Demand from Baseline Year (BLY)

Example - 2021

SWC Member	Forecast Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	RISD (BLY 06/08/12)	Shortfall
A&B	467	122,306		122,773	59,992	0
AFRD2	16,941	364,890	1,000	382,831	427,672	44,800
BID	64,881	213,484	5,130	283,494	251,531	0
Milner	3,050	72,450		75,500	47,135	0
Minidoka	88,905	301,293	8,370	398,568	369,492	0
NSCC	246,664	744,164	(7,750)	983,078	978,888	0
TFCC	741,869	207,120	(6,750)	942,239	1,060,011	117,800
					Total	162,600

Methodology – Steps 3, 4, & 5

- By May 1, or within fourteen (14) days from issuance of the final order predicting the April Forecast Supply, whichever is later in time, junior ground water users with approved mitigation plans for delivery of water must secure, to the satisfaction of the Director, a volume of water equal to their proportionate share of the April Demand Shortfall. The secured water will not be required to be delivered to the injured members of the SWC until the Time of Need.

- Director will issue an order curtailing junior ground water users who:

    - (1) do not have approved mitigation plans;
    - (2) fail to secure the required water consistent with their approved mitigation plans; or
    - (3) otherwise fail to comply with their approved mitigation plans.

- If the storage allocations held by members of the SWC do not fill, within fourteen (14) days following the publication of Water District 01's initial storage report, the volume of water secured by junior ground water users to fulfill the reasonable carryover shortfall shall be made available to injured members of the SWC.

Methodology – Step 6

- Completed in July
- Approximately halfway through the irrigation season, but following the events described in Step 5, the Director will, for each member of the SWC:
  - (1) Recalculate RISD;
  - (2) Issue a revised Forecast Supply, and
  - (3) Estimate the Time of Need date.

Methodology – Step 6

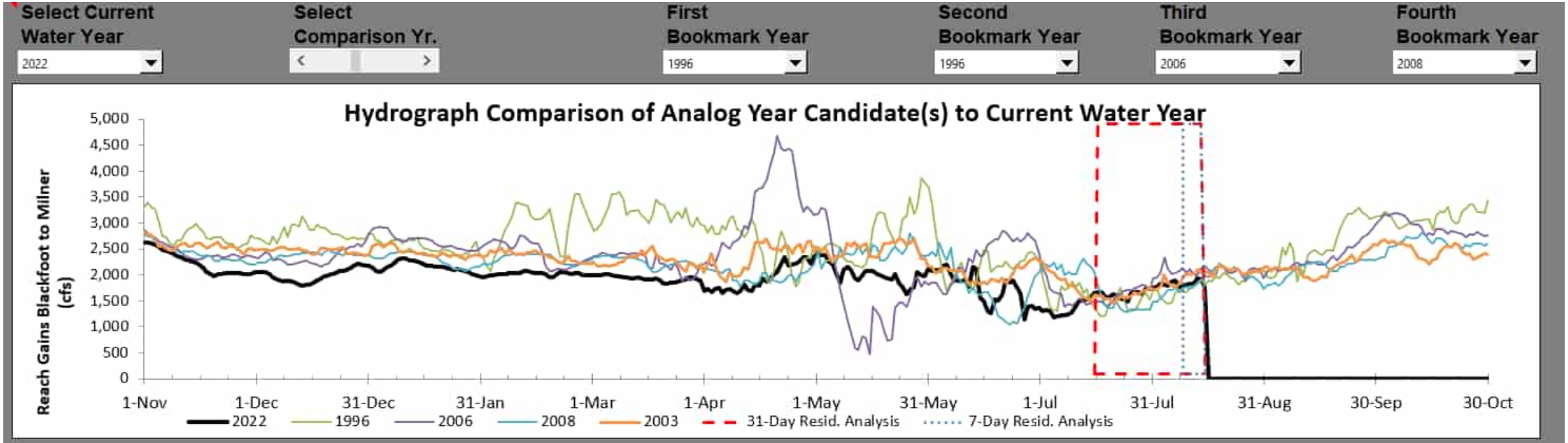
Milestone	Supply	Reasonable In-Season Demand (RISD)
July	Actual Diverted Natural Flow (Apr-June) Forecast Natural Flow (July-Oct) • Regression Equations Storage Allocation • Storage Report or Analogous Year	Crop Water Need (Apr-June) • ET • Precipitation • Project Efficiency Predicted Demand (July-Oct) • Historical Demand from Baseline Year (BLY)

Example - 2021

SWC Member	Actual Diverted Natural Flow (Apr-June)	Forecast Natural Flow (July-Oct)	Natural Flow Adjustment	Preliminary Storage Allocation	Minidoka Credit Adjustment	Total Supply	RISD	Shortfall
A&B	12	0	0	106,072	0	106,084	59,008	0
AFRD2	40,438	0	(2,425)	338,244	1,000	377,257	423,430	46,200
BID	85,459	11,633	(3,800)	202,292	5,130	300,715	233,921	0
Milner	9,464	123	(2,900)	63,046	0	69,733	50,585	0
Minidoka	93,175	15,515	0	251,631	8,370	368,691	349,372	0
NSCC	287,666	94,427	0	762,788	(7,750)	1,137,131	961,652	0
TFCC	367,078	449,532	(139)	220,394	(6,750)	1,030,115	1,036,539	400
							Total	52,600

Methodology – Step 6

- Estimate the Time of Need date.



Avg. % Resid.	CY: 2003	BM1: 1996	BM2: 1996	BM3: 2006	BM4: 2008
Entire Water Yr.	-18.6%	-32.3%	-32.3%	-20.3%	-11.8%
31 Day Detail	-1.6%	9.6%	9.6%	-6.7%	8.6%
7 Day Detail	-10.3%	3.3%	3.3%	-13.4%	0.6%

Methodology – Step 7

- Completed before the Time of Need (~August)
- Shortly before the estimated Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC:
  - (1) Recalculate RISD;
  - (2) Issue a revised FS; and
  - (3) Establish the Time of Need.

Methodology – Step 7

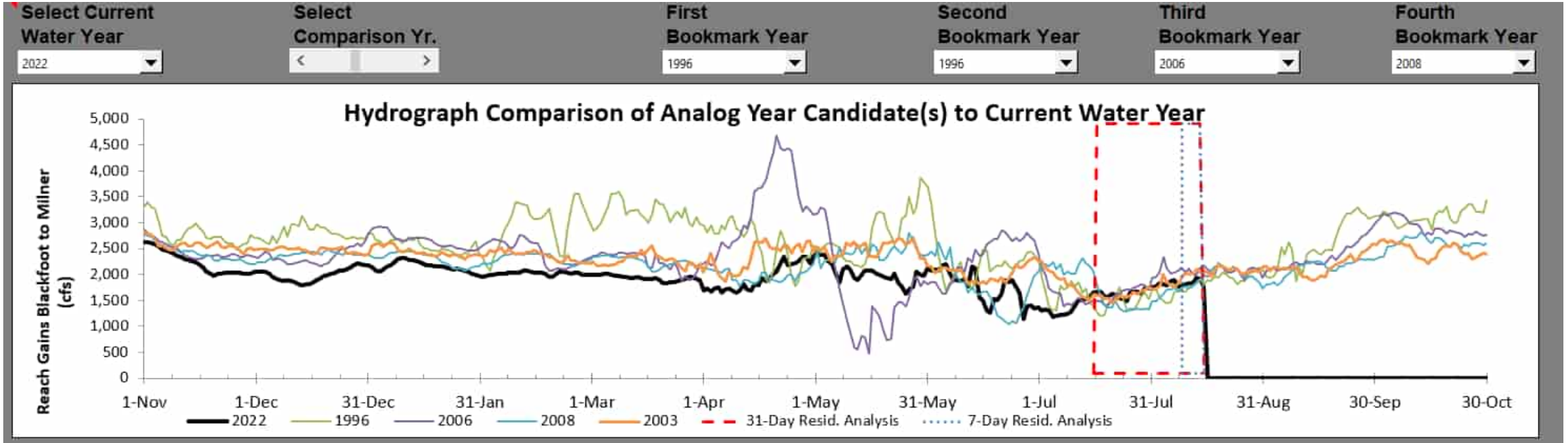
Milestone	Supply	Reasonable In-Season Demand (RISD)
Time of Need	Actual Diverted Natural Flow (Apr-Time of Need) Forecast Natural Flow (Time of Need-Oct) • Natural Flow from Comparable Year Storage Allocation • Storage Report	Crop Water Need (Apr-Time of Need) • ET • Precipitation • Project Efficiency Predicted Demand (Time of Need-Oct) • Historical Demand from Baseline Year (BLY)

Example - 2021

SWC Member	Actual Diverted Natural Flow (4/1 to 8/15)	Forecast Natural Flow (8/16 to 10/31)	Natural Flow Adjustment	Preliminary Storage Allocation	Minidoka Credit Adjustment	Total Supply	RISD	Shortfall
A&B	0	0	0	106,072	0	106,072	58,495	0
AFRD2	40,611	0	(2,425)	338,245	1,000	377,431	435,494	58,100
BID	97,654	1,521	(3,714)	202,293	5,130	302,884	234,407	0
Milner	9,705	0	(3,011)	63,046	0	69,740	55,691	0
Minidoka	93,765	1,555	0	251,632	8,370	355,323	341,626	0
NSCC	312,089	33,294	0	762,791	(7,750)	1,100,423	991,743	0
TFCC	529,573	252,324	(139)	220,395	(6,750)	995,403	1,069,430	74,000
							Total	132,100

Methodology – Step 7

- Establish the Time of Need date.



Avg. % Resid.	CY: 2003	BM1: 1996	BM2: 1996	BM3: 2006	BM4: 2008
Entire Water Yr.	-18.6%	-32.3%	-32.3%	-20.3%	-11.8%
31 Day Detail	-1.6%	9.6%	9.6%	-6.7%	8.6%
7 Day Detail	-10.3%	3.3%	3.3%	-13.4%	0.6%

Exhibit 900 - Page 13

Methodology – Step 8

- At the Time of Need, junior ground water users are required to deliver to each injured member of the SWC the Step 7 revised Demand Shortfall calculated at the Time of Need.

Methodology – Step 9

- Completed in November
- Following the end of the irrigation season (on or before November 30), the Department will determine the total actual volumetric demand and total actual CWN for the entire irrigation season.
- On or before November 30, the Department will issue estimates of actual carryover and reasonable carryover shortfall volumes for all members of SWC.

Methodology – Step 9 Demand Shortfall

Milestone	Supply	Reasonable In-Season Demand (RISD)
November	Actual Diverted Natural Flow (Apr-Oct) Storage Allocation • Storage Report	Crop Water Need (Apr-Oct) • ET • Precipitation • Project Efficiency

Example - 2021

SWC Member	Actual Diverted Natural Flow (Apr-Oct)	Natural Flow Adjustments	Preliminary Storage Allocation	Storage Adjustments	Total Supply	RISD (Apr-Oct)	Demand Shortfall
A&B	2,879		132,913		135,792	67,666	0
AFRD2	64,375	7,101	382,492	1,000	454,968	486,878	31,900
BID	102,479	3,700	220,123	5,130	331,432	273,584	0
Milner	11,134	3,000	83,050		97,184	64,834	0
Minidoka	133,539		314,318	8,370	456,226	415,254	0
NSCC	344,787	0	834,679	(7750)	1,171,716	1,100,537	0
TFCC	831,340	1,095	237,962	(6750)	1,063,647	1,277,798	214,200
							246,100

Methodology – Step 9 Carryover Shortfall

Milestone	Carryover
November	• Actual Carryover • Reasonable Carryover

Example - 2021

SWC Member	October 31 Carryover in Water Rights Accounting	Storage Received for Mitigation	Storage Water Private Leases or to Rental Pool	Carryover Adjusted for Water Provided from SWC for Mitigation(-) or Leased (+)	Reasonable Carryover	Reasonable Carryover Shortfall
A&B	74,265	7,488	0	66,777	18,500	0
AFRD2	2,690	7,733	5	(5,038)	11,500	16,538
BID	55,709	4,388	699	52,020	0	0
Milner	27,713	1,170	4,000	30,543	4,800	0
Minidoka	72,652	0	36,000	108,652	0	0
NSCC	126,682	11,602	0	115,080	65,500	0
TFCC	8,707	31,615	0	(22,908)	25,200	48,108
						64,647

Documents

- Conjunctive Management Rules (IDAPA)
  - https://adminrules.idaho.gov/rules/current/37/0311.pdf
- Department “Water Delivery Call Actions” and “Mitigation Plan Actions”
  - All current and past legal documents
  - https://idwr.idaho.gov/legal-actions/
- SWC Delivery Call Related Documents
  - https://idwr.idaho.gov/News/WaterCalls/Surface%20Coalition%20Call/
- 4th Amended Methodology Order
  - https://idwr.idaho.gov/files/legal/CM-DC-2010-001/CM-DC-2010-001-20160419-Fourth-Amended-Final-Order-Regarding-Methodology-for-Determining-Material-Injury-to-Reasonable-In-Season-Demand-and-Reasonable-Carryover.pdf

Questions?

(208) 287-4932
matthew.anders@idwr.Idaho.gov

(208) 287-4937
kara.ferguson@idwr.Idaho.gov



Evaluation of Method for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: April and July Forecast Supply

Presented by: Kara Ferguson

Date: 11/17/2022

Elements of Shortfall Calculation – Forecast Supply

Milestone	Supply	Reasonable In-Season Demand (RISD)
April	Forecast Natural Flow (Apr-Oct) • Regression Equations Predicted Storage Allocation • Analogous Year or Years	Predicted Demand (Apr-Oct) • Historical Demand from Baseline Year (BLY)
July	Actual Diverted Natural Flow (Apr-June) Forecast Natural Flow (July-Oct) • Regression Equations Storage Allocation • Storage Report or Analogous Year	Crop Water Need (Apr-June) • ET • Precipitation • Project Efficiency Predicted Demand (July-Oct) • Historical Demand from Baseline Year (BLY)

Elements of Shortfall Calculation – Forecast Supply

Milestone	Supply	Reasonable In-Season Demand (RISD)
Time of Need	Actual Diverted Natural Flow (Apr-Time of Need) Forecast Natural Flow (Time of Need-Oct) • Natural Flow from Comparable Year Storage Allocation • Storage Report	Crop Water Need (Apr-Time of Need) • ET • Precipitation • Project Efficiency Predicted Demand (Time of Need-Oct) • Historical Demand from Baseline Year (BLY)
November	Actual Diverted Natural Flow (Apr-Oct) Storage Allocation • Storage Report	Crop Water Need (Apr-Oct) • ET • Precipitation • Project Efficiency

Methodology Reference

- April Forecast Supply (pages 17 & 18 of Methodology)
  - *The forecast supply is comprised of natural flow and stored water.*
  - *With data from 1990 through the irrigation year previous to the current year, a regression equation will be developed for each SWC member.*
  - *The regression equations for **A&B and Milner** were developed by comparing the actual Heise natural flow to the natural flow diverted.*
  - *For **AFRD2, BID, Minidoka, NSCC, and TFCC**, multi-linear regression equations were developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted.*
  - *The regression equations will be used to predict the natural flow diverted for the upcoming irrigation season.*
  - *The actual natural flow volume predicted will be one standard error below the regression line, which underestimates the available supply.*

Forecast Supply – Developing Regression Equations

- *With data from 1990 through the irrigation year previous to the current year, a regression equation will be developed for each SWC member.*

- Linear Regression Models
  - Input
    - Historic April-October natural flow diverted
    - Historic predictor variable data (e.g., Heise discharge, Box Canyon discharge, depth to well, SWE)
  - Output
    - Regression equation components:
      - Predictor variable coefficients
      - Intercept

response / dependent variable = predictor variable coefficient (predictor variable) + intercept

    - Regression statistics:
      - R-squared, adjusted R-squared, correlation coefficient, standard error, # of observations

Evaluating Regression Model Performance

- R-squared (coefficient of determination)
  - The proportion of variance in the response variable that can be explained by the predictor variable(s) in the model.
  - The R-squared value ranges from 0 and 1.
    - 0 indicates that the predictor variable(s) explains NONE of the variability of the response variable.
    - 1 indicates that the predictor variable(s) explains ALL of the variability of the response variable.
  - Adjusted R-squared is a modified version that adjusts for the number of predictors in the model.

Forecast Supply – Developing Regression Equations Outliers

- In regression analysis, an outlier is an observation for which the residual (actual – predicted) is large in magnitude compared to other observations in the dataset.
- Removal of outliers from the dataset used to develop the model may improve model performance.
- Identifying outliers
  - Used since 2016 – years with absolute value of residual greater than two times the residual standard error removed from model development.

Year	Actual Natural Flow	Predicted Natural Flow	Residual (actual - predicted)
1990	974,792	918,339	56,454
1991	956,689	943,827	12,863
1992	772,034	842,889	-70,855
1993	929,167	906,909	22,258
1994	832,820	823,586	9,235
1995	895,125	935,055	-39,931
1996	1,025,163	1,025,409	-246
1997	1,092,381	1,110,727	-18,345
1998	947,001	995,225	-48,224
1999	1,051,438	1,019,072	32,366
2000	975,905	913,623	62,282
2001	807,762	838,604	-30,843
2002	851,970	857,157	-5,187
2003	789,693	849,887	-60,195
2004	881,345	851,491	29,854
2005	738,442	813,205	-74,763
2006	804,294	895,946	-91,652
2007	792,910	806,304	-13,394
2008	924,211	928,549	-4,338
2009	898,449	941,817	-43,367
2010	840,634	878,866	-38,231
2011	983,308	1,043,069	-59,761
2012	917,357	894,734	22,623
2013	835,410	851,951	-16,541
2014	1,018,656	919,386	99,271
2015	894,042	824,929	69,113
2016	795,127	825,097	-29,970
2017	985,339	976,387	8,951
2018	944,036	931,488	12,548
2019	940,432	895,647	44,785
2020	1,036,435	895,151	141,284
2021	836,183	814,227	21,957
SE			51,972
2 * SE			103,943

April Forecast Supply – Forecasting Natural Flow Diverted

- *The regression equations for **A&B and Milner** were developed by comparing the actual Heise natural flow to the natural flow diverted.*

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**) + intercept

Adjusted R-squared Progression					
SWC Member	***2014 Calculations (1990-2013)**	**2016 Calculations (1990-2015)**	**April 15, 2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
A&B	0.88	0.91 excl 2000, 2014	0.92 excl 2000, 2014	0.92 excl 2000, 2014	0.93 excl 2000, 2014, 2020
Milner	0.92	0.95 excl 2000, 2004	0.96 excl 2000, 2010	0.96 excl 2000, 2004, 2010	0.93 excl 2020

*Regression models built using irrigation year (Nov-Oct) natural flow diversion totals.

April Forecast Supply – Forecasting Natural Flow Diverted

- *For **AFRD2, BID, Minidoka, NSCC, and TFCC**, multi-linear regression equations were developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted.*

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**)
+ Box Canyon coefficient (**Box Canyon Nov-March volume**) + intercept

Adjusted R-squared Progression					
SWC Member	***2014 Methodology Review (1990-2013)**	**2016 Calculations (1990-2015)**	**April 15, 2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
AFRD2	0.85	0.85	0.87 excl 2004	0.86 excl 2004	0.84 excl 2004
BID	0.85	0.89 excl 1993 & 2001	0.89 excl 1993 & 2001	0.85 excl 1993 & 2001	0.85 excl 2001 & 2020
Minidoka	0.88	0.90 excl 1993 & 2014	0.90 excl 1993 & 2014	0.90 excl 1993 & 2014	0.91 excl 1993, 2011, 2014
NSCC	0.92	0.92	0.91	0.90 excl 2019	0.90 excl 2019
TFCC	0.86	0.84 excl 2014 & 2015	0.83 excl 2014 & 2015	0.80 excl 2014 & 2015	0.72 excl 2020

*Regression models built using irrigation year (Nov-Oct) natural flow diversion totals.

Methodology Reference

- July Forecast Supply (pages 17 & 18 of Methodology)
  - *The Department's WRA program will compute year-to-date natural flow diverted by each member of the SWC. The natural flow diversion for the remainder of the irrigation season will be estimated based on the regression analyses.*
  - *The regression equations for **AFRD2, A&B, and Milner**, were developed by comparing July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site to the natural flow diversions. The regression equations would be applied only in those years when the SWE is greater than zero.*
  - *Multiple linear regression equations for **BID, Minidoka, and NSCC** were developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) March depth to water at well 05S31E27ABA1 and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*
  - *The multiple linear regression model for the **TFCC** will be based on the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) Spring Creek total discharge (January – May) and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

July Forecast Supply – Forecasting Natural Flow

- *The regression equations for **AFRD2, A&B, and Milner**, were developed by comparing July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site to the natural flow diversions. The regression equations would be applied only in those years when the SWE is greater than zero.*

predicted natural flow diverted = Two Ocean coefficient (**7/1 SWE Two Ocean SNOTEL**) + intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)** **10 Observations**	***2016 Calculations (1990-2015)** **9 Observations**	**2018 Calculations (1990-2017)** **11 Observations**	**2020 Calculations (1990-2019)** **11 Observations**	**2022 Calculations (1990-2021)** **12 Observations**
A&B	0.93 excl 1997	0.80 excl 1997	0.84 excl 1997	0.84 excl 1997	0.84 excl 1997
AFRD2	0.87 excl 1997	0.75 excl 1997	0.76 excl 1997	0.76 excl 1997	0.76 excl 1997
Milner	0.84 excl 1997	0.68 excl 1997	0.74 excl 1997	0.74 excl 1997	0.78 excl 1997

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Forecasting Natural Flow

- *Multiple linear regression equations for **BID, Minidoka, and NSCC** were developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) March depth to water at well 05S31E27ABA1 and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Well coefficient (**March depth to water**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)**	***2016 Calculations (1990-2015)**	**2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
BID	0.89	0.91 excl 2014	0.85 excl 2017	0.85 excl 2017	0.85 excl 2017
Minidoka	0.90	0.92 excl 2014	0.87 excl 2017	0.85 excl 2017	0.85 excl 2017
NSCC	0.86	0.87	0.82 excl 1997 & 2017	0.79 excl 1997 & 2017	0.78 excl 1997 & 2017

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Natural Flow

- *The multiple linear regression model for the **TFCC** will be based on the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) Spring Creek total discharge (January – May) and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Spring Creek coefficient (**Spring Creek Jan-May discharge**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)**	***2016 Calculations (1990-2015)**	**2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
TFCC	0.85	0.83	0.90 excl 1993 & 2014	0.89 excl 1993 & 2014	0.88 excl 1993 & 2014

*Regression models built using Togowtee Pass SNOTEL data.

Questions?

Kara Ferguson
(208) 287-4937
kara.ferguson@idwr.idaho.gov

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Evaluation of Method for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: April and July Forecast Supply

Presented by: Kara Ferguson

Date: 12/14/2022

April Forecast Supply – Forecasting Natural Flow Diverted

- *The regression equations for **A&B and Milner** were developed by comparing the actual Heise natural flow to the natural flow diverted.*

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**) + intercept

Adjusted R-squared Progression					
SWC Member	***2014 Calculations (1990-2013)**	**2016 Calculations (1990-2015)**	**April 15, 2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
A&B	0.88	0.91 excl 2000, 2014	0.92 excl 2000, 2014	0.92 excl 2000, 2014	0.93 excl 2000, 2014, 2020
Milner	0.92	0.95 excl 2000, 2004	0.96 excl 2000, 2010	0.96 excl 2000, 2004, 2010	0.93 excl 2020

*Regression models built using irrigation year (Nov-Oct) natural flow diversion totals.

April Forecast Supply – Forecasting Natural Flow Diverted Summary

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**) + intercept

Year	SWC Member	Intercept	Heise Coefficient	Adjusted R^2	SE	df	years excluded
2014	A&B	-15,840	9.21	0.88	3,974	22	-
2018	A&B	-16,742	9.41	0.92	3,221	24	2004, 2014
2022	A&B	-16,720	9.44	0.93	3,108	27	2000, 2014, 2020
2014	Milner	-15,936	10.21	0.92	3,476	22	-
2018	MIlner	-16,672	10.26	0.96	2,694	23	2000, 2005, 2010
2022	Milner	-14,980	9.88	0.93	3,221	29	2020

April Forecast Supply – Forecasting Natural Flow Diverted

- *For **AFRD2, BID, Minidoka, NSCC, and TFCC**, multi-linear regression equations were developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted.*

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**)
+ Box Canyon coefficient (**Box Canyon Nov-March volume**) + intercept

Adjusted R-squared Progression					
SWC Member	***2014 Methodology Review (1990-2013)**	**2016 Calculations (1990-2015)**	**April 15, 2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
AFRD2	0.85	0.85	0.87 excl 2004	0.86 excl 2004	0.84 excl 2004
BID	0.85	0.89 excl 1993 & 2001	0.89 excl 1993 & 2001	0.85 excl 1993 & 2001	0.85 excl 2001 & 2020
Minidoka	0.88	0.90 excl 1993 & 2014	0.90 excl 1993 & 2014	0.90 excl 1993 & 2014	0.91 excl 1993, 2011, 2014
NSCC	0.92	0.92	0.91	0.90 excl 2019	0.90 excl 2019
TFCC	0.86	0.84 excl 2014 & 2015	0.83 excl 2014 & 2015	0.80 excl 2014 & 2015	0.72 excl 2020

*Regression models built using irrigation year (Nov-Oct) natural flow diversion totals.

April Forecast Supply – Forecasting Natural Flow Diverted Summary

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**)
+ Box Canyon coefficient (**Box Canyon Nov-March volume**) + intercept

SWC Member	Intercept	Heise Coefficient	Box Coefficient	Adjusted R^2	SE	df	years excluded
AFRD2	-435,713	73.2	3,318	0.84	37,290	21	-
AFRD2	-263,605	70.6	1,709	0.87	31,562	24	2004
AFRD2	-292,585	67.0	2,118	0.84	32,595	28	2004
BID	-240,800	33.6	2,570	0.85	17,100	21	-
BID	-217,895	31.9	2,417	0.89	13,867	23	1993, 2001
BID	-200,374	31.2	2,287	0.85	15,580	27	2001, 2020
MID	-401,000	47.1	4,302	0.88	22,070	21	-
MID	-379,633	46.1	4,120	0.90	19,143	23	1993, 2014
MID	-368,398	47.9	3,981	0.91	17,968	26	1993, 2011, 2014
NSCC	-677,949	154.2	6,834	0.92	55,950	21	-
NSCC	-647,724	145.1	6,774	0.91	54,814	25	-
NSCC	-617,984	141.8	6,565	0.90	54,217	28	2019
TFCC	-609,600	62.0	12,980	0.87	38,010	21	-
TFCC	-317,167	60.8	10,064	0.83	38,973	23	2014, 2015
TFCC	-7,081	60.4	7,126	0.72	47,369	28	2020

July Forecast Supply – Forecasting Natural Flow

- *The regression equations for **AFRD2, A&B, and Milner**, were developed by comparing July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site to the natural flow diversions. The regression equations would be applied only in those years when the SWE is greater than zero.*

predicted natural flow diverted = Two Ocean coefficient (**7/1 SWE Two Ocean SNOTEL**) + intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)** **10 Observations**	***2016 Calculations (1990-2015)** **9 Observations**	**2018 Calculations (1990-2017)** **11 Observations**	**2020 Calculations (1990-2019)** **11 Observations**	**2022 Calculations (1990-2021)** **12 Observations**
A&B	0.93 excl 1997	0.80 excl 1997	0.84 excl 1997	0.84 excl 1997	0.84 excl 1997
AFRD2	0.87 excl 1997	0.75 excl 1997	0.76 excl 1997	0.76 excl 1997	0.76 excl 1997
Milner	0.84 excl 1997	0.68 excl 1997	0.74 excl 1997	0.74 excl 1997	0.78 excl 1997

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Forecasting Natural Flow Summary

predicted natural flow diverted = Two Ocean coefficient (**7/1 SWE Two Ocean SNOTEL**) + intercept

Year	SWC Member	Intercept	Heise Coefficient	Adjusted R^2	SE	# of obs	years excluded (not including 0 SWE years)
2014	A&B	-546	296	0.93	741	10	1997
2018	A&B	-654	587	0.84	2,049	11	1997
2022	A&B	-155	561	0.84	2,069	12	1997
2014	AFRD2	-2887	2137	0.87	7,502	10	1997
2018	AFRD2	-1971	4239	0.76	19,243	11	1997
2022	AFRD2	2065	3995	0.76	18,747	12	1997
2014	Milner	-870	737	0.84	2,939	10	1997
2018	Milner	-229	740	0.74	3,529	11	1997
2022	Milner	123	706	0.78	3,124	12	1997

July Forecast Supply – Forecasting Natural Flow

- *Multiple linear regression equations for **BID, Minidoka, and NSCC** were developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) March depth to water at well 05S31E27ABA1 and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Well coefficient (**March depth to water**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)**	***2016 Calculations (1990-2015)**	**2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
BID	0.89	0.91 excl 2014	0.85 excl 2017	0.85 excl 2017	0.85 excl 2017
Minidoka	0.90	0.92 excl 2014	0.87 excl 2017	0.85 excl 2017	0.85 excl 2017
NSCC	0.86	0.87	0.82 excl 1997 & 2017	0.79 excl 1997 & 2017	0.78 excl 1997 & 2017

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Forecasting Natural Flow Summary

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Well coefficient (**March depth to water**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Year	SWC Member	Intercept	Heise Coefficient	March 23 Well 05S31E27ABA1 Coefficient	Two Oceans 6/15 Coefficient	Adjusted R^2	SE	df	years excluded
2014	BID	269,423	15.2	-11,230	800	0.89	11,480	20	-
2018	BID	208,824	18.7	-9,053	707	0.87	12,495	23	2017
2022	BID	225,625	14.8	-9,478	893	0.85	12,875	27	2017
2014	MID	403,010	21.8	-16,734	1,127	0.90	15,720	20	
2018	MID	308,111	27.2	-13,328	988	0.87	17,854	23	2017
2022	MID	331,939	21.7	-13,944	1,252	0.85	18,262	27	2017
2014	NSCC	533,460	91.3	-24,979	1,524	0.85	46,930	20	
2018	NSCC	447,994	68.1	-19,935	2,483	0.82	41,988	22	1997, 2017
2022	NSCC	480,829	47.4	-19,877	3,296	0.78	43,665	26	1997, 2017

July Forecast Supply – Natural Flow

- *The multiple linear regression model for the **TFCC** will be based on the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) Spring Creek total discharge (January – May) and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Spring Creek coefficient (**Spring Creek Jan-May discharge**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)**	***2016 Calculations (1990-2015)**	**2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
TFCC	0.85	0.83	0.90 excl 1993 & 2014	0.89 excl 1993 & 2014	0.88 excl 1993 & 2014

*Regression models built using Togowtee Pass SNOTEL data.

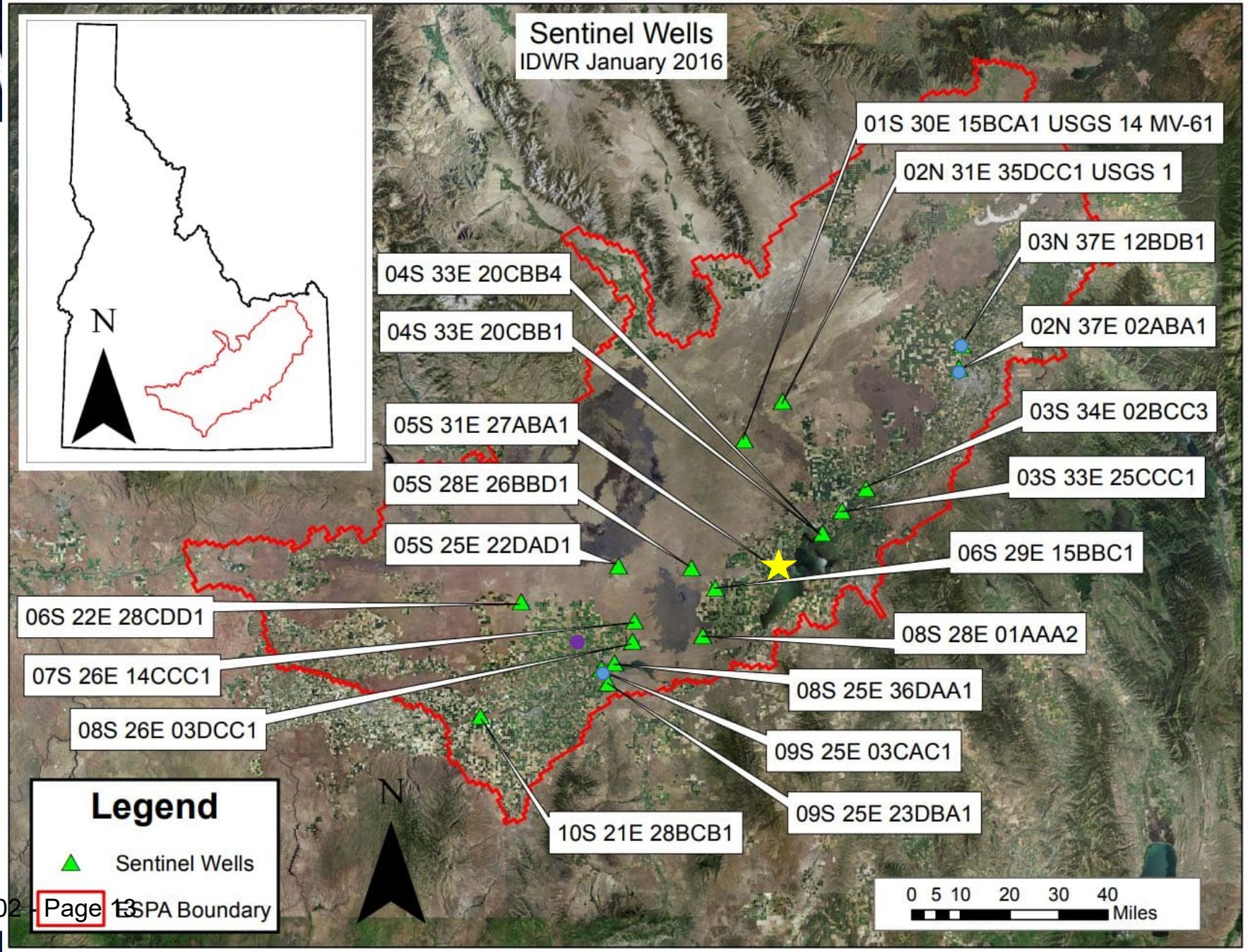
July Forecast Supply – Forecasting Natural Flow Summary

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Spring Creek coefficient (**Spring Creek Jan-May discharge**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Year	SWC Member	Intercept	Heise Coefficient	Two Ocean 6/15 Coefficient	Spring Creek (Jan-May) Coefficient	Adjusted R^2	SE	df	years excluded
2014	TFCC	106,500	26.8	2,562	2,986	0.85	29,270	20	-
2018	TFCC	98,824	25.0	2,628	3,070	0.90	24,313	22	1993, 2014
2022	TFCC	102,851	25.3	2,649	3,036	0.88	25,837	26	1993, 2014

Variable Name	Description	Units
HeiseAprtoJulKAF	**USBR Hydromet Heise Natural Flow April - July**	**KAF**
MarWell1	USGS Well: WL-9S 25E 03CAC1 March depth to water	Feet
MarWell2	USGS Well: WL-2N 37E 02ABA1 March depth to water	Feet
MarWell3	USGS Well: WL-3N 37E 12BDB1 March depth to water	Feet
MarWell4	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
MarWell5	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
RupNovtoMar	Rupert Agrimet Total Precipitation November - March	Inches
TYHEE	USGS 13075910 PORTNEUF RIVER NR TYHEE ID Total Flow November - March	AF
LastYearNF7to9	TFCC Natural flow diversions July - September, lagged by 1 year	AF
SpringCreek11to3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow November - March	AF
SpringCr3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow March	AF
Devils11to3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S Total Flow November - March	AF
Devils3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S total Flow March	AF
Box11to3	**USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow November - March**	**AF**
Box3	USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow March	AF
Briggs11to3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow November - March	AF
Briggs3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow March	AF
TwoOceans71	**NRCS Two Oceans Plateau (837) Snow Water Equivalent on July 1**	**Inches**
HEIAprtoJune	**USBR Hydromet Heise Natural Flow April - June**	**KAF**
SpringJantoMay	**USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow January - May**	**KAF**
NA	NRCS Spring Creek Divide (779) Snow Water Equivalent on July 1	Inches
NA	NRCS Togwotee Pass (822) Snow Water Equivalent on July 1	Inches
NA	NRCS Phillips Bench (689) Snow Water Equivalent on July 1	Inches
2OcTow	Sum of Two Oceans Plateau and Togwotee Pass Snow Water Equivalent on July 1	Inches

Variables in Bold were used in the models


Sentinel Wells
IDWR January 2016
N
01S 30E 15BCA1 USGS 14 MV-61
02N 31E 35DCC1 USGS 1
03N 37E 12BDB1
04S 33E 20CBB4
04S 33E 20CBB1
02N 37E 02ABA1
05S 31E 27ABA1
03S 34E 02BCC3
05S 28E 26BBD1
03S 33E 25CCC1
05S 25E 22DAD1
06S 29E 15BBC1
06S 22E 28CDD1
08S 28E 01AAA2
07S 26E 14CCC1
08S 25E 36DAA1
08S 26E 03DCC1
09S 25E 03CAC1
09S 25E 23DBA1
10S 21E 28BCB1
Legend
Sentinel Wells
SRPA Boundary
0 5 10 20 30 40
Miles

2014 Analysis Summary of Promising Predictor Variables
April Natural Flow Forecast

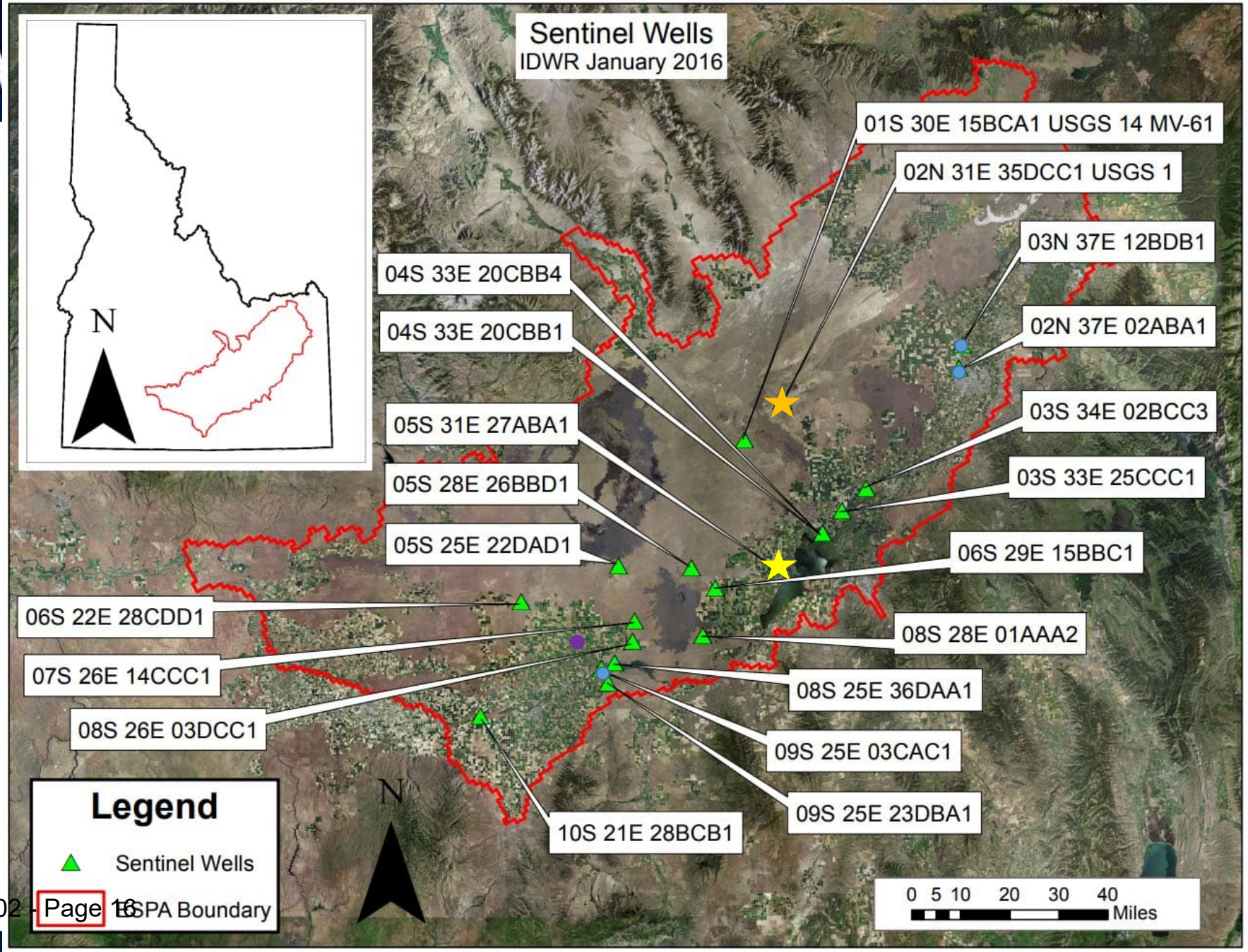
	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Heise April-July only	0.88	0.82	0.79	0.92	0.78	0.89	0.52
Heise April-July + Box Canyon Nov-Mar	0.88	0.84	0.85	0.93	0.88	0.92	0.87
Heise April-July + Spring Creek Nov-Mar			0.84		0.87	0.94	0.75
Heise April-July + Spring Creek Nov-Feb			0.83		0.86	0.94	0.74
Heise April-July + Spring Creek Jan-Feb			0.85		0.88	0.94	0.75
Heise April-July + Well 05S31E27ABA1 Mar 15			0.87		0.88	0.94	0.69

Red text are current regression equations

2014 Analysis Summary of Promising Predictor Variables
July Natural Flow Forecast

	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Two Ocean 7/1	0.95	0.91		0.90			
Two Ocean 6/15	0.71	0.66		0.67			
Heise April-June + Two Ocean 6/15 + SpringCreek Jan-May			0.83		0.84	0.86	0.85
Heise April-June + Two Ocean 6/15 + SpringCreek April-May			0.85		0.87	0.85	0.85
Heise April-June + Two Ocean 6/15 + 05S31E27ABA1 March 15			0.89		0.90	0.86	0.83
Heise April-June + Two Ocean 6/15 + Box Canyon Jan-Mar			0.75		0.76	0.81	0.81
Heise April-June + Two Ocean 7/1 + SpringCreek Jan-May			0.87		0.88	0.90	0.83

Red text are current regression equations


Sentinel Wells
IDWR January 2016
N
01S 30E 15BCA1 USGS 14 MV-61
02N 31E 35DCC1 USGS 1
03N 37E 12BDB1
04S 33E 20CBB4
04S 33E 20CBB1
02N 37E 02ABA1
05S 31E 27ABA1
03S 34E 02BCC3
05S 28E 26BBD1
03S 33E 25CCC1
05S 25E 22DAD1
06S 29E 15BBC1
06S 22E 28CDD1
08S 28E 01AAA2
07S 26E 14CCC1
08S 25E 36DAA1
08S 26E 03DCC1
09S 25E 03CAC1
09S 25E 23DBA1
10S 21E 28BCB1
Legend
Sentinel Wells
SPA Boundary
0 5 10 20 30 40
Miles

2022 Summary of Test Predictor Variables
April Natural Flow Forecast

	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Heise April-July + Well 02N 31E 35DCC1		0.84	0.85		0.87	0.88	0.67
Heise April-July + Sentinel Well Index							0.65
Heise April-July + Box Canyon Nov-Mar		0.84	0.85		0.91	0.90	0.72

2022 Summary of Test Predictor Variables
July Natural Flow Forecast

2022 NCSS test	Adjusted R2
Heise April-June + Two Ocean 6/15 + Well new April Avg	0.78
Heise April-June + Two Ocean 6/15 + Well new March Avg	0.78
Heise April-June + Two Ocean 6/15 + SpringCreek Jan-May	0.80
Heise April-June + Two Ocean 6/15 + 05S31E27ABA1 March 15	0.78

Questions?

Kara Ferguson
(208) 287-4937
kara.ferguson@idwr.idaho.gov



Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC

Presented by Ethan Geisler

November 17, 2022

IDAHO DEPARTMENT OF WATER RESOURCES

Elements of Shortfall Calculation

Milestone	Supply	Reasonable In-Season Demand (RISD)
April	Forecast Natural Flow (Apr-Oct) • Regression Equations Predicted Storage Allocation • Analogous Year or Years	Predicted Demand (Apr-Oct) • Historical Demand from Baseline Year (BLY)
July	Actual Diverted Natural Flow (Apr-June) Forecast Natural Flow (July-Oct) • Regression Equations Storage Allocation • Storage Report or Analogous Year	Crop Water Need (Apr-June) • ET • Precipitation • Project Efficiency Predicted Demand (July-Oct) • Historical Demand from Baseline Year (BLY)

Elements of Shortfall Calculation

Milestone	Supply	Reasonable In-Season Demand (RISD)
Time of Need	Actual Diverted Natural Flow (Apr-Time of Need) Forecast Natural Flow (Time of Need-Oct) • Natural Flow from Comparable Year Storage Allocation • Storage Report	Crop Water Need (Apr-Time of Need) • ET • Precipitation • Project Efficiency Predicted Demand (Time of Need-Oct) • Historical Demand from Baseline Year (BLY)
November	Actual Diverted Natural Flow (Apr-Oct) Storage Allocation • Storage Report	Crop Water Need (Apr-Oct) • ET • Precipitation • Project Efficiency

Current Method - USDA Crop Data Layer

Methodology Reference

- Crop Water Need (CWN) (Page 14 of Methodology)
  - Volume of irrigation water required for crop growth within a SWC entity boundary, such that crop growth is not limited by water availability.
  - CWN_{crop} = (ET_{crop}- Effective Precipitation) * $Acres_{crop}$

- Acres of a Crop (Page 15 of Methodology)
  - The areas for individual crop types will be derived from published crop distributions from the USDA annual crop-specific land cover digital dataset called the Cropland Data Layer (CDL).

Current Method Crop Water Need

$$CWN_{crop} = (ET_{crop} - \text{Effective Precipitation}) * Acres_{crop}$$

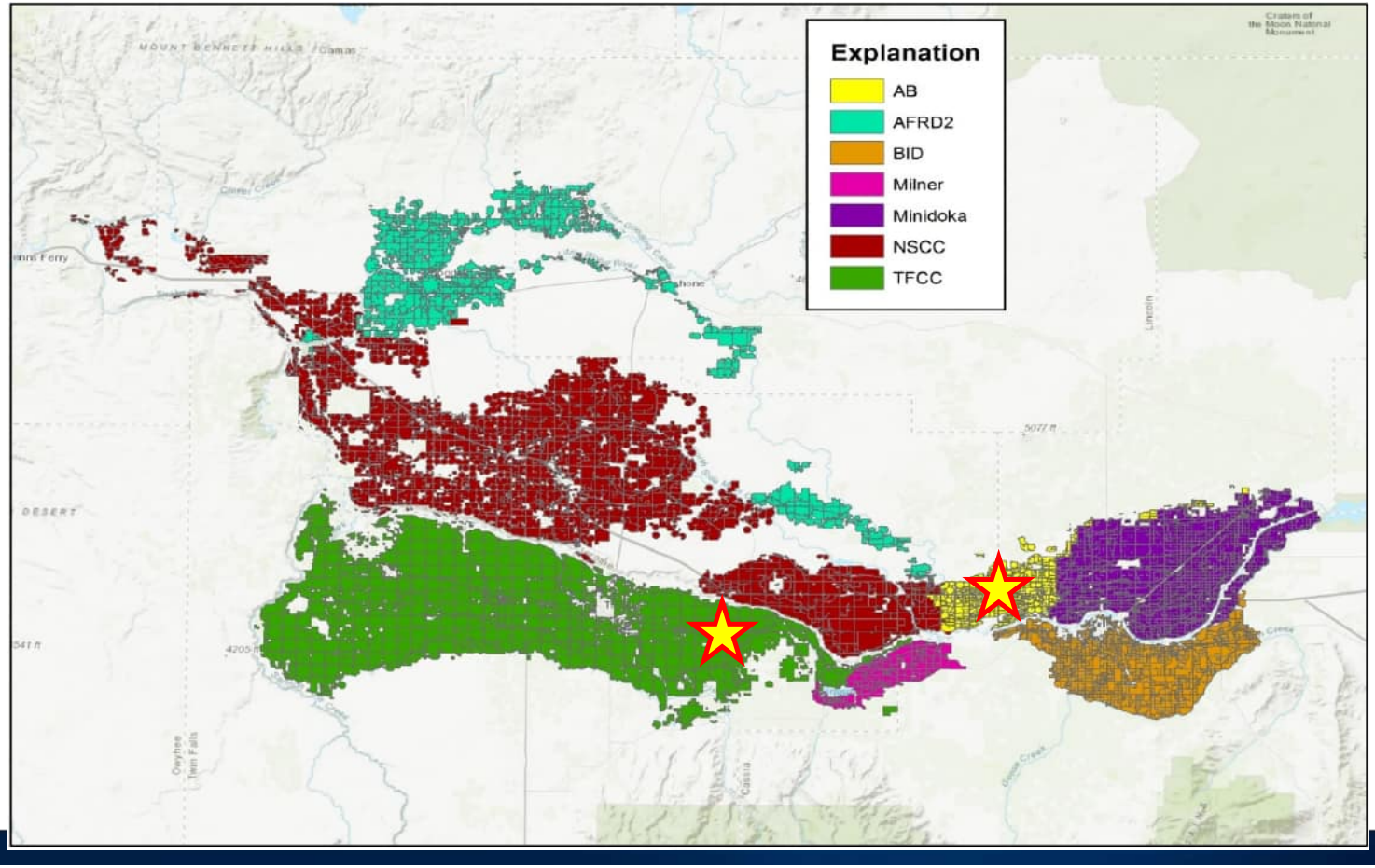
- AgriMet ET
- Daily data from Rupert & Twin Falls stations.

- AgriMet Precipitation
- Daily data from Rupert & Twin Falls stations.
- Calculate monthly effective precipitation.

- USDA Crop Data Layer (CDL)
- Remove data speckling and assign the majority crop in each polygon.
- Remove non-irrigated land from CDL using the IDWR Irrigated Lands Dataset.
- Clip CDL to SWC service areas.
- Determine the 3-year average crop mix percentage
- Acres of Each Crop = Crop Mix % * Acres From Methodology

Current Method Crop Water Need

- Significant Shortcomings
  - ET and precipitation from Rupert & Twin Falls stations assumed to represent entire SWC service area.



Current Method Crop Water Need

- Significant Shortcomings - continued
  - CDL is from previous year.
  - Irrigated acres datasets for SWC sometimes represent service areas, not the actual irrigated land.

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	Methodology Acres
A&B	PPU	2010	21,972	15,924
AFRD2	PPU	2010	69,077	62,361
Burley	SWC	2013	46,035	46,035
Milner	PPU	2010	13,264	13,335
Minidoka	SWC	2022	74,849	75,060
NSCC	PPU	2010	224,463	154,067
TFCC	SWC	2013	194,727*	194,732

* After NRT METRIC processing 179,000 acres.

Proposed Method - Near Real Time METRIC

Mapping **E**vapo**T**ranspiration at high **R**esolution and **I**nternalized **C**alibration

- METRIC
  - Developed by Rick Allen et al. in 2007 at the University of Idaho
  - Uses Landsat imagery
  - Utilizes the surface energy balance to calculate ET
  - “Internalized Calibration” ties ET to weather data
  - Calculates ET at a 30-meter scale
- Near Real Time (NRT) METRIC
  - METRIC processed at the end of each month during the irrigation season



Proposed Method NRT METRIC Crop Water Need

CWN = (ET - Effective Precipitation) * Acres

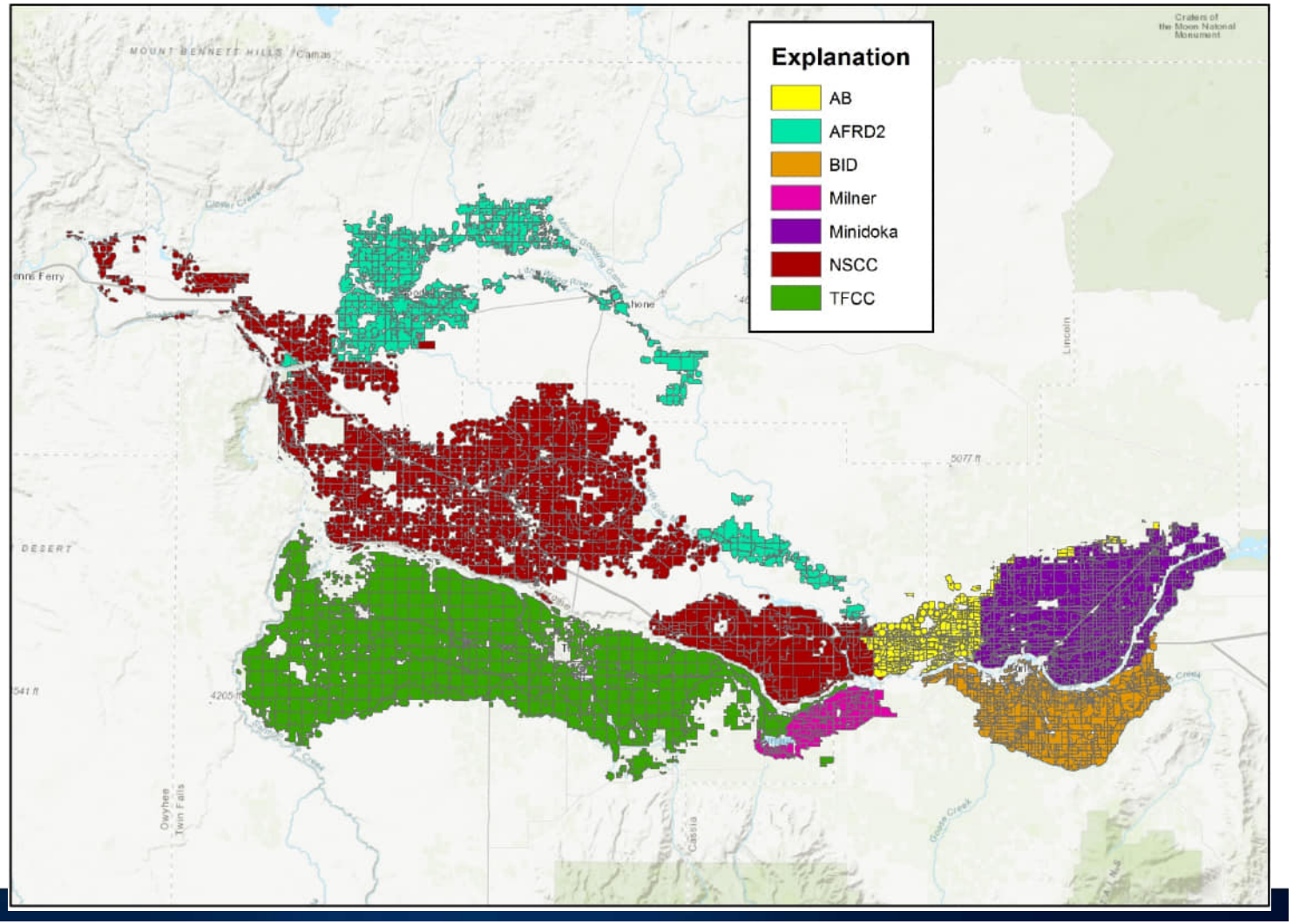
- NRT METRIC
- Remove non-irrigated land
- Normalize “ET – Effective Precipitation” to AF/Acre for each SWC member

- Irrigated acres from methodology

- Oregon State University Prism Precipitation
- Calculate monthly effective precipitation

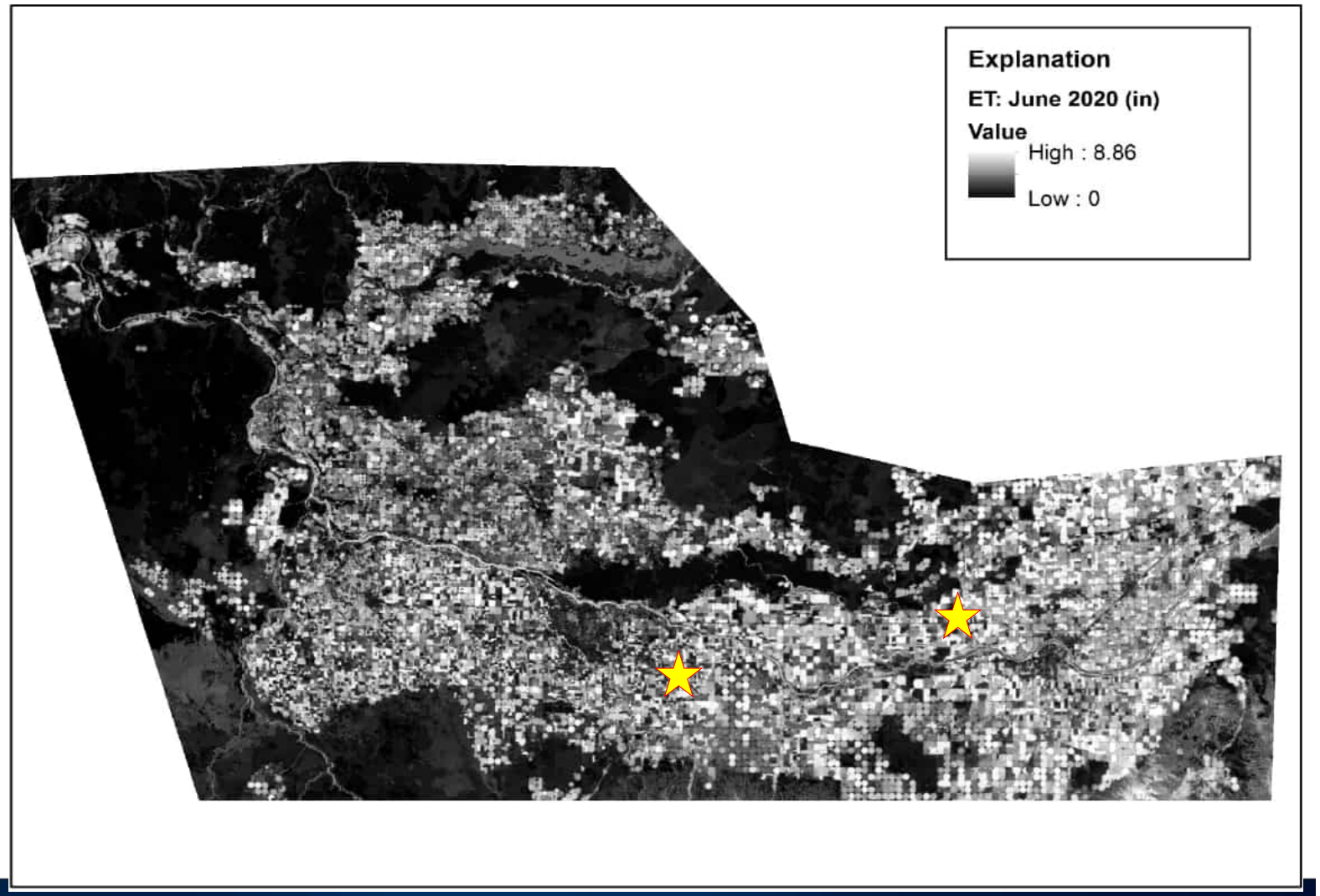
Irrigation Company Service Areas

- Shapefiles are from SWC members and IDWR water right PPU

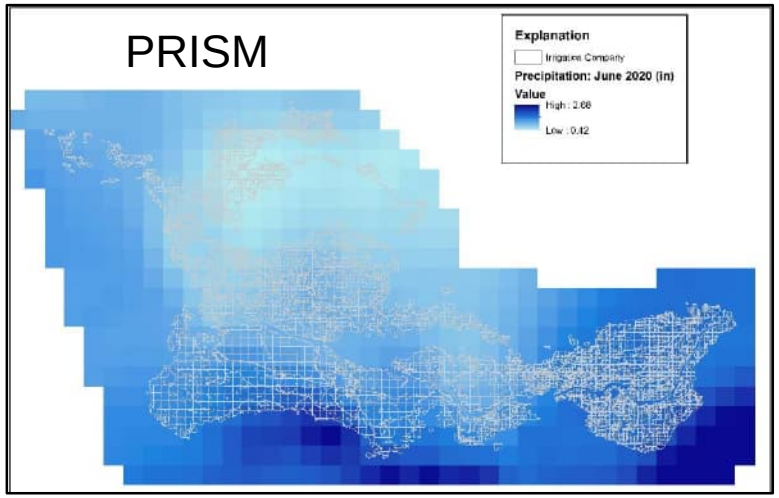


Near Real Time (NRT) METRIC

- Spatial variability is well represented

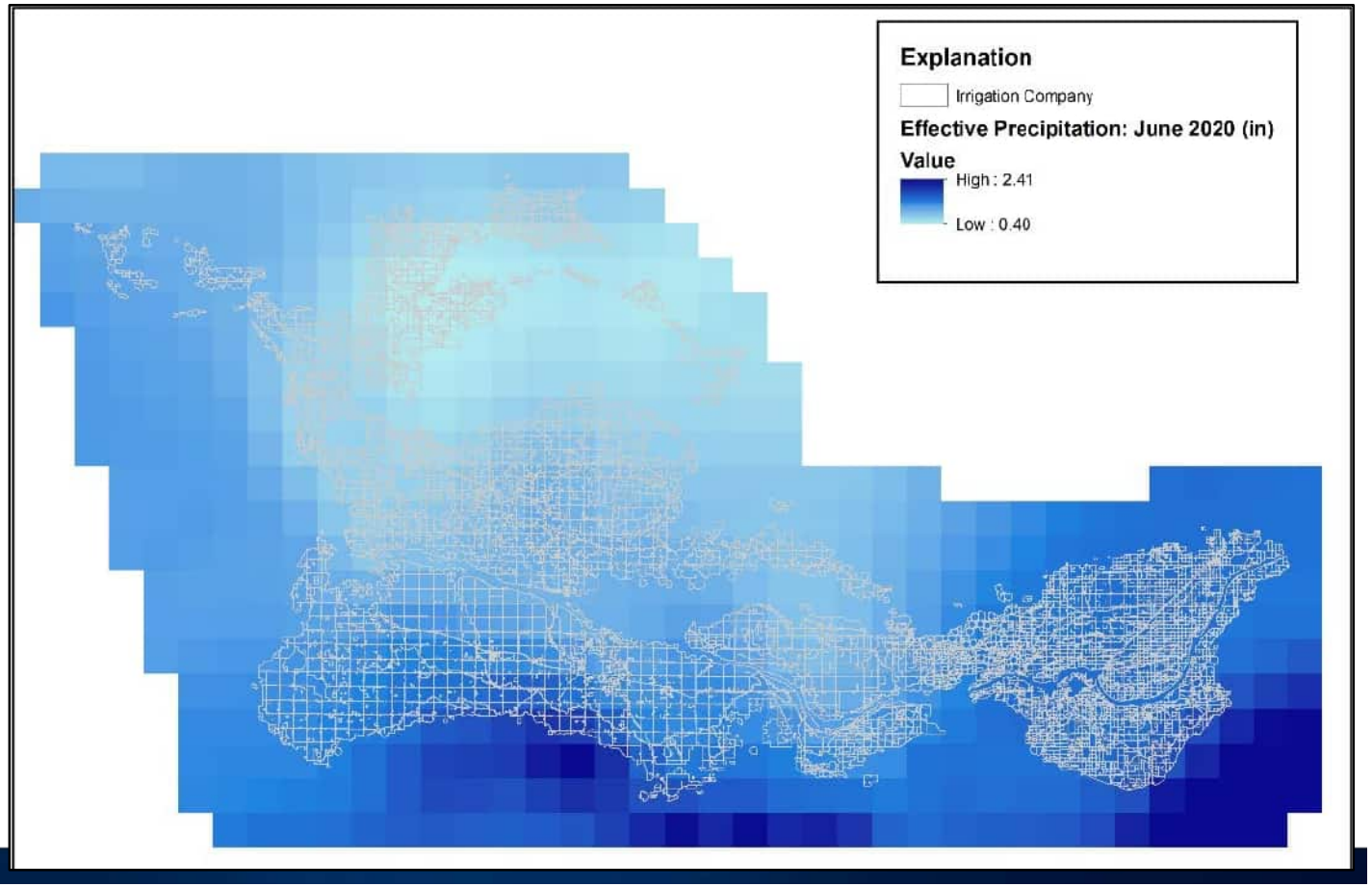


Effective Precipitation: Applied to PRISM



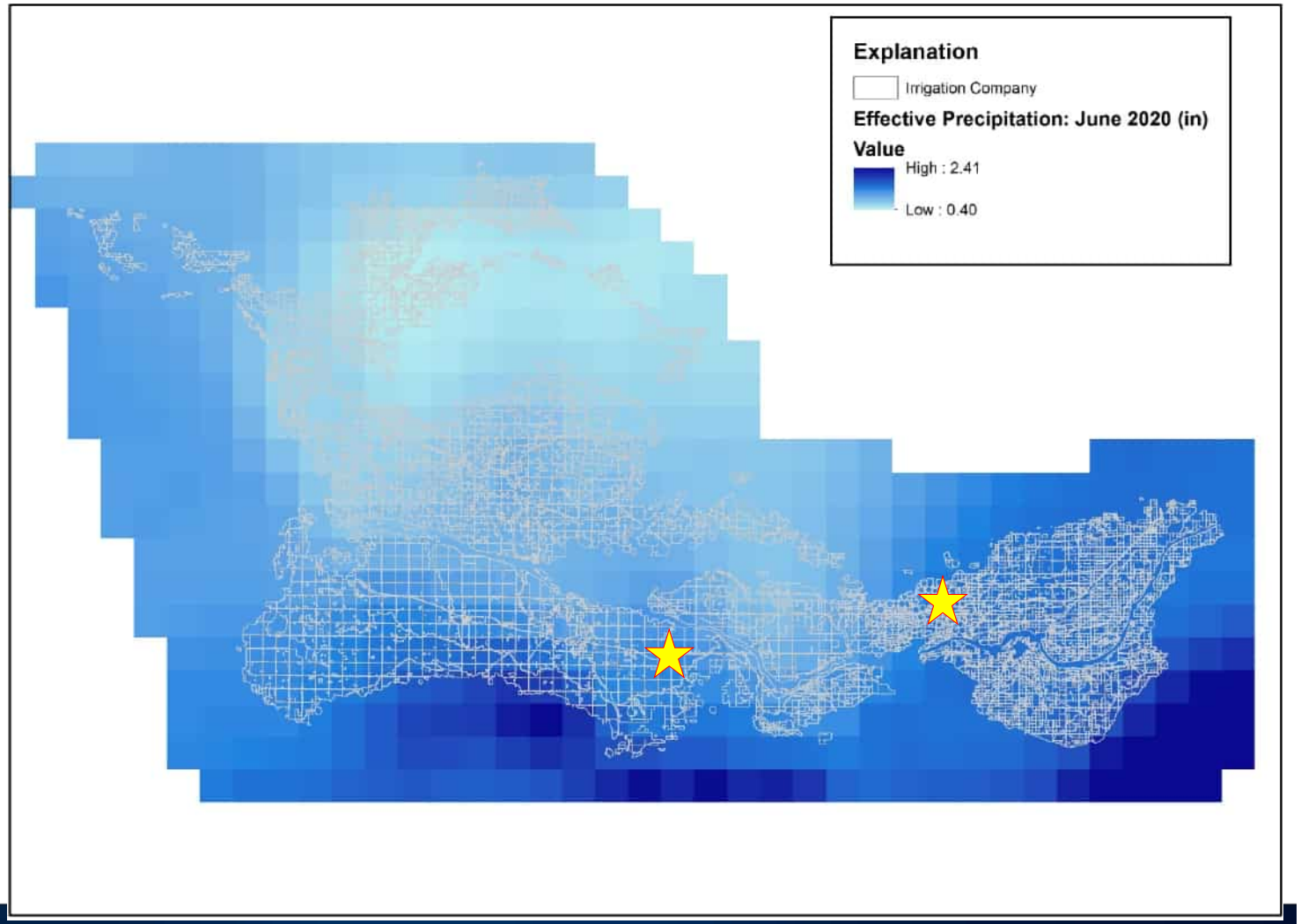
USDA Technical Bulletin 1275		
Total Monthly Precipitation (in)	Percent Effective	Total Monthly Effective Precipitation (in)
1	95%	0.95
2	90%	1.85
3	82%	2.67
4	65%	3.32
5	45%	3.77
6	25%	4.02
>6	5%	

- Similar process used in the CDL method

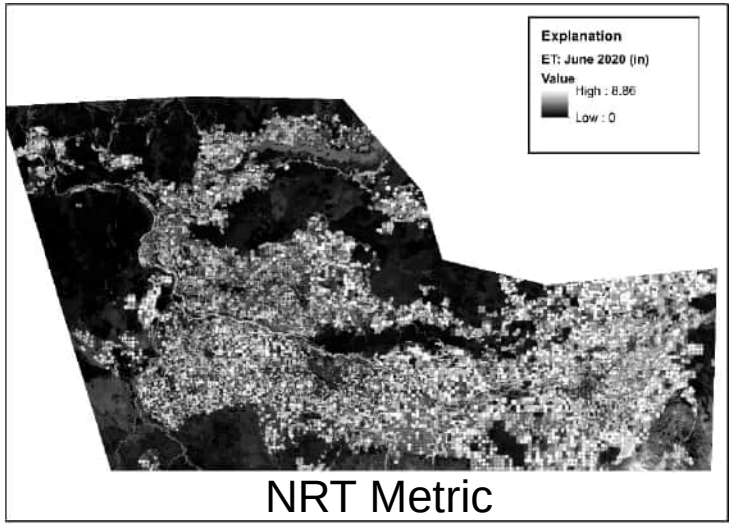


PRISM Effective Precipitation

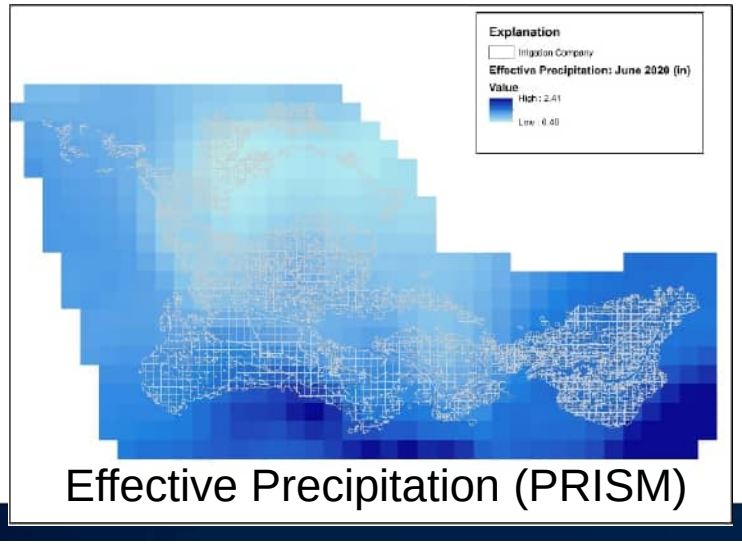
- Spatial coverage is better than the CDL method, which uses two AgriMet Stations (Rupert and Twin Falls)



NRT METRIC – Effective Precipitation (PRISM)

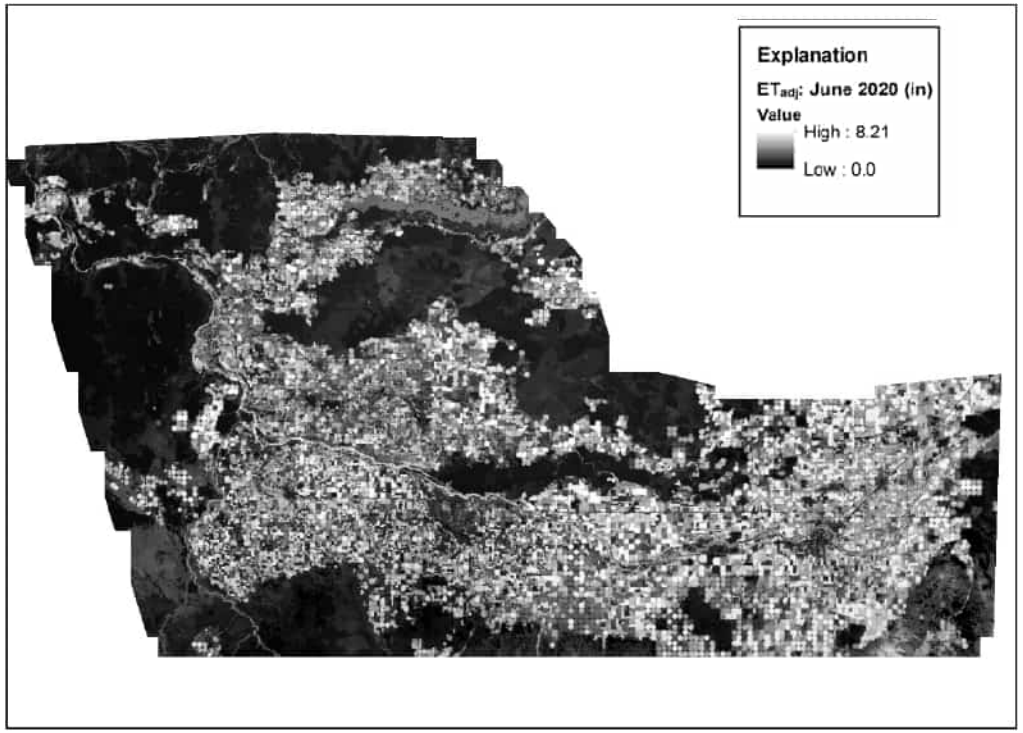


NRT Metric



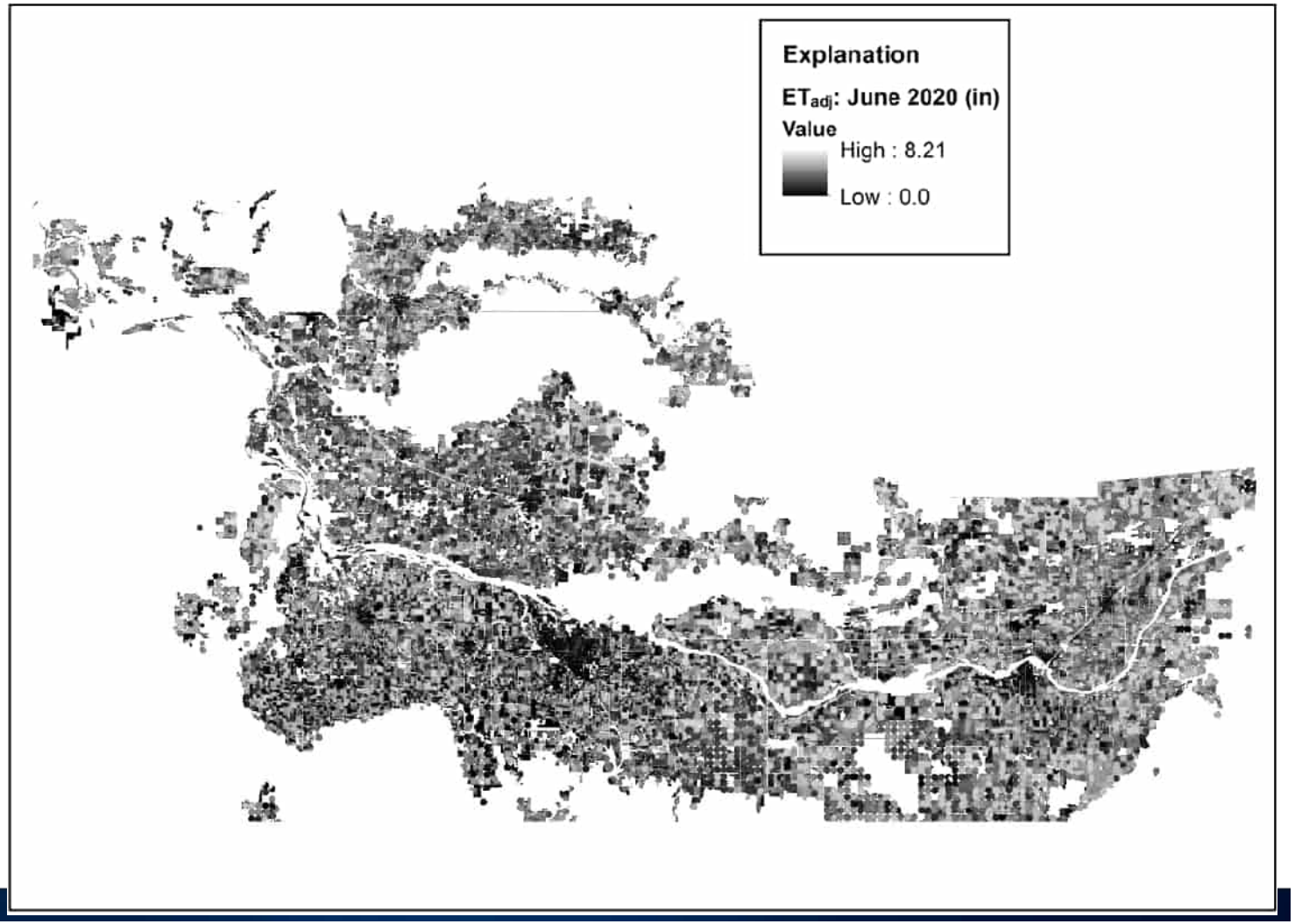
Effective Precipitation (PRISM)

- NRT Metric ET – PRISM Effective Precipitation = ET_{Adj}



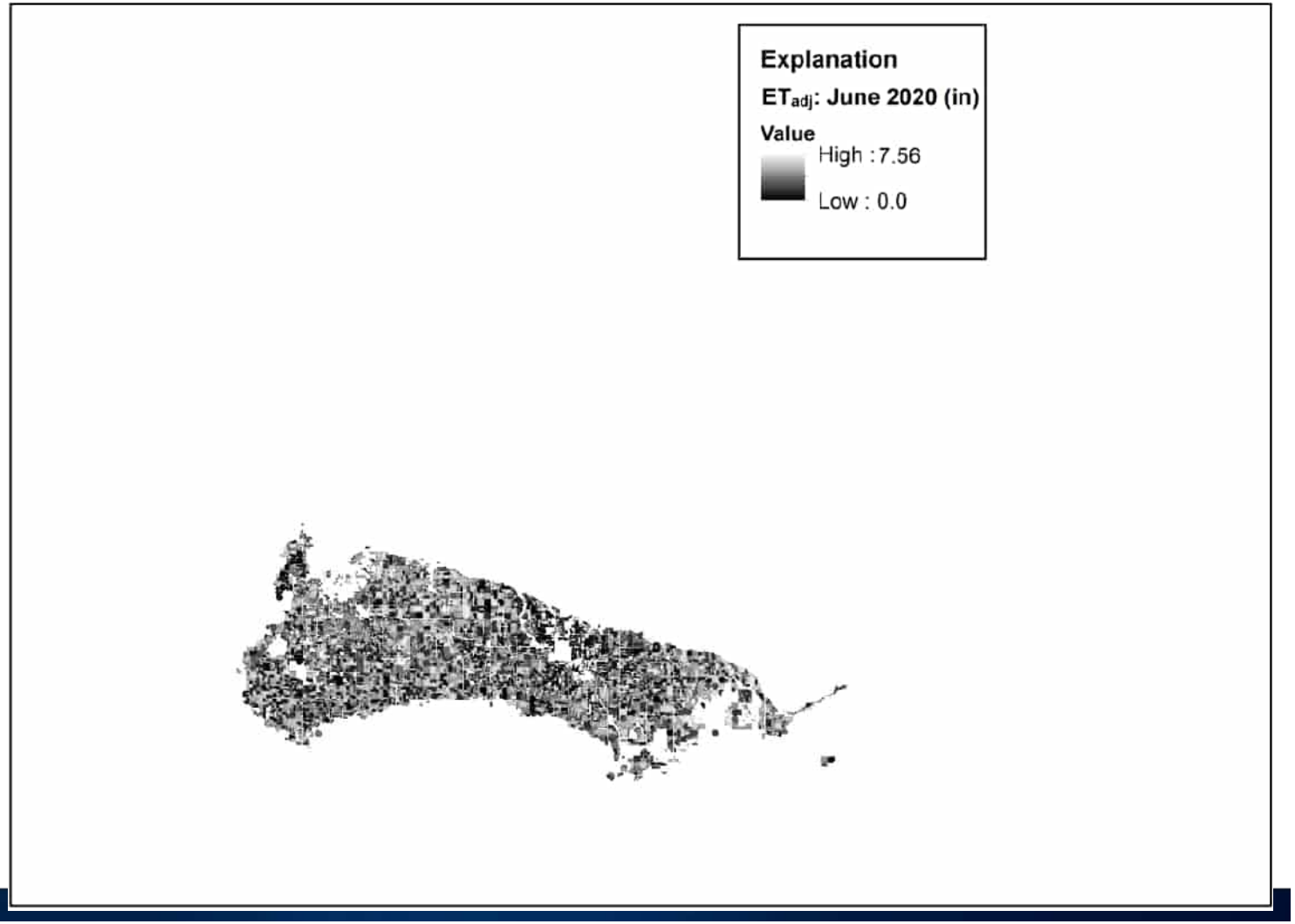
Remove non-irrigated lands

- Remove non-irrigated lands using the IDWR Irrigated Lands dataset

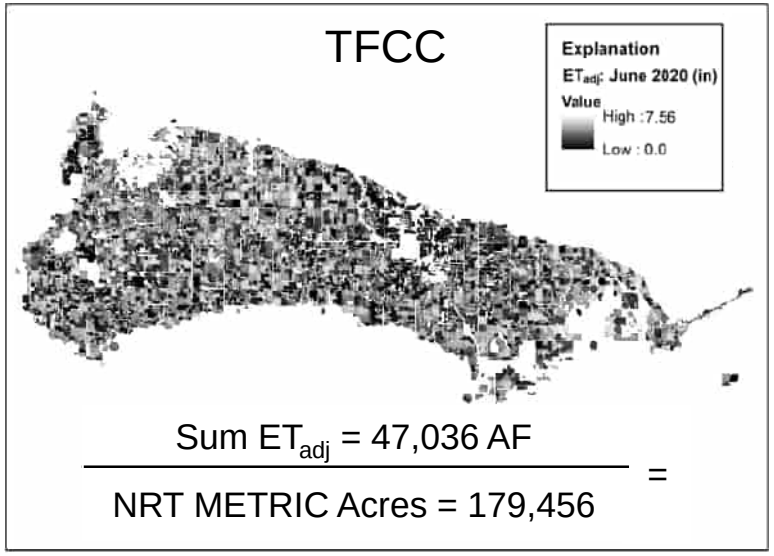


Crop the dataset to each Irrigation Company

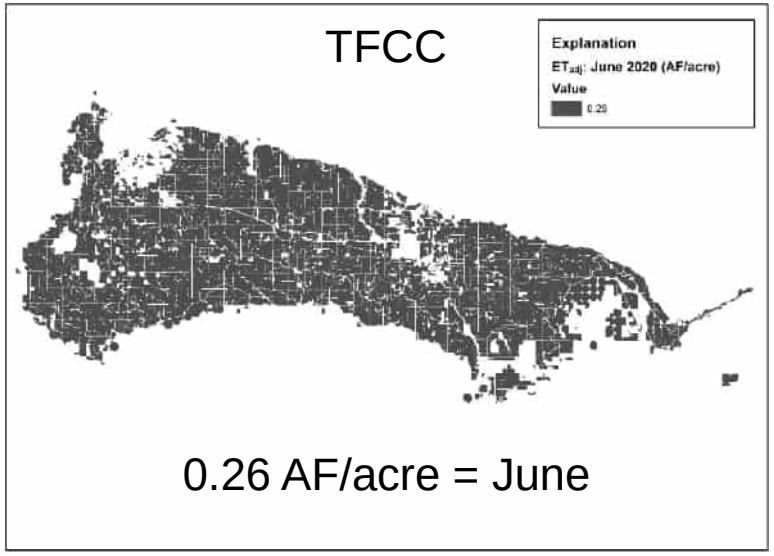
- Example: Twin Falls Canal Company



Normalize to AF/acre to apply to Irrigated Acres in the Methodology



$$\frac{\text{Sum } ET_{adj} = 47{,}036 \text{ AF}}{\text{NRT METRIC Acres} = 179{,}456} =$$



0.26 AF/acre = June

- Similar normalization process used in the CDL method
  - Sum ET_{adj} from each Irrigation Company for each month (example: June)
  - Divide the monthly sum by the number of acres in the NRT METRIC dataset
  - Multiply AF/acre value by irrigated acres in the Methodology

Comparison of Results (April-October)

2016 Crop Water Need (AF)

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
NRT METRIC-PRISM	39,543	165,707	105,838	31,183	181,682	408,468	449,478
CDL-AgriMet	38,437	139,802	109,186	28,483	194,956	333,038	415,928
Difference	**1,106**	**25,905**	**-3,348**	**2,700**	**-13,274**	**75,430**	**33,550**
% Difference	**2.9%**	**18.5%**	**-3.1%**	**9.5%**	**-6.8%**	**22.6%**	**8.1%**

2017 Crop Water Need (AF)

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
NRT METRIC-PRISM	37,954	160,600	100,882	34,214	172,207	396,041	439,185
CDL-AgriMet	37,740	147,288	108,590	29,877	194,378	347,966	435,307
Difference	**214**	**13,312**	**-7,708**	**4,337**	**-22,171**	**48,075**	**3,878**
% Difference	**0.6%**	**9.0%**	**-7.1%**	**14.5%**	**-11.4%**	**13.8%**	**0.9%**

2018 Crop Water Need (AF)

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
NRT METRIC-PRISM	34,509	140,057	100,794	32,354	157,442	339,957	375,023
CDL-AgriMet	38,220	156,633	111,821	31,156	200,689	367,342	462,889
Difference	**-3,711**	**-16,576**	**-11,027**	**1,198**	**-43,247**	**-27,385**	**-87,866**
% Difference	**-9.7%**	**-10.6%**	**-9.9%**	**3.8%**	**-21.5%**	**-7.5%**	**-19.0%**

2019 Crop Water Need (AF)

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
NRT METRIC-PRISM	32,194	131,954	87,281	28,501	145,349	315,422	354,220
CDL-AgriMet	31,215	133,905	92,247	26,864	163,730	314,842	396,648
Difference	**979**	**-1,951**	**-4,966**	**1,637**	**-18,381**	**580**	**-42,428**
% Difference	**3.1%**	**-1.5%**	**-5.4%**	**6.1%**	**-11.2%**	**0.2%**	**-10.7%**

2020 Crop Water Need (AF)

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
NRT METRIC-PRISM	40,082	162,899	110,703	34,383	188,681	386,761	426,023
CDL-AgriMet	34,227	156,003	99,510	30,601	184,631	360,319	465,580
Difference	**5,855**	**6,896**	**11,193**	**3,782**	**4,050**	**26,442**	**-39,557**
% Difference	**17.1%**	**4.4%**	**11.2%**	**12.4%**	**2.2%**	**7.3%**	**-8.5%**

2021 Crop Water Need (AF)

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
NRT METRIC-PRISM	44,717	186,291	122,540	37,688	212,450	447,810	481,903
CDL-AgriMet	39,992	159,868	114,228	32,534	206,729	372,604	478,907
Difference	**4,725**	**26,423**	**8,312**	**5,154**	**5,721**	**75,206**	**2,996**
% Difference	**11.8%**	**16.5%**	**7.3%**	**15.8%**	**2.8%**	**20.2%**	**0.6%**

Proposed Method NRT METRIC Demand Shortfall Hindcast – Total for SWC

Year	April AgriMet-CDL (AF)	April NRT METRIC (AF)	July AgriMet-CDL (AF)	July NRT METRIC (AF)	November AgriMet-CDL (AF)	November NRT METRIC (AF)
2016	44,163	44,163	21,271	0	7,853	89,486
2017	0	0	0	0	0	0
2018	0	0	0	0	10,996	0
2019	20,943	20,943	0	0	0	0
2020	0	0	0	0	0	0
2021	40,491	40,491	162,873	271,198	190,816	457,325

Shortcomings of using NRT METRIC Crop Water Need

- Clouds
  - Extra processing time and possible delays
- Deadlines
  - July 5th
  - August 5th
  - August 20th (Time of Need)
  - Nov 15th
- Data can change in subsequent months in NRT METRIC
  - All SWC Irrigation Companies
    - June: +1.02% to -2.30%
  - TFCC
    - June: -0.21% to -2.12%
- Normalized to AF/acre
  - This process is also performed in the current CDL Method
- By calculating Actual ET with NRT METRIC is the calculation failing to capture a portion of the shortfall in dry years?

Conclusion

- Switching to NRT METRIC is an upgrade.

CDL	NRT METRIC
Average crop mix from the previous 3 years	Eliminates the crop mix variable and uses data from the current year.
Calculates the potential ET assuming the crops are getting a full water supply.	Calculates actual ET of the crops as they are maturing.
Applies ET and precipitation data collected at the Twin Falls and Rupert AgriMet Stations to SWC service areas.	ET and precipitation are spatial datasets that represent conditions throughout the SWC service areas.

Questions?

(208) 287-4816
ethan.geisler@idwr.idaho.gov

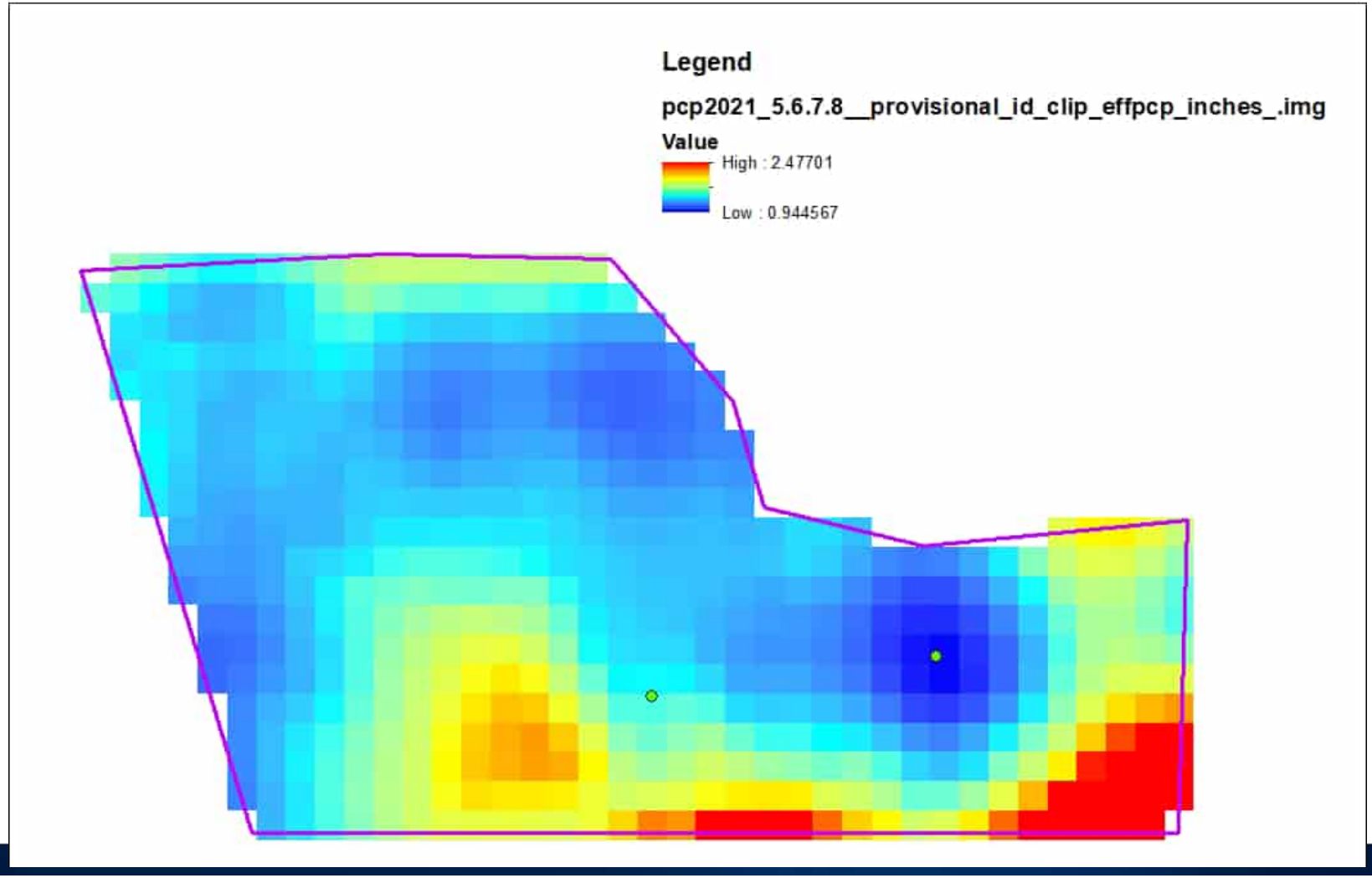
Proposed Method NRT METRIC Demand Shortfall Hindcast – By SWC Member

Shortfall: CDL								Shortfall: METRIC							
Milestone	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Milestone	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
2016															
1-Apr	0	0	0	0	0	0	44,163	1-Apr	0	0	0	0	0	0	44,163
1-Jul	0	0	0	0	0	0	21,271	1-Jul	0	0	0	0	0	0	0
1-Nov	0	0	0	0	0	0	7,853	1-Nov	0	0	0	0	0	0	89,486
2017															
1-Apr	0	0	0	0	0	0	0	1-Apr	0	0	0	0	0	0	0
1-Jul	0	0	0	0	0	0	0	1-Jul	0	0	0	0	0	0	0
1-Nov	0	0	0	0	0	0	0	1-Nov	0	0	0	0	0	0	0
2018															
1-Apr	0	0	0	0	0	0	0	1-Apr	0	0	0	0	0	0	0
1-Jul	0	0	0	0	0	0	0	1-Jul	0	0	0	0	0	0	0
1-Nov	0	0	0	0	0	0	10,996	1-Nov	0	0	0	0	0	0	0
2019															
1-Apr	0	0	0	0	0	0	20,943	1-Apr	0	0	0	0	0	0	20,943
1-Jul	0	0	0	0	0	0	0	1-Jul	0	0	0	0	0	0	0
1-Nov	0	0	0	0	0	0	0	1-Nov	0	0	0	0	0	0	0

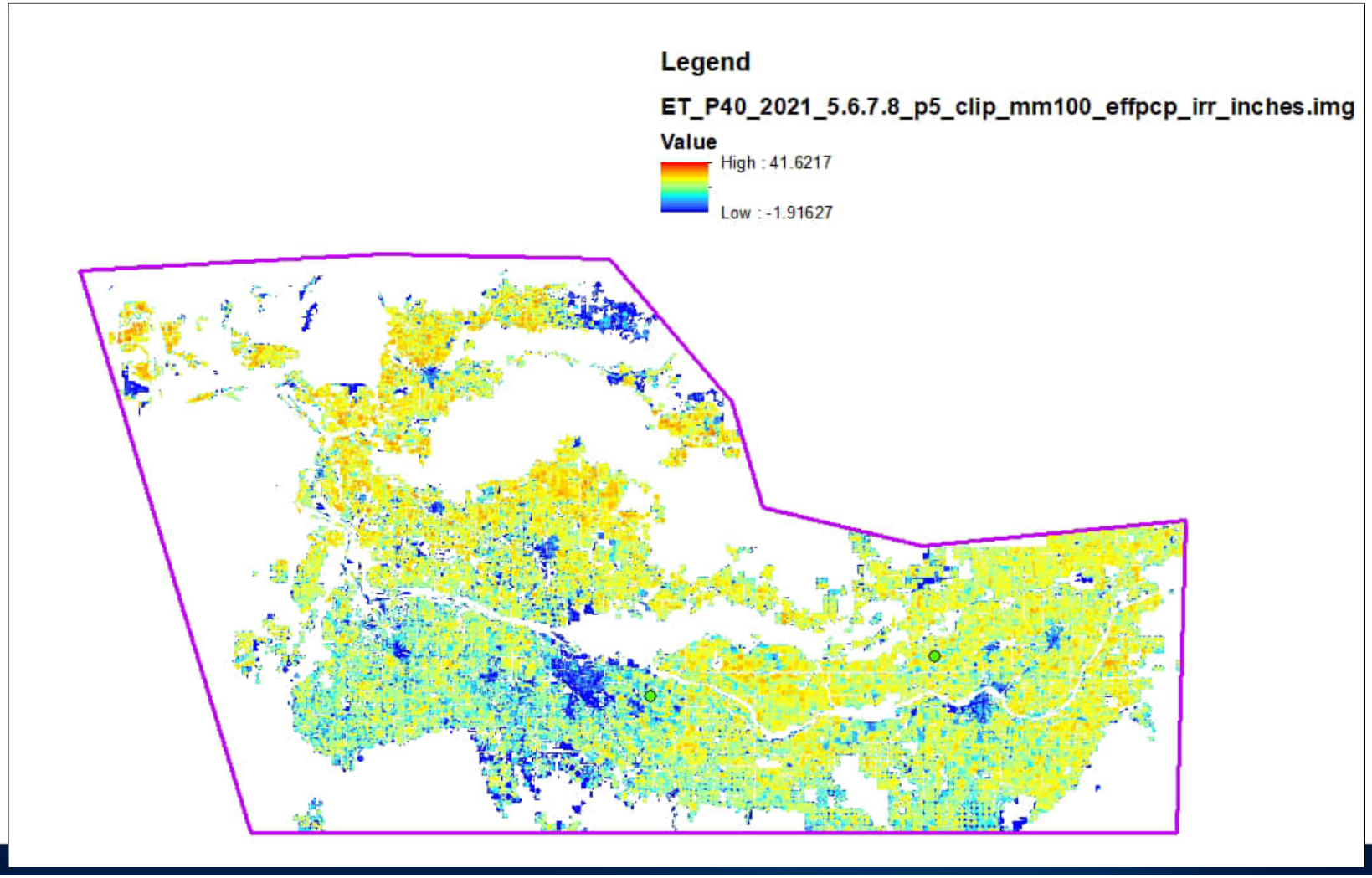
Proposed Method NRT METRIC Demand Shortfall Hindcast – By SWC Member

Shortfall: CDL								Shortfall: METRIC							
Milestone	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Milestone	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
2020															
1-Apr	0	0	0	0	0	0	0	1-Apr	0	0	0	0	0	0	0
1-Jul	0	0	0	0	0	0	0	1-Jul	0	0	0	0	0	0	0
1-Nov	0	0	0	0	0	0	0	1-Nov	0	0	0	0	0	0	0
2021															
1-Apr	0	0	0	0	0	0	40,491	1-Apr	0	0	0	0	0	0	40,491
1-Jul	0	46,509	0	0	0	0	116,364	1-Jul	0	88,249	0	0	0	56,991	125,958
1-Aug	0	85,400	0	0	0	0	108,575	1-Aug	0	138,912	0	0	0	38,346	122,041
1-Nov	0	18,085	0	0	0	0	172,731	1-Nov	0	109,718	0	0	11,010	100,690	235,907

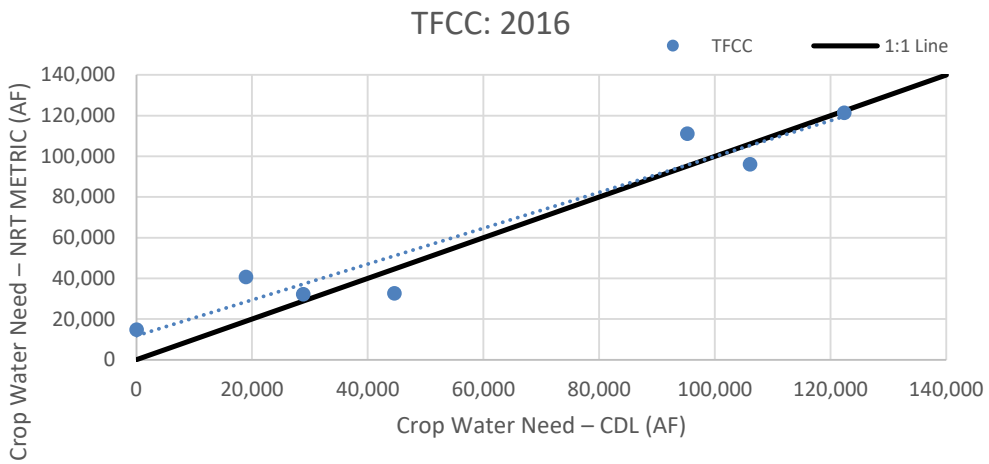
Effective Precipitation May-August 2021 – PRISM Data



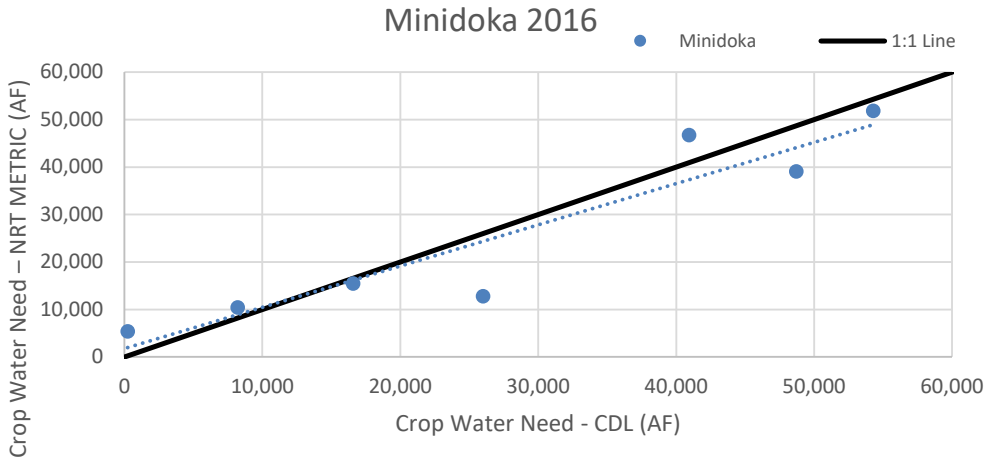
Evapotranspiration May-August 2021 – By Irrigated Field



Example Comparison of Results

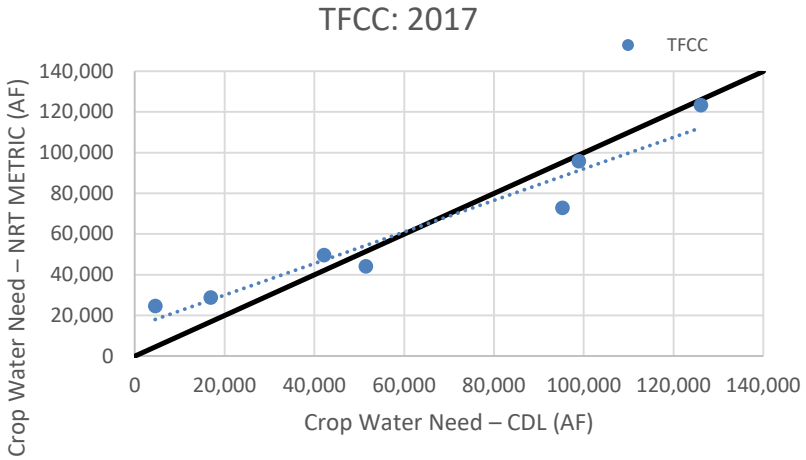


TFCC 2016 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	32,250	28,809
5	32,702	44,594
6	96,176	106,050
7	121,520	122,343
8	111,221	95,195
9	40,761	18,935
10	14,849	0
Sum	449,478	415,928

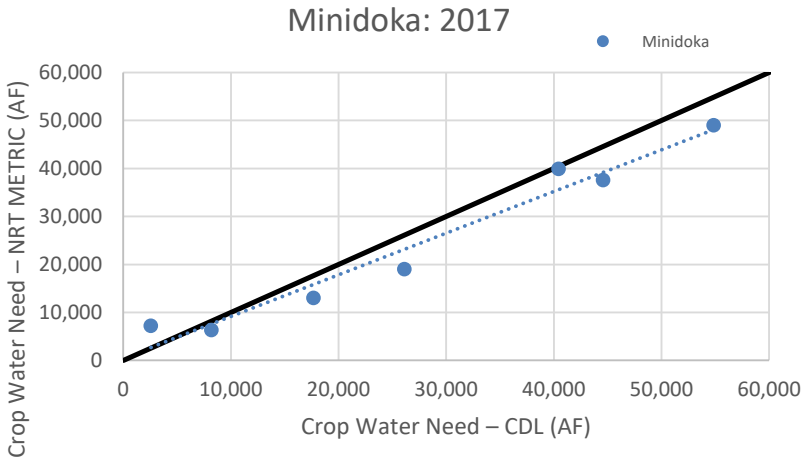


Minidoka 2016 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	15,455	16,584
5	12,757	26,009
6	39,103	48,698
7	51,854	54,295
8	46,710	40,929
9	10,420	8,212
10	5,383	229
Sum	181,682	194,956

Example Comparison of Results

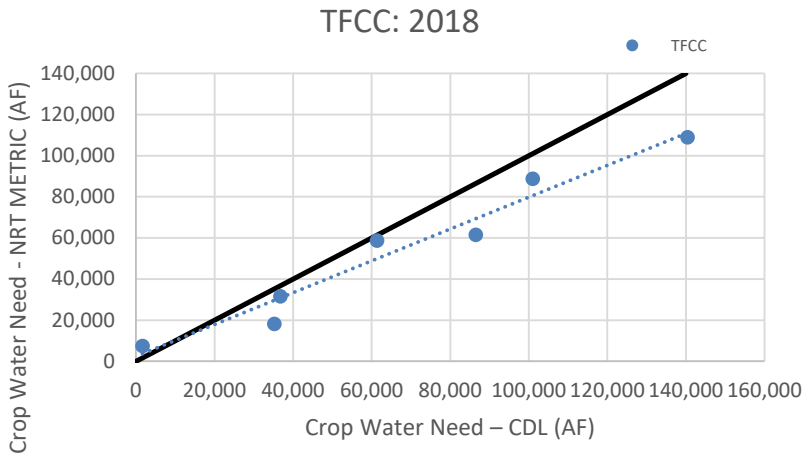


TFCC 2017 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	28,779	16,945
5	44,057	51,478
6	72,919	95,273
7	123,369	126,054
8	95,807	98,879
9	49,591	42,137
10	24,664	4,541
Sum	439,185	435,307

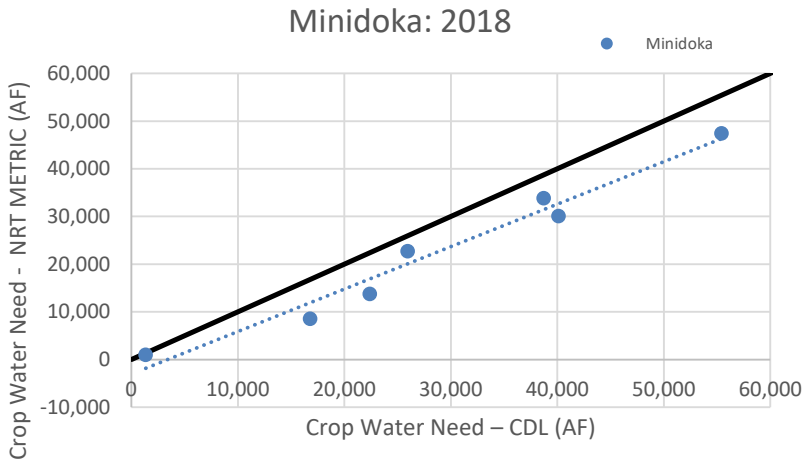


Minidoka 2017 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	6,339	8,194
5	19,055	26,095
6	37,564	44,570
7	49,029	54,855
8	39,958	40,442
9	13,016	17,661
10	7,246	2,560
Sum	172,207	194,378

Example Comparison of Results

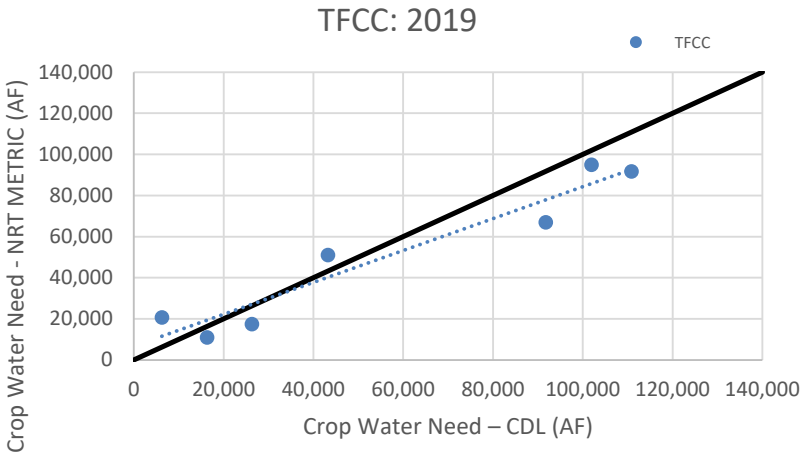


TFCC 2018 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	18,190	35,207
5	31,551	36,736
6	61,469	86,532
7	108,948	140,373
8	88,696	100,978
9	58,663	61,395
10	7,505	1,668
Sum	375,023	462,889

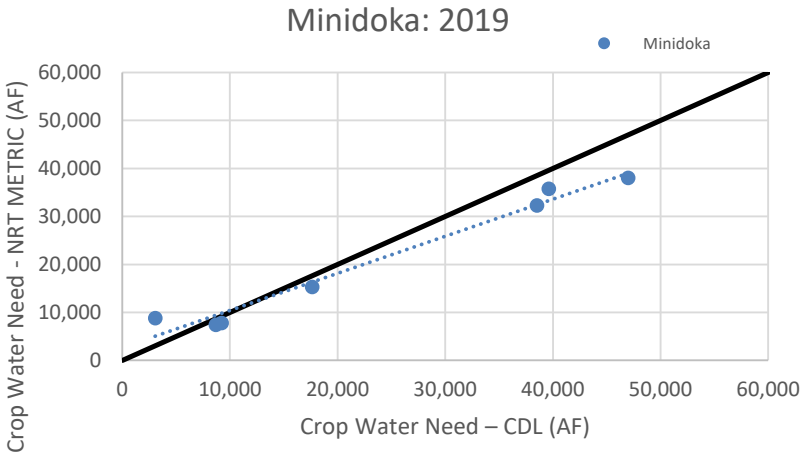


Minidoka 2018 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	8,546	16,772
5	13,790	22,382
6	30,115	40,110
7	47,405	55,423
8	33,849	38,714
9	22,750	25,944
10	987	1,344
Sum	157,442	200,689

Example Comparison of Results

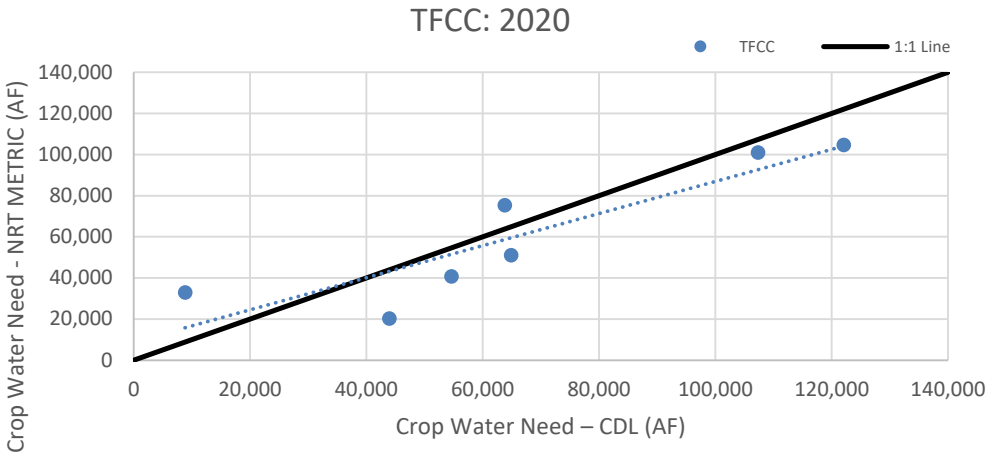


TFCC 2019 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	11,094	16,303
5	17,503	26,328
6	67,027	91,740
7	91,807	110,869
8	94,933	101,948
9	51,108	43,213
10	20,748	6,247
Sum	354,220	396,648

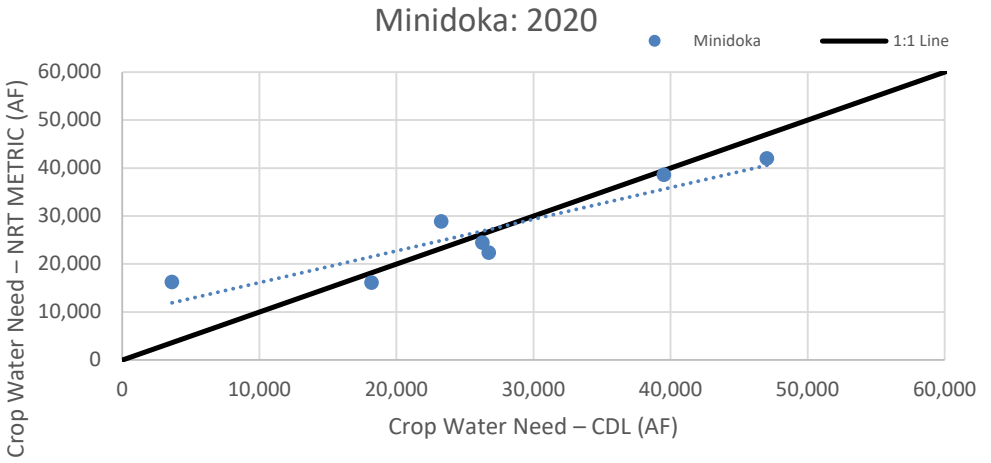


Minidoka 2019 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	7,818	9,228
5	7,391	8,692
6	32,312	38,513
7	38,031	46,999
8	35,739	39,610
9	15,278	17,635
10	8,780	3,053
Sum	145,349	163,730

Example Comparison of Results

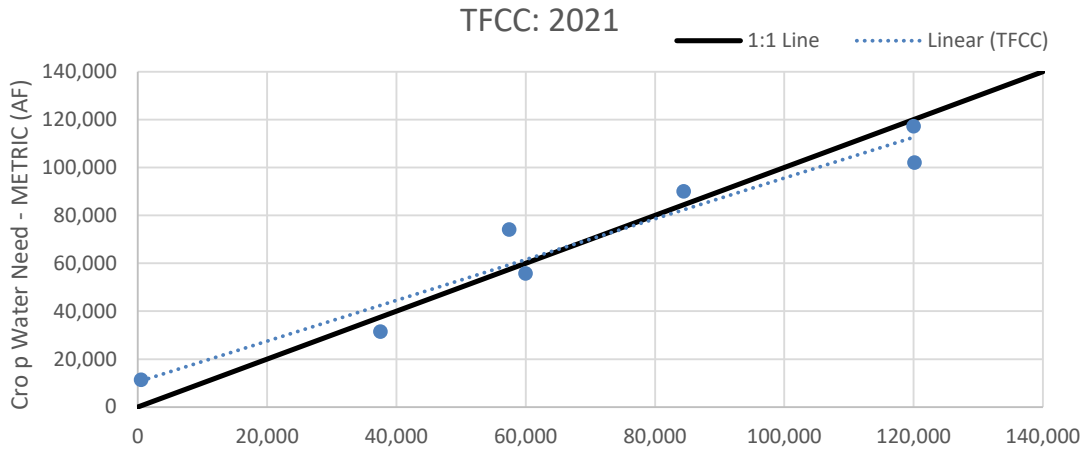


TFCC 2020 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	20,261	43,947
5	40,702	54,646
6	51,040	64,915
7	104,710	122,097
8	101,009	107,335
9	75,427	63,819
10	32,873	8,822
Sum	426,023	465,580

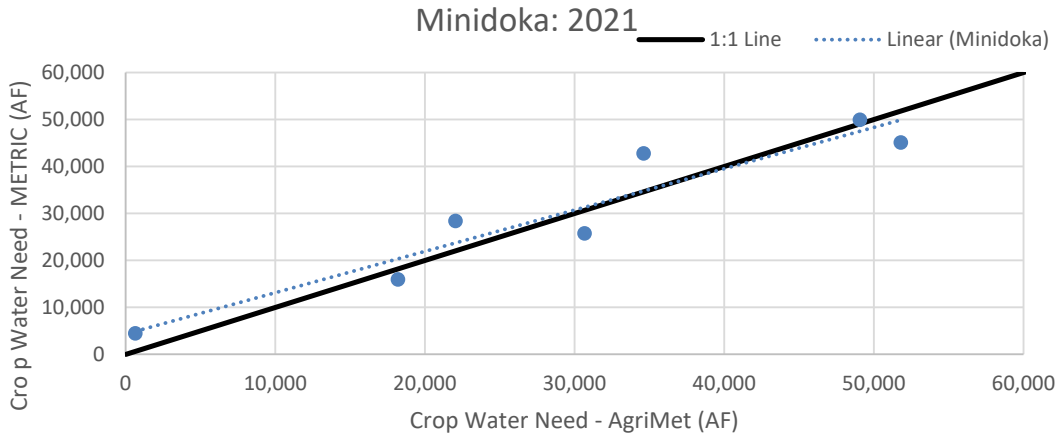


Minidoka 2020 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	16,136	18,184
5	22,360	26,738
6	24,439	26,267
7	42,020	47,032
8	38,564	39,504
9	28,892	23,276
10	16,269	3,630
Sum	188,681	184,631

Example Comparison of Results



TFCC 2021 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	31,499	37,450
5	55,780	59,711
6	102,037	120,215
7	117,222	120,000
8	89,963	84,065
9	74,076	57,465
10	11,325	0
Sum	481,903	478,907



Minidoka 2021 Crop Water Need (AF)		
Month	NRT METRIC - PRISM	CDL-AgriMet
4	15,984	18,137
5	25,730	30,549
6	45,097	51,806
7	49,934	49,088
8	42,816	34,679
9	28,397	22,032
10	4,493	438
Sum	212,450	206,729

CDL vs. NRT METRIC Summary

CDL	NRT METRIC
Download CDL dataset from previous year	---
Process the CDL to remove speckling	---
Remove non-irrigated land from the CDL using the IDWR Irrigated Lands dataset	---
Determine the crop mix for each SWC Member	---
Determine the “3-Year average crop mix” for each SWC Member	---
Download AgriMet Precipitation data	Download Prism Precipitation data
Calculate monthly Effective Precipitation	Calculate monthly Effective Precipitation
Download AgriMet ET data	Obtain NRT METRIC ET data
Subtract monthly Effective Precipitation from ET	Subtract monthly Effective Precipitation from ET
---	Remove non-irrigated land from the “ET – Effective Precipitation” dataset using the IDWR Irrigated Lands dataset
---	Calculate “ET – Effective Precipitation” in Acre-Feet for each SWC Member
Determine the number of acres of each crop grown by each SWC member by multiplying the “3-Year average crop mix” for each SWC Member by the number of acres used for the Methodology	Normalize the “ET – Effective Precipitation” for each SWC member to the number of acres used for the Methodology
Calculate “ET – Effective Precipitation” in Acre-Feet for each SWC Member	---

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Proposed Modification of the Methodology For Determining Material Injury To Reasonable In-Season Demand and Reasonable Carryover: Baseline Year

Presented by: Matt Anders

Date: 11/16/2022

Elements of Shortfall Calculation – Baseline Year (BLY)

Milestone	Supply	Reasonable In-Season Demand (RISD)
April	Forecast Natural Flow (Apr-Oct) • Regression Equations Predicted Storage Allocation • Analogous Year or Years	Predicted Demand (Apr-Oct) • Historical Demand from Baseline Year (BLY)
July	Actual Diverted Natural Flow (Apr-June) Forecast Natural Flow (July-Oct) • Regression Equations Storage Allocation • Storage Report or Analogous Year	Crop Water Need (Apr-June) • ET • Precipitation • Project Efficiency Predicted Demand (July-Oct) • Historical Demand from Baseline Year (BLY)

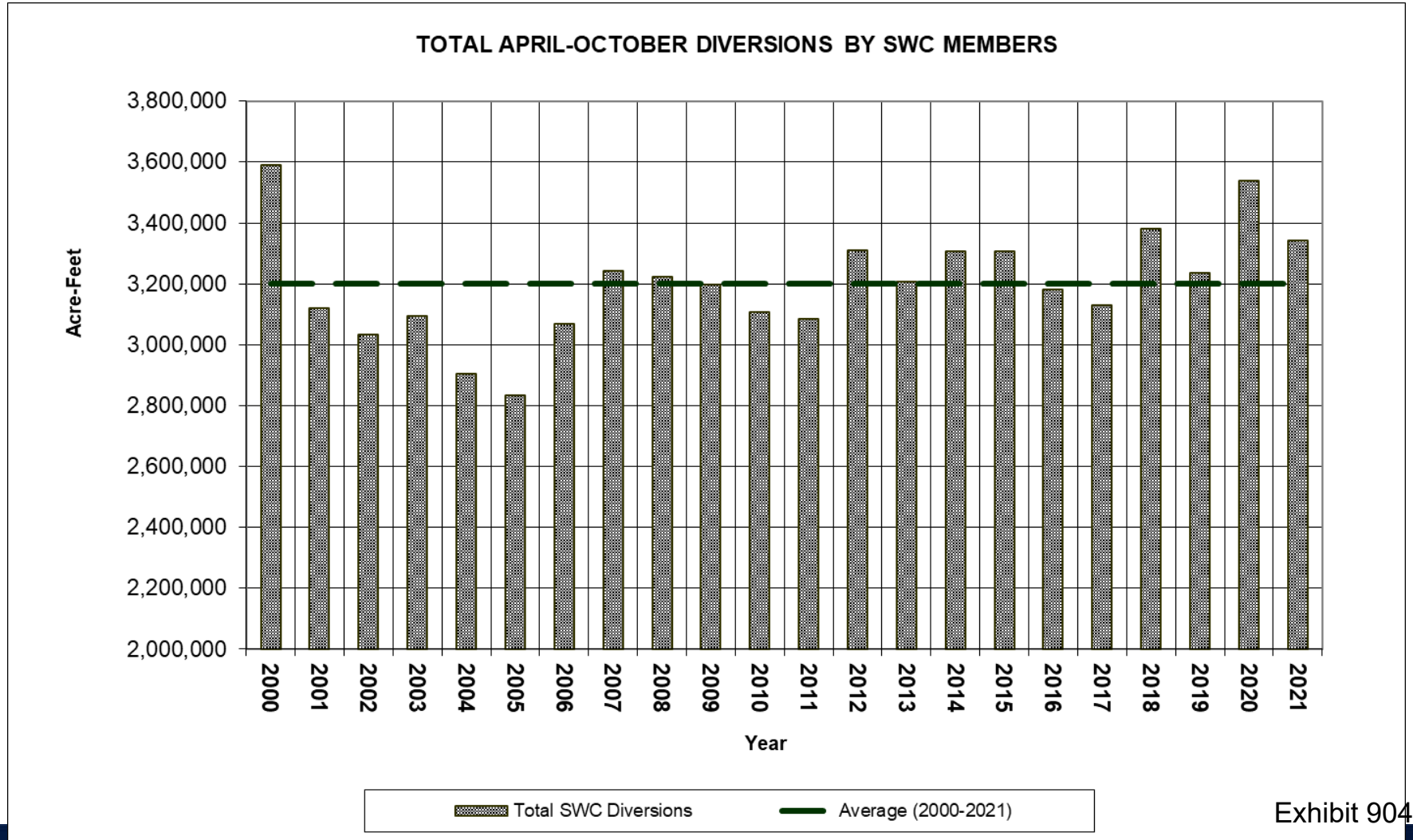
Elements of Shortfall Calculation – Baseline Year (BLY)

Milestone	Supply	Reasonable In-Season Demand (RISD)
Time of Need	Actual Diverted Natural Flow (Apr-Time of Need) Forecast Natural Flow (Time of Need-Oct) • Natural Flow from Comparable Year Storage Allocation • Storage Report	Crop Water Need (Apr-Time of Need) • ET • Precipitation • Project Efficiency Predicted Demand (Time of Need-Oct) • Historical Demand from Baseline Year (BLY)
November	Actual Diverted Natural Flow (Apr-Oct) Storage Allocation • Storage Report	Crop Water Need (Apr-Oct) • ET • Precipitation • Project Efficiency

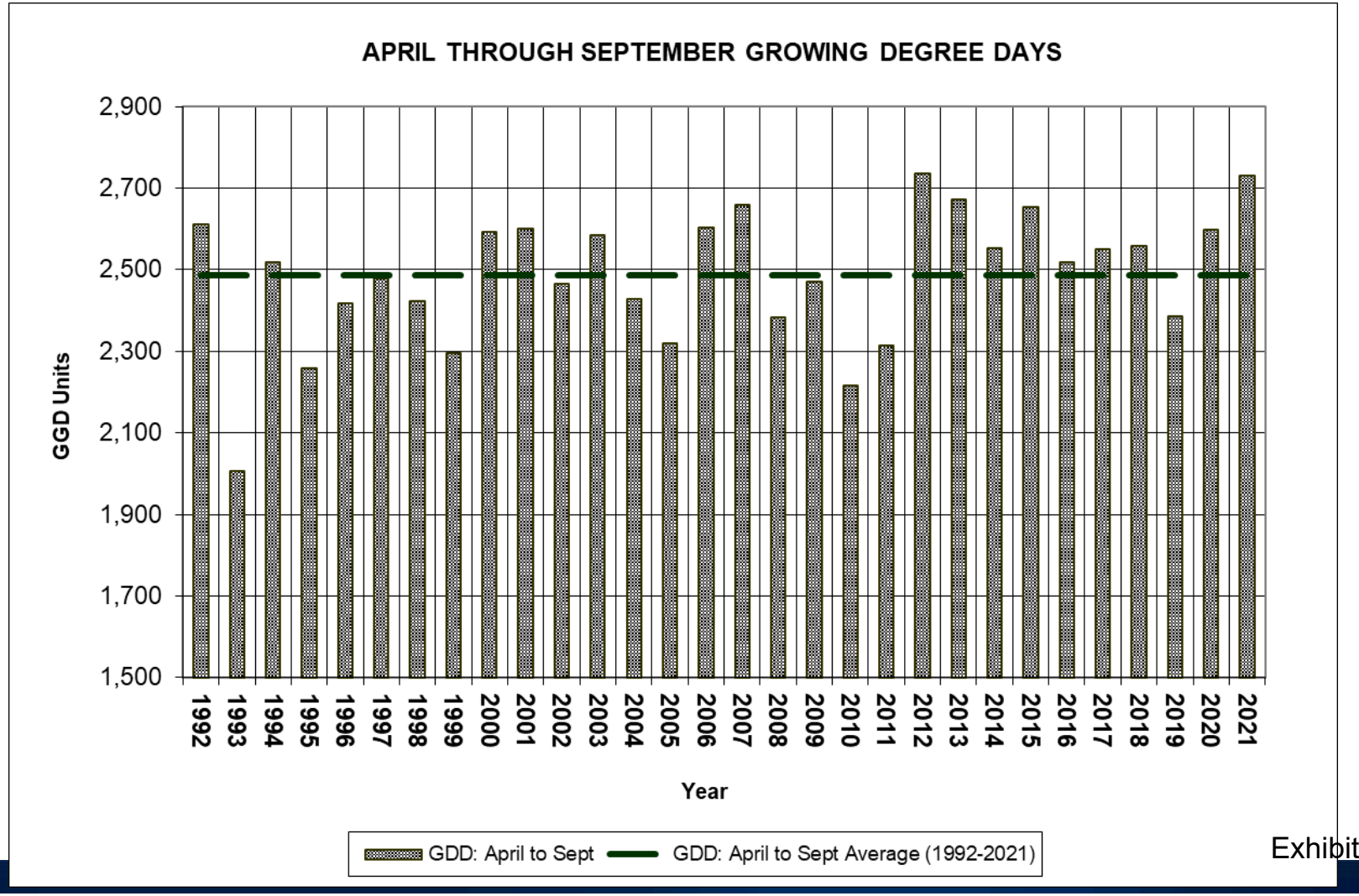
Methodology Reference

- Baseline Year (BLY) (Page 5 of Methodology)
  - Finding of Fact 7: A BLY is a year or average of years when irrigation demand represents conditions that can be used to predict need in the current year of irrigation at the start of the irrigation season.
  - Finding of Fact 9: Intended to shift risk to junior water right holders.
- Used in methodology calculation to predict irrigation demand
  - April
  - July
  - Time of Need
- BLY Criteria
  - Above average
    - Diversions
    - Temperatures (Growing Degree Days)
    - ET
  - Below average precipitation
  - Not a year of limited supply

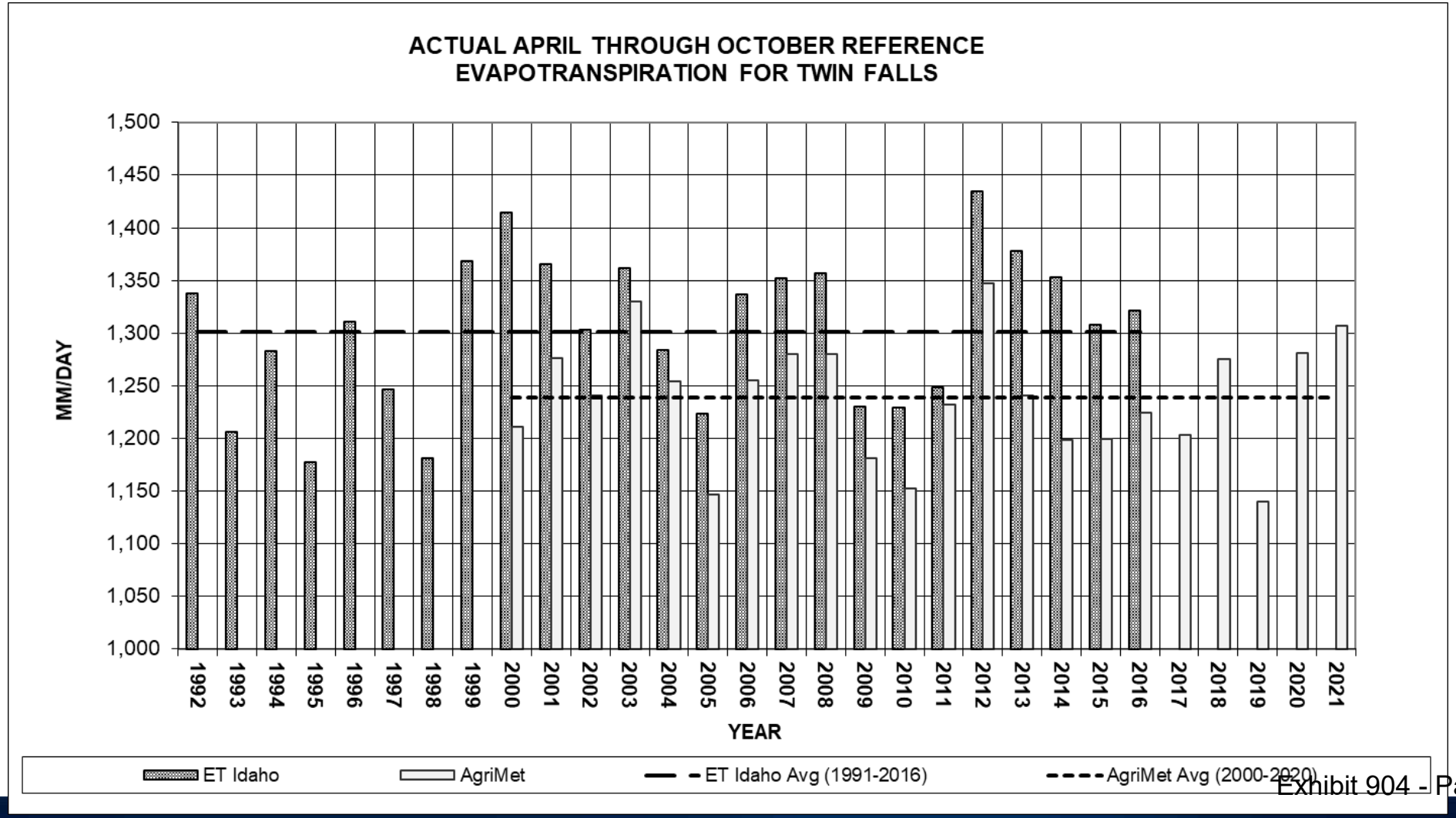
Diversions (Above Average)



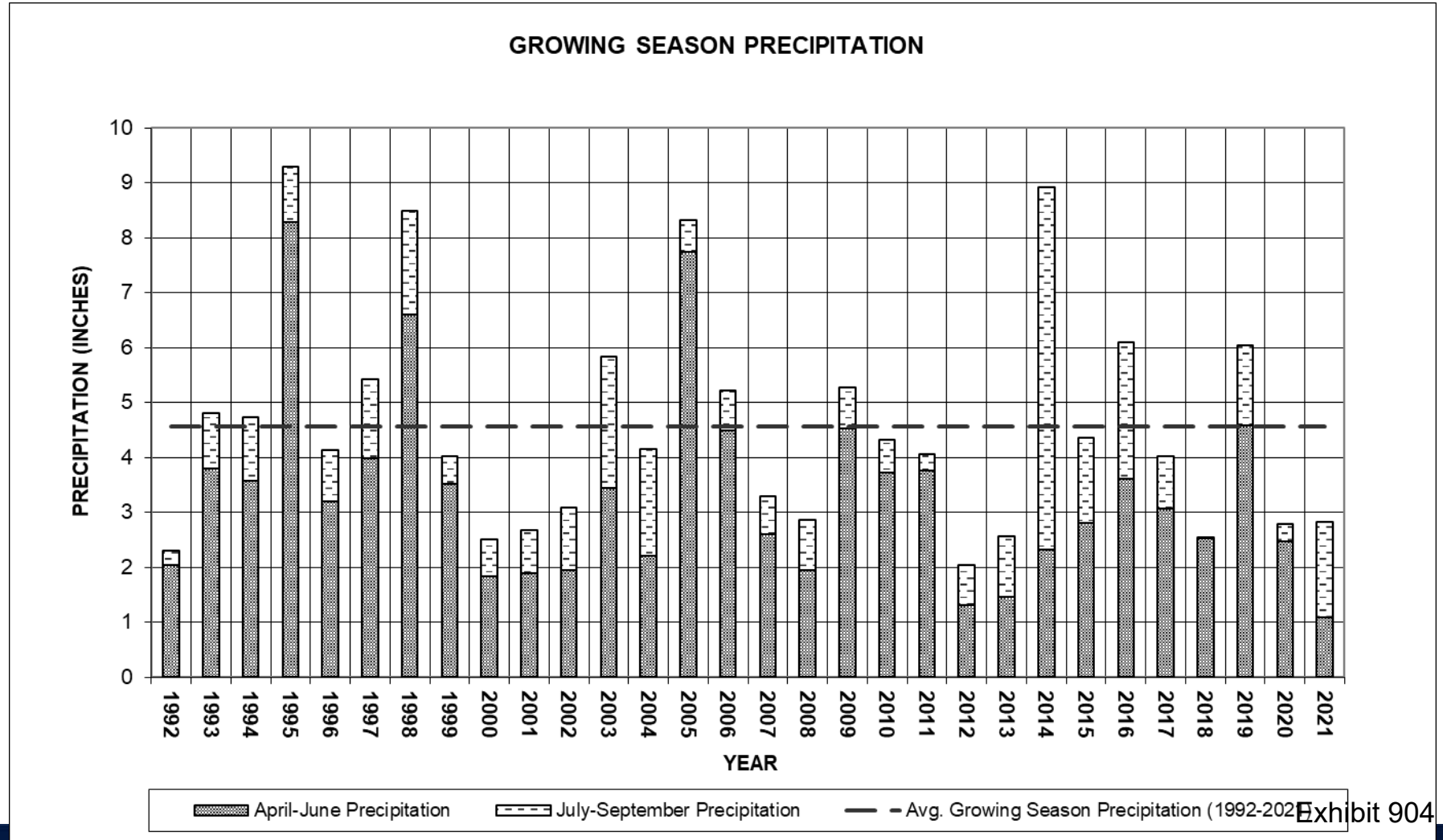
Growing Degree Days (Above Average)



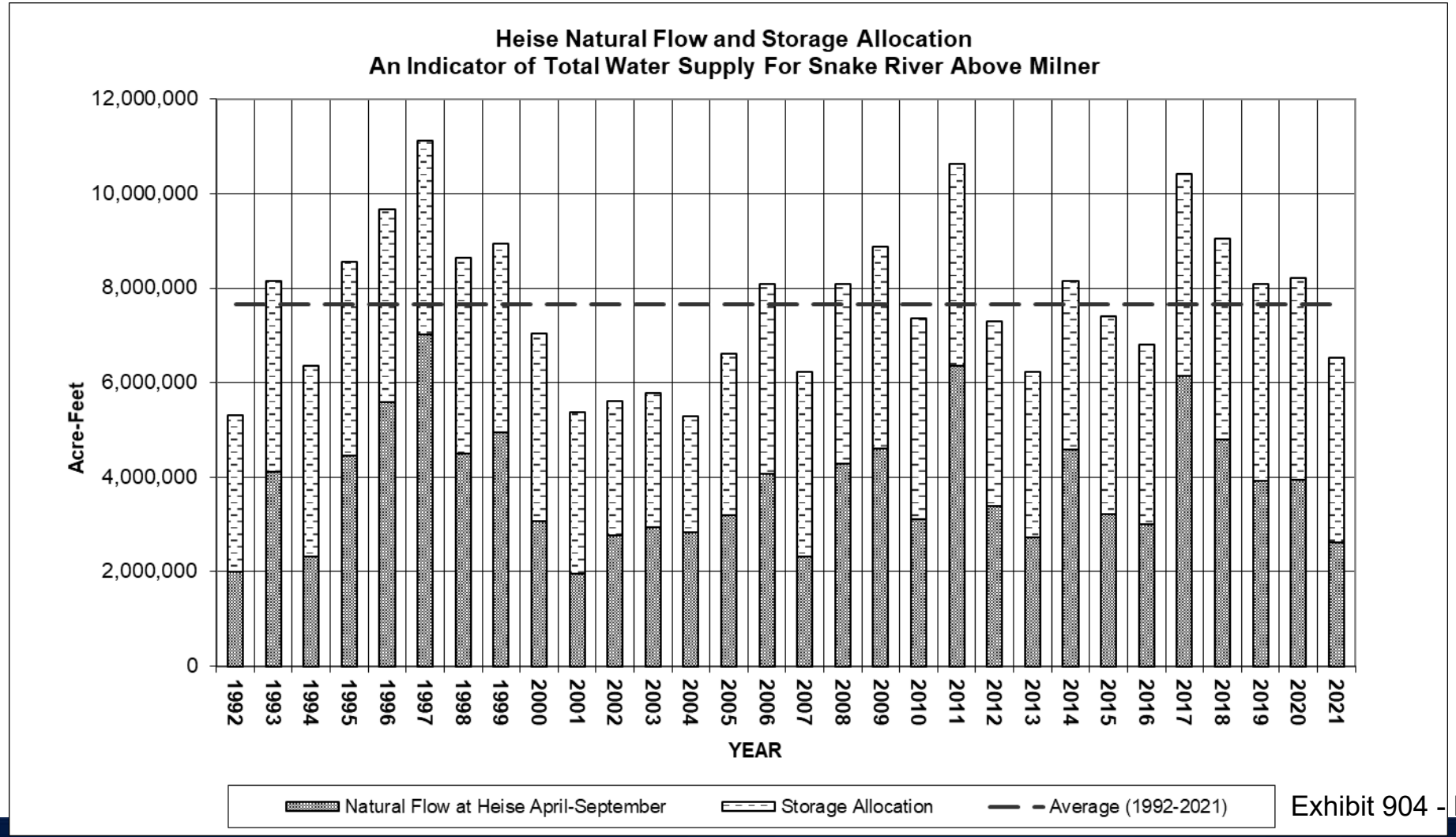
Reference ET (Above Average)



Precipitation (Below Average)



Supply Not Limited (Above Average)



BLY Criteria Data Ranges

- BLY Criteria
  - Above average
    - Diversions — 2000-2021
      - Finding of Fact 8 (page 5) & Finding of Fact 20 (page 10):
        To capture current irrigation practices…selection of a BLY should be limited to years subsequent to 1999.
    - Temperatures (Growing Degree Days) — 1992-2021
    - ET — 1992-2021
  - Below average precipitation — 1992-2021
  - Not a year of limited supply — 1992-2021

Diversions

	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)	Total (AF)
BLY 06/08/12	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011	3,194,722
Average 2000-2014	57,944	421,003	241,806	50,450	355,105	983,517	1,045,120	3,154,945
BLY % of Average 2000 -2014	103.5%	101.6%	104.0%	93.4%	104.1%	99.5%	101.4%	101.3%

BLY 06/08/12	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011	3,194,722
Average 2000-2021	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848
BLY % of Average 2000-2021	100.9%	100.0%	101.8%	87.6%	104.2%	98.2%	99.8%	99.8%

- Finding of Fact 25 (page 11): When compared to the average diversion from 2000-2014, the 06/08 diversions are no longer above average.
- 06/08/12 can no longer be the BLY because diversions are no longer above average.

BLY Selection Criteria

Year	Above Average ∑SWC Diversions (2000-2021)	Above Average GDD (1992-2021)	Above Average ET (1991-2021)	Below Average Precipitation (1992-2021)	Above Average Heise Runoff (1992-2021)	Supply Not Limited (Above Average) (1992-2021)	Notes
2000	x	x		x			
2001		x	x	x			
2002			x	x			
2003		x	x				
2004				x			
2005							
2006		x	x		x	x	Below average diversions
2007	x	x	x	x			Hot dry Spring, low carryover TFCC
2008	x		x	x	x	x	Below average GGD
2009	x				x	x	
2010				x			
2011				x	x	x	Very Wet
2012	x	x	x	x			Hot dry spring, lowest precipitation, highest ET, most GGD
2013	x	x	x	x			Wet Fall, AFRD2 and TFCC reduced deliveries in-season.
2014	x	x			x	x	Record August Rains
2015	x	x		x			
2016		x					
2017		x		x	x	x	
2018	x	x	x	x	x	x	
2019	x				x	x	
2020	x	x	x	x	x	x	Abnormally high diversions?
2021	x	x	x	x			

* To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999 (Page 5).

SWC Annual Diversions

Year	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)	Total SWC Diversions (AF)
2000	62,623	512,980	268,653	66,583	400,544	1,119,218	1,160,451	3,591,053
2001	63,229	415,977	225,398	53,572	369,320	979,689	1,012,202	3,119,388
2002	59,354	400,654	229,261	60,327	349,680	926,219	1,009,092	3,034,586
2003	59,479	397,573	249,562	56,966	353,245	929,453	1,046,624	3,092,903
2004	49,708	299,371	254,082	35,674	340,958	924,324	1,001,779	2,905,896
2005	46,929	401,735	219,600	38,948	307,628	900,339	918,011	2,833,190
2006	57,493	410,376	247,849	41,672	352,269	963,208	995,822	3,068,689
2007	60,227	429,040	259,495	52,342	375,519	1,015,260	1,048,965	3,240,849
2008	59,493	421,083	254,105	50,994	373,499	967,543	1,094,941	3,221,658
2009	57,344	453,757	236,983	55,713	343,520	1,007,862	1,043,006	3,198,185
2010	53,528	431,376	231,542	45,471	319,837	995,820	1,029,645	3,107,219
2011	53,788	427,228	219,855	46,932	319,744	963,049	1,054,435	3,085,031
2012	63,550	454,143	248,557	49,038	387,998	1,018,145	1,089,269	3,310,699
2013	62,016	400,729	248,424	52,561	364,124	1,021,024	1,058,154	3,207,032
2014	60,392	459,017	233,728	49,961	368,685	1,021,605	1,114,409	3,307,796
2015	62,975	442,896	253,107	55,153	368,773	1,021,958	1,102,412	3,307,275
2016	60,409	438,224	250,702	56,550	349,779	978,658	1,045,567	3,179,888
2017	60,713	391,658	239,685	62,371	335,922	987,102	1,053,742	3,131,193
2018	64,192	456,319	263,954	68,429	362,970	1,037,970	1,127,305	3,381,139
2019	56,115	436,533	254,189	52,326	327,963	1,032,687	1,075,987	3,235,802
2020	65,828	493,153	282,949	67,227	373,531	1,048,708	1,206,401	3,537,797
2021	69,035	437,025	265,141	64,748	354,595	1,069,340	1,083,514	3,343,398
Average	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848

SWC Annual Diversions – Ranked

Year	A&B Rank	AFRD2 Rank	BID Rank	Milner Rank	Minidoka Rank	NSCC Rank	TFCC Rank	Total SWC Diversions Rank
2000	7	1	2	3	1	1	2	1
2001	5	15	20	11	6	14	18	15
2002	15	19	19	6	15	20	19	20
2003	14	20	11	7	12	19	14	17
2004	21	22	8	22	17	21	20	21
2005	22	17	22	21	22	22	22	22
2006	16	16	14	20	13	17	21	19
2007	12	12	5	13	3	10	13	8
2008	13	14	7	15	5	16	6	10
2009	17	6	16	9	16	11	16	12
2010	20	11	18	19	20	12	17	16
2011	19	13	21	18	21	18	11	18
2012	4	5	12	17	2	9	7	5
2013	8	18	13	12	9	8	10	11
2014	11	3	17	16	8	7	4	6
2015	6	7	9	10	7	6	5	7
2016	10	8	10	8	14	15	15	13
2017	9	21	15	5	18	13	12	14
2018	3	4	4	1	10	4	3	3
2019	18	10	6	14	19	5	9	9
2020	2	2	1	2	4	3	1	2
2021	1	9	3	4	11	2	8	4

Diversions – BLY 2018

	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)	Total (AF)
BLY 06/08/12	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011	3,194,722
Average 2000-2021	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848
BLY % of Average 2000-2021	100.9%	100.0%	101.8%	87.6%	104.2%	98.2%	99.8%	99.8%

Proposed BLY 2018	**64,192**	**456,319**	**263,954**	**68,429**	**362,970**	**1,037,970**	**1,127,305**	**3,381,139**
Average 2000-2021	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848
BLY % of Average 2000-2021	107.9%	106.7%	106.8%	127.2%	102.4%	104.1%	106.1%	105.6%

2018 BLY Demand Shortfall Hindcast

Year	April BLY 06-08-12 (AF)	April BLY 2018 (AF)	July BLY 06-08-12 (AF)	July BLY 2018 (AF)	November Actual Demand Shortfall (AF)
2000	30,183	126,125	0	0	0
2001	179,947	334,970	160,472	200,546	243,565
2002	42,800	131,308	17,381	45,136	31,217
2003	10,124	93,902	43,808	80,241	0
2004	199,101	364,958	223,032	264,426	264,340
2005	114,916	228,241	0	0	0
2006	0	0	365,880	388,939	23,792
2007	56,914	152,855	201,036	253,185	289,065
2008	0	15,138	46,525	55,334	0
2009	0	34,109	0	0	0
2010	94,957	190,898	0	0	0
2011	0	0	0	0	0
2012	0	53,778	69,066	92,125	139,524
2013	28,802	110,912	114,058	154,132	22,588
2014	0	0	0	0	0
2015	88,959	184,901	107,418	138,684	92,246
2016	44,163	111,457	21,271	44,330	7,853
2017	0	65,382	0	0	0
2018	0	44,805	0	0	10,996
2019	20,943	88,237	0	0	0
2020	0	59,101	0	0	0
2021	40,491	126,102	162,873	194,139	190,816

Diversions - 2020

	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)	Total (AF)
BLY 06/08/12	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011	3,194,722
Average 2000-2021	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848
BLY % of Average 2000-2021	100.9%	100.0%	101.8%	87.6%	104.2%	98.2%	99.8%	99.8%

Proposed BLY 2020	**65,828**	**493,153**	**282,949**	**67,227**	**373,531**	**1,048,708**	**1,206,401**	**3,537,797**
Average 2000-2021	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848
BLY % of Average 2000-2021	110.7%	115.3%	114.5%	125.0%	105.4%	105.2%	113.6%	110.5%

2020 BLY Demand Shortfall Hindcast

Year	April BLY 06-08-12 (AF)	April BLY 2020 (AF)	July BLY 06-08-12 (AF)	July BLY 2020 (AF)	November Actual Demand Shortfall (AF)
2000	30,183	242,054	0	0	0
2001	179,947	461,638	160,472	264,889	243,565
2002	42,800	248,875	17,381	103,917	31,217
2003	10,124	210,787	43,808	134,310	0
2004	199,101	492,060	223,032	322,017	264,340
2005	114,916	348,648	0	17,037	0
2006	0	77,945	365,880	424,154	23,792
2007	56,914	268,785	201,036	328,560	289,065
2008	0	94,234	46,525	60,897	0
2009	0	113,204	0	0	0
2010	94,957	306,828	0	22,571	0
2011	0	58,274	0	0	0
2012	0	137,335	69,066	127,340	139,524
2013	28,802	226,842	114,058	218,476	22,588
2014	0	56,595	0	33,283	0
2015	88,959	300,829	107,418	197,465	92,246
2016	44,163	217,598	21,271	79,545	7,853
2017	0	144,478	0	0	0
2018	0	123,901	0	0	10,996
2019	20,943	187,289	0	0	0
2020	0	138,197	0	0	0
2021	40,491	242,032	162,873	252,919	190,816

Questions

(208) 287-4932
matthew.anders@idwr.idaho.gov

2018 BLY Shortfall Hindcast by SWC Member

2018 BLY Demand Shortfall Hindcast – A&B

Year	A&B April BLY 06-08-12 (AF)	A&B April BLY 2018 (AF)	A&B July BLY 06-08-12 (AF)	A&B July BLY 2018 (AF)	A&B November (AF)
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	3,680	0	0	0
2003	0	3,183	2,032	4,446	0
2004	10,336	14,536	10,558	13,002	14,616
2005	13,415	17,615	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2018 BLY Demand Shortfall Hindcast – AFRD2

Year	AFRD2 April BLY 06-08-12 (AF)	AFRD2 April BLY 2018 (AF)	AFRD2 July BLY 06-08-12 (AF)	AFRD2 July BLY 2018 (AF)	AFRD2 November (AF)
2000	72	28,719	0	0	0
2001	40,570	69,217	11,618	19,825	0
2002	0	17,534	17,381	25,587	0
2003	0	12,620	20,808	29,014	0
2004	71,650	100,298	110,723	118,930	68,166
2005	20,045	48,692	0	0	0
2006	0	0	0	0	0
2007	13,889	42,536	14,932	23,139	1,168
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	23,696	52,343	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	14,816	2,261	10,468	4,349
2014	0	0	0	0	0
2015	15,255	43,903	24,907	33,114	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	18,317	46,509	54,716	18,085

2018 BLY Demand Shortfall Hindcast – BID

Year	BID April BLY 06-08-12 (AF)	BID April BLY 2018 (AF)	BID July BLY 06-08-12 (AF)	BID July BLY 2018 (AF)	BID November (AF)
2000	0	0	0	0	0
2001	0	0	36,637	45,445	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	2,889	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	34,619	43,428	0
2008	0	0	46,525	55,334	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	4,930	13,738	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2018 BLY Demand Shortfall Hindcast – Milner

Year	Milner April BLY 06-08-12 (AF)	Milner April BLY 2018 (AF)	Milner July BLY 06-08-12 (AF)	Milner July BLY 2018 (AF)	Milner November (AF)
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	681	0	2,754	0
2004	0	19,429	0	4,796	0
2005	0	13,184	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2018 BLY Demand Shortfall Hindcast – Minidoka

Year	Minidoka April BLY 06-08-12 (AF)	Minidoka April BLY 2018 (AF)	Minidoka July BLY 06-08-12 (AF)	Minidoka July BLY 2018 (AF)	Minidoka November (AF)
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2018 BLY Demand Shortfall Hindcast – NSCC

Year	NSCC April BLY 06-08-12 (AF)	NSCC April BLY 2018 (AF)	NSCC July BLY 06-08-12 (AF)	NSCC July BLY 2018 (AF)	NSCC November (AF)
2000	0	0	0	0	0
2001	16,439	75,521	0	0	223,243
2002	0	0	0	0	31,217
2003	0	0	0	0	0
2004	0	46,286	0	0	175,533
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	19,504	31,578	143,433
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	103,224
2013	0	0	0	0	18,239
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2018 BLY Demand Shortfall Hindcast - TFCC

Year	TFCC April BLY 06-08-12 (AF)	TFCC April BLY 2018 (AF)	TFCC July BLY 06-08-12 (AF)	TFCC July BLY 2018 (AF)	TFCC November (AF)
2000	30,111	97,406	0	0	0
2001	122,938	190,232	112,217	135,276	20,322
2002	42,800	110,094	0	19,549	0
2003	10,124	77,418	20,968	44,027	0
2004	117,115	184,409	101,751	124,809	6,025
2005	81,456	148,750	0	0	0
2006	0	0	365,880	388,939	23,792
2007	43,025	110,319	131,981	155,040	144,464
2008	0	15,138	0	0	0
2009	0	34,109	0	0	0
2010	71,261	138,555	0	0	0
2011	0	0	0	0	0
2012	0	53,778	69,066	92,125	36,300
2013	28,802	96,096	106,867	129,926	0
2014	0	0	0	0	0
2015	73,704	140,998	82,511	105,570	92,246
2016	44,163	111,457	21,271	44,330	7,853
2017	0	65,382	0	0	0
2018	0	44,805	0	0	10,996
2019	20,943	88,237	0	0	0
2020	0	59,101	0	0	0
2021	40,491	107,785	116,364	139,423	172,731

2020 BLY Shortfall Hindcast by SWC Member

2020 BLY Demand Shortfall Hindcast – A&B

Year	A&B April BLY 06-08-12 (AF)	A&B April BLY 2020 (AF)	A&B July BLY 06-08-12 (AF)	A&B July BLY 2020 (AF)	A&B November (AF)
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	5,317	0	0	0
2003	0	4,820	2,032	2,488	0
2004	10,336	16,172	10,558	11,044	14,616
2005	13,415	19,251	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2020 BLY Demand Shortfall Hindcast – AFRD2

Year	AFRD2 April BLY 06-08-12 (AF)	AFRD2 April BLY 2020 (AF)	AFRD2 July BLY 06-08-12 (AF)	AFRD2 July BLY 2020 (AF)	AFRD2 November (AF)
2000	72	65,553	0	0	0
2001	40,570	106,051	11,618	43,390	0
2002	0	54,368	17,381	49,153	0
2003	0	49,453	20,808	52,580	0
2004	71,650	137,131	110,723	142,495	68,166
2005	20,045	85,526	0	0	0
2006	0	0	0	0	0
2007	13,889	79,370	14,932	46,705	1,168
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	23,696	89,177	0	0	0
2011	0	0	0	0	0
2012	0	4,461	0	0	0
2013	0	51,650	2,261	34,033	4,349
2014	0	0	0	0	0
2015	15,255	80,736	24,907	56,680	0
2016	0	27,045	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	19,956	0	0	0
2020	0	0	0	0	0
2021	0	55,151	46,509	78,281	18,085

2020 BLY Demand Shortfall Hindcast – BID

Year	BID April BLY 06-08-12 (AF)	BID April BLY 2020 (AF)	BID July BLY 06-08-12 (AF)	BID July BLY 2020 (AF)	BID November (AF)
2000	0	0	0	0	0
2001	0	0	36,637	51,008	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	8,453	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	34,619	48,991	0
2008	0	0	46,525	60,897	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	4,930	19,302	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2020 BLY Demand Shortfall Hindcast – Milner

Year	Milner April BLY 06-08-12 (AF)	Milner April BLY 2020 (AF)	Milner July BLY 06-08-12 (AF)	Milner July BLY 2020 (AF)	Milner November (AF)
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	18,228	0	0	0
2005	0	11,983	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2020 BLY Demand Shortfall Hindcast – Minidoka

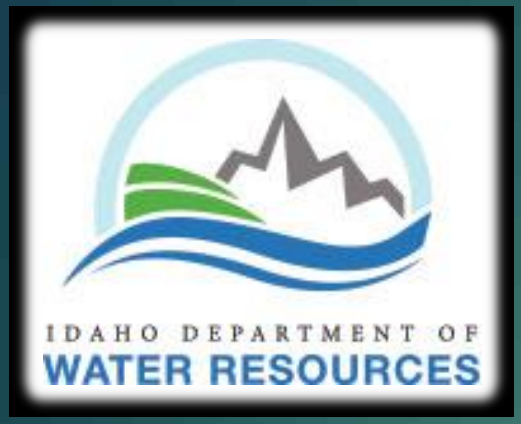
Year	Minidoka April BLY 06-08-12 (AF)	Minidoka April BLY 2020 (AF)	Minidoka July BLY 06-08-12 (AF)	Minidoka July BLY 2020 (AF)	Minidoka November (AF)
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2020 BLY Demand Shortfall Hindcast – NSCC

Year	NSCC April BLY 06-08-12 (AF)	NSCC April BLY 2020 (AF)	NSCC July BLY 06-08-12 (AF)	NSCC July BLY 2020 (AF)	NSCC November (AF)
2000	0	0	0	0	0
2001	16,439	86,259	0	0	223,243
2002	0	0	0	0	31,217
2003	0	0	0	0	0
2004	0	57,024	0	0	175,533
2005	0	4,042	0	0	0
2006	0	0	0	0	0
2007	0	0	19,504	42,609	143,433
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	103,224
2013	0	0	0	0	18,239
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0

2020 BLY Demand Shortfall Hindcast - TFCC

Year	TFCC April BLY 06-08-12 (AF)	TFCC April BLY 2020 (AF)	TFCC July BLY 06-08-12 (AF)	TFCC July BLY 2020 (AF)	TFCC November (AF)
2000	30,111	176,501	0	0	0
2001	122,938	269,328	112,217	170,491	20,322
2002	42,800	189,190	0	54,764	0
2003	10,124	156,514	20,968	79,242	0
2004	117,115	263,505	101,751	160,025	6,025
2005	81,456	227,846	0	17,037	0
2006	0	77,945	365,880	424,154	23,792
2007	43,025	189,415	131,981	190,255	144,464
2008	0	94,234	0	0	0
2009	0	113,204	0	0	0
2010	71,261	217,651	0	22,571	0
2011	0	58,274	0	0	0
2012	0	132,874	69,066	127,340	36,300
2013	28,802	175,192	106,867	165,141	0
2014	0	56,595	0	33,283	0
2015	73,704	220,093	82,511	140,785	92,246
2016	44,163	190,553	21,271	79,545	7,853
2017	0	144,478	0	0	0
2018	0	123,901	0	0	10,996
2019	20,943	167,333	0	0	0
2020	0	138,197	0	0	0
2021	40,491	186,881	116,364	174,638	172,731



SWC methodology – calculation of priority dates for curtailment of junior groundwater users

Presented to the SWC Methodology Technical Working Group

Jennifer Sukow, P.E., P.G.

November 28, 2022

Methodology reference

- Curtailment date calculation (Step 2) (Page 36 of Methodology)
  - The ESPA Model will be run to determine the curtailment date which will produce a volume of water equal to the DS in the near Blackfoot to Minidoka reach. The model simulation will be run at steady state within the area of common ground water supply as described by CM Rule 50.01.
- Curtailment date calculation (Step 6) (Page 38 of Methodology)
  - Upon a determination of an additional mitigation obligation, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure a volume of storage water pursuant to an approved mitigation plan or to conduct other approved mitigation activities that will deliver the additional mitigation obligation water to the injured members of the SWC at the Time of Need. If junior ground water users fail or refuse to submit this information within fourteen (14) days from issuance of a Step 6 order, the Director will issue an order curtailing junior ground water users.[13] The ESPA Model will be run to determine the priority date to produce the necessary additional mitigation obligation volume within the area of common ground water supply, as described by CM Rule 50.01.

Methodology reference

- Curtailment for carryover shortfall (Step 9) (Page 39 of Methodology)
  - Fourteen (14) days following the issuance by the Department of reasonable carryover shortfall obligations, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to supply a volume of storage water or to conduct other approved mitigation activities that will provide water to the injured members of the SWC equal to the reasonable carryover shortfall for all injured members of the SWC. If junior ground water users cannot provide this information, the Director will issue an order curtailing junior ground water rights.

Presentation outline

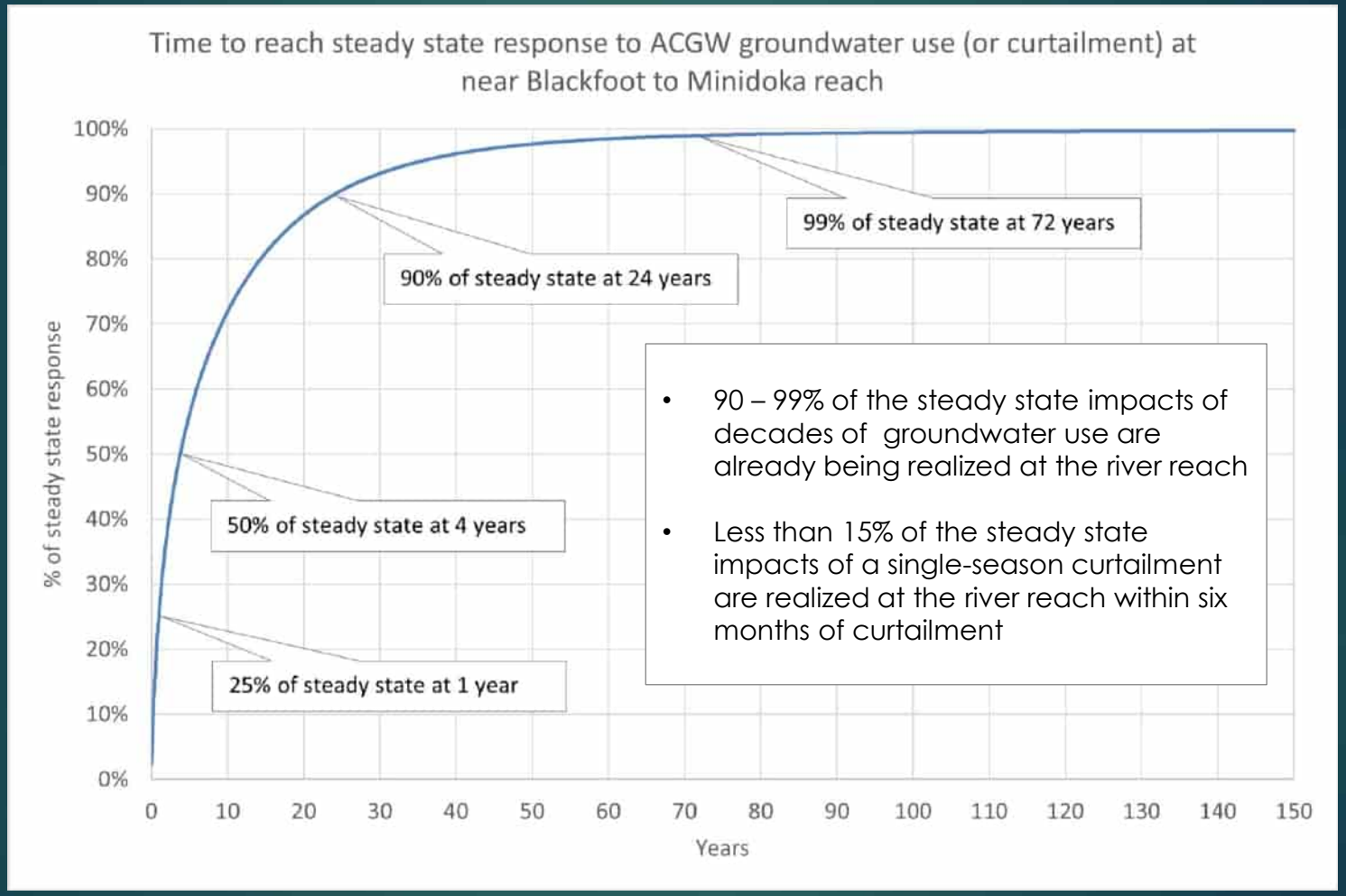
- Steady state vs. transient model simulations
- Transient model results for curtailment priority dates in 2022 orders
- Examples of transient model simulations for calculation of curtailment priority dates
  - Assumptions for transient model simulations
  - Comparison of priority dates and acres curtailed for various shortfall volumes
  - Transient analyses for water years 2021-2022

Steady state vs. transient model simulations

- Merriam-Webster definition of *steady state*
  - a state or condition of a system or process that does not change in time

- Steady state ESPAM simulation for calculation of curtailment priority date
  - Predicts long-term response to continuous curtailment of groundwater use at a constant rate for an infinite number of years
  - Result is a prediction of the long-term average annual impact of curtailment on the near Blackfoot to Minidoka reach
  - Curtailments ordered as prescribed in methodology order are not continuous or long-term
  - Groundwater use does not occur at a constant rate throughout the year

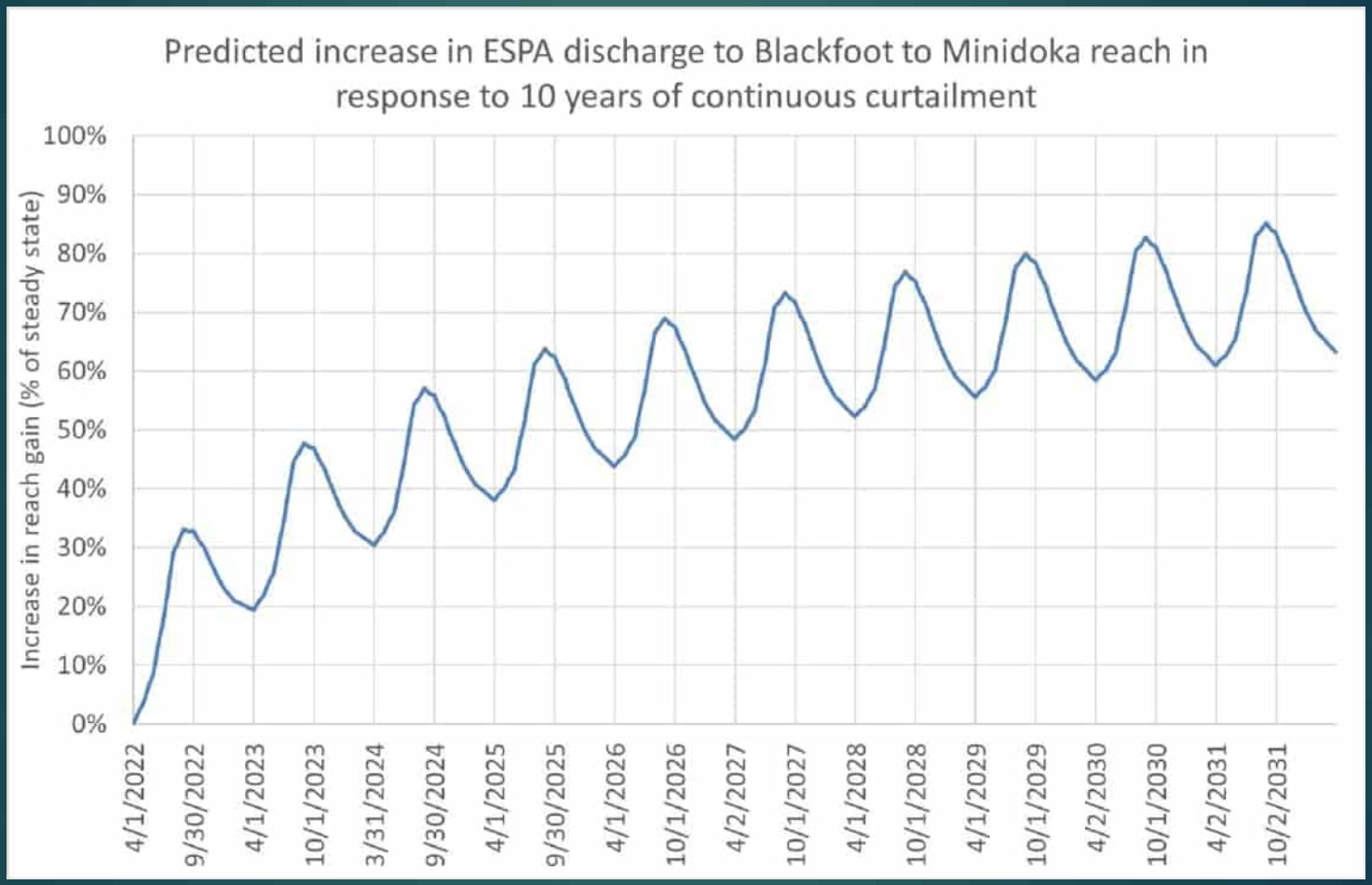
How long does it take to approach steady state conditions?



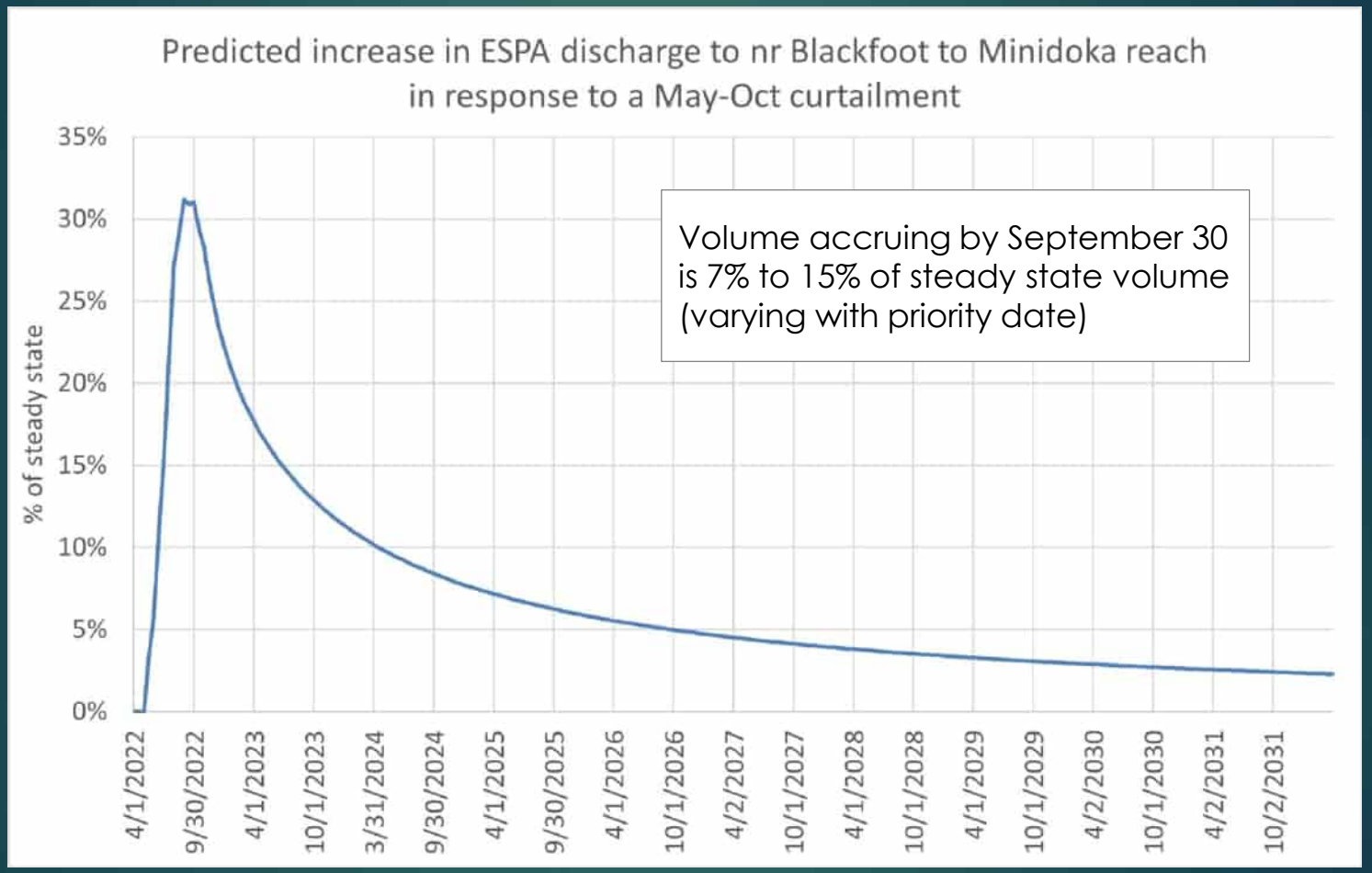
Steady state vs. transient model simulations

- Merriam-Webster definition of *transient*
  - passing especially quickly into and out of existence
- Transient ESPAM simulation for calculation of curtailment priority date
  - Predicts timing and magnitude of response to time-varying changes in aquifer stress resulting from short-term curtailment of groundwater use to address a predicted shortfall
  - Result is a prediction of the timing and magnitude of the response to time-varying curtailment of groundwater use

Steady state vs. transient model simulations



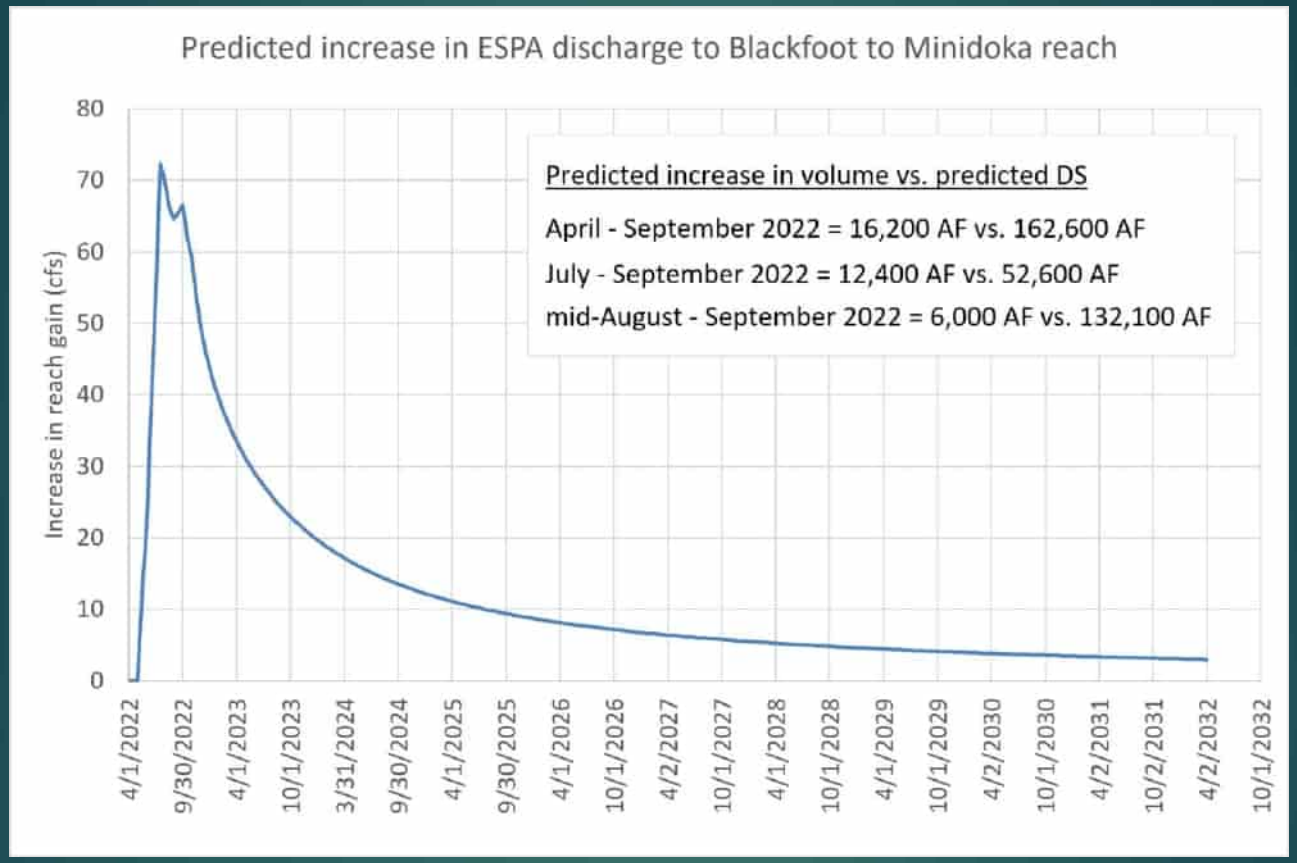
Steady state vs. transient model simulations



Transient simulation of curtailments ordered in 2022

- 2022 curtailments ordered
  - Curtailment priority dates were calculated based on steady state response at near Blackfoot to Minidoka
  - April 1 DS forecast of 162,600 AF → curtailment junior to December 25, 1979 beginning May
  - July 1 DS Forecast of 52,600 AF → curtailment reduced to junior to March 12, 1989 in July
  - Time of Need Forecast of 132,100 AF → curtailment increased to junior to March 25, 1981 in August
- Transient simulation of these curtailment dates was performed to compare volumes predicted to accrue to near Blackfoot to Minidoka during this season with the predicted DS volumes

Transient simulation of curtailments ordered in 2022

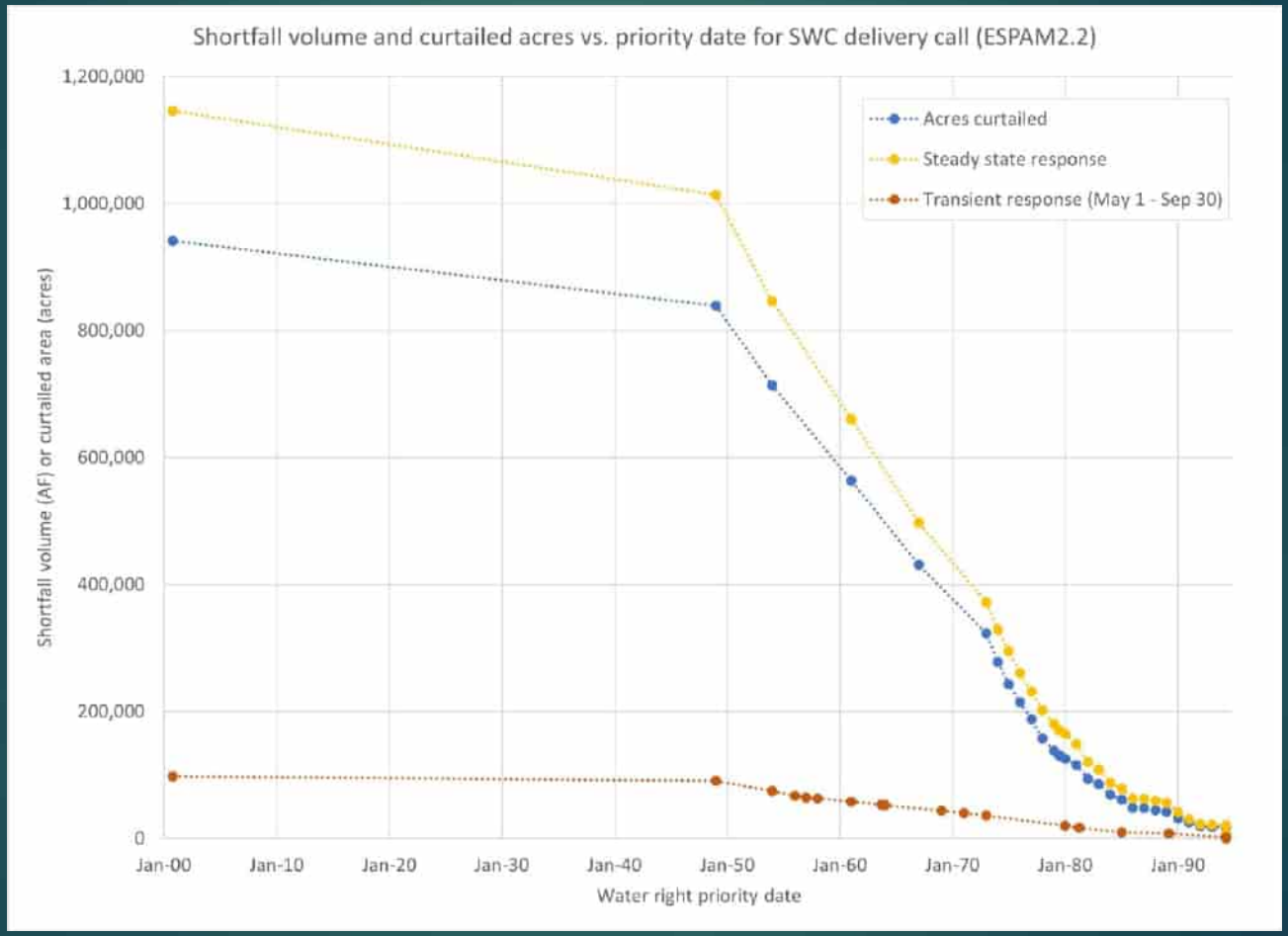


- Volume that would accrue from the ordered curtailments during the period of each shortfall is much less than the predicted shortfall
- Increases in reach gain would continue to accrue in future water years

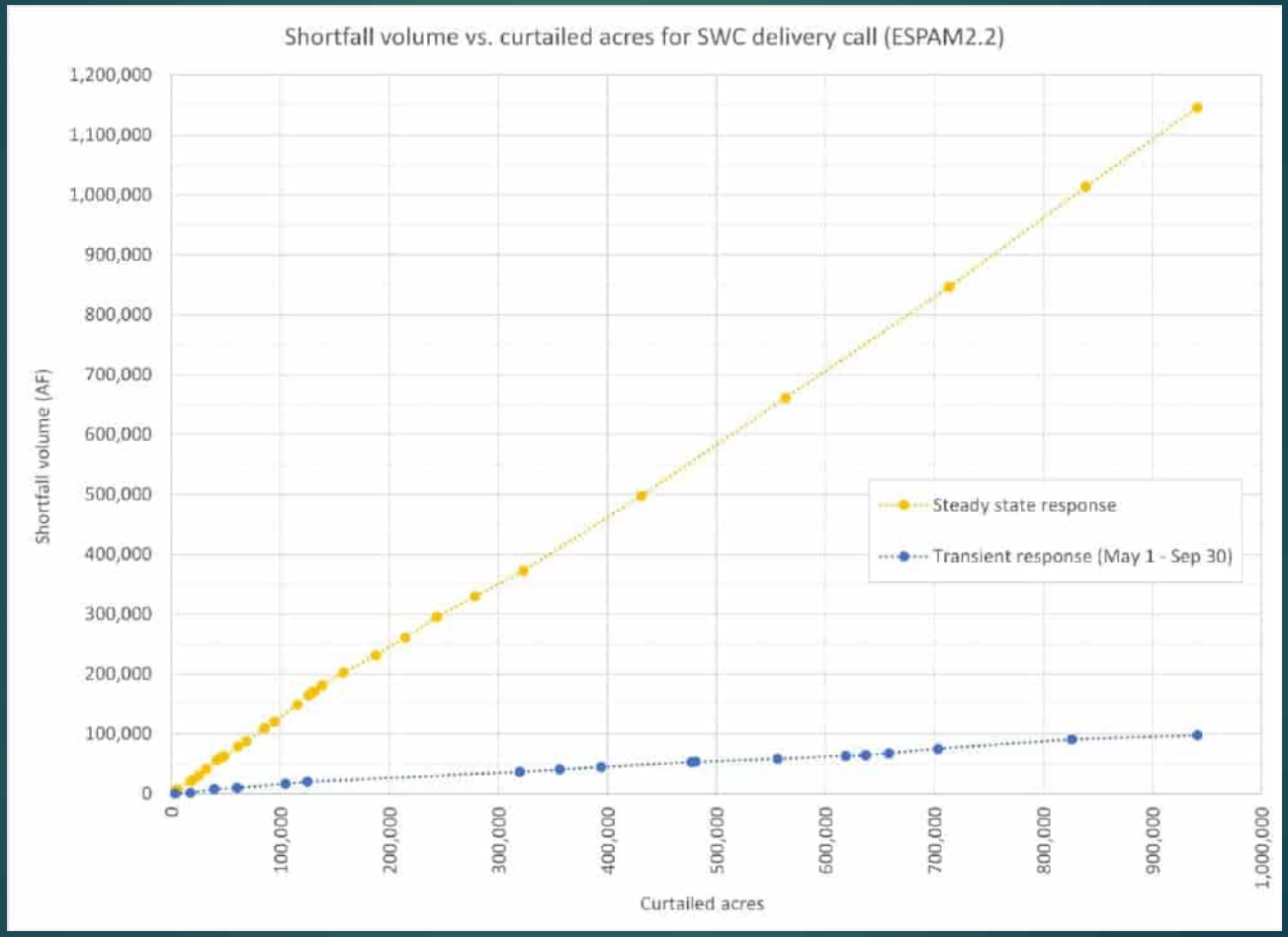
Assumptions for example transient model simulations

- Continue to use methods documented in "Curtailment Scenario" report (Sukow, 2021) https://research.idwr.idaho.gov/files/projects/espam/browse/ESPAM22_Reports/Scenarios/CurtScen22_FinalwApp.pdf
  - Use average monthly ET and precipitation from WY2009-WY2018 instead of average annual values
- Analysis of municipal curtailment continues to use methods described in 2015 IDWR staff memo for Rangen delivery call (Sukow, 2015) https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-MP-2014-007/CM-MP-2014-007-20150123-Staff-Memo-Cities-2nd.pdf
  - Five-year average pumping rates within ACGW are updated each year based on reported annual pumping volumes
- Curtailment for April forecast begins ~ May 1
- Curtailment priority date revision for July forecast goes into effect ~ July 16 if April DS > July DS
- Curtailment priority date revision for July forecast goes into effect ~ August 1 if April DS < July DS
- Curtailment priority date revision for Time of Need (mid-August) forecast goes into effect ~ September 1
- Target for transient calculation is a modeled benefit at near Blackfoot to Minidoka equal to DS volume accruing between DS forecast date and September 30
- Earliest curtailment priority date is junior to October 11, 1900 (TFCC and NSCC natural flow water rights)

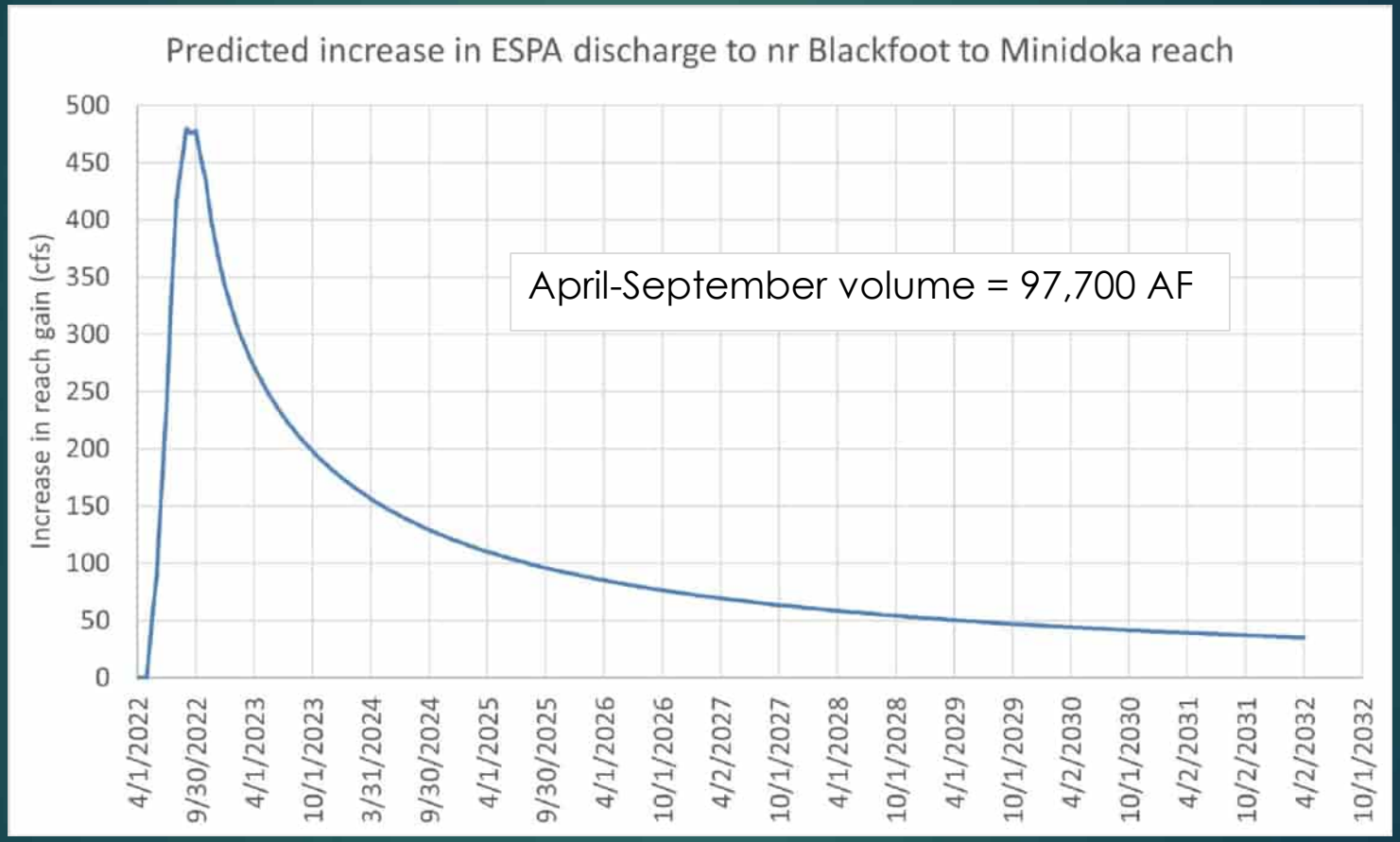
Comparison of priority dates calculated for April DS forecasts (May 1 curtailment)



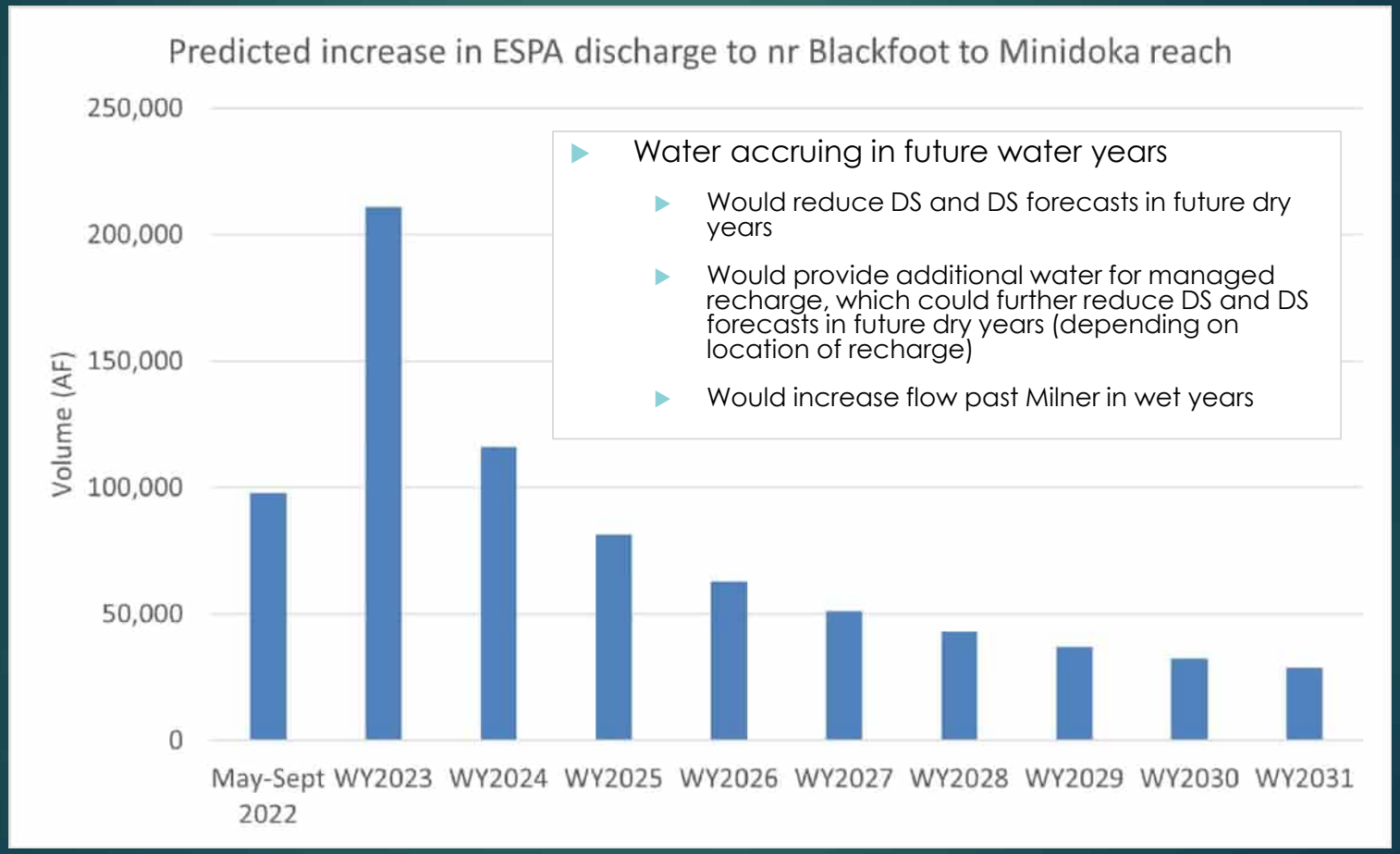
Comparison of priority dates calculated for April DS forecasts (May 1 curtailment)



Predicted response to May 1 curtailment of water rights junior to October 11, 1900



Predicted response to May 1 curtailment of water rights junior to October 11, 1900



Transient analyses for 2021 shortfall volumes

- April DS forecast = 40,500 AF
  - Curtail junior to **January 11, 1971** starting May 1
    - May 1 – Sep 30 predicted response = 40,500 AF
- July DS forecast = 170,000 AF
  - Increase curtailment to junior to **October 11, 1900** starting August 1
    - Jul 1 – Sep 30 predicted response = 44,400 AF
- Time of Need DS forecast = 142,700 AF
  - Maintain curtailment junior to **October 11, 1900**
    - Aug 16 – Sep 30 predicted response = 27,400 AF
- Carryover shortfall forecast = 64,600 AF
  - Curtail junior to **April 19, 1961** starting January 1
    - Jan 1 – Sep 30 predicted response = 64,700 AF

Transient analysis for 2021 carryover shortfall

- Calculation target is volume accruing between date of curtailment and September 30 of the next irrigation season
- Carryover shortfall forecast = 64,600 AF
  - Curtail junior to **April 19, 1961** starting January 1
    - Jan 1 – Sep 30 predicted response = 64,700 AF

Transient analyses for 2022 shortfall volumes

- April DS forecast = 162,600 AF
  - Curtail junior to **October 11, 1900** starting May 1
    - May 1 – Sep 30 predicted response = 97,700 AF
- July DS forecast = 52,600 AF
  - Decrease curtailment to junior to **March 13, 1981** starting July 16
    - Jul 1 – Sep 30 predicted response = 52,600 AF
- Time of Need DS forecast = 132,100 AF
  - Increase curtailment to junior to **October 11, 1900** starting September 1
    - Aug 16 – Sep 30 predicted response = 27,200 AF

Comparison of priority dates calculated using transient and steady state analyses

Forecast	Steady state date	Transient date	Steady state acres	Transient acres
April 1, 2021	1990	1/11/1971	~30,000	357,000
July 1, 2021	7/18/1979	10/11/1900	130,300	941,400
August 15, 2021	1981	10/11/1900	~110,000	941,400
Final net DS	1976	10/11/1900	~200,000	941,400
Carryover 2021	6/29/1985	4/19/1961	55,300	539,700
April 1, 2022	12/25/1979	10/11/1900	124,700	941,400
July 1, 2022	3/12/1989	3/31/1981	39,300	104,700
August 15, 2022	3/25/1981	10/11/1900	105,000	941,400

Range of priority dates using steady state simulations:
1976 – 1990 (30,000 to 200,000 acres)

Range of priority dates using transient simulations:
1900 – 1981 (105,000 to 940,000 acres)

Conclusions

- Steady state simulations are appropriate for evaluating the impact of aquifer stresses that have been applied for decades (i.e. groundwater pumping, continuous curtailment to same date every year)
- Transient simulations are appropriate to evaluate the impacts of aquifer stresses applied for short periods of time (i.e. short-term curtailments with varying priority dates)
- Steady state simulations of continuous curtailment do not simulate the short-term curtailments prescribed in the SWC methodology
- Transient simulations better simulate the short-term curtailments prescribed in the SWC methodology

Conclusions

- Short-term curtailments in response to in-season predictions of DS are inadequate to provide water during the time of need for several of the shortfall volumes predicted in 2021-2022
- Curtailments sufficient to provide water during the time of need would also provide water to reduce shortfalls in future dry years, but would result in additional flow past Milner in future wet years

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Proposed Modification of the Methodology For Determining Material Injury To Reasonable In-Season Demand and Reasonable Carryover: Project Efficiency

Presented by: Matt Anders

Date: 11/28/2022

Elements of Shortfall Calculation – Project Efficiency

Milestone	Supply	Reasonable In-Season Demand (RISD)
April	Forecast Natural Flow (Apr-Oct) • Regression Equations Predicted Storage Allocation • Analogous Year or Years	Predicted Demand (Apr-Oct) • Historical Demand from Baseline Year (BLY)
July	Actual Diverted Natural Flow (Apr-June) Forecast Natural Flow (July-Oct) • Regression Equations Storage Allocation • Storage Report or Analogous Year	Crop Water Need (Apr-June) • ET • Precipitation • Project Efficiency Predicted Demand (July-Oct) • Historical Demand from Baseline Year (BLY)

Elements of Shortfall Calculation – Project Efficiency

Milestone	Supply	Reasonable In-Season Demand (RISD)
Time of Need	Actual Diverted Natural Flow (Apr-Time of Need) Forecast Natural Flow (Time of Need-Oct) • Natural Flow from Comparable Year Storage Allocation • Storage Report	Crop Water Need (Apr-Time of Need) • ET • Precipitation • Project Efficiency Predicted Demand (Time of Need-Oct) • Historical Demand from Baseline Year (BLY)
November	Actual Diverted Natural Flow (Apr-Oct) Storage Allocation • Storage Report	Crop Water Need (Apr-Oct) • ET • Precipitation • Project Efficiency

Methodology Reference

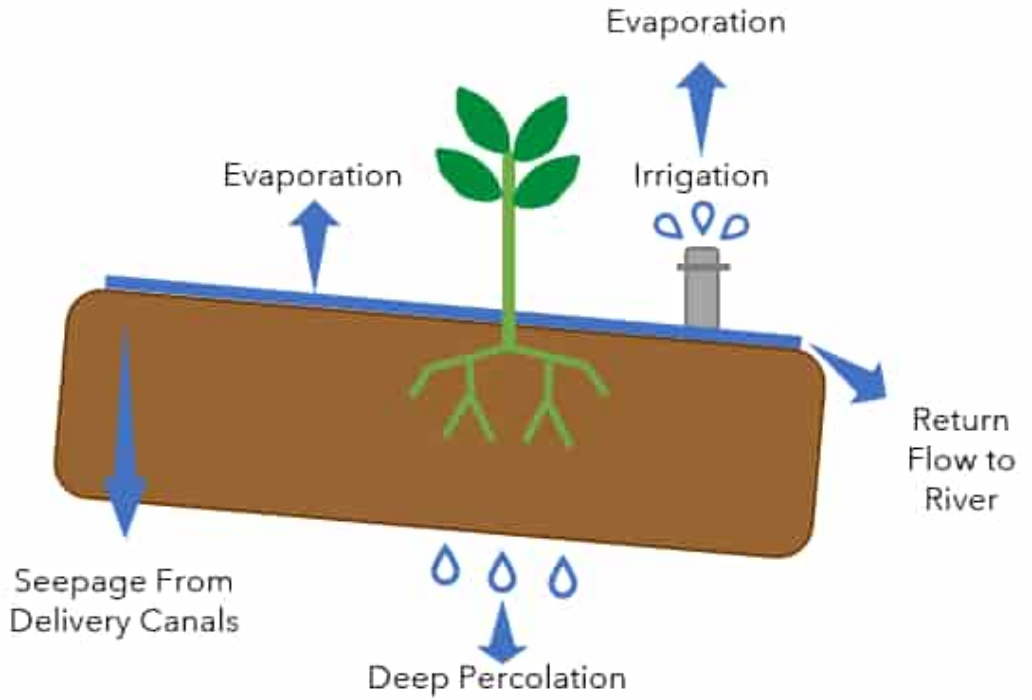
- Project Efficiency (Page 13 of Methodology)
  - Finding of Fact 30: Project efficiency is the ratio of total volumetric crop water need within a SWC entity's boundary and the total volume of water diverted by that entity to satisfy its crop needs. Implicit in this relationship are the components of seepage loss, on farm application losses, and system operational losses for which data is not obtainable by the Department. By utilizing project efficiency, the influence of the unknown components for which data is not obtainable can be captured and described without quantifying each of the components. Project efficiency is derived by dividing crop water need by total diversions:

$$E_p = \frac{CWN}{Q_D}$$

  - Where:
    - E_p = project efficiency
    - CWN = crop water need
    - Q_D = irrigation entity diversion of water specifically put to beneficial use for the growing of crops within the irrigation entity.

Examples of Losses Captured in Project Efficiency

- Seepage losses
  - Delivery canals
- On farm application losses
  - Evaporation from ground, sprinklers, and foliage
  - Deep percolation from saturated root zone
- System operational losses
  - Return flow to river



Methodology Reference

- Project Efficiency (Page 14 of Methodology)
  - Finding of Fact 32: Monthly project efficiencies will be computed for the entire irrigation season. Project efficiency varies from month-to-month during the season, and will typically be lower during the beginning and ending of the season. Monthly project efficiencies will be divided into actual monthly crop water need ("CWN") values to determine RISD during the year of evaluation.

$$RISD = \frac{CWN}{E_p}$$

  - Where:
    - RISD = reasonable in-season demand
    - CWN = crop water need
    - E_p = project efficiency

- Used in methodology calculation to calculate RISD for:
  - July
  - Time of Need
  - November

Methodology Reference

- Project Efficiency (Page 14 of Methodology)

Summary of Average PE Values for 2007-2014

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	1.67	0.39	0.43	0.77	0.47	0.16	0.30	0.60
5	0.61	0.29	0.28	0.41	0.37	0.29	0.31	0.37
6	0.73	0.43	0.44	0.63	0.54	0.47	0.51	0.54
7	0.68	0.45	0.56	0.74	0.61	0.50	0.58	0.59
8	0.50	0.39	0.60	0.66	0.53	0.32	0.44	0.49
9	0.41	0.26	0.48	0.56	0.44	0.21	0.26	0.38
10	0.14	0.26	0.14	0.15	0.14	0.05	0.04	0.13
Season Avg.	0.68	0.35	0.42	0.56	0.44	0.29	0.35	

- Updates since 2015:
  - Fixed error in the 2000-2010 crop percentages used in crop water need
  - Updated crop water need for 2014

Calculating Project Efficiency: 2022

- Average Project Efficiency is calculated for each SWC member and for each month

$$\text{Project Efficiency} = \frac{\text{Crop Water Need (AF)}}{\text{Demand (AF)}}$$

  - Exclude values greater than 2 standard deviations by month from the 2001-2021 dataset (highlighted in blue)
  - Average the values from the most recent 8-year period (2014-2021)
  - Example: A&B for 2022

Month	2014	2015	2016	2017	2018	2019	2020	2021	Average
4	1.13	0.43	1.44	0.66	1.21	1.07	0.61	0.69	0.91
5	0.49	0.35	0.70	0.55	0.40	0.20	0.45	0.49	0.46
6	0.67	0.75	0.64	0.63	0.60	0.62	0.35	0.61	0.64
7	0.77	0.66	0.79	0.79	0.78	0.70	0.73	0.72	0.74
8	0.48	0.50	0.53	0.61	0.56	0.59	0.56	0.53	0.54
9	0.45	0.46	0.23	0.39	0.50	0.39	0.47	0.48	0.42
10	0.24	0.20	0.03	0.35	0.12	0.38	0.28	0.04	0.21

Average Project Efficiency Values for 2014-2021

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.91	0.34	0.44	0.83	0.53	0.23	0.31	0.51
5	0.46	0.20	0.30	0.33	0.38	0.21	0.29	0.31
6	0.64	0.38	0.46	0.53	0.57	0.39	0.51	0.50
7	0.74	0.43	0.53	0.62	0.66	0.46	0.58	0.58
8	0.54	0.41	0.47	0.52	0.59	0.44	0.48	0.49
9	0.42	0.29	0.36	0.42	0.43	0.33	0.29	0.36
10	0.21	0.07	0.10	0.14	0.14	0.06	0.05	0.11
Season Avg.	0.56	0.30	0.38	0.49	0.47	0.30	0.36	

Applying Project Efficiency: 2022

- Reasonable In-Season Demand (RISD)

$$RISD = \frac{CWN}{E_p}$$

  - Where:
    - RISD = reasonable in-season demand
    - CWN = crop water need
    - E_p = project efficiency

- Example: A&B for 2022

Month	Monthly Crop Water Need (AF)	Average Project Efficiency 2014-2021	Monthly RISD (AF)
4	2,028	0.91	2,241
5	3,378	0.46	7,397
6	8,528	0.64	13,256
7	11,058	0.74	14,918
8	3,381	0.54	6,214
9		0.42	
10		0.21	

Change in Average Project Efficiency Values Since 2014 Order

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	-0.77	-0.05	0.00	0.06	0.05	0.08	0.02	-0.09
5	-0.15	-0.09	0.01	-0.07	0.01	-0.09	-0.03	-0.06
6	-0.09	-0.05	0.02	-0.09	0.03	-0.08	0.00	-0.04
7	0.06	-0.02	-0.03	-0.11	0.04	-0.04	0.00	-0.01
8	0.04	0.02	-0.13	-0.13	0.07	0.12	0.05	0.00
9	0.01	0.02	-0.13	-0.14	-0.01	0.12	0.03	-0.01
10	0.06	-0.18	-0.04	-0.01	0.00	0.02	0.01	-0.02
Season Avg.	-0.12	-0.05	-0.04	-0.07	0.03	0.02	0.01	

- Reasons for change since 2014 Order
  - Fixed error in the 2000-2010 crop percentages
  - Updated crop water need for 2014
  - Changes in project efficiency

Possible Changes to Project Efficiency

- To calculate Crop Water Need for each SWC member:
  - Currently using an average of the Project Efficiency for most recent 8 years.
  - Update to use an average of the Project Efficiency for most recent 15 years.

Possible Change to Project Efficiency

- Project Efficiency for most recent 15 years (2007-2021).

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.98	0.33	0.45	0.86	0.43	0.24	0.31	0.51
5	0.47	0.22	0.32	0.39	0.35	0.24	0.30	0.33
6	0.66	0.40	0.49	0.60	0.56	0.41	0.51	0.52
7	0.74	0.45	0.52	0.66	0.63	0.48	0.58	0.58
8	0.58	0.41	0.42	0.55	0.52	0.43	0.46	0.48
9	0.45	0.27	0.32	0.45	0.38	0.32	0.27	0.35
10	0.18	0.16	0.09	0.14	0.11	0.06	0.04	0.11
Season Avg.	0.58	0.32	0.37	0.52	0.43	0.31	0.35	

Possible Change to Project Efficiency

- Change in Project Efficiency compared to the current method (Average of Project Efficiency 2014-2021)

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Monthly Avg.
4	0.08	-0.01	0.01	0.03	-0.09	0.00	-0.01	0.00
5	0.02	0.02	0.03	0.06	-0.03	0.03	0.01	0.02
6	0.01	0.01	0.02	0.06	-0.01	0.02	0.00	0.02
7	0.00	0.01	-0.01	0.04	-0.03	0.01	0.00	0.00
8	0.04	0.00	-0.04	0.02	-0.07	-0.01	-0.02	-0.01
9	0.03	-0.01	-0.03	0.03	-0.05	-0.02	-0.02	-0.01
10	-0.03	0.08	-0.01	-0.01	-0.04	0.00	-0.01	0.00
Season Avg.	0.02	0.02	-0.01	0.03	-0.05	0.01	-0.01	

Demand Shortfall Hindcast

- Used Project Efficiency for preceding 15 years.

Year Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
2016	71,208	71,208	21,271	25,836	7,853	20,128
2017	0	0	0	0	0	0
2018	0	0	0	0	10,996	24,765
2019	40,899	40,899	0	0	0	0
2020	0	0	0	0	0	0
2021	40,491	40,491	162,873	144,601	190,816	184,039

Questions

(208) 287-4932
matthew.anders@idwr.idaho.gov

Demand Shortfall Hindcast - 2016

- Used Project Efficiency for preceding 15 years (2001-2015).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	27,045	27,045	0	0	0	0
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	44,163	44,163	21,271	25,836	7,853	20,128

Demand Shortfall Hindcast - 2017

- Used Project Efficiency for preceding 15 years (2002-2016).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	0	0	0	0	0	0
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	0	0	0	0	0	0

Demand Shortfall Hindcast - 2018

- Used Project Efficiency for preceding 15 years (2003-2017).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	0	0	0	0	0	0
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	0	0	0	0	10,996	24,765

Demand Shortfall Hindcast - 2019

- Used Project Efficiency for preceding 15 years (2004-2018).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	19,956	19,956	0	0	0	0
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	20,943	20,943	0	0	0	0

Demand Shortfall Hindcast - 2020

- Used Project Efficiency for preceding 15 years (2005-2019).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	0	0	0	0	0	0
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	0	0	0	0	0	0

Demand Shortfall Hindcast - 2021

- Used Project Efficiency for preceding 15 years (2006-2020).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 15-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 15-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 15-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	0	0	46,509	35,339	18,085	4,523
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	40,491	40,491	116,364	109,262	172,731	179,517

Demand Shortfall Hindcast - 2021

- Used Project Efficiency for preceding 20 years (2001-2020).

SWC Member	April Project Efficiency 8-year Average (AF)	April Project Efficiency 20-year Average (AF)	July Project Efficiency 8-year Average (AF)	July Project Efficiency 20-year Average (AF)	November Project Efficiency 8-year Average (AF)	November Project Efficiency 20-year Average (AF)
A&B	0	0	0	0	0	0
AFRD2	0	0	46,509	39,724	18,085	10,431
BID	0	0	0	0	0	0
Milner	0	0	0	0	0	0
Minidoka	0	0	0	0	0	0
NSCC	0	0	0	0	0	0
TFCC	40,491	40,491	116,364	118,538	172,731	202,578



Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC

Presented by Ethan Geisler, Kara Ferguson, & Matt Anders

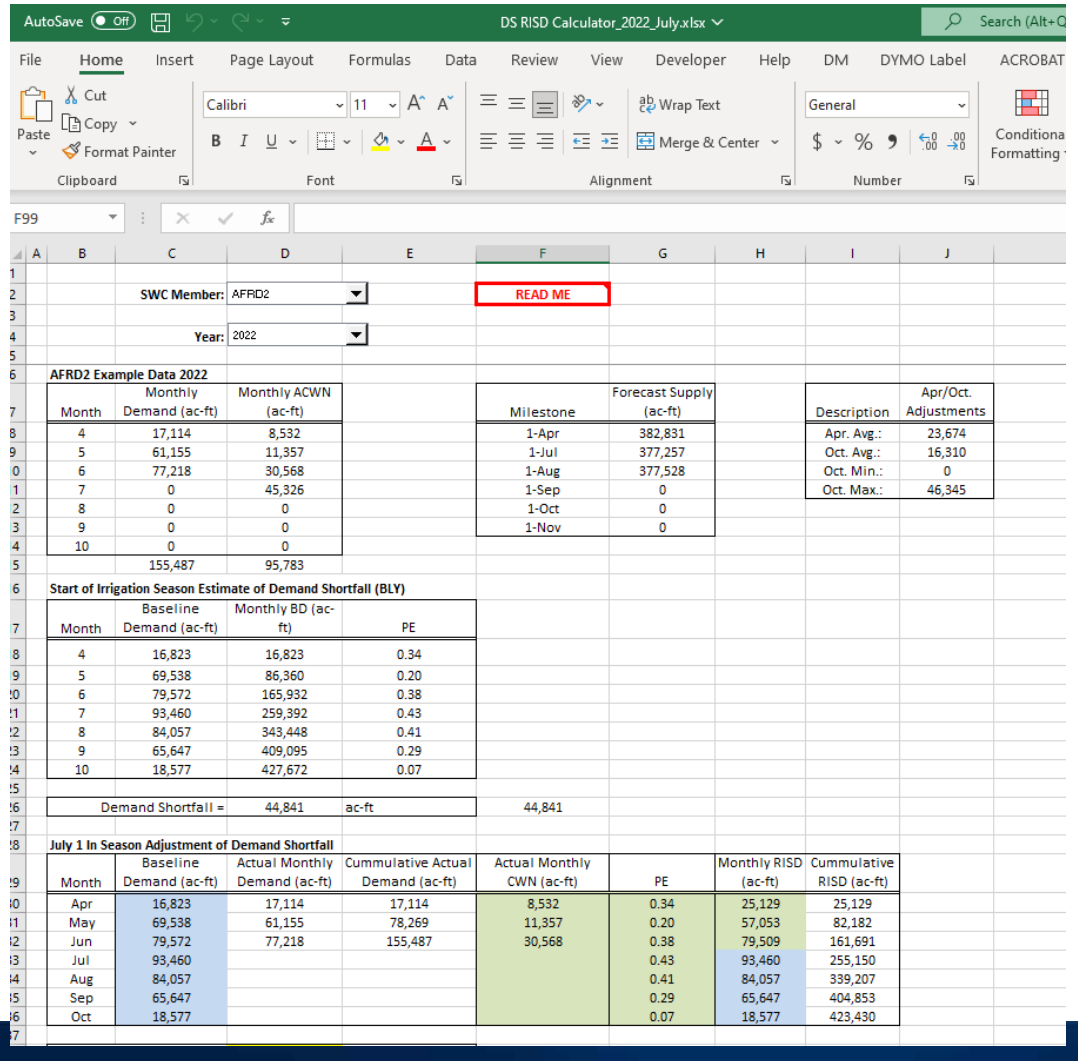
December 1, 2022

IDWR SWC Website

- SWC Delivery Call Related Documents
  - https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/

- 4th Amended Methodology Order
  - https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-DC-2010-001/CM-DC-2010-001-20160419-Fourth-Amended-Final-Order-Regarding-Methodology-for-Determining-Material-Injury-to-Reasonable-In-Season-Demand-and-Reasonable-Carryover.pdf

SWC Demand Shortfall Calculator



DS RISD Calculator_2022_July.xlsx

SWC Member: AFRD2

Year: 2022

READ ME

AFRD2 Example Data 2022

Month	Monthly Demand (ac-ft)	Monthly ACWN (ac-ft)
4	17,114	8,532
5	61,155	11,357
6	77,218	30,568
7	0	45,326
8	0	0
9	0	0
10	0	0
	155,487	95,783

Milestone	Forecast Supply (ac-ft)
1-Apr	382,831
1-Jul	377,257
1-Aug	377,528
1-Sep	0
1-Oct	0
1-Nov	0

Description	Apr/Oct. Adjustments
Apr. Avg.:	23,674
Oct. Avg.:	16,310
Oct. Min.:	0
Oct. Max.:	46,345

Start of Irrigation Season Estimate of Demand Shortfall (BLY)

Month	Baseline Demand (ac-ft)	Monthly BD (ac-ft)	PE
4	16,823	16,823	0.34
5	69,538	86,360	0.20
6	79,572	165,932	0.38
7	93,460	259,392	0.43
8	84,057	343,448	0.41
9	65,647	409,095	0.29
10	18,577	427,672	0.07

Demand Shortfall = 44,841 ac-ft 44,841

July 1 In Season Adjustment of Demand Shortfall

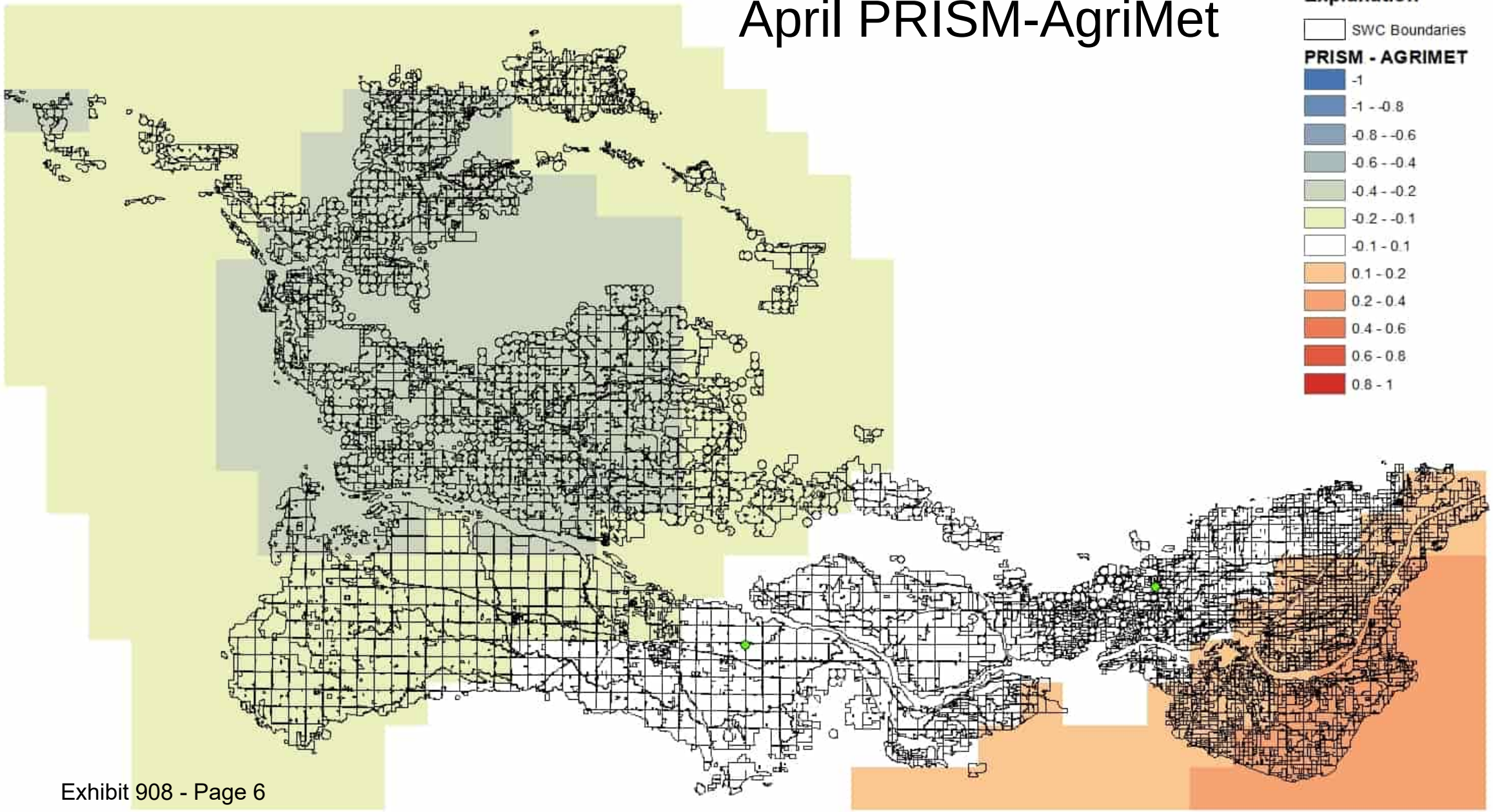
Month	Baseline Demand (ac-ft)	Actual Monthly Demand (ac-ft)	Cummulative Actual Demand (ac-ft)	Actual Monthly CWN (ac-ft)	PE	Monthly RISD (ac-ft)	Cummulative RISD (ac-ft)
Apr	16,823	17,114	17,114	8,532	0.34	25,129	25,129
May	69,538	61,155	78,269	11,357	0.20	57,053	82,182
Jun	79,572	77,218	155,487	30,568	0.38	79,509	161,691
Jul	93,460				0.43	93,460	255,150
Aug	84,057				0.41	84,057	339,207
Sep	65,647				0.29	65,647	404,853
Oct	18,577				0.07	18,577	423,430

PRISM – AgriMet Difference Analysis for 2021

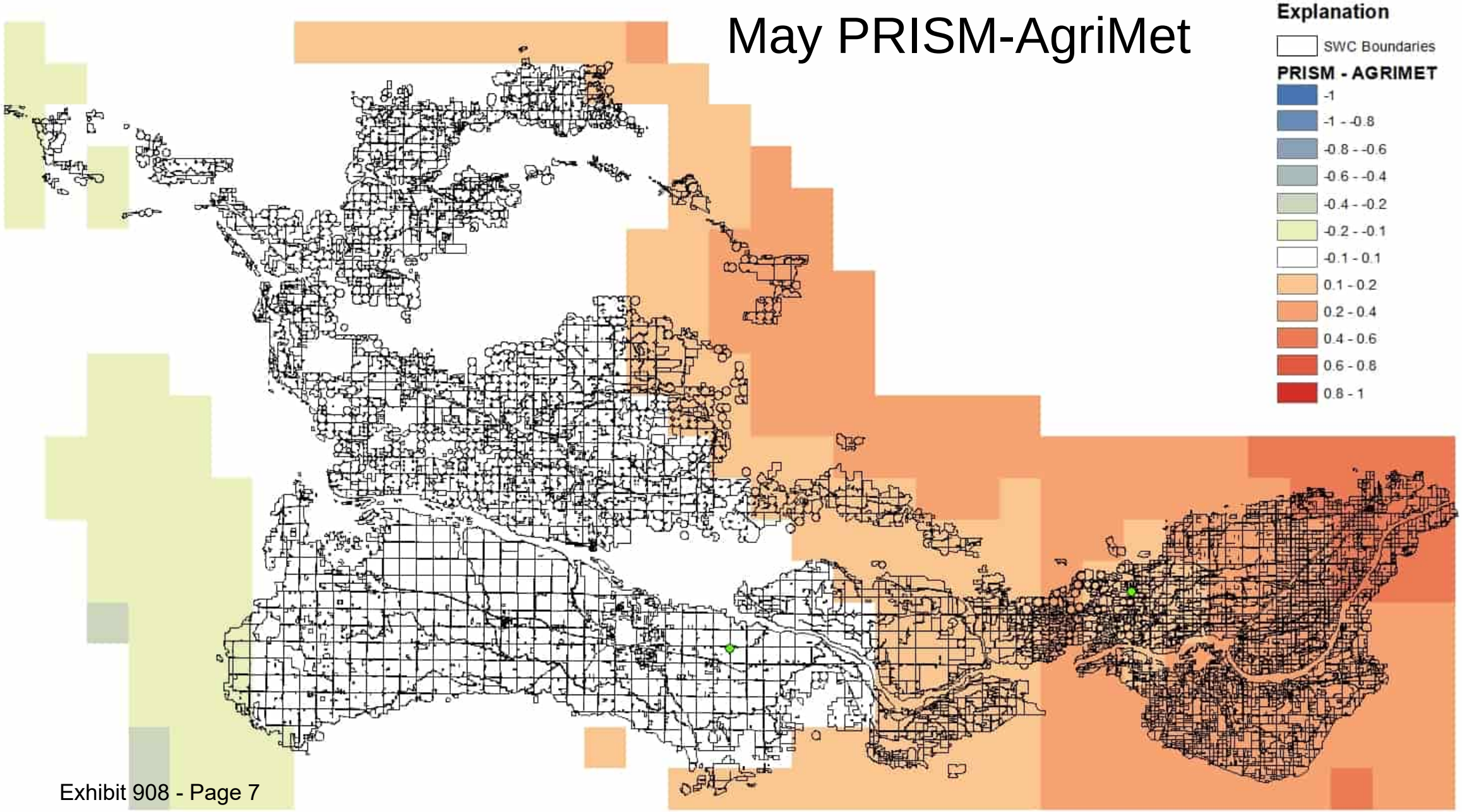
PRISM – AgriMet Difference Analysis for 2021

- Value (in inches) represent the difference between Effective precipitation from PRISM minus Effective Precipitation from AgriMet
- Same Effective precipitation method was used for both methods
- Twin Falls AgriMet was included for:
  - TFCC, AFRD2, NSCC, Milner
- Rupert AgriMet was included for:
  - A&B, Burley, MID
- Negative value in the graph below indicates Agrimet Effective precipitation was higher and would therefore decrease Crop Water Need more than PRISM for that month
- White background indicates the difference was between -0.1 and 0.1 inches

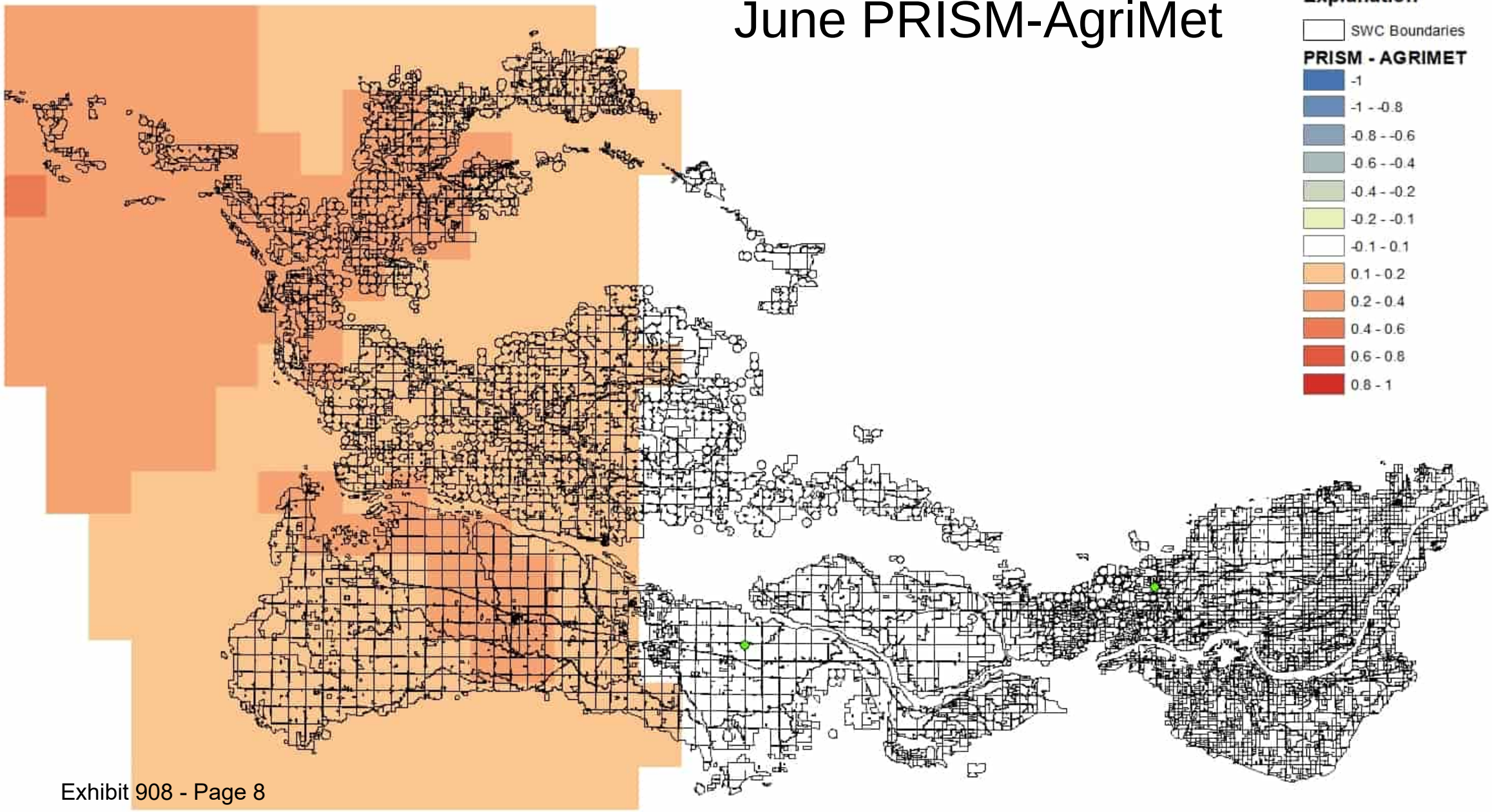
April PRISM-AgriMet



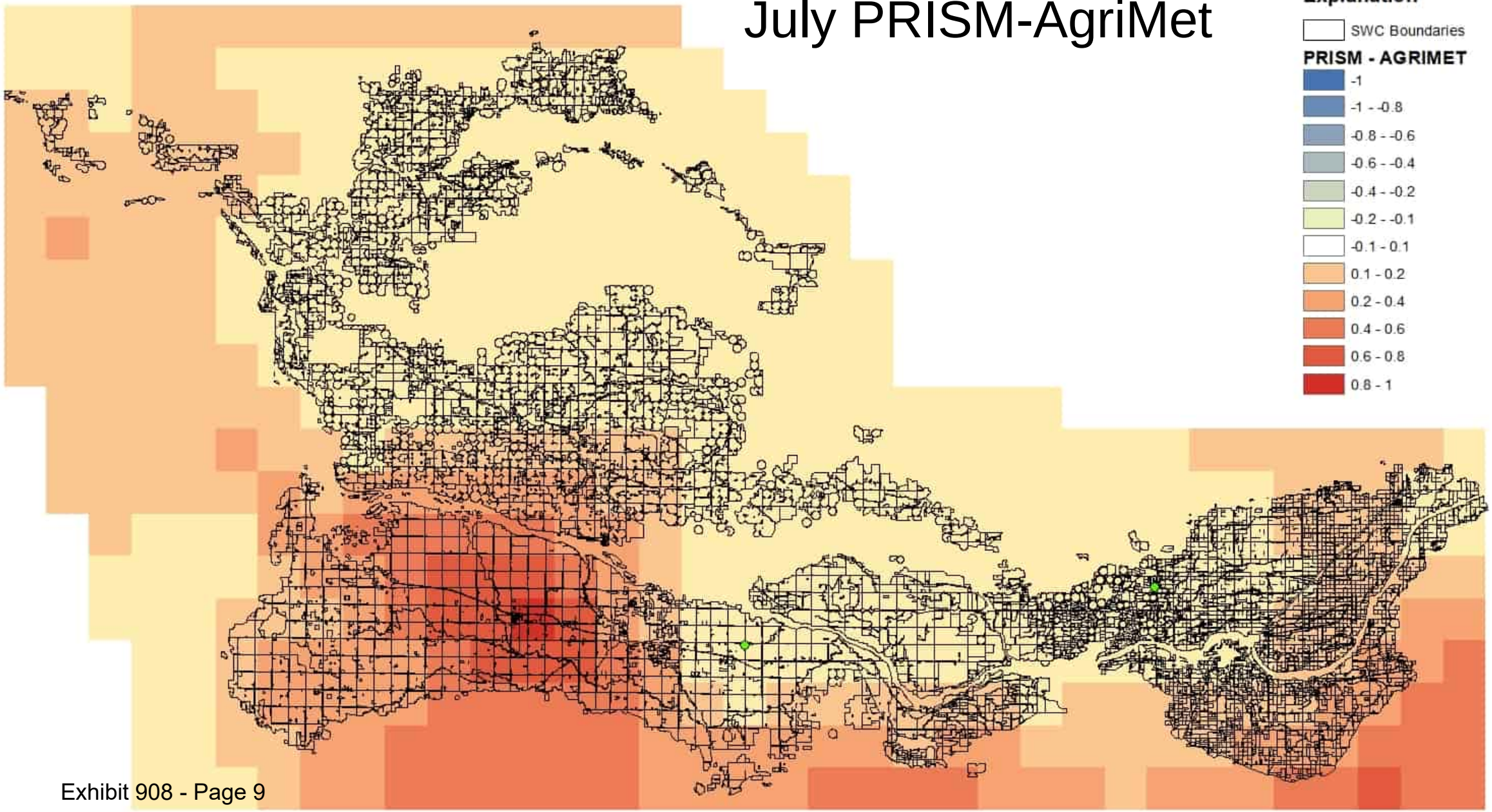
May PRISM-AgriMet



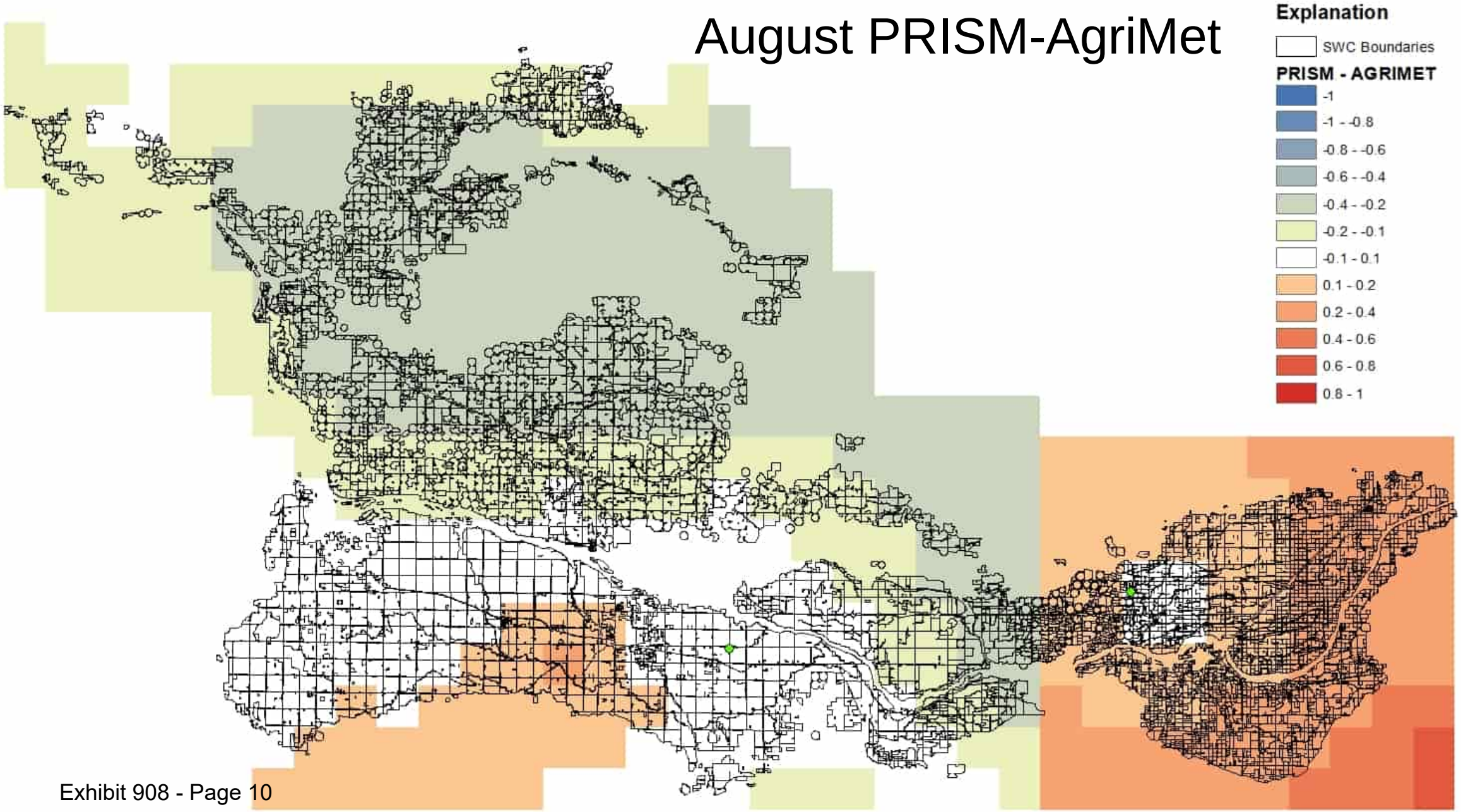
June PRISM-AgriMet



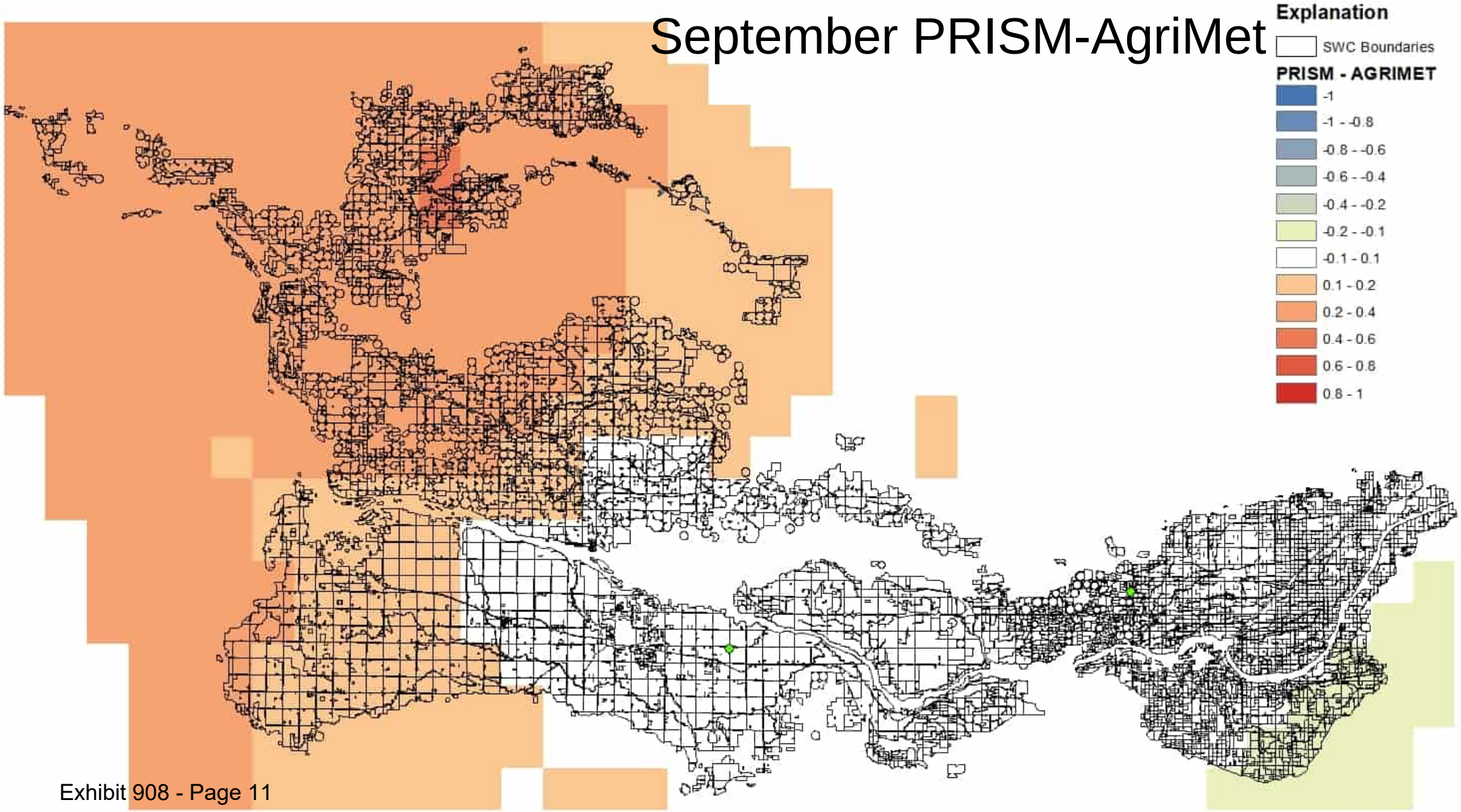
July PRISM-AgriMet



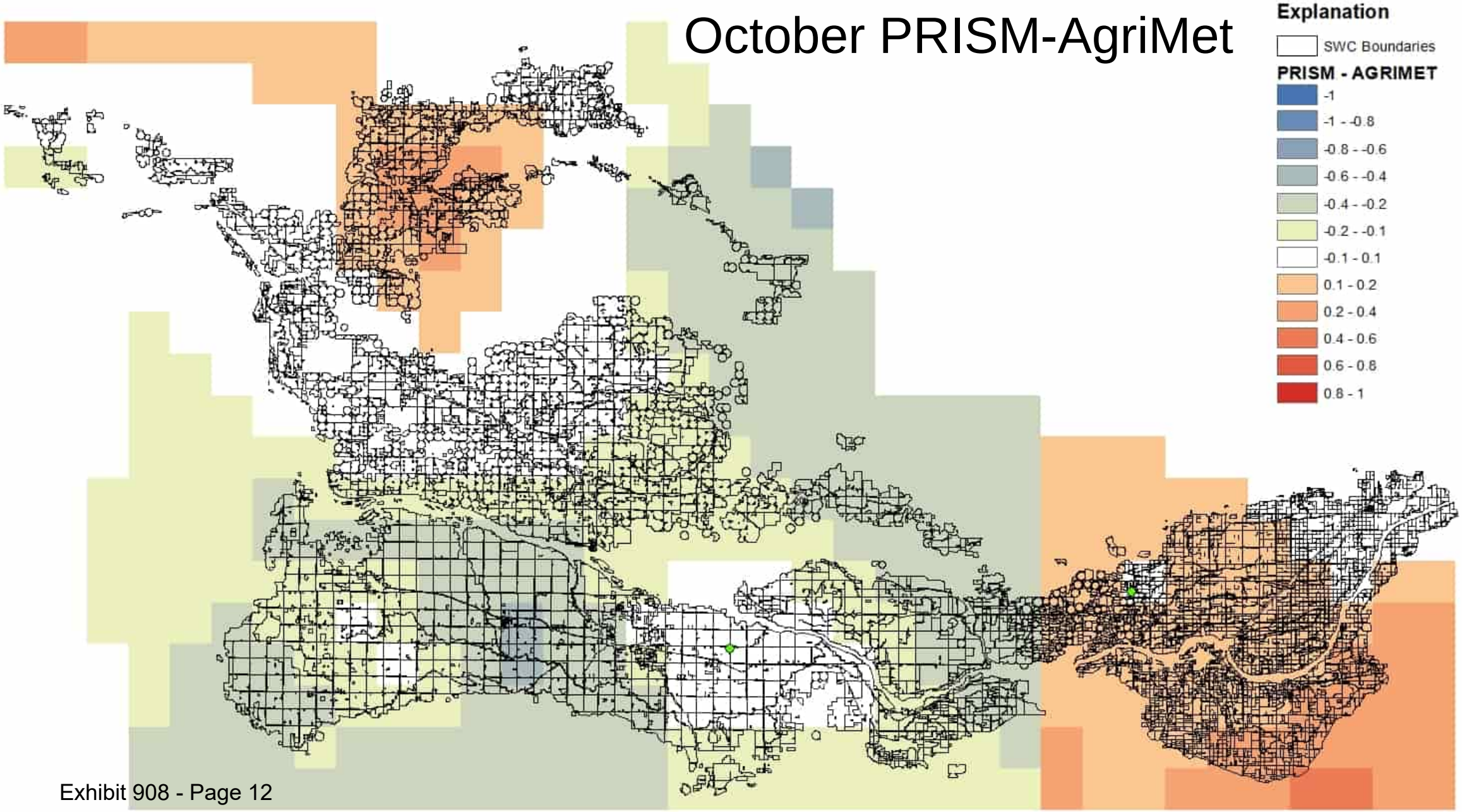
August PRISM-AgriMet



September PRISM-AgriMet



October PRISM-AgriMet



SWC Irrigated Acres

Current Method Crop Water Need

$CWN_{crop} = (ET_{crop}$- Effective Precipitation) * $Acres_{crop}$

- AgriMet ET
- Daily data from Rupert & Twin Falls stations.

- AgriMet Precipitation
- Daily data from Rupert & Twin Falls stations.
- Calculate monthly effective precipitation.

- USDA Crop Data Layer (CDL)
- Remove data speckling and assign the majority crop in each polygon.
- Remove non-irrigated land from CDL using the IDWR Irrigated Lands Dataset.
- Clip CDL to SWC service areas.
- Determine the 3-year average crop mix percentage
- Acres of Each Crop = Crop Mix % * Acres From Methodology

Proposed Method NRT METRIC Crop Water Need

CWN = (ET - Effective Precipitation) * Acres

- NRT METRIC
- Remove non-irrigated land
- Normalize “ET – Effective Precipitation” to AF/Acre for each SWC member

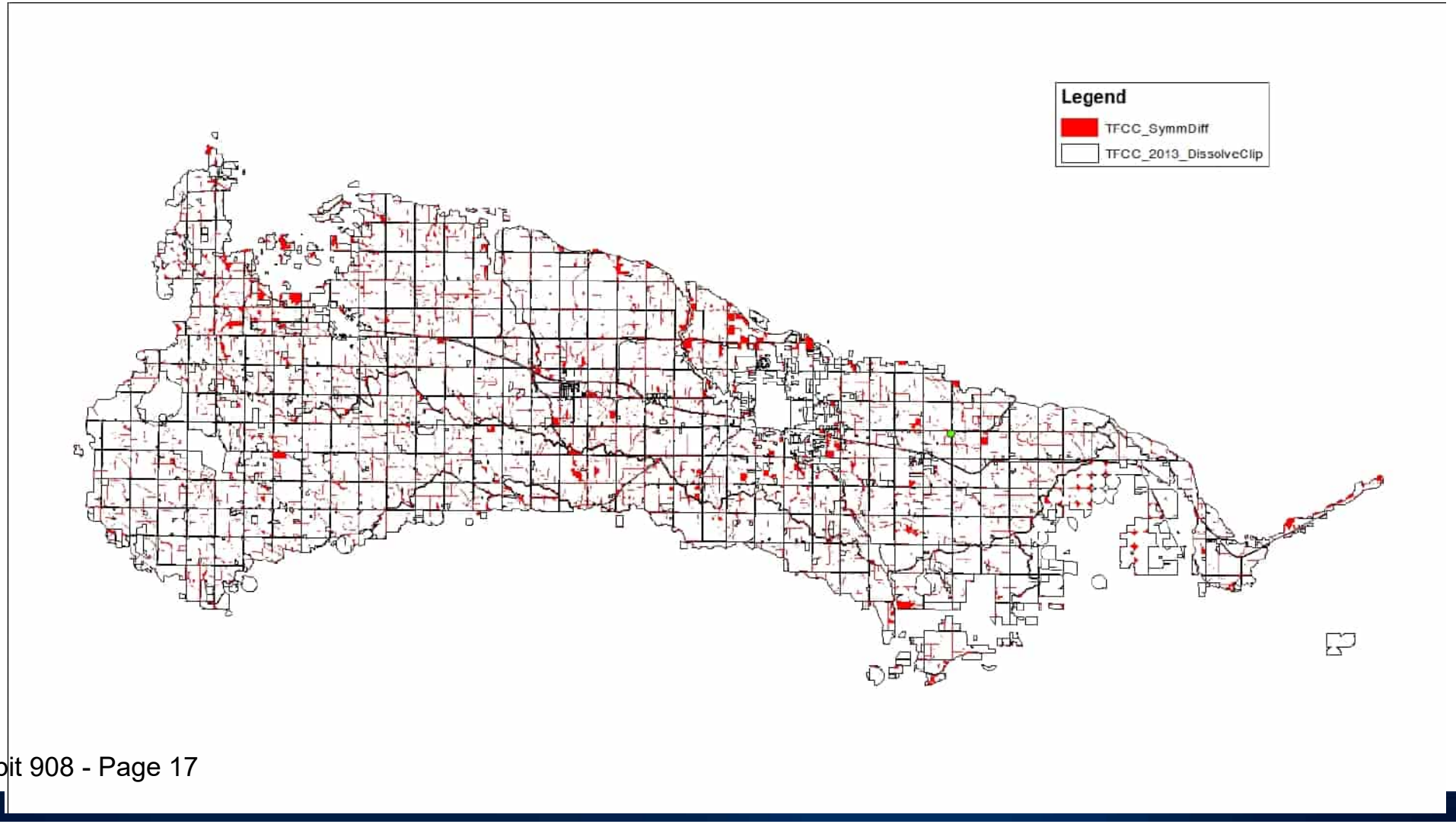
- Irrigated acres from methodology

- Oregon State University Prism Precipitation
- Calculate monthly effective precipitation

SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	CDL Processing Acres (2021)	NRT METRIC Processing Acres (2021)	Methodology Acres
A&B	PPU	2010	21,972	22,025	21,625	15,924
AFRD2	PPU	2010	69,077	69,105	68,384	62,361
Burley	SWC	2013	46,035	46,167	44,139	46,035
Milner	PPU	2010	13,264	13,302	13,233	13,335
Minidoka	SWC	2022	74,849	75,136	71,073	75,060
NSCC	PPU	2010	224,463	224,684	220,937	154,067
TFCC	SWC	2013	194,727	195,342	179,456	194,732

Example – Non-Irrigated Acres Removed From TFCC



Methodology Reference

- Irrigated Acres (Page 35 of Methodology)
  - Step 1:
    - Department staff will review submitted shapefiles and modify them as necessary to ensure that:
      - (1) the total acreage count does not exceed the decreed number of acres;
      - (2) all of the irrigated land is located within the decreed place of use; and
      - (3) acres are not counted more than once due to overlapping polygons within a shapefile or between shapefiles submitted by different SWC members.
    - Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department.
      - If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery.
      - If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season.

SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	If Remove Non-Irrigated Acres with 2011 Irrigated lands Dataset	If Remove Non-Irrigated Acres with 2017 Irrigated lands Dataset	Methodology Acres
A&B	PPU	2010	21,972	21,585	21,634	15,924
AFRD2	PPU	2010	69,077	68,368	66,606	62,361
Burley	SWC	2013	46,035	44,113	44,168	46,035
Milner	PPU	2010	13,264	13,239	13,202	13,335
Minidoka	SWC	2022	74,849	71,295	72,016	75,060
NSCC	PPU	2010	224,463	220,953	218,498	154,067
TFCC	SWC	2013	194,727	179,486	180,956	194,732

SWC Irrigated Acres

- IDWR Irrigated Lands Datasets
  - 2010-2017
  - 2021 complete in 2024?

Questions?

(208) 287-4816
ethan.geisler@idwr.idaho.gov

IDAHO Department of Water Resources

x

IDAHO DEPARTMENT OF WATER RESOURCES



Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC

Presented by Ethan Geisler

December 9, 2022

IDAHO DEPARTMENT OF WATER RESOURCES

PRISM Station Coverage and Final vs Provisional Difference Analysis for 2021

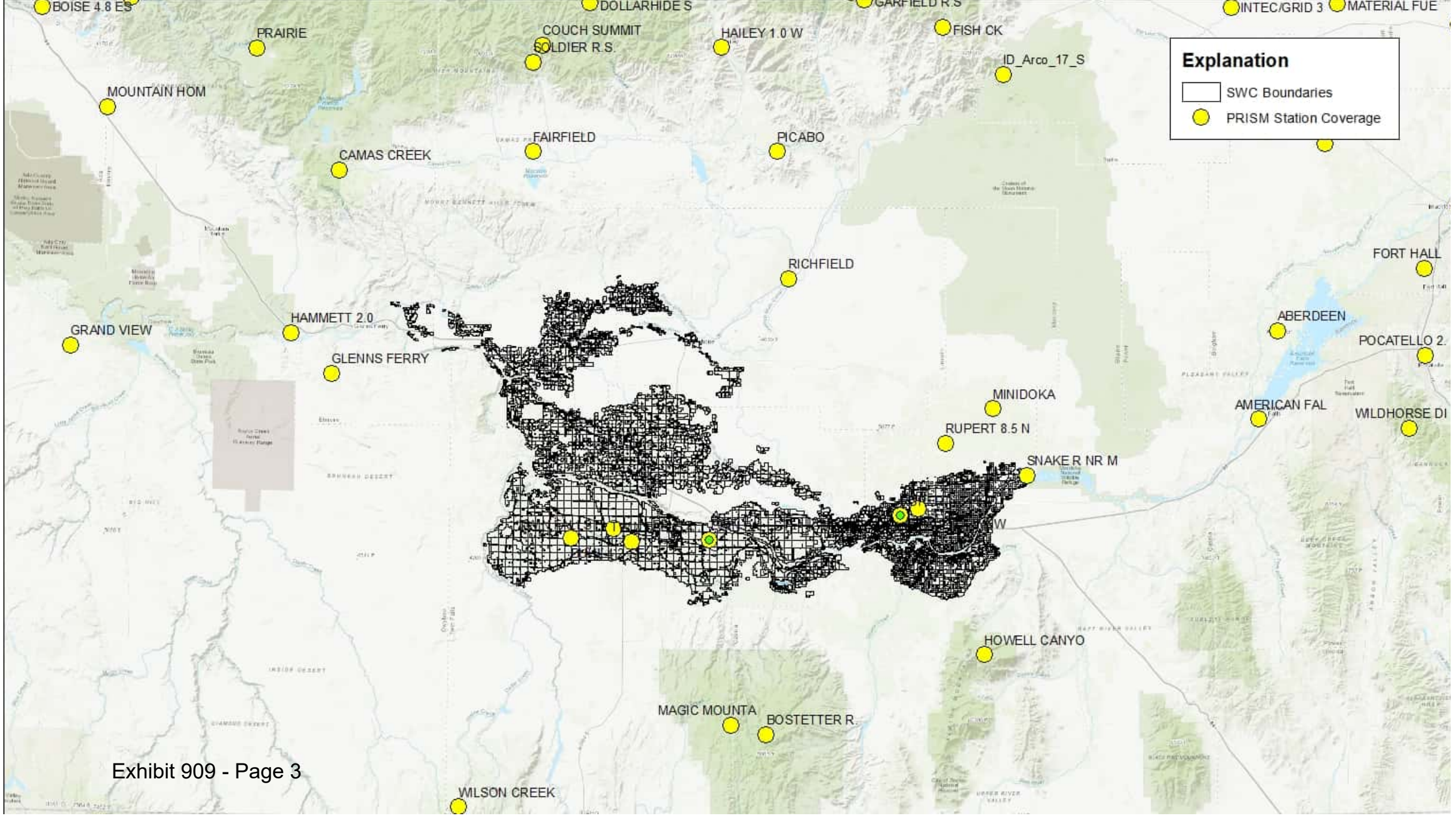
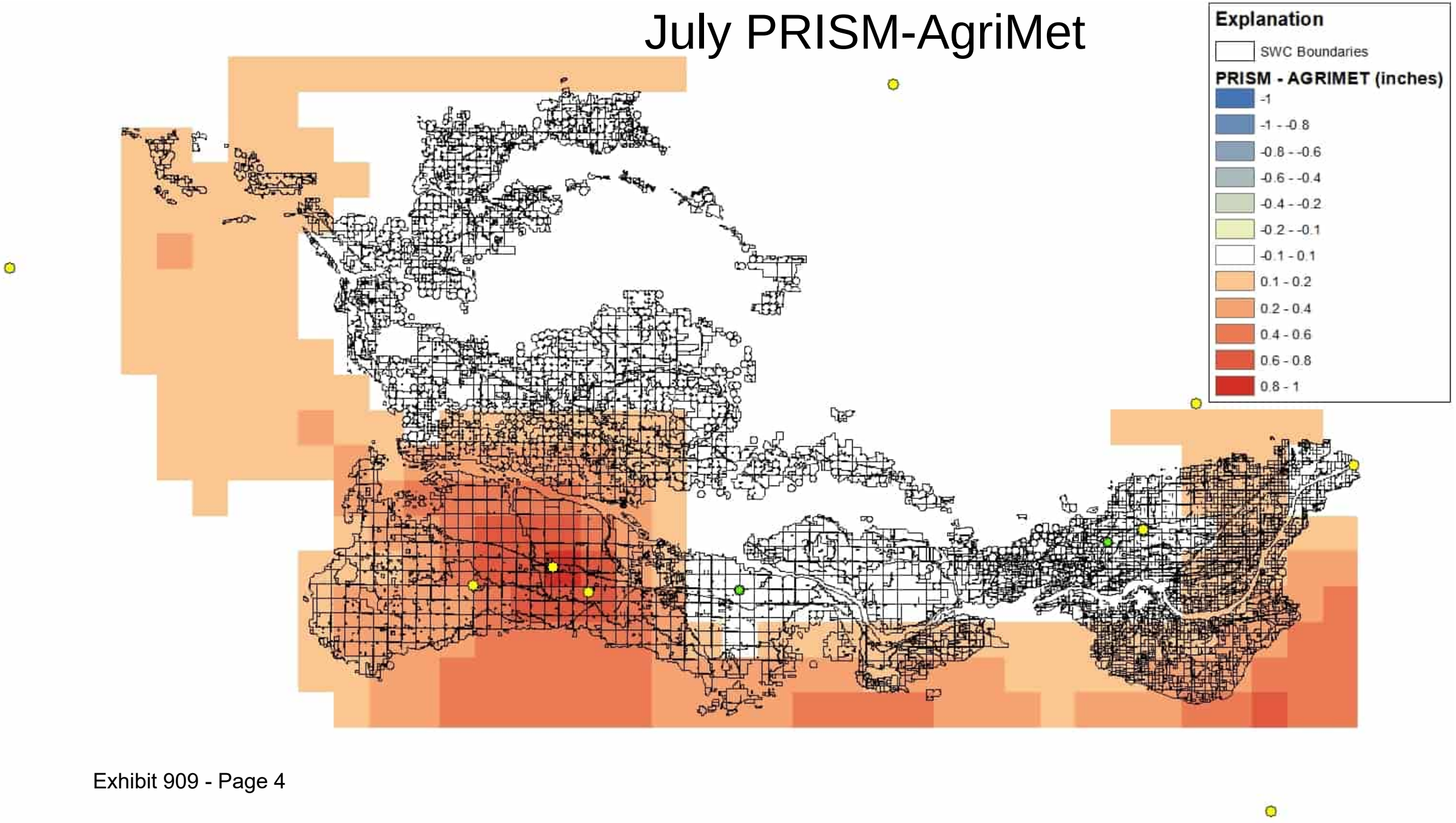


Exhibit 909 - Page 3

July PRISM-AgriMet



2021 PRISM Provisional data vs Final data

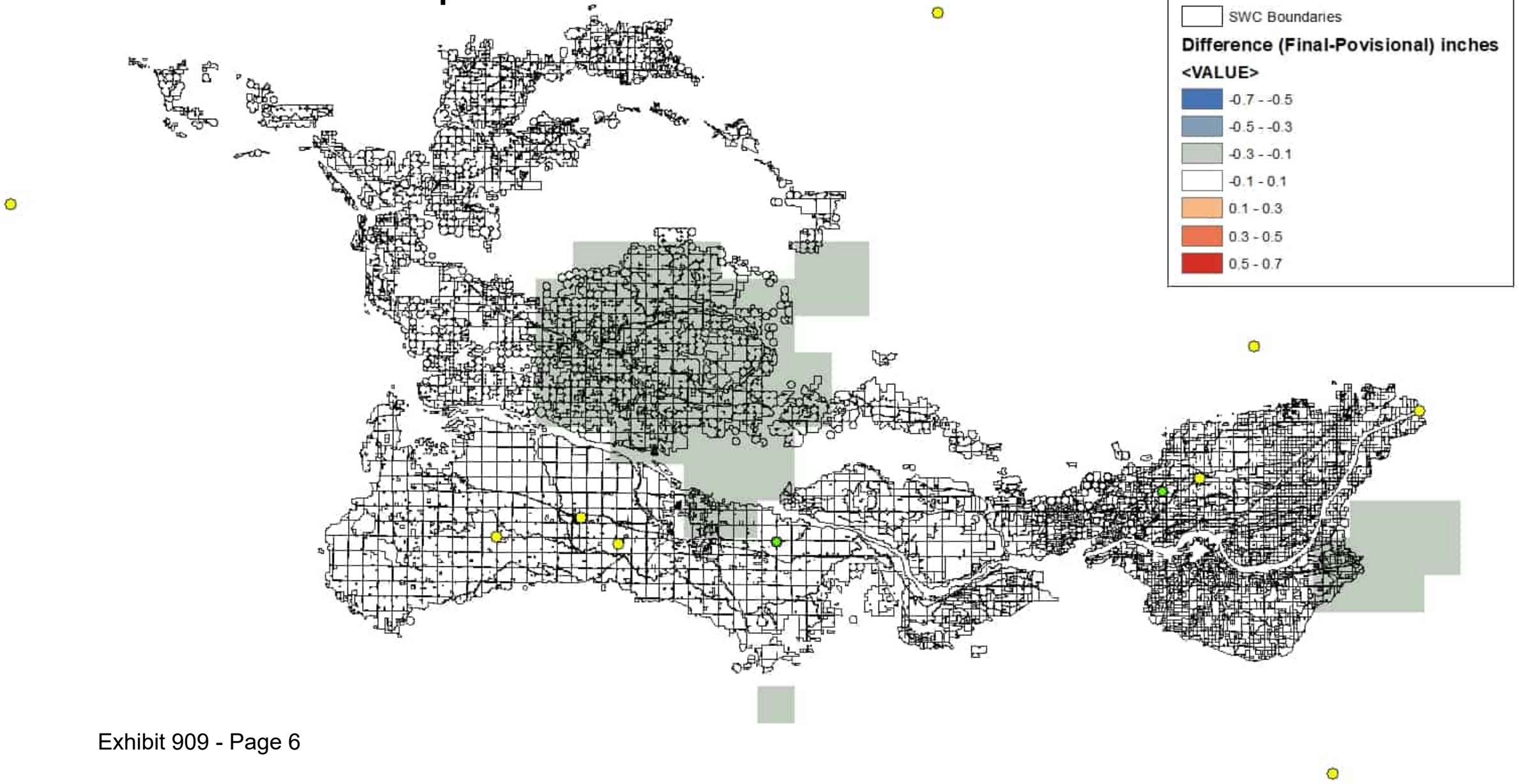
- Values (in inches) represent the difference between Final PRISM data and the real-time Provisional PRISM data.

- Negative value in the graphs below indicates Provisional PRISM was higher than Final PRISM
  - Crop Water Need would be underestimated with Provisional PRISM compared to Final PRISM

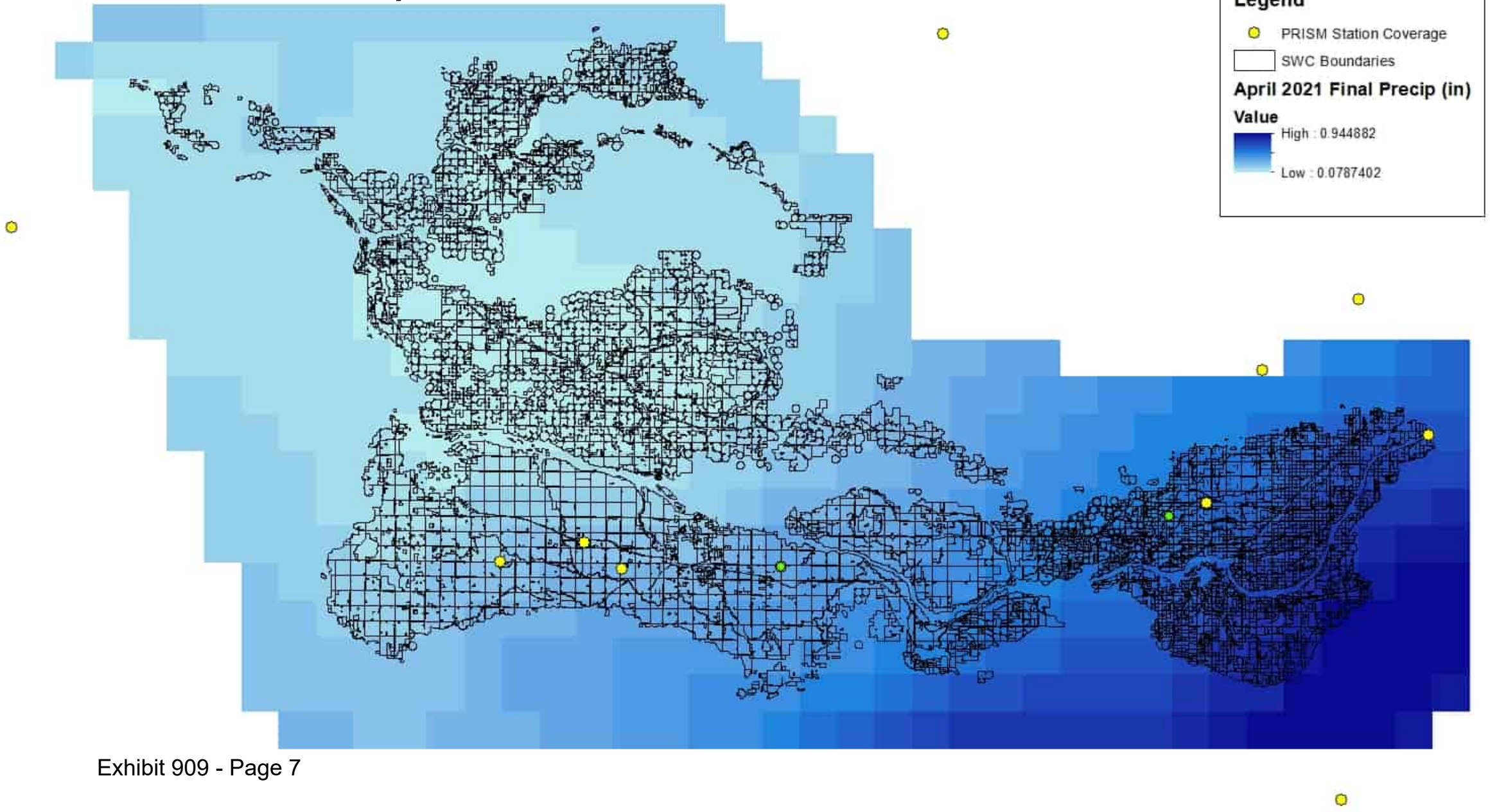
- Positive values in the graphs below indicated Final PRISM was higher than Provisional PRISM
  - Crop Water Need would be overestimated with Provisional PRISM compared to Final PRISM

- White background indicates the difference was between -0.1 and 0.1 inches, with very little change between provisional and final.

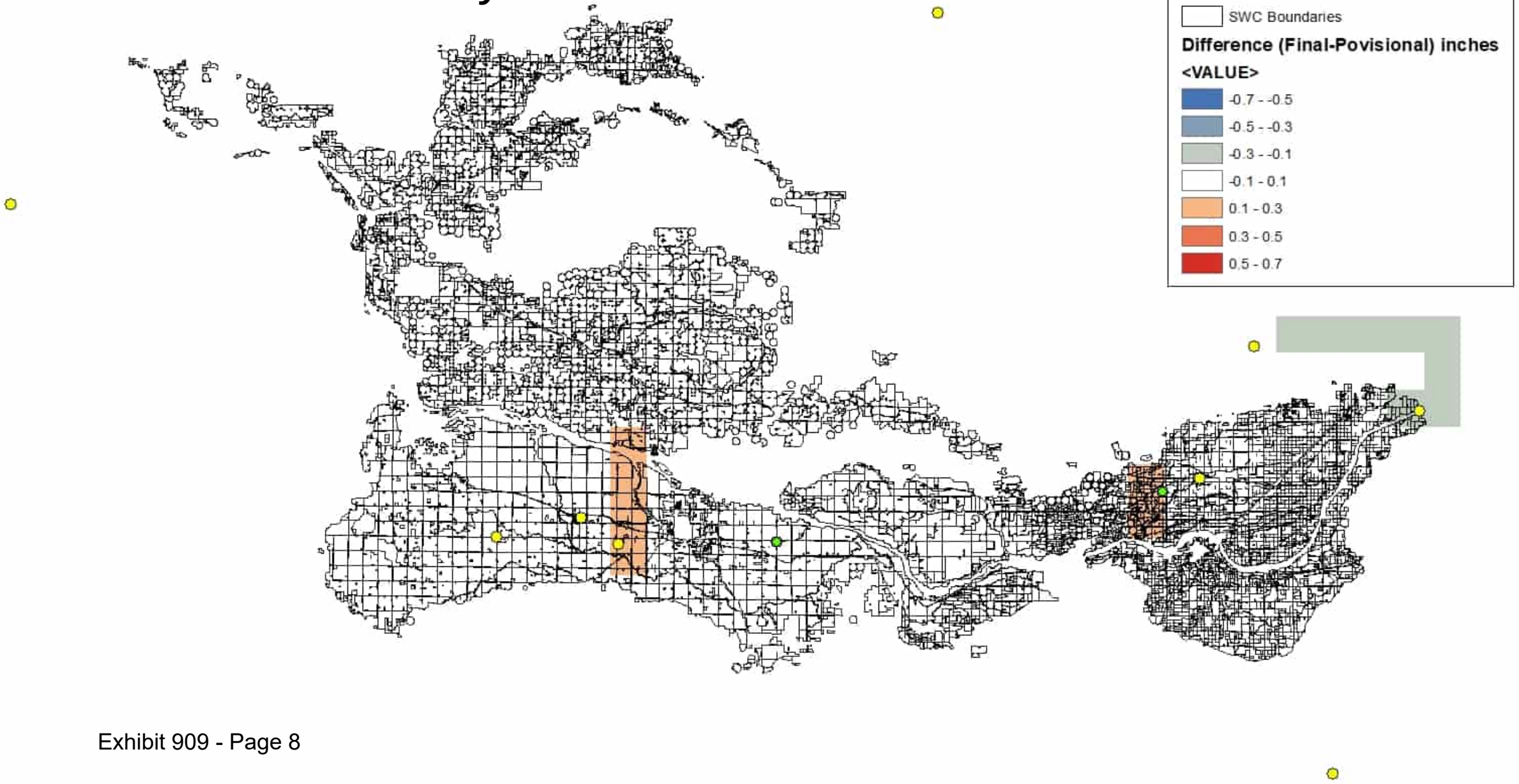
April PRISM Final - Provisional



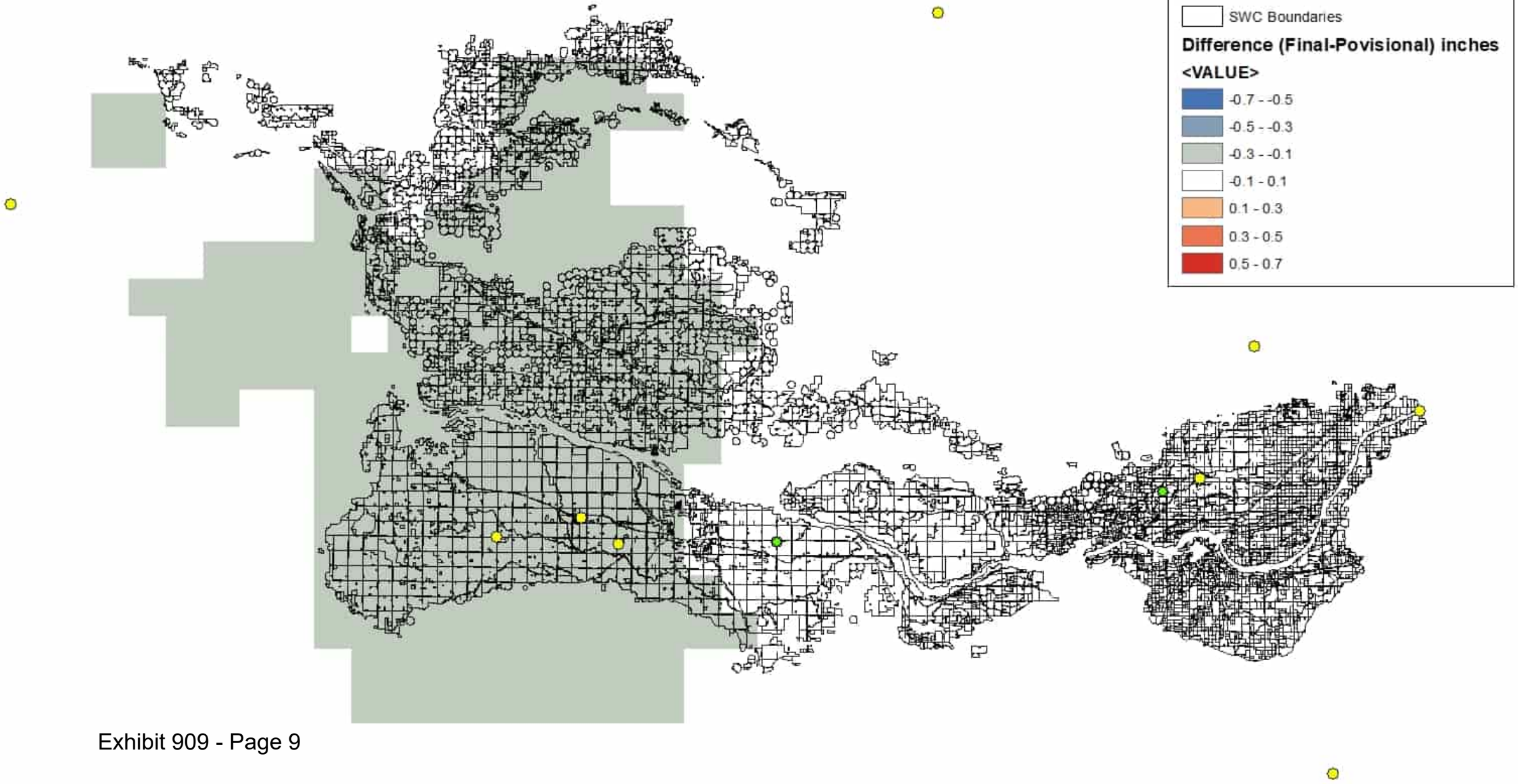
April 2021 Final PRISM values



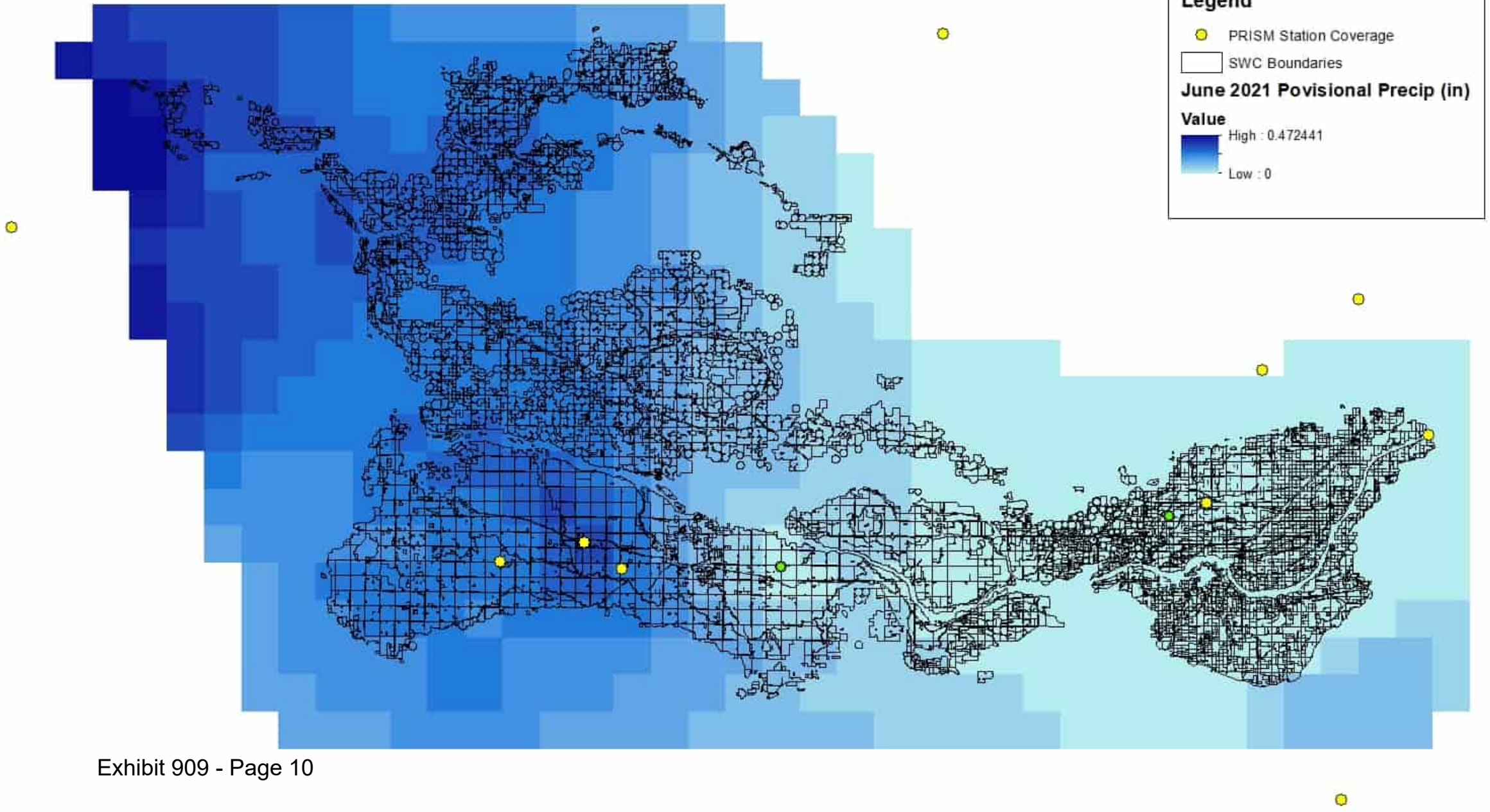
May PRISM Final - Provisional



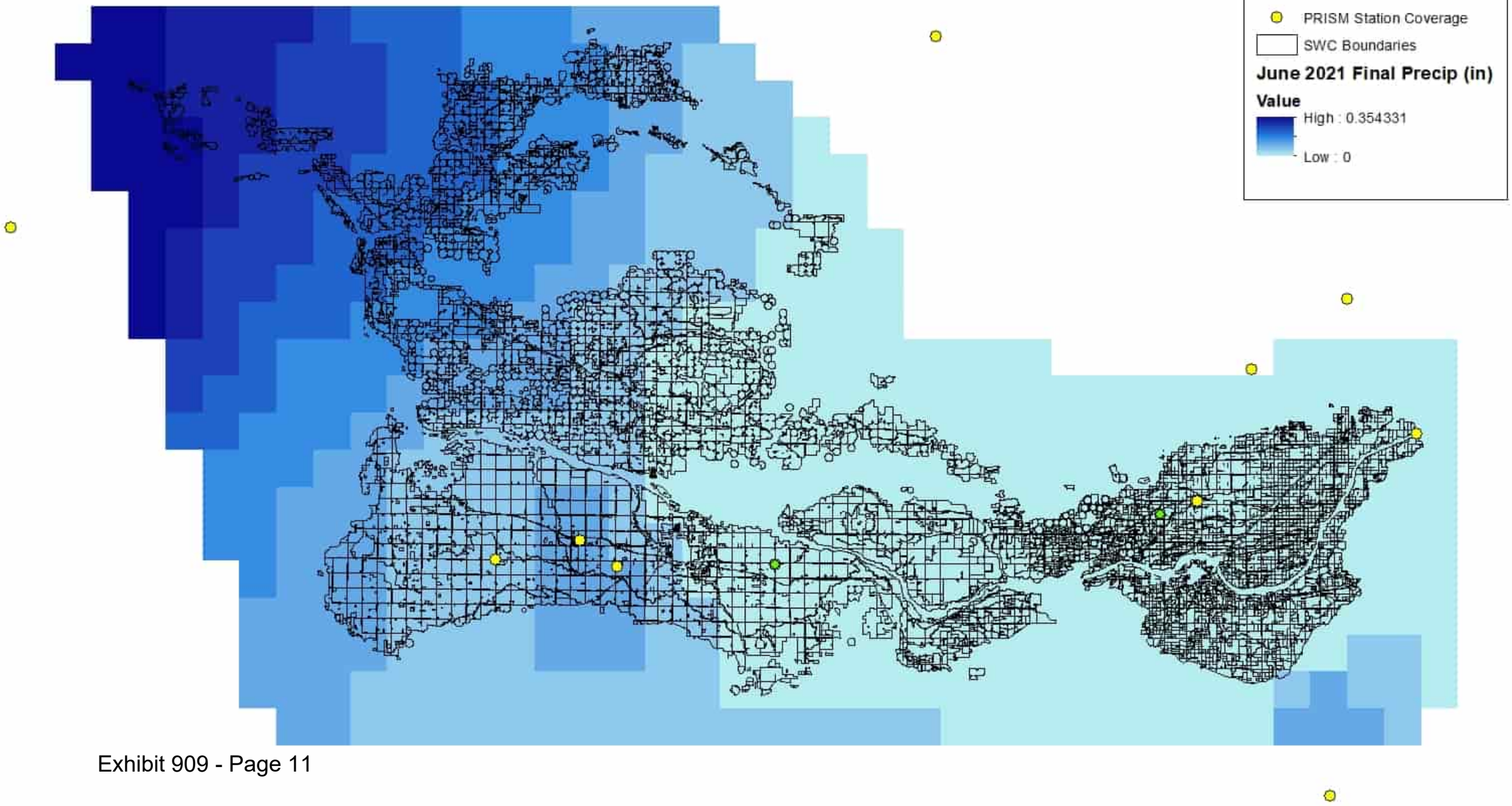
June PRISM Final - Provisional



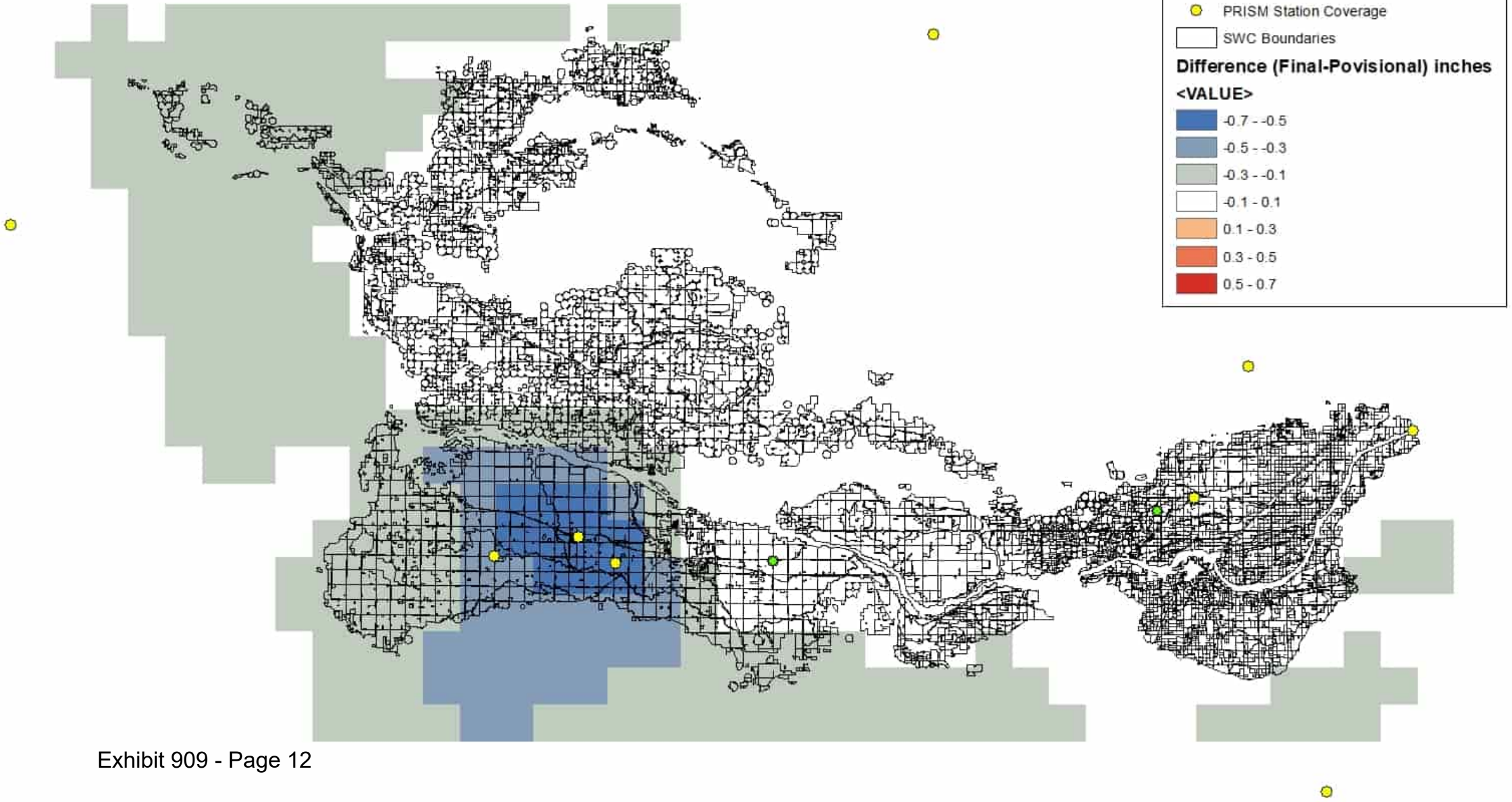
June 2021 Provisional PRISM values



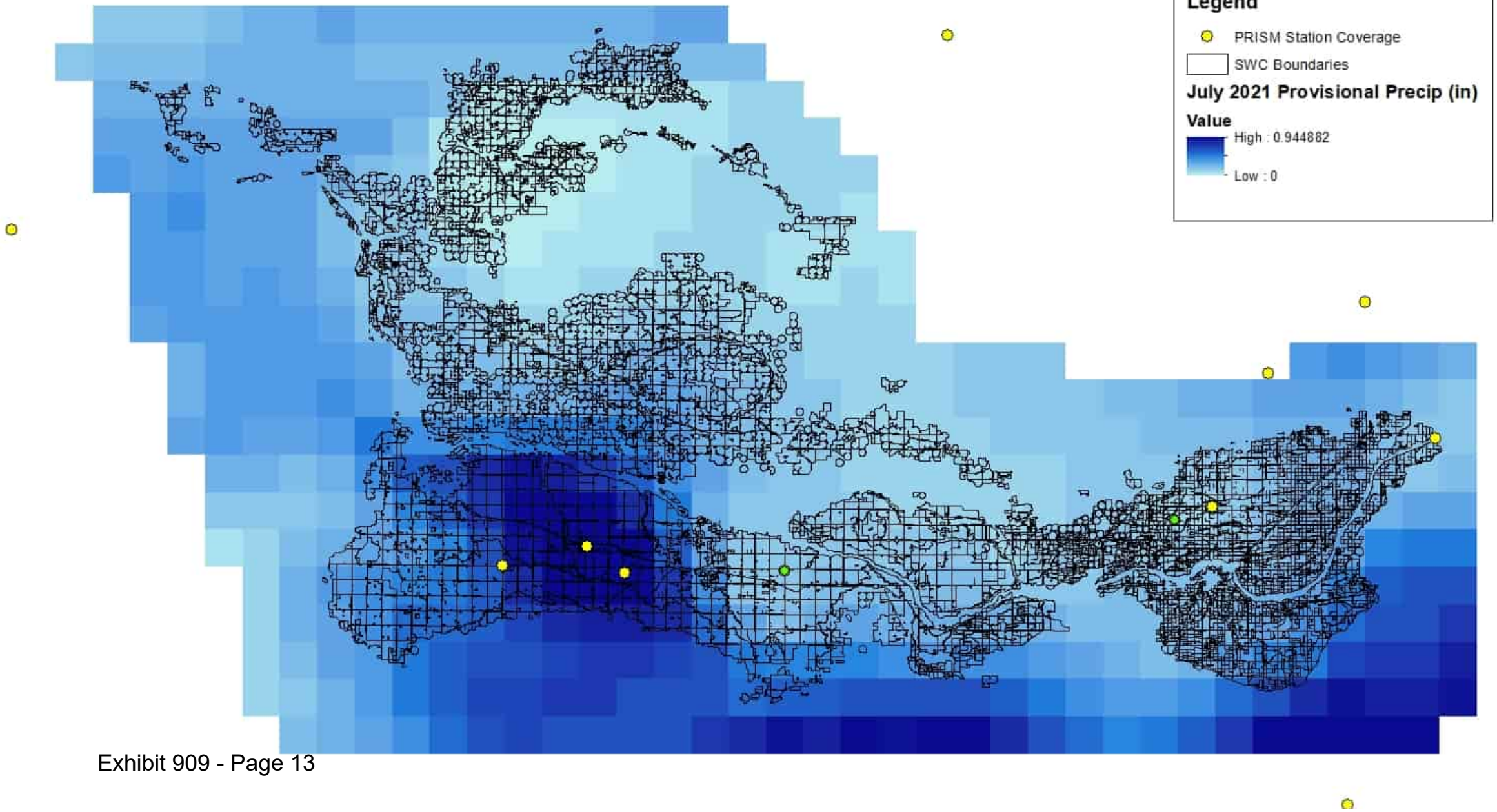
June 2021 Final PRISM values



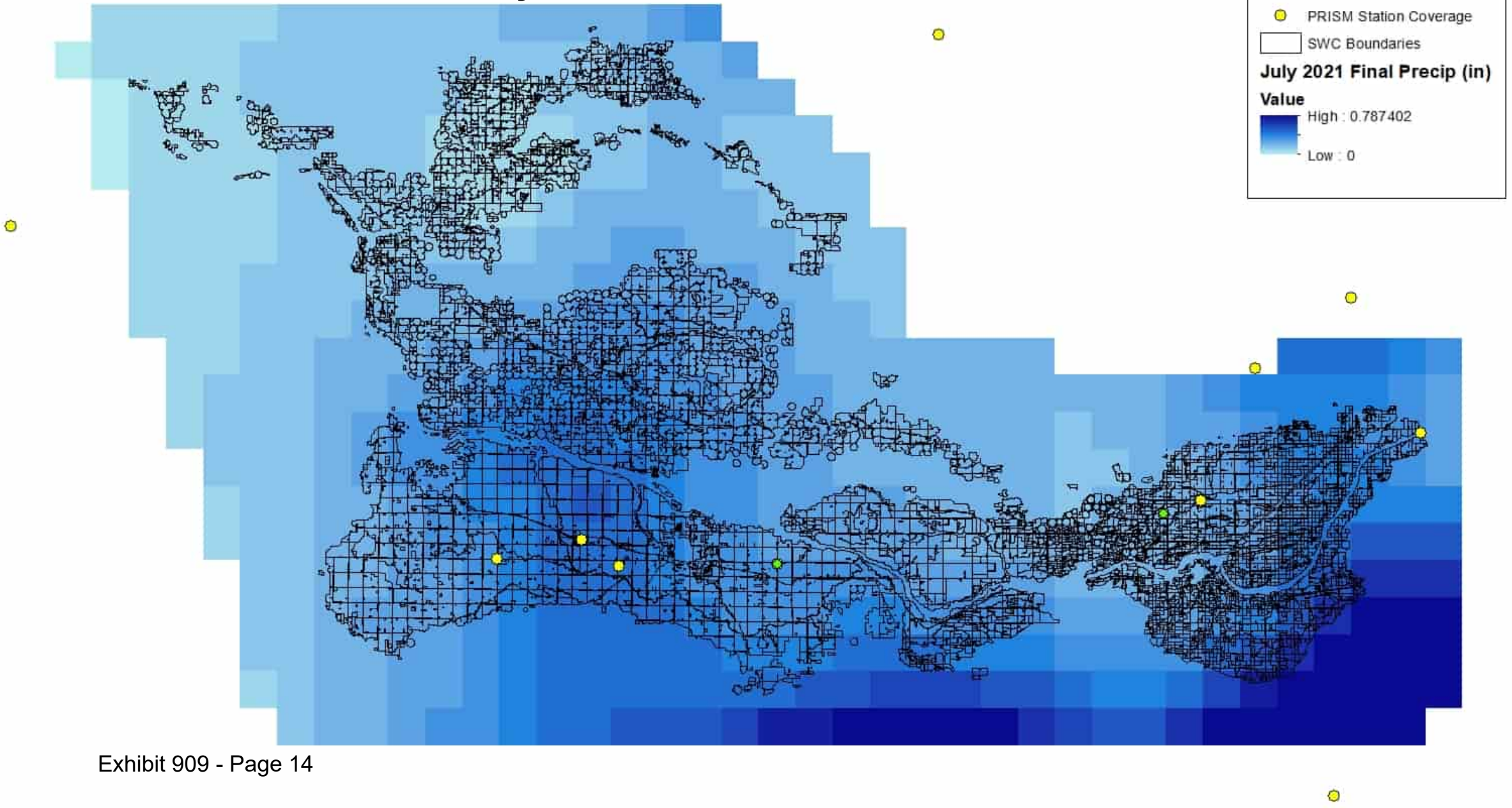
July PRISM Final - Provisional



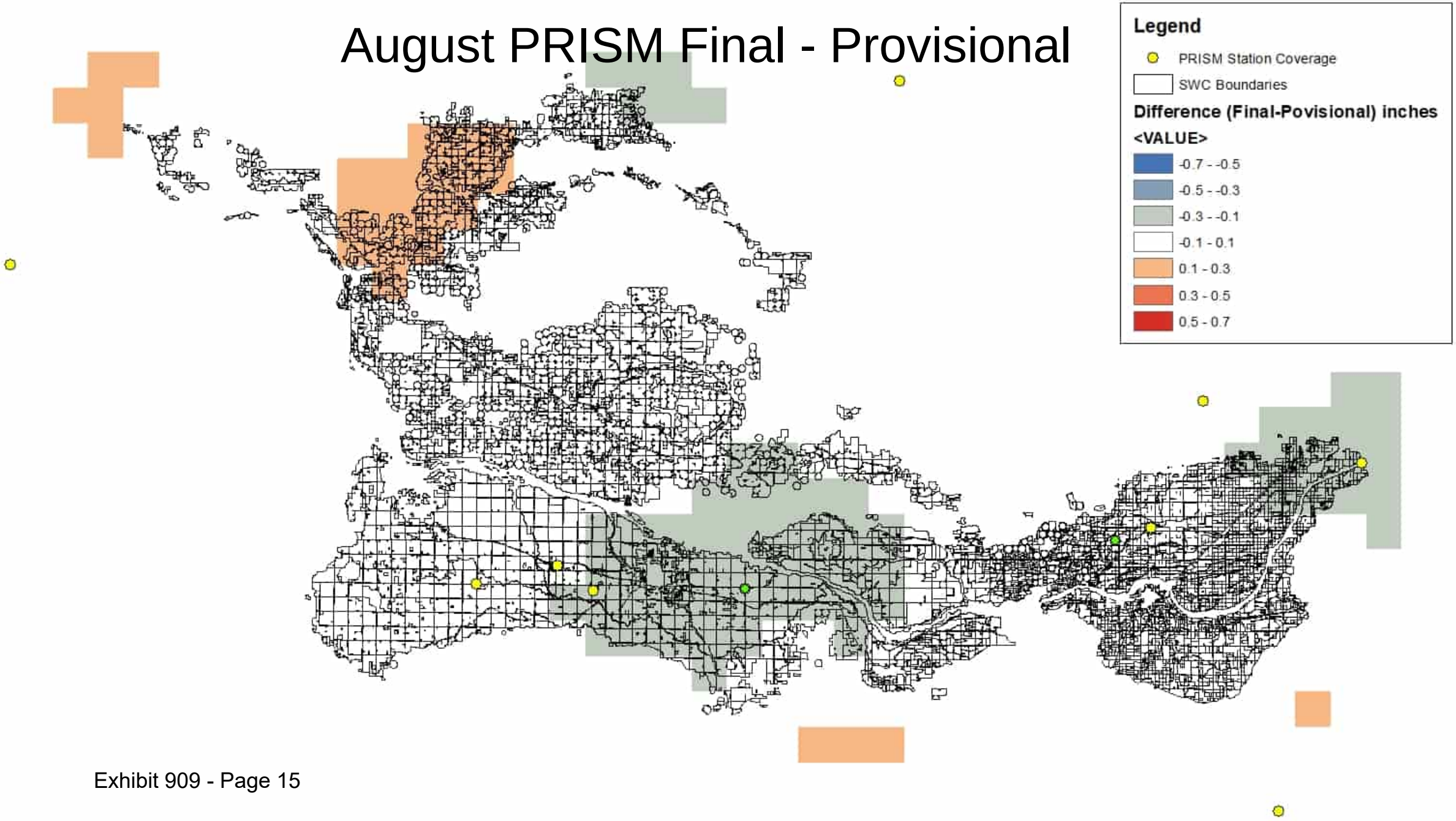
July 2021 Provisional PRISM values



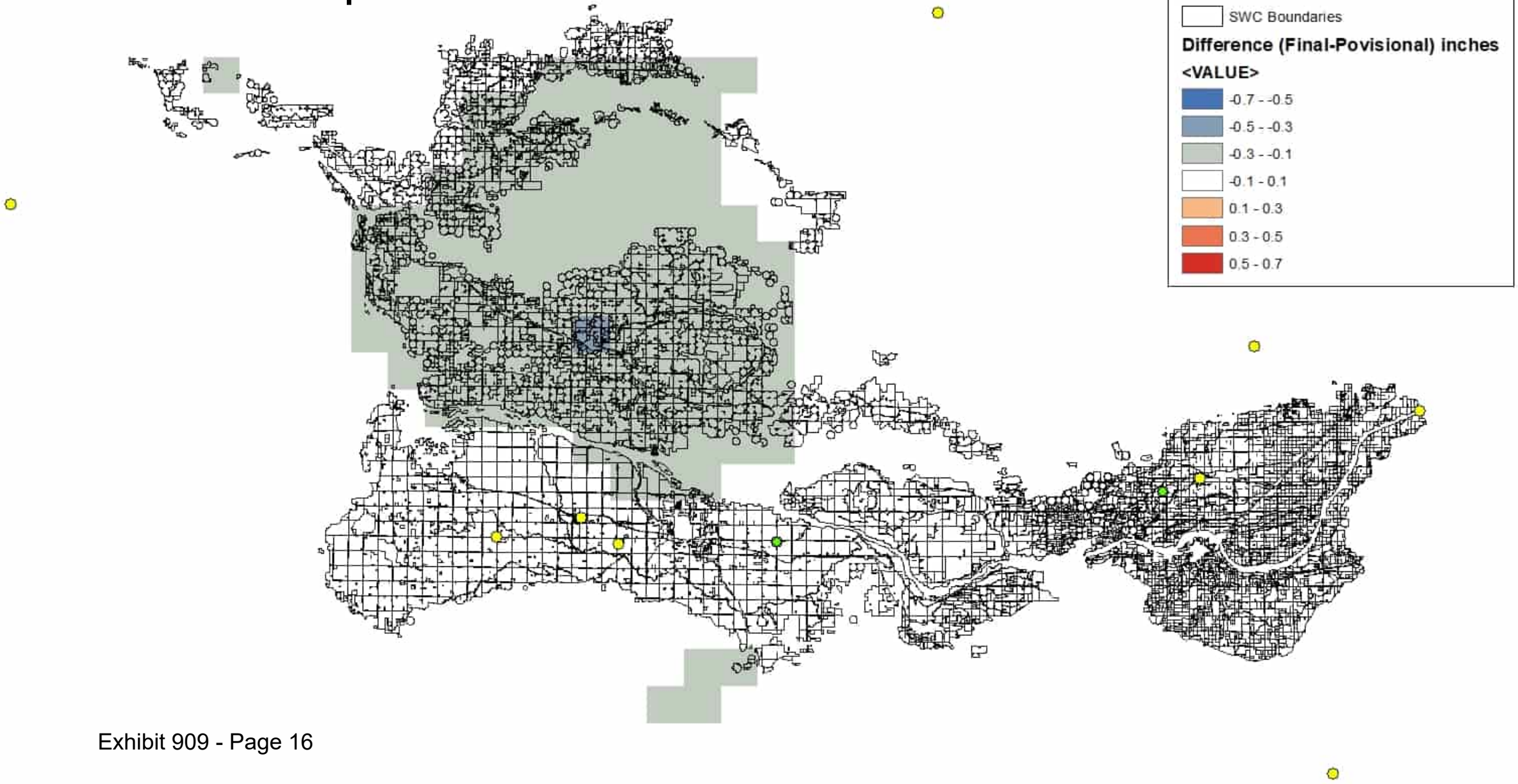
July 2021 Final PRISM values



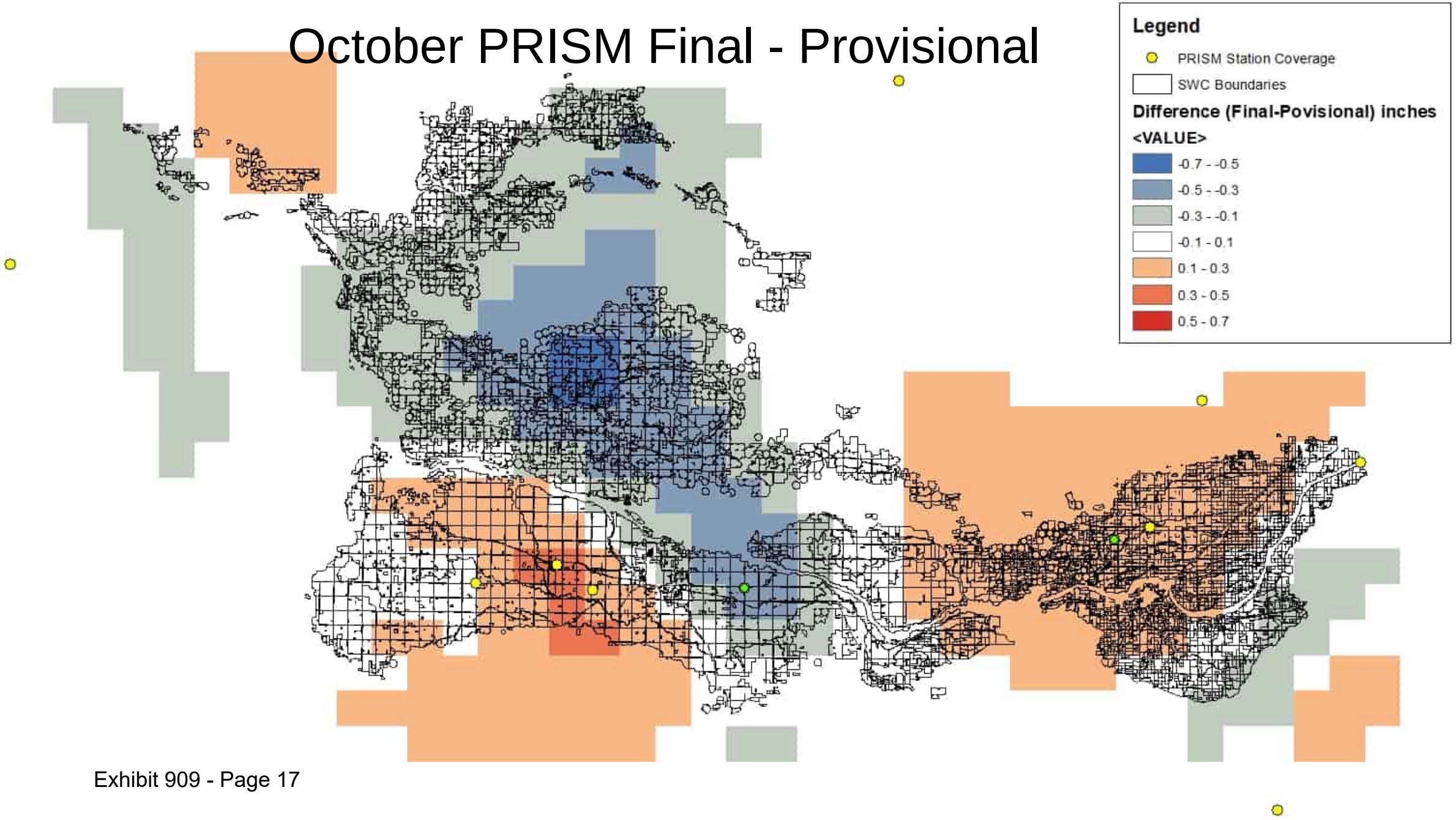
August PRISM Final - Provisional



September PRISM Final - Provisional



October PRISM Final - Provisional





Proposed Modification of the Methodology For Determining Material Injury To Reasonable In-Season Demand and Reasonable Carryover: Reasonable Carryover

Presented by: Matt Anders

Date: 12/9/2022

Methodology Reference

- Reasonable Carryover (Page 21 of Methodology)
  - Conjunctive Management Rule 42.01.g states the following guidance for determining reasonable carryover: "In determining a reasonable amount of carry-over storage water, the Director shall consider average annual rate of fill of storage reservoirs and the average annual carry-over for prior comparable water conditions and the projected water supply for the system."
  - Carryover shortfall will be determined following the completion of the irrigation season.
  - Because it is not possible to adequately forecast the irrigation supply or demand for the following irrigation season at the end of the current irrigation season, the Director must estimate the carryover water needed in future dry years when demand exceeds supply, creating a need for carryover storage.
  - The Director projected the water supply using typical dry years and subtracted it from a projected future demand to determine a projected carryover need.

Methodology Reference

- Reasonable Carryover (Page 23 of Methodology)
  - Projected Carryover Need = Projected Demand (06/08/12 BLY) - Projected Supply (Average 02/04)

	Projected Demand (06/08/12 BLY)	Projected Supply (Average 02/04)	Projected Carryover Need
	----------Acre-Feet----------		
A&B	59,992	41,496	18,496
AFRD2	427,672	360,730	66,942
BID	251,531	259,716	0
Milner	47,135	42,345	4,790
Minidoka	369,492	385,787	0
NSCC	978,888	913,385	65,503
TFCC	1,060,011	1,034,883	25,128

SWC Projected Demand, Projected Supply and Projected Carryover Need (acre-feet).

AFRD2 adjusted based on high likelihood of the reservoir space filling.

	Reasonable Carryover (Acre-Feet)
A&B	18,500
AFRD2	11,500
BID	0
Milner	4,800
Minidoka	0
NSCC	65,500
TFCC	25,200

02/04 as Predictor of Total Water Supply?

- For the years 2002 and 2004 the Heise natural flows were well below the long-term average (1991-2014) but were not the lowest years on record.

- The average of the 2002 and 2004 supply will be the projected supply, representing a typical dry year.

1990-2014 Average 4,891 KAF

Year	% Average	Rank
1997	176%	1
2011	153%	2
1996	142%	3
1999	129%	4
1998	123%	5
2009	119%	6
2014	117%	7
1995	114%	8
2008	109%	9
2006	107%	10
1993	103%	11
2012	99%	12
2000	90%	13
1991	90%	14
2005	88%	15
2010	85%	16
2003	81%	17
1990	79%	18
2004	79%	19
2013	78%	20
2002	75%	21
2007	72%	22
1994	70%	23
1992	62%	24
2001	61%	25

1990-2022 Average 4,935 KAF

Year	% Average	Rank
1997	174%	1
2017	159%	2
2011	151%	3
1996	141%	4
1999	128%	5
2018	128%	6
1998	122%	7
2009	118%	8
2014	116%	9
1995	113%	10
2008	108%	11
2006	106%	12
2020	104%	13
2019	104%	14
1993	102%	15
2012	99%	16
2015	92%	17
2000	89%	18
1991	89%	19
2005	87%	20
2010	85%	21
2016	83%	22
2003	80%	23
1990	79%	24
2004	78%	25
2013	77%	26
2022	76%	27
2021	75%	28
2002	74%	29
2007	71%	30
1994	70%	31
1992	62%	32
2001	61%	33

If BLY Updated to 2018 Diversions

	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)	Total (AF)
Proposed BLY 2018	64,192	456,319	263,954	68,429	362,970	1,037,970	1,127,305	3,381,139
Average 2000-2021	59,474	427,766	247,128	53,798	354,550	996,781	1,062,352	3,201,848
BLY % of Average 2000-2021	107.9%	106.7%	106.8%	127.2%	102.4%	104.1%	106.1%	105.6%

Reasonable Carryover With BLY 2018 & 02/04 Water Supply

SWC Member	Projected Demand (2018 BLY) (AF)	Projected Supply (Average 02/04) (AF)	Projected Carryover Need (AF)
A&B	64,192	41,496	22,696
AFRD2	456,319	360,730	95,589
BID	263,954	259,716	4,238
Milner	68,429	42,345	26,084
Minidoka	362,970	385,787	0
NSCC	1,037,970	913,385	124,586
TFCC	1,127,305	1,034,883	92,422

4th Amended Methodology

	Reasonable Carryover (Acre-Feet)
A&B	18,500
AFRD2	11,500
BID	0
Milner	4,800
Minidoka	0
NSCC	65,500
TFCC	25,200

Annual Carryover Volumes 1995-2022 – 4th Method. Shortfall

Heise (AF)	Year	Heise Natural Flow April - Sept (KAF)	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)
	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	38,686
	2007	2,320	62,739	7,962	32,138	37,761	61,744	66,807	39,999
Very Dry	2021	2,622	73,688	988	61,327	27,448	65,393	121,946	13,581
<3000	2013	2,721	55,563	21,477	54,350	34,740	55,374	135,658	23,419
	2002	2,775	30,192	8,932	74,573	14,662	102,139	133,702	46,825
	2022 Preliminary	2,806	54,982	10	51,583	28,424	66,727	171,637	31,125
	2004	2,833	0	18,617	48,809	8,735	99,199	54,141	58,813
	2003	2,931	9,401	3,904	52,550	6,944	82,895	169,674	0
	Average	**2,588**	**42,150**	**10,333**	**51,877**	**25,719**	**76,825**	**113,816**	**31,041**
	2016	3,012	89,845	58,689	84,302	46,050	108,482	283,728	21,497
	2000	3,059	69,436	20,787	107,425	45,762	161,423	205,510	56,536
	2010	3,108	96,172	113,895	101,620	59,628	184,940	324,712	46,243
Dry	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	68,352
3000 - 4000	2015	3,208	88,616	57,344	73,449	47,322	130,942	208,274	44,957
	2012	3,385	68,109	41,395	88,526	42,214	119,361	198,853	72,267
	2019	3,930	88,506	106,833	113,278	48,393	203,434	406,865	94,193
	2020	3,962	95,105	99,782	110,640	52,750	168,213	360,234	66,609
	Average	**3,357**	**79,057**	**74,728**	**96,179**	**47,464**	**153,427**	**294,147**	**58,832**
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	78,562
	1993	4,116	102,493	123,508	154,461	60,332	264,713	300,942	104,424
Average	2008	4,288	91,835	104,219	124,128	62,359	182,722	414,171	70,192
4000 - 4500	1995	4,447	103,295	167,451	159,214	75,451	258,028	476,312	68,576
	1998	4,498	100,817	144,057	157,265	69,384	227,726	494,385	156,433
	Average	**4,286**	**97,550**	**129,383**	**139,588**	**65,256**	**223,160**	**410,296**	**95,637**
	2014	4,594	78,917	96,756	154,382	57,305	207,834	448,682	130,086
	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
	2018	4,796	93,754	115,442	92,727	50,776	163,465	351,483	54,285
>4500 KAF	1999	4,949	93,354	121,793	168,545	67,147	243,322	453,706	191,501
	1996	5,583	105,209	145,019	150,358	70,250	253,786	522,790	111,459
	2017	6,139	110,348	219,940	168,293	67,754	258,106	528,880	169,862
	2011	6,347	102,139	107,618	104,915	64,487	246,699	504,578	129,757
	1997	7,007	102,539	114,684	134,906	65,307	242,758	464,411	136,926
	Average	**5,504**	**98,804**	**133,348**	**137,477**	**63,745**	**227,569**	**462,664**	**127,426**

Annual Carryover Volumes 1995-2022 – BLY 2018 Shortfall

Heise (AF)	Year	Heise Natural Flow April - Sept (KAF)	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)
	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	38,686
	2007	2,320	62,739	7,962	32,138	37,761	61,744	66,807	39,999
Very Dry	2021	2,622	73,688	988	61,327	27,448	65,393	121,946	13,581
<3000	2013	2,721	55,563	21,477	54,350	34,740	55,374	135,658	23,419
	2002	2,775	30,192	8,932	74,573	14,662	102,139	133,702	46,825
	2022 Preliminary	2,806	54,982	10	51,583	28,424	66,727	171,637	31,125
	2004	2,833	0	18,617	48,809	8,735	99,199	54,141	58,813
	2003	2,931	9,401	3,904	52,550	6,944	82,895	169,674	0
	Average	**2,588**	**42,150**	**10,333**	**51,877**	**25,719**	**76,825**	**113,816**	**31,041**
	2016	3,012	89,845	58,689	84,302	46,050	108,482	283,728	21,497
	2000	3,059	69,436	20,787	107,425	45,762	161,423	205,510	56,536
	2010	3,108	96,172	113,895	101,620	59,628	184,940	324,712	46,243
Dry	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	68,352
3000 - 4000	2015	3,208	88,616	57,344	73,449	47,322	130,942	208,274	44,957
	2012	3,385	68,109	41,395	88,526	42,214	119,361	198,853	72,267
	2019	3,930	88,506	106,833	113,278	48,393	203,434	406,865	94,193
	2020	3,962	95,105	99,782	110,640	52,750	168,213	360,234	66,609
	Average	**3,357**	**79,057**	**74,728**	**96,179**	**47,464**	**153,427**	**294,147**	**58,832**
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	78,562
	1993	4,116	102,493	123,508	154,461	60,332	264,713	300,942	104,424
Average	2008	4,288	91,835	104,219	124,128	62,359	182,722	414,171	70,192
4000 - 4500	1995	4,447	103,295	167,451	159,214	75,451	258,028	476,312	68,576
	1998	4,498	100,817	144,057	157,265	69,384	227,726	494,385	156,433
	Average	**4,286**	**97,550**	**129,383**	**139,588**	**65,256**	**223,160**	**410,296**	**95,637**
	2014	4,594	78,917	96,756	154,382	57,305	207,834	448,682	130,086
	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
	2018	4,796	93,754	115,442	92,727	50,776	163,465	351,483	54,285
>4500 KAF	1999	4,949	93,354	121,793	168,545	67,147	243,322	453,706	191,501
	1996	5,583	105,209	145,019	150,358	70,250	253,786	522,790	111,459
	2017	6,139	110,348	219,940	168,293	67,754	258,106	528,880	169,862
	2011	6,347	102,139	107,618	104,915	64,487	246,699	504,578	129,757
	1997	7,007	102,539	114,684	134,906	65,307	242,758	464,411	136,926
	Average	**5,504**	**98,804**	**133,348**	**137,477**	**63,745**	**227,569**	**462,664**	**127,426**

Annual Percent Fill 1995-2022

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
1995	100%	100%	100%	100%	100%	100%	100%
1996	100%	100%	100%	100%	100%	100%	100%
1997	100%	100%	100%	100%	100%	100%	100%
1998	100%	100%	100%	100%	100%	100%	100%
1999	100%	100%	100%	96%	98%	98%	99%
2000	100%	99%	99%	98%	100%	97%	97%
2001	100%	100%	100%	100%	100%	91%	87%
2002	41%	100%	100%	79%	92%	84%	88%
2003	43%	100%	99%	66%	92%	94%	99%
2004	34%	82%	97%	48%	94%	78%	63%
2005	58%	100%	100%	76%	98%	100%	100%
2006	98%	100%	99%	98%	100%	99%	99%
2007	89%	100%	97%	92%	94%	95%	97%
2008	100%	100%	100%	100%	100%	99%	100%
2009	100%	100%	100%	100%	100%	100%	100%
2010	100%	100%	100%	100%	100%	100%	100%
2011	100%	100%	100%	100%	100%	100%	100%
2012	88%	100%	97%	91%	94%	94%	96%
2013	80%	100%	97%	90%	90%	97%	100%
2014	93%	100%	100%	100%	95%	100%	100%
2015	100%	100%	100%	100%	100%	100%	100%
2016	100%	100%	100%	100%	95%	100%	100%
2017	100%	100%	100%	100%	100%	100%	100%
2018	100%	100%	100%	100%	100%	100%	100%
2019	96%	100%	99%	97%	98%	98%	99%
2020	100%	100%	100%	100%	100%	100%	100%
2021	100%	100%	100%	100%	98%	100%	100%
2022 Preliminary	86%	94%	99%	83%	92%	97%	100%
Average	90%	99%	99%	93%	97%	97%	97%
Std Dev	20%	3%	1%	13%	3%	5%	7%

Total Reservoir Space in Comparison to Demand – BLY 2018

	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)
Projected Demand 2018 BLY	64,192	456,319	263,954	68,429	362,970	1,037,970	1,127,305
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930
Number of Seasons of Reservoir Space	2.1	0.9	0.9	1.3	1.0	0.8	0.2

4th Amended Methodology

	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
	----------Acre-Feet----------						
06/08/12 BLY	59,993	427,672	251,531	47,135	369,492	978,888	1,060,011
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930
Number of Seasons of Reservoir Space	2.3	0.9	0.9	1.9	1.0	0.9	0.2

Annual Carryover Volumes 1995-2022

Heise (AF)	Year	Heise Natural Flow April - Sept (KAF)	A&B (AF)	AFRD2 (AF)	BID (AF)	Milner (AF)	Minidoka (AF)	NSCC (AF)	TFCC (AF)
	2001	1,968	9,902	4,217	37,430	26,854	55,132	42,421	26,917
	1994	2,319	82,885	26,894	54,136	45,902	102,823	128,356	38,686
	2007	2,320	62,739	7,962	32,138	37,761	61,744	66,807	39,999
Very Dry	2021	2,622	73,688	988	61,327	27,448	65,393	121,946	13,581
<3000	2013	2,721	55,563	21,477	54,350	34,740	55,374	135,658	23,419
	2002	2,775	30,192	8,932	74,573	14,662	102,139	133,702	46,825
	2022 Preliminary	2,806	54,982	10	51,583	28,424	66,727	171,637	31,125
	2004	2,833	0	18,617	48,809	8,735	99,199	54,141	58,813
	2003	2,931	9,401	3,904	52,550	6,944	82,895	169,674	0
	Average	**2,588**	**42,150**	**10,333**	**51,877**	**25,719**	**76,825**	**113,816**	**31,041**
	2016	3,012	89,845	58,689	84,302	46,050	108,482	283,728	21,497
	2000	3,059	69,436	20,787	107,425	45,762	161,423	205,510	56,536
	2010	3,108	96,172	113,895	101,620	59,628	184,940	324,712	46,243
Dry	2005	3,195	36,665	99,097	90,190	37,593	150,623	365,001	68,352
3000 - 4000	2015	3,208	88,616	57,344	73,449	47,322	130,942	208,274	44,957
	2012	3,385	68,109	41,395	88,526	42,214	119,361	198,853	72,267
	2019	3,930	88,506	106,833	113,278	48,393	203,434	406,865	94,193
	2020	3,962	95,105	99,782	110,640	52,750	168,213	360,234	66,609
	Average	**3,357**	**79,057**	**74,728**	**96,179**	**47,464**	**153,427**	**294,147**	**58,832**
	2006	4,079	89,311	107,682	102,873	58,755	182,612	365,672	78,562
	1993	4,116	102,493	123,508	154,461	60,332	264,713	300,942	104,424
Average	2008	4,288	91,835	104,219	124,128	62,359	182,722	414,171	70,192
4000 - 4500	1995	4,447	103,295	167,451	159,214	75,451	258,028	476,312	68,576
	1998	4,498	100,817	144,057	157,265	69,384	227,726	494,385	156,433
	Average	**4,286**	**97,550**	**129,383**	**139,588**	**65,256**	**223,160**	**410,296**	**95,637**
	2014	4,594	78,917	96,756	154,382	57,305	207,834	448,682	130,086
	2009	4,613	104,174	145,530	125,688	66,935	204,581	426,779	95,533
	2018	4,796	93,754	115,442	92,727	50,776	163,465	351,483	54,285
>4500 KAF	1999	4,949	93,354	121,793	168,545	67,147	243,322	453,706	191,501
	1996	5,583	105,209	145,019	150,358	70,250	253,786	522,790	111,459
	2017	6,139	110,348	219,940	168,293	67,754	258,106	528,880	169,862
	2011	6,347	102,139	107,618	104,915	64,487	246,699	504,578	129,757
	1997	7,007	102,539	114,684	134,906	65,307	242,758	464,411	136,926
	Average	**5,504**	**98,804**	**133,348**	**137,477**	**63,745**	**227,569**	**462,664**	**127,426**

Questions

(208) 287-4932
matthew.anders@idwr.idaho.gov



Evaluation of Method for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: April and July Forecast Supply

Presented by: Kara Ferguson

Date: 12/14/2022

April Forecast Supply – Forecasting Natural Flow Diverted

- *The regression equations for **A&B and Milner** were developed by comparing the actual Heise natural flow to the natural flow diverted.*

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**) + intercept

Adjusted R-squared Progression					
SWC Member	***2014 Calculations (1990-2013)**	**2016 Calculations (1990-2015)**	**April 15, 2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
A&B	0.88	0.91 excl 2000, 2014	0.92 excl 2000, 2014	0.92 excl 2000, 2014	0.93 excl 2000, 2014, 2020
Milner	0.92	0.95 excl 2000, 2004	0.96 excl 2000, 2010	0.96 excl 2000, 2004, 2010	0.93 excl 2020

*Regression models built using irrigation year (Nov-Oct) natural flow diversion totals.

April Forecast Supply – Natural Flow Diverted Regression Summary Statistics

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**) + intercept

Year	SWC Member	Intercept	Heise Coefficient	Adjusted R^2	SE	df	years excluded
2014	A&B	-15,840	9.21	0.88	3,974	22	-
2018	A&B	-16,742	9.41	0.92	3,221	24	2004, 2014
2022	A&B	-16,720	9.44	0.93	3,108	27	2000, 2014, 2020
2014	Milner	-15,936	10.21	0.92	3,476	22	-
2018	Milner	-16,672	10.26	0.96	2,694	23	2000, 2005, 2010
2022	Milner	-14,980	9.88	0.93	3,221	29	2020

April Forecast Supply – Forecasting Natural Flow Diverted

- *For **AFRD2, BID, Minidoka, NSCC, and TFCC**, multi-linear regression equations were developed by comparing the actual Snake River near Heise natural flow and the flows at Box Canyon to the natural flow diverted.*

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**)
+ Box Canyon coefficient (**Box Canyon Nov-March volume**) + intercept

Adjusted R-squared Progression					
SWC Member	***2014 Methodology Review (1990-2013)**	**2016 Calculations (1990-2015)**	**April 15, 2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
AFRD2	0.85	0.85	0.87 excl 2004	0.86 excl 2004	0.84 excl 2004
BID	0.85	0.89 excl 1993 & 2001	0.89 excl 1993 & 2001	0.85 excl 1993 & 2001	0.85 excl 2001 & 2020
Minidoka	0.88	0.90 excl 1993 & 2014	0.90 excl 1993 & 2014	0.90 excl 1993 & 2014	0.91 excl 1993, 2011, 2014
NSCC	0.92	0.92	0.91	0.90 excl 2019	0.90 excl 2019
TFCC	0.86	0.84 excl 2014 & 2015	0.83 excl 2014 & 2015	0.80 excl 2014 & 2015	0.72 excl 2020

*Regression models built using irrigation year (Nov-Oct) natural flow diversion totals.

April Forecast Supply – Natural Flow Diverted Regression Summary Statistics

predicted natural flow diverted = Heise coefficient (**Heise April-July volume**)
+ Box Canyon coefficient (**Box Canyon Nov-March volume**) + intercept

Year	SWC Member	Intercept	Heise Coefficient	Box Coefficient	Adjusted R^2	SE	df	years excluded
2014	AFRD2	-435,713	73.2	3,318	0.84	37,290	21	-
2018	AFRD2	-263,605	70.6	1,709	0.87	31,562	24	2004
2022	AFRD2	-292,585	67.0	2,118	0.84	32,595	28	2004
2014	BID	-240,800	33.6	2,570	0.85	17,100	21	-
2018	BID	-217,895	31.9	2,417	0.89	13,867	23	1993, 2001
2022	BID	-200,374	31.2	2,287	0.85	15,580	27	2001, 2020
2014	MID	-401,000	47.1	4,302	0.88	22,070	21	-
2018	MID	-379,633	46.1	4,120	0.90	19,143	23	1993, 2014
2022	MID	-368,398	47.9	3,981	0.91	17,968	26	1993, 2011, 2014
2014	NSCC	-677,949	154.2	6,834	0.92	55,950	21	-
2018	NSCC	-647,724	145.1	6,774	0.91	54,814	25	-
2022	NSCC	-617,984	141.8	6,565	0.90	54,217	28	2019
2014	TFCC	-609,600	62.0	12,980	0.87	38,010	21	-
2018	TFCC	-317,167	60.8	10,064	0.83	38,973	23	2014, 2015
2022	TFCC	-7,081	60.4	7,126	0.72	47,369	28	2020

July Forecast Supply – Forecasting Natural Flow

- *The regression equations for **AFRD2, A&B, and Milner**, were developed by comparing July 1 snow water equivalent at the Two Oceans Plateau SNOTEL site to the natural flow diversions. The regression equations would be applied only in those years when the SWE is greater than zero.*

predicted natural flow diverted = Two Ocean coefficient (**7/1 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)** **10 Observations**	***2016 Calculations (1990-2015)** **9 Observations**	**2018 Calculations (1990-2017)** **11 Observations**	**2020 Calculations (1990-2019)** **11 Observations**	**2022 Calculations (1990-2021)** **12 Observations**
A&B	0.93 excl 1997	0.80 excl 1997	0.84 excl 1997	0.84 excl 1997	0.84 excl 1997
AFRD2	0.87 excl 1997	0.75 excl 1997	0.76 excl 1997	0.76 excl 1997	0.76 excl 1997
Milner	0.84 excl 1997	0.68 excl 1997	0.74 excl 1997	0.74 excl 1997	0.78 excl 1997

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Natural Flow Diverted Regression Summary Statistics

predicted natural flow diverted = Two Ocean coefficient (**7/1 SWE Two Ocean SNOTEL**) + intercept

Year	SWC Member	Intercept	Heise Coefficient	Adjusted R^2	SE	# of obs	years excluded (not including 0 SWE years)
2014	A&B	-546	296	0.93	741	10	1997
2018	A&B	-654	587	0.84	2,049	11	1997
2022	A&B	-155	561	0.84	2,069	12	1997
2014	AFRD2	-2887	2137	0.87	7,502	10	1997
2018	AFRD2	-1971	4239	0.76	19,243	11	1997
2022	AFRD2	2065	3995	0.76	18,747	12	1997
2014	Milner	-870	737	0.84	2,939	10	1997
2018	Milner	-229	740	0.74	3,529	11	1997
2022	Milner	123	706	0.78	3,124	12	1997

July Forecast Supply – Forecasting Natural Flow

- *Multiple linear regression equations for **BID, Minidoka, and NSCC** were developed to predict natural flow diversions employing the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) March depth to water at well 05S31E27ABA1 and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Well coefficient (**March depth to water**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)**	***2016 Calculations (1990-2015)**	**2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
BID	0.89	0.91 excl 2014	0.85 excl 2017	0.85 excl 2017	0.85 excl 2017
Minidoka	0.90	0.92 excl 2014	0.87 excl 2017	0.85 excl 2017	0.85 excl 2017
NSCC	0.86	0.87	0.82 excl 1997 & 2017	0.79 excl 1997 & 2017	0.78 excl 1997 & 2017

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Natural Flow Diverted Regression Summary Statistics

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Well coefficient (**March depth to water**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Year	SWC Member	Intercept	Heise Coefficient	March 23 Well 05S31E27ABA1 Coefficient	Two Oceans 6/15 Coefficient	Adjusted R^2	SE	df	years excluded
2014	BID	269,423	15.2	-11,230	800	0.89	11,480	20	-
2018	BID	208,824	18.7	-9,053	707	0.87	12,495	23	2017
2022	BID	225,625	14.8	-9,478	893	0.85	12,875	27	2017
2014	MID	403,010	21.8	-16,734	1,127	0.90	15,720	20	-
2018	MID	308,111	27.2	-13,328	988	0.87	17,854	23	2017
2022	MID	331,939	21.7	-13,944	1,252	0.85	18,262	27	2017
2014	NSCC	533,460	91.3	-24,979	1,524	0.85	46,930	20	-
2018	NSCC	447,994	68.1	-19,935	2,483	0.82	41,988	22	1997, 2017
2022	NSCC	480,829	47.4	-19,877	3,296	0.78	43,665	26	1997, 2017

July Forecast Supply – Forecasting Natural Flow

- *The multiple linear regression model for the **TFCC** will be based on the following predictor variables: (1) Snake River near Heise natural flow (April-June), (2) Spring Creek total discharge (January – May) and (3) the SWE at the Two Oceans Plateau SNOTEL site on June 15.*

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Spring Creek coefficient (**Spring Creek Jan-May discharge**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Adjusted R-squared Progression					
SWC Member	**2014 Methodology Review (1990-2013)**	***2016 Calculations (1990-2015)**	**2018 Calculations (1990-2017)**	**2020 Calculations (1990-2019)**	**2022 Calculations (1990-2021)**
TFCC	0.85	0.83	0.90 excl 1993 & 2014	0.89 excl 1993 & 2014	0.88 excl 1993 & 2014

*Regression models built using Togowtee Pass SNOTEL data.

July Forecast Supply – Natural Flow Diverted Regression Summary Statistics

predicted natural flow diverted = Heise coefficient (**Heise April-June volume**)
+ Spring Creek coefficient (**Spring Creek Jan-May discharge**)
+ Two Ocean coefficient (**6/15 SWE Two Ocean SNOTEL**)
+ intercept

Year	SWC Member	Intercept	Heise Coefficient	Two Ocean 6/15 Coefficient	Spring Creek (Jan-May) Coefficient	Adjusted R^2	SE	df	years excluded
2014	TFCC	106,500	26.8	2,562	2,986	0.85	29,270	20	-
2018	TFCC	98,824	25.0	2,628	3,070	0.90	24,313	22	1993, 2014
2022	TFCC	102,851	25.3	2,649	3,036	0.88	25,837	26	1993, 2014

Variables Tested in 2014 MLR Models

Variable Name	Description	Units
HeiseAprtoJulKAF	**USBR Hydromet Heise Natural Flow April - July**	**KAF**
MarWell1	USGS Well: WL-9S 25E 03CAC1 March depth to water	Feet
MarWell2	USGS Well: WL-2N 37E 02ABA1 March depth to water	Feet
MarWell3	USGS Well: WL-3N 37E 12BDB1 March depth to water	Feet
MarWell4	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
MarWell5	USGS Well: WL-8S 24E 31DAC1 March depth to water	Feet
RupNovtoMar	Rupert Agrimet Total Precipitation November - March	Inches
TYHEE	USGS 13075910 PORTNEUF RIVER NR TYHEE ID Total Flow November - March	AF
LastYearNF7to9	TFCC Natural flow diversions July - September, lagged by 1 year	AF
SpringCreek11to3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow November - March	AF
SpringCr3	USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow March	AF
Devils11to3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S Total Flow November - March	AF
Devils3	USGS 13089500 DEVILS WASHBOWL SPRING NR KIMBERLY 10S 18E 04AAD1S total Flow March	AF
Box11to3	**USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow November - March**	**AF**
Box3	USGS 13095500 BOX CANYON SPRINGS NR WENDELL ID Total Flow March	AF
Briggs11to3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow November - March	AF
Briggs3	USGS 13095175 BRIGGS SPRING AT HEAD NEAR BUHL ID Total Flow March	AF
TwoOceans71	**NRCS Two Oceans Plateau (837) Snow Water Equivalent on July 1**	**Inches**
HEIAprtoJune	**USBR Hydromet Heise Natural Flow April - June**	**KAF**
SpringJantoMay	**USGS 13075983 SPRING CREEK AT SHEEPSKIN RD NR FORT HALL ID Total Flow January - May**	**KAF**
NA	NRCS Spring Creek Divide (779) Snow Water Equivalent on July 1	Inches
NA	NRCS Togwotee Pass (822) Snow Water Equivalent on July 1	Inches
NA	NRCS Phillips Bench (689) Snow Water Equivalent on July 1	Inches
2OcTow	Sum of Two Oceans Plateau and Togwotee Pass Snow Water Equivalent on July 1	Inches

Variables in Bold were used in the models

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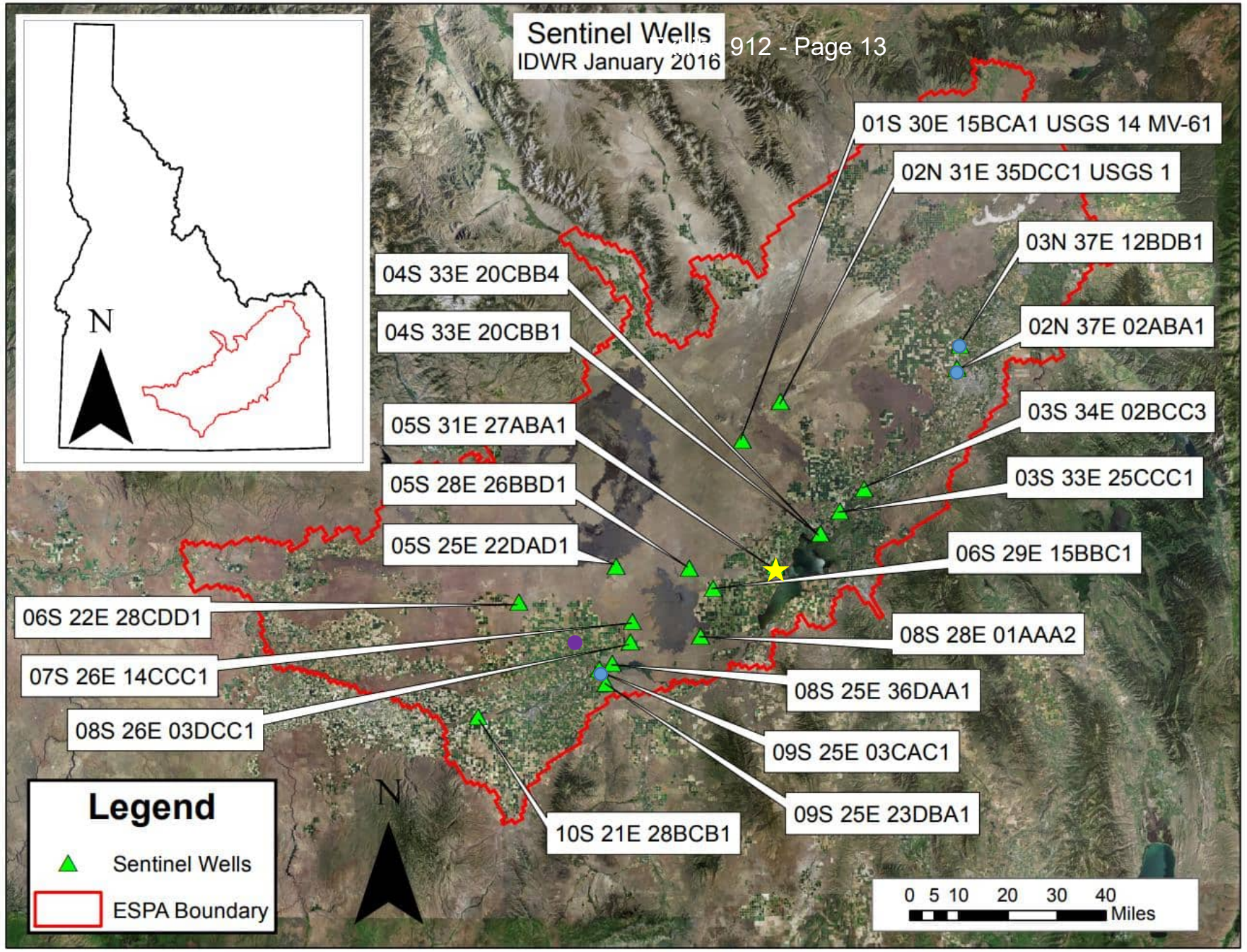

- Sentinel Well currently used in July Natural Flow Regression Equation for BID, MID, and NSCC
- Sentinel Wells evaluated in 2014
- USGS Well: WL-8S 24E 31DAC1 evaluated in 2014

April Forecast Supply – Natural Flow Diverted
2014 Adjusted R-Squared Summary of Promising Predictor Variables
1990-2013 (no years excluded)

Regression Variables	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Heise April-July only	0.88	0.82	0.79	0.92	0.78	0.89	0.52
Heise April-July + Box Canyon Nov-Mar	0.88	0.84	0.85	0.93	0.88	0.92	0.87
Heise April-July + Spring Creek Nov-Mar			0.84		0.87	0.94	0.75
Heise April-July + Spring Creek Nov-Feb			0.83		0.86	0.94	0.74
Heise April-July + Spring Creek Jan-Feb			0.85		0.88	0.94	0.75
Heise April-July + Well 05S 31E 27ABA1 March			0.87		0.88	0.94	0.69

Red R^2 indicate regression equations listed in the Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

July Forecast Supply – Natural Flow Diverted
2014 Adjusted R-Squared Summary of Promising Predictor Variables
1990-2013 (no years excluded)

Regression Variables	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Two Ocean 7/1	0.95	0.91		0.90			
Two Ocean 6/15	0.71	0.66		0.67			
Heise April-June + Two Ocean 6/15 + Spring Creek Jan-May			0.83		0.84	0.86	0.85
Heise April-June + Two Ocean 6/15 + Spring Creek April-May			0.85		0.87	0.85	0.85
Heise April-June + Two Ocean 6/15 + Well 05S 31E 27ABA1 March			0.89		0.90	0.86	0.83
Heise April-June + Two Ocean 6/15 + Box Canyon Jan-Mar			0.75		0.76	0.81	0.81
Heise April-June + Two Ocean 7/1 + Spring Creek Jan-May			0.87		0.88	0.90	0.83

Red R^2 indicate regression equations listed in the Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

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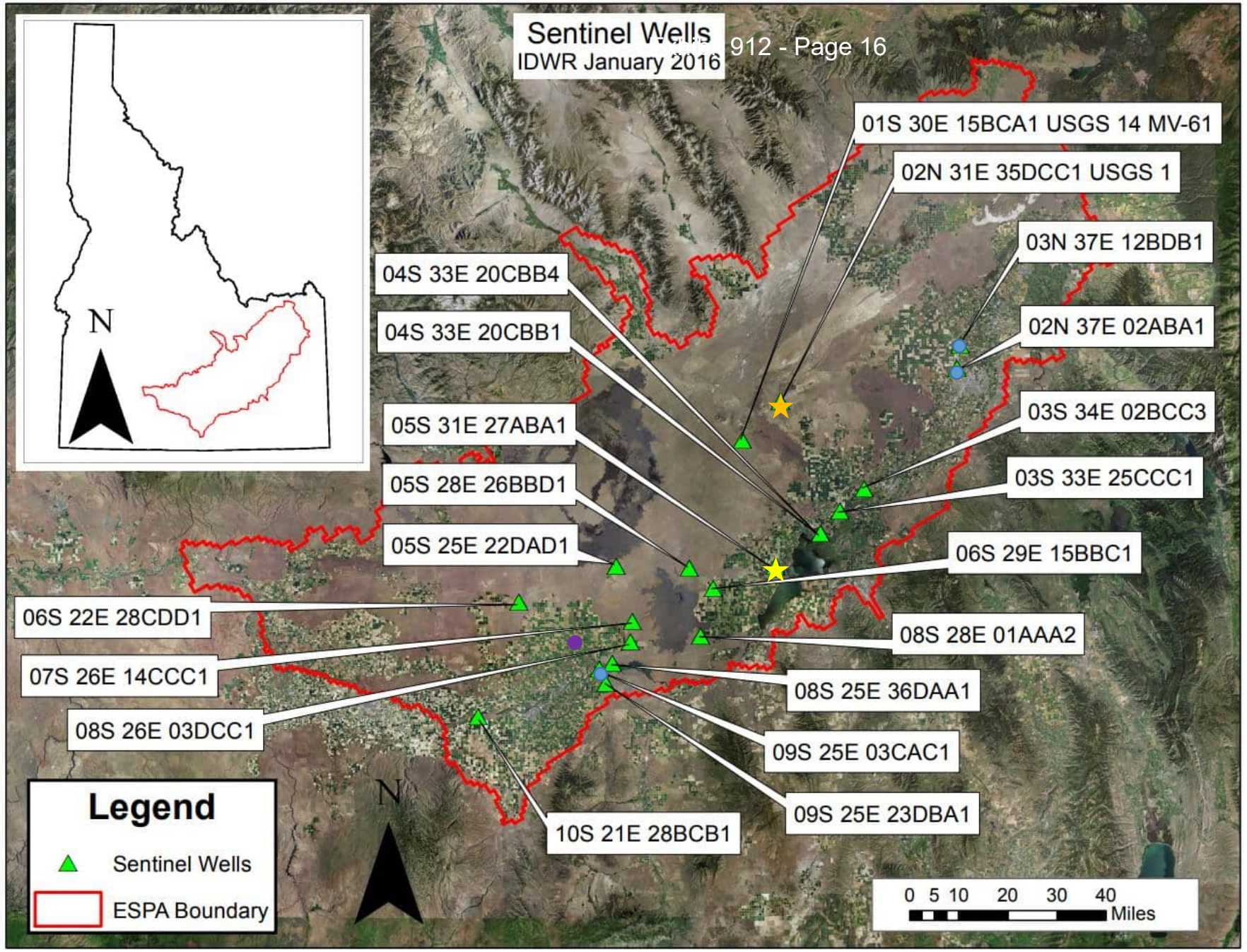

- Sentinel Well currently used in July Natural Flow Regression Equation for BID, MID, and NSCC
- Sentinel Wells evaluated in 2014
- USGS Well: WL-8S 24E 31DAC1 evaluated in 2014
- Sentinel Well evaluated in 2022

2022 Summary of Test Predictor Variables
April Natural Flow Forecast

	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Heise April-July + Well 02N 31E 35DCC1		0.84	0.85		0.87	0.88	0.67
Heise April-July + Sentinel Well Index							0.65
Heise April-July + Box Canyon Nov-Mar		0.84	0.85		0.91	0.90	0.72

**Note: This slide is from the original presentation. The updated slide (next) shows test predictor variables Adjusted R-squared values for ALL years, no exclusions. Presenting results from ALL years allows for easier comparison, since excluded years (outliers) may differ depending on variables used in regressions.

April Forecast Supply – Natural Flow Diverted
2022 Adjusted R-squared Summary of Test Predictor Variables
1990-2021 (no years excluded)

Regression Variables	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Heise April-July + Box Canyon Nov-Mar		0.83	0.81		0.85	0.88	0.65
Heise April-July + Well 02N 31E 35DCC1 March Avg		0.83	0.80		0.84	0.88	0.60
Heise April-July + Sentinel Well Index		0.82	0.80		0.83	0.87	0.58

Red R^2 indicate regression equations listed in the Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

2022 Summary of Test Predictor Variables
July Natural Flow Forecast

2022 NCSS test	Adjusted R2
Heise April-June + Two Ocean 6/15 + Well new April Avg	0.78
Heise April-June + Two Ocean 6/15 + Well new March Avg	0.78
Heise April-June + Two Ocean 6/15 + Spring Creek Jan-May	0.80
Heise April-June + Two Ocean 6/15 + 05S31E27ABA1 March 15	0.78

**Note: This slide is from the original presentation. The top 3 Adjusted R-squared values include ALL years. The bottom Adjusted R-squared value in blue has two years excluded (1997 & 2017).
The updated slide (next) shows test predictor variables Adjusted R-squared values for ALL years, no exclusions. Presenting results from ALL years allows for easier comparison, since excluded years (outliers) may differ depending on variables used in regressions.

July Forecast Supply – Natural Flow Diverted
2022 Adjusted R-squared Summary of Test Predictor Variables
1990-2021 (no years excluded)

Regression Variables	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Heise April-June + Two Ocean 6/15 + 05S31E27ABA1 March			0.75		0.75	0.74	0.73
Heise April-June + Two Ocean 6/15 + Spring Creek Jan-May			0.80		0.82	0.80	0.82
Heise April-June + Two Ocean 6/15 + Well 02N 31E 35DCC1 March Avg			0.81		0.83	0.78	0.81
Heise April-June + Two Ocean 6/15 + Well 02N 31E 35DCC1 April Avg			0.81		0.83	0.78	0.81
Heise April-June + Two Ocean 6/15 + Sentinel Well Index			0.79		0.80	0.77	0.78

Red R^2 indicate regression equations listed in the Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover

Questions?

Kara Ferguson
(208) 287-4937
kara.ferguson@idwr.idaho.gov

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322 E Front Street, Suite 648, Boise ID 83702 • PO Box 83720, Boise ID 83720-0098
Phone: 208-287-4800 • Fax: 208-287-6700 • Email: idwrinfo@idwr.idaho.gov • Website: idwr.idaho.gov

Governor Brad Little **Director Gary Spackman**

Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition

12/23/2022

By: Kara Ferguson, Staff Hydrologist & Matt Anders, Hydrology Section Supervisor

In a status conference on August 5, 2022, the Director of the Idaho Department of Water Resources (IDWR) issued a directive to IDWR staff to convene a committee of experts to review and provide comments on potential technical changes to the "Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover" (Methodology) issued on April 19, 2016. IDWR staff created a technical working group composed of IDWR staff, experts representing the parties to the ongoing Surface Water Coalition (SWC) delivery call, and other interested parties. IDWR identified potential technical changes to the Methodology and presented them to the technical working group for discussion.

IDWR hosted six technical working group meetings between November 16 and December 14, 2022. Before each meeting, IDWR staff circulated PowerPoint presentations and agendas to the working group. The meetings were attended by interested members of the public and consultants and attorneys for parties to the SWC delivery call. Department staff and attorneys also participated. The meetings included presentations by IDWR staff and working group members, as well as open discussion on the topics presented. During the final meeting on December 14, 2022, IDWR staff stated that IDWR would provide a document summarizing staff's preliminary recommendations on potential technical changes to the Methodology.

Based on the information presented at the meetings and distributed to the technical working group, IDWR staff have the following preliminary technical recommendations:

- Update the Baseline Year (BLY) irrigation demand used to determine reasonable in-season demand from the current average of diversion demands for the 2006, 2008, and 2012 irrigation seasons to the diversion demand for the 2018 irrigation season.
- Update the BLY irrigation demand used to determine reasonable carryover for each SWC member from the current average of the diversion demands for the 2006, 2008, and 2012 irrigation seasons to the diversion demand for the 2018 irrigation season.
- Update the project efficiency value used to calculate monthly reasonable in-season demand from a rolling average of the previous eight years to a rolling average of the previous fifteen years.

At this time, staff do not have recommendations on utilizing near real time METRIC for determining crop water need, updating April and July regressions to improve their predictive power for natural flow supply, or using transient model simulation for determining curtailment priority dates. IDWR will continue to evaluate the integration of these and other techniques into the methodology.

IDWR requests written comments from the technical working group on the above recommendations or any other topic covered during the meetings. Please submit any comments no later than January 16, 2023, to matthew.anders@idwr.idaho.gov.

Spronk Water Engineers, Inc.
1000 Logan St. | Denver, CO 80203-3011 | (303) 861-9700 | spronkwaterengineers.com

TO: Kara Ferguson, Staff Hydrologist & Matt Anders, Hydrology Section Supervisor, Idaho Department of Water Resources

CC: Candice McHugh and Chris Bromley, McHugh Bromley, PLLC; Rob Harris, Holden, Kidwell, Hahn & Crapo, PLLC; and Sarah Klahn, Somach Simmons & Dunn, PC

FROM: Heidi Netter and Greg Sullivan, Spronk Water Engineers, Inc.

DATE: January 16, 2023

RE: Comments on behalf of the Coalition of Cities and the City of Pocatello on the Idaho Department of Resources Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition, by Kara Ferguson and Matt Anders on December 23, 2022.

Under direction of the Director of the Idaho Department of Water Resources ("IDWR"), IDWR staff organized a technical working group ("TWG") to provide comments on potential technical changes to the Fourth Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("SWC Methodology"). The SWC Methodology was first ordered on April 7, 2010 and last amended on April 19, 2016. IDWR held numerous TWG meetings between November 16 – December 14, 2022 and Greg Sullivan and Heidi Netter of Spronk Water Engineers, Inc. ("SWE") participated in all of them, along with representatives of the Coalition of Cities and the City of Pocatello ("Cities").

On December 12 and 21, 2022, during the period of the TWG meetings, SWE submitted comments to the TWG via emails with attachments (*see* **Attachments 1** and **2**). These comments are made on behalf of the Cities to elaborate on the comments and materials previously provided.

IDWR Recommendations:

Following the conclusion of the TWG meetings, IDWR staff submitted a summary of three proposed changes to the SWC Methodology on December 23, 2022 that it recommends be implemented ("IDWR Recommendations"). The proposed changes consist of the following:

1. Update the Baseline Year ("BLY") irrigation demand used to determine reasonable in-season demand from the current average of diversion demands for the 2006, 2008, and 2012 irrigation seasons to the diversion demand for the 2018 irrigation season.

2. Update the BLY irrigation demand used to determine reasonable carryover for each SWC member from the current average of the diversion demands for the 2006, 2008, and 2012 irrigation seasons to the diversion demand for the 2018 irrigation season.

3. Update the project efficiency value used to calculate monthly reasonable in-season demand from a rolling average of the previous eight years to a rolling average of the previous fifteen years.

Comments on IDWR Recommendations:

Updated Baseline Year

IWDR staff recommends that the BLY be changed to 2018 because the previous BLY that is based on an average of conditions during 2006, 2008, and 2012 ("06/08/12") no longer reflects conditions during year(s) with above average diversions. During the meeting on November 16, 2022, IDWR presented information showing that combined SWC member diversions during 06/08/12 that averaged a combined 3,194,722 acre-feet and were 99.8% of the 2001 – 2021 average. This information showed that the SWC member diversions were no longer above average, but instead were very slightly below average. The combined SWC diversions during the proposed new BLY of 2018 are 186,000 acre-feet greater than the combined average diversions the 06/08/12 BLY. The increased diversions for the proposed new BLY will translate into greater projected shortages to the SWC members under the SWC Methodology.

A review of the data suggests that the 06/08/12 average diversions are no longer above average because the diversions by several of the SWC members have increased since the SWC Methodology was last updated in 2016. IWDR did not provide any information or analysis to explain why the SWC diversions have increased.

The information previously submitted by SWE on December 12 and 21, 2002 indicates that the computed Project Efficiency ("PE") for most of the SWC members has decreased or remained flat since the methodology was last updated in 2016. This is surprising given the continued sprinkler conversions and general advances in irrigation practices and technology that have occurred in the irrigation industry over the past 20 years. Only Minidoka shows a trend of significantly increasing efficiency. In addition, the low PE values for most SWC members during September and October are concerning.

The 2010 Fourth Amended Methodology Order states that "[d]uring periods of drought when groundwater users are subject to curtailment, members of the SWC should exercise reasonable efficiencies to promote the optimum utilization of the State's water resources." (paragraph 15). Application of the current SWC Methodology results in an unreasonable positive feedback loop for determination of the BLY: the more the SWC members divert, the greater the BLY diversions must be in order to stay above average. IDWR (or the TWG) should conduct additional analysis to determine whether the additional diversions are needed to meet crop demands, an analysis that could take the form of a basin-wide crop survey or other type of analysis. In the meantime, it is unreasonable to change the BLY in the manner that will increase shortages to the SWC members and result in greater curtailment of juniors.

Updated Project Efficiencies

IDWR proposes to change computation of the monthly average PE values from the average for the most recent 8 years to the average of the most recent 15 years. IDWR did not explain why it is proposing this

change. Changing from an 8-year average to a 15-year average may lessen the effect of recent reductions in PE for certain SWC members. The 2010 Order entails a "reasonable test" be applied to SWC member efficiencies. Here no reasonableness test has been applied, and as discussed in detail in **Attachment 1**, flat or decreasing PE values for the SWC members are concerning given continued sprinkler conversions by the SWC members and the advances in irrigation practices that continue to occur in the industry.

Other Comments

1. Irrigated acres provided by SWC should be accompanied by shapefiles to show that the reported irrigated acres reasonably match the actual irrigated lands. This can be confirmed using aerial imagery, field verification, and/or remote sensing such as NDVI, METRIC ET, and CDL.
2. The SWC Methodology provides that the crop water needs of the SWC members may be adjusted for supplemental groundwater use on the irrigated lands. IDWR should require that information necessary for this adjustment be compiled and utilized to adjust the reasonable in-season demand of the SWC members.

Attachments

Exhibit 915 - Page 4

Attachment 1 - 12/12/2022 Email

From: Greg Sullivan <gsullivan@spronkwater.com>
Sent: Monday, December 12, 2022 9:48 AM
To: Anders, Matthew; Jaxon Higgs; ssigstedt@lynker.com; Dave Shaw; Heidi Netter; Ferguson, Kara; dave.colvin@lrewater.com; TJ Budge; wkf@pmt.org; Travis Thompson (tlt@idahowaters.com); sklahn@somachlaw.com; Chris Bromley; 'Candice McHugh'; MHoward@usbr.gov; rbsnowmobiles@gmail.com; Kresta Davis (KDavis2@idahopower.com); Dave Blew (DBlew@Idahopower.com); Ragan, Brian; Baxter, Garrick; John Simpson - Barker Rosholt & Simpson LLP (jks@idahowaters.com); Heidi Netter; Geisler, Ethan; Sukow, Jennifer
Subject: Weaver, Mathew <Mathew.Weaver@idwr.idaho.gov>; Cecchini-Beaver, Mark <Mark.Cecchini-Beaver@idwr.idaho.gov>; Vincent, Sean <Sean.Vincent@idwr.idaho.gov>; Spackman, Gary <Gary.Spackman@idwr.idaho.gov>
Attachments: 2022-12-12 SWC Diversions and CWN.xlsx

Attached is a spreadsheet containing the graphs and tables of historical adjusted diversions and crop water needs for the SWC members that I presented to the SWC TWG on Friday, December 9. The underlying IDWR data on which the graphs and tables are based are also included.

As discussed during the meeting, the graphs and tables in the spreadsheet suggest that use of crop water need and project efficiency as a predictor of demand in the SWC Methodology should be revisited.

Let me know if you have any questions.

Thanks,

Greg

Gregory K. Sullivan, P.E.
Principal Water Resources Engineer
Spronk Water Engineers, Inc.
1000 Logan Street
Denver, CO 80203
303.884.9976 cell
gsullivan@spronkwater.com

From: Greg Sullivan <gsullivan@spronkwater.com>
Sent: Wednesday, December 21, 2022 1:23 PM
To: Anders, Matthew; Jaxon Higgs; ssigstedt@lynker.com; Dave Shaw; Heidi Netter; Ferguson, Kara; dave.colvin@lrewater.com; TJ Budge; wkf@pmt.org; Travis Thompson (tlt@idahowaters.com); sklahn@somachlaw.com; Chris Bromley; 'Candice McHugh'; MHoward@usbr.gov; rbsnowmobiles@gmail.com; Kresta Davis (KDavis2@idahopower.com); Dave Blew (DBlew@Idahopower.com); Ragan, Brian; Baxter, Garrick; John Simpson - Barker Rosholt & Simpson LLP (jks@idahowaters.com); Heidi Netter; Geisler, Ethan; Sukow, Jennifer
Subject: Updated Comparison of Adjusted Diversions and Crop Water Needs for SWC Members
Attachments: 2022-12-21 SWC Diversions and CWN.xlsx; 2022-12-21 SWC Diversions and CWN Charts.pdf

TWG Members:

Attached is updated version of the spreadsheet comparing the historical Adjusted Diversions and Crop Water Needs (CWN) for the SWC members during 2001 – 2021. The spreadsheet includes several additional charts described below. PDFs of the added charts are attached.

Annual Project Efficiency Time-Series (AnnChartsPE Tab)

Additional charts were added in columns S – AH showing the computed annual Project Efficiency (PE) for each SWC member during from 2001 – 2021. The input flags that can be used to exclude certain years from the analysis (set on the AB tab) also operate to limit the annual efficiency values that are plotted in the new graphs. The flag in the attached spreadsheet is currently set to exclude years with a Demand Shortfall (DS) [flag = 2]. The trendlines plotted on the graphs indicate generally flat or declining PE for 6 of the 7 SWC members. This is surprising given the continued sprinkler conversions and general advances in irrigation practices and technology that have occurred in the irrigation industry over the past 20 years. Only Minidoka shows a trend of significantly increasing efficiency. The following are the changes in PE from 2001 – 2021 indicated by the trendlines for each SWC member:

Change in Project Efficiency (2001-2021)
(percentage point change)

A&B	-4.6%
AFRD2	-3.6%
BID	-1.0%
Milner	-12.6%
Minidoka	+12.2%
NSCC	-3.0%
TFCC	+1.8%

Because the PE values used in the SWC Methodology are currently based on averages for the most recent 8 years, any declines in the computed PE values will translate into increased demands and increased shortages.

Annual Project Efficiency vs Annual Adjusted Diversions AND Annual Crop Water Need (AnnAll Tab)

Additional scatter diagrams were added in columns AG – BM to plot the Annual Project Efficiency (PE) vs the Annual Adjusted Diversions AND Annual Crop Water Need for the 2001 – 2021 period. Again, the flag in the attached spreadsheet is set to exclude years with computed Demand Shortfalls (DS). Also plotted on the Annual Adjusted Diversions scatter charts are the average PE (solid black line) and the average PE + 1 standard deviation (dotted black line).

Monthly vs. Annual Project Efficiencies (AnnAll Tab)

Charts were added in columns BO – CD that compare the monthly average PE, average annual PE, and average annual PE + 1 standard deviation for each SWC member. These charts illustrate the low PE values in some months that cause monthly demands computed based on CWN / PE to be very sensitive to changes in CWN.

Discussion

The current SWC Methodology uses Monthly CWN / Avg Monthly PE to compute the monthly Diversion Demand. The Avg Monthly PE values for many of the SWC members vary widely throughout the irrigation season, and are unreasonably low in some months, particularly in September and October. The low monthly PE values may be due in part because they do not reflect the portion of the diversions that may be stored in soil moisture for subsequent use. For example, consider a month with 100 AF diverted, 30 AF of CWN, and 20 AF accruing to soil moisture. Under the SWC methodology, the computed PE would be 30%, but the actual PE considering the water stored in soil moisture would be 50%.

Because of the wide variability in the computed monthly PE values, consideration should be given to using seasonal PE values rather than monthly PE values in computing the monthly Diversion Demands. This would help level out the wide swings in the monthly diversion demands that sometimes occur in application of the SWC Methodology when relatively low monthly PE values are divided into relatively high monthly CWN values. If seasonal PE values are utilized, the data for September and October should be reviewed and potentially excluded from calculation of the seasonal PE values since the efficiencies in those months are unreasonably low.

In addition, the current use of average PE values during the most recent 8 years in the Diversion Demand calculations should be reviewed. The 2010 Fourth Amended Methodology Order states that "[d]uring periods of drought when junior groundwater users are subject to curtailment, members of the SWC should exercise reasonable efficiencies to promote the optimum utilization of the State's water resources." (paragraph 15). The annual PE values shown in the above referenced graphs show significant year-to-year variations for each SWC member. Since the data in the charts have been filtered to exclude years with computed demand shortages, variations in the computed annual PE values indicate that each of the SWC members have operated at a range of efficiencies to meet crop water demands over the past 20 years. Given the level or declining trend in average efficiencies for most SWC members, the current methodology that uses average efficiencies for the most recent 8 years may discourage reasonable and efficient use by the SWC to the detriment of groundwater users and contrary to optimum utilization of the State's water resources.

The following table compares the average annual PE values for 2014-2021 (most recent 8-year period) against alternate PE values computed from annual data and April – August data for 2001-2021. The alternate PE values are tabulated as averages and as averages plus 1 standard deviation. All values exclude years in which demand shortages were computed.

PE Summaries	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC
2014-2021 Avg	58%	32%	41%	49%	52%	34%	38%
2001-2021 Avg	60%	34%	41%	56%	47%	34%	38%
2001-2021 Avg + 1 Std Dev	65%	36%	45%	65%	53%	37%	41%
2001-2021 (Apr-Aug) Avg	63%	36%	44%	58%	50%	37%	43%
2001-2021 (Apr-Aug) Avg + 1 Std Dev	68%	39%	48%	68%	55%	40%	46%

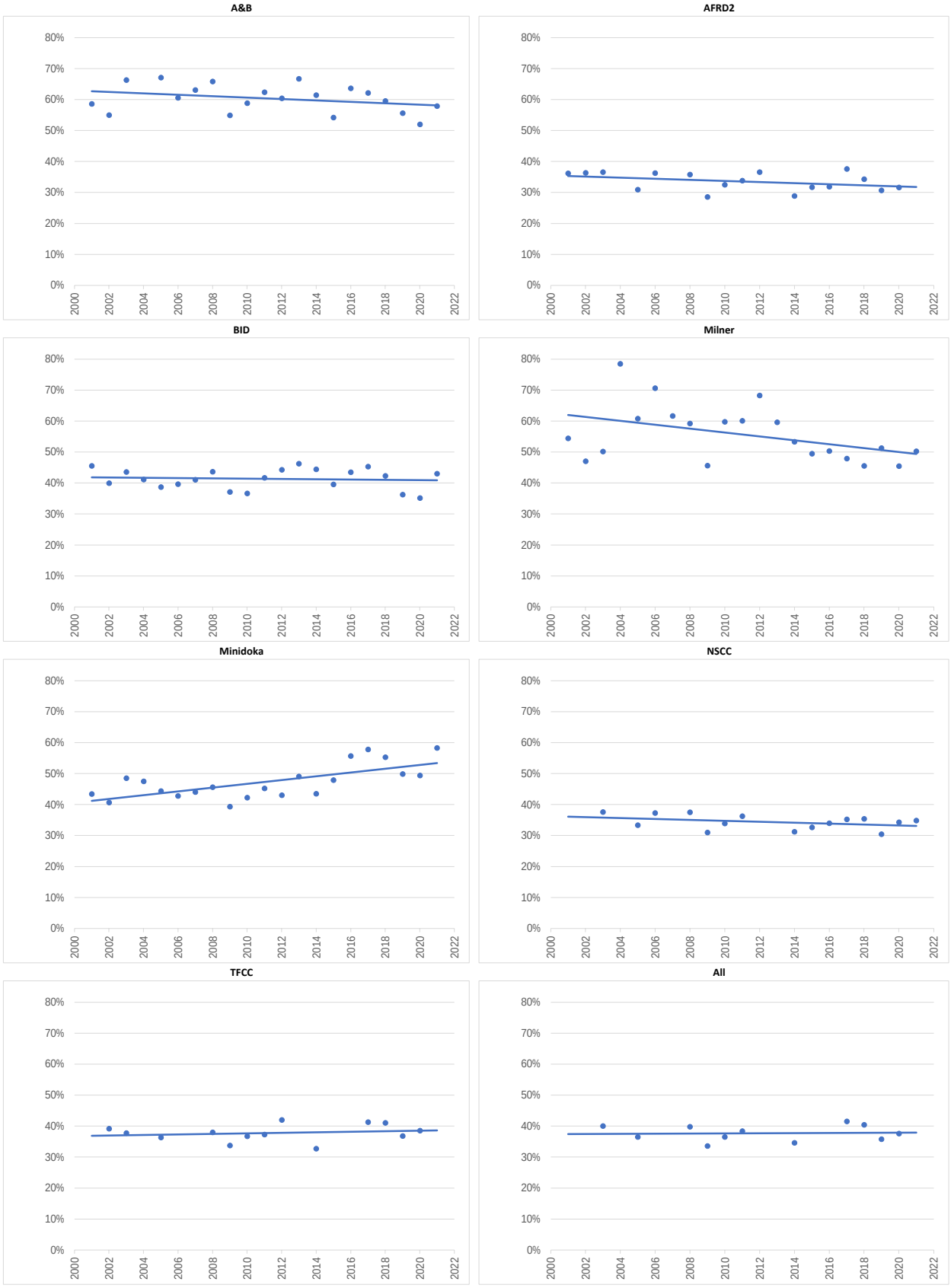
The above values are computed in columns CF – CU in the AnnAll tab in the attached spreadsheet. These values illustrate some different ways that annual and seasonal PE values can be computed from the historical data. If IDWR is going to continue computing Reasonable In Season Demand (RISD) based on CWN / PE, consideration should be given to using PE values that better reflect reasonable and efficient operations of the SWC members than do the historical averages that are currently used in the SWC Methodology. This would help ensure that curtailment and/or mitigation of impacts from junior groundwater use occurs when SWC supplies are short under reasonable and efficient operations.

Thanks,

Greg

Gregory K. Sullivan, P.E.
Principal Water Resources Engineer
Spronk Water Engineers, Inc.
1000 Logan Street
Denver, CO 80203
303.861.9700
303.884.9976 cell
gsullivan@spronkwater.com

Annual Project Efficiency
Surface Water Coalition Members
2001 - 2021 (AF)
Exclude Years with Demand Shortfall (DS)

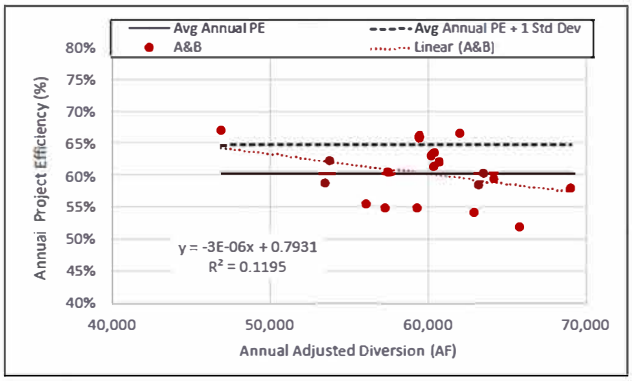


Annual Project Efficiency v. Annual Adjusted Diversions

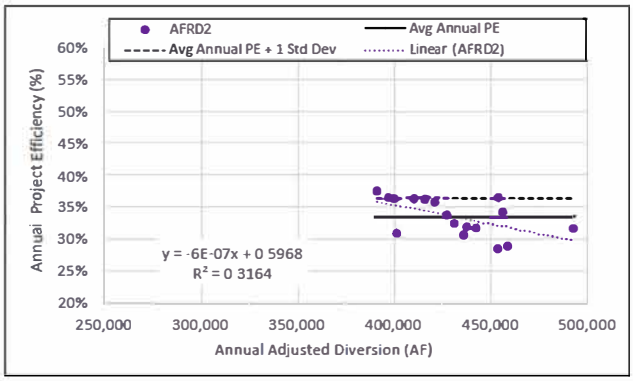
Surface Water Coalition Members

Exclude Years with Demand Shortfall (DS)

A&B



AFRD2



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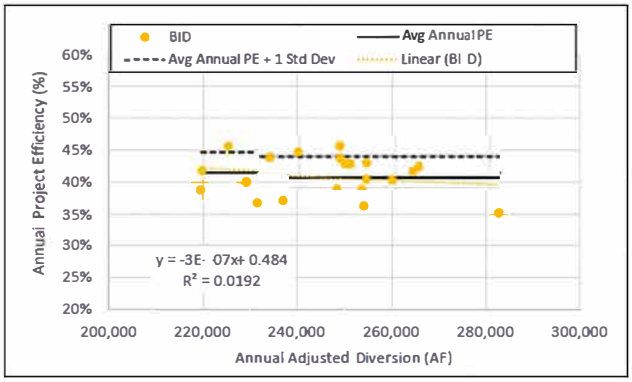
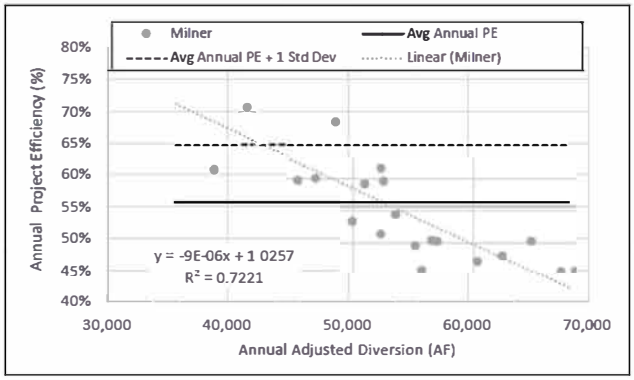


Milner



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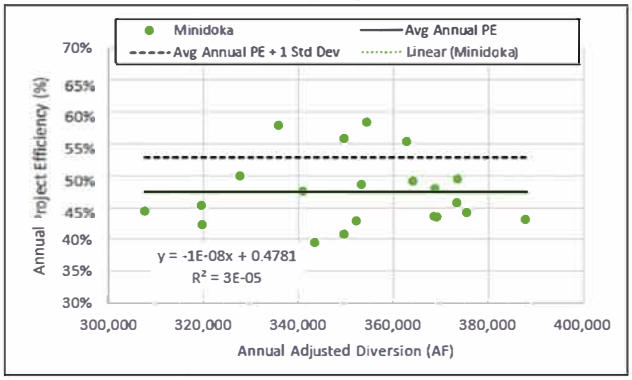

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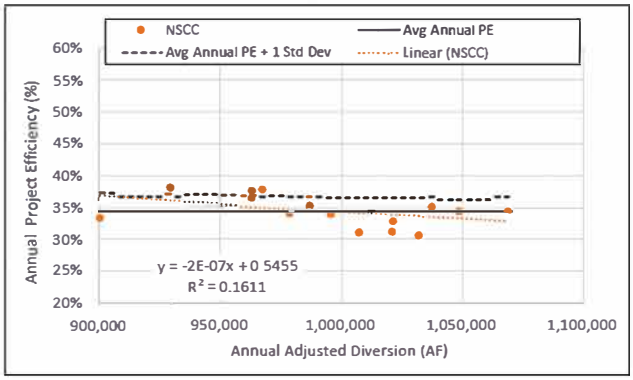
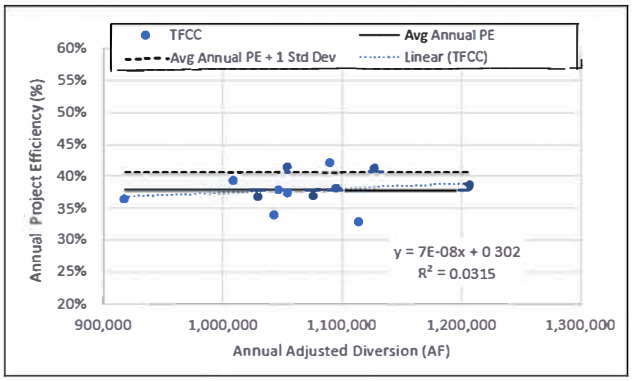


TFCC



Notes:

Note different scales.

(1) Annual Project Efficiency (PE) computed as Annual Crop Water Need (BCWN) divided by Annual Adjusted Diversion.

(2) Annual Adjusted Diversions are historical reported diversions adjusted for to remove wheeled water, recharge, and mitigation (IDWR spreadsheet: DS RISD Calculator_2022_August 15 xlsx).

(3) Annual Crop Water Need (BCWN) computed as crop weighted average crop irrigation requirement ("CIR") multiplied by District reported irrigated area.

(4) Average Annual PE is the average of the 2001-2021 annual PE values.

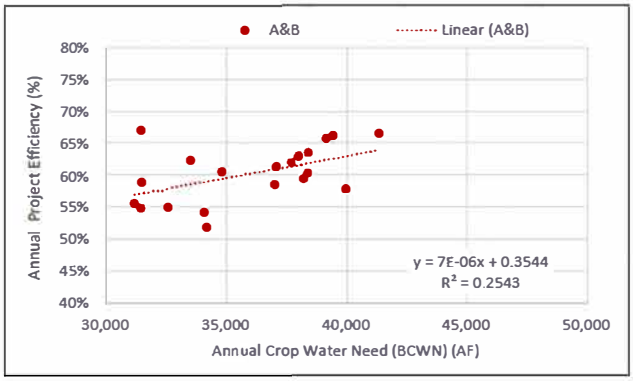
(5) Average Annual PE + 1 Std Dev is the average of the 2001-2021 annual PE Values plus 1 standard deviation.

Annual Project Efficiency v. Annual Crop Water Need (CWN)

Surface Water Coalition Members

Exclude Years with Demand Shortfall (DS)

A&B



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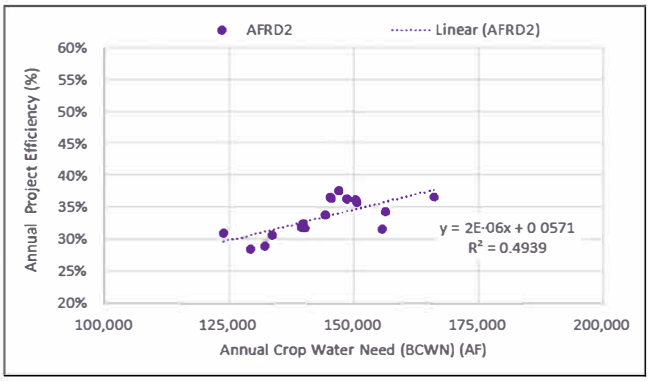

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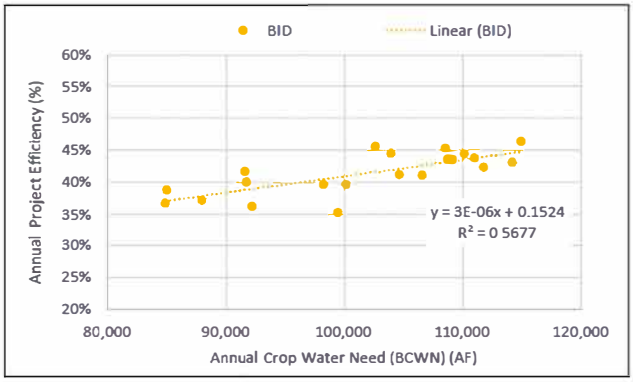

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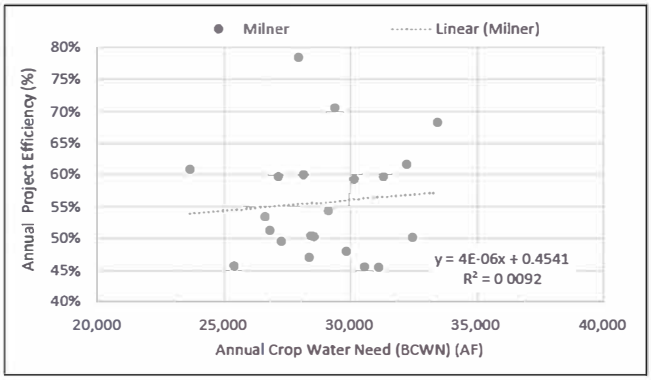
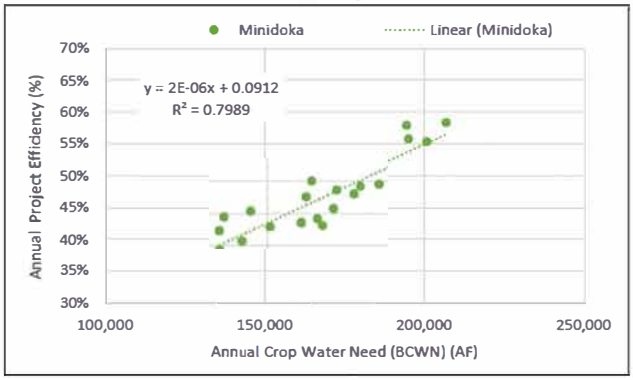
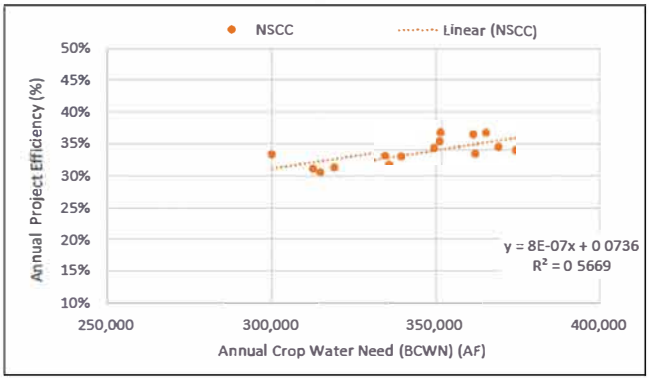


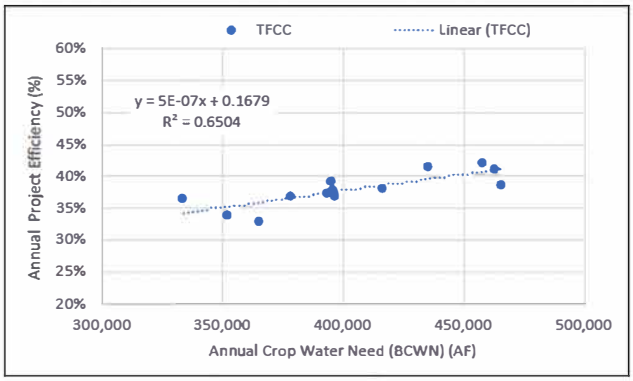
Minidoka



NSCC



TFCC



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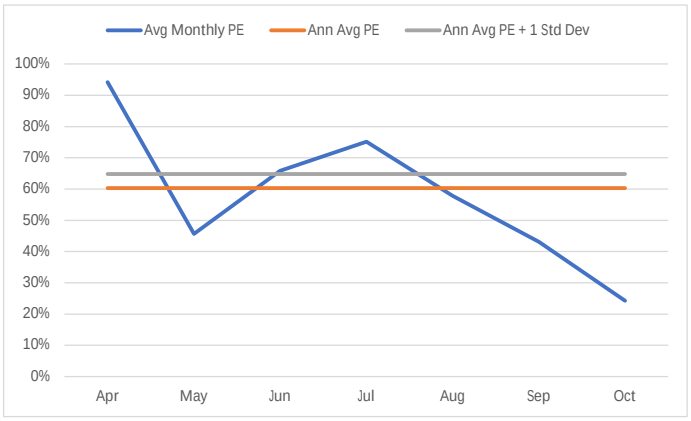
(3) Annual Crop Water Need (BCWN) computed as crop weighted average crop irrigation requirement ("CIR") multiplied by District reported irrigated area.

Annual Project Efficiency v. Monthly Project Efficiencies

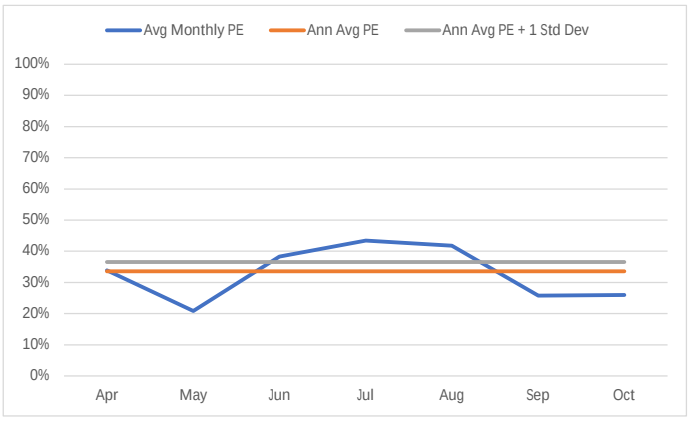
Surface Water Coalition Members

Exclude Years with Demand Shortfall (DS)

A&B



AFRD2



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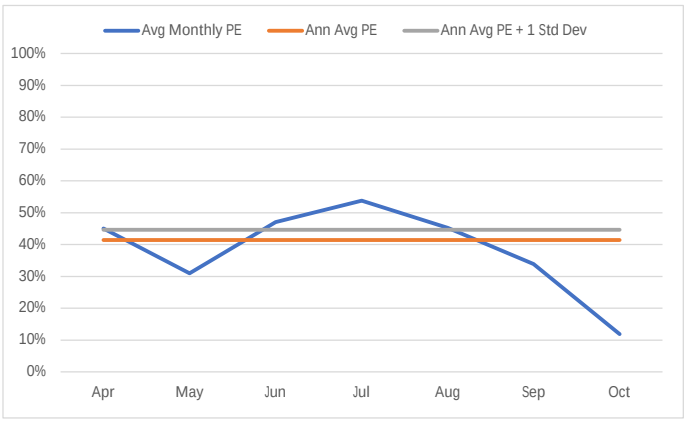
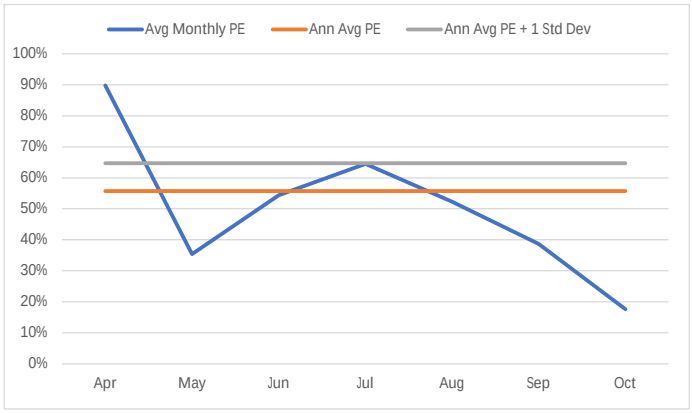


Milner



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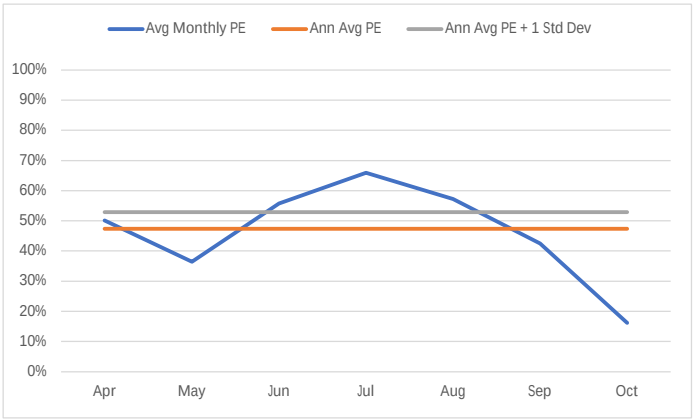

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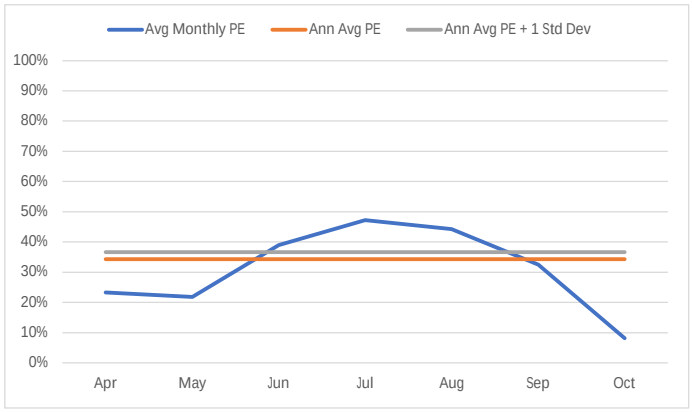
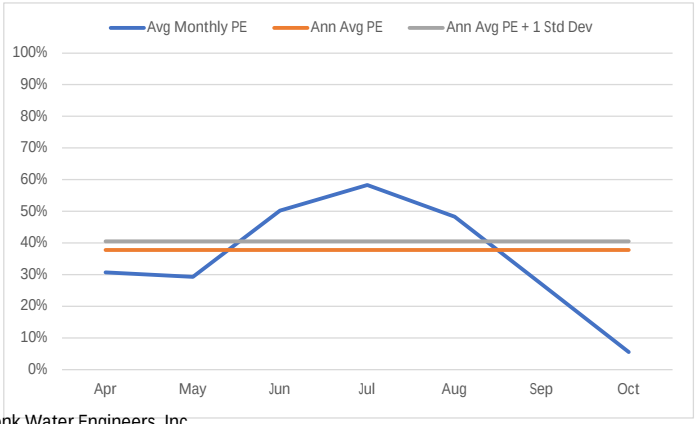


TFCC



MEMORANDUM

To: Matt Anders and Kara Ferguson, IDWR

From: Sophia C. Sigstedt, Lynker

Subject: Comments on 2022 IDWR Staff Recommendations

Date: January 16, 2023

This memorandum addresses my comments on the analyses presented to the 2022 Technical Working Group (TWG) related to revisions to the Methodology Order for determining injury to water rights held by members of the Surface Water Coalition. It serves as an addendum to Idaho Department of Water Resources (IDWR or Department) staff recommendations for the 2022 Methodology Update. IDWR staff and other members of the TWG presented analyses and recommendations regarding the following topics:

1. Baseline Year (BLY)
2. Forecasting Natural Flow Supply
3. Near-Real-Time METRIC for ET
4. Project Efficiency (PE)
5. ESPAM2.2 Steady State v. Transient

IDWR staff proposed changes related to BLY and PE, but only presented the results of internal analysis without recommending changes to the other topics investigated. TWG members were asked to consider whether the proposed recommendations provide a better technical basis than the current technique, or if there was an alternative with a better technical basis.

Sections 1-5 summarize my comments based on the proceedings for each TWG topic as listed above, respectively.

The topics identified above are not the only items in the Amended Methodology Order that should be considered regarding technical improvements. The comments in this memo are primarily in response to recommended changes made by IDWR staff in their memorandum dated December 23rd, 2022[1] and should not be considered a comprehensive summary of my opinions on all the technical aspects presented to the TWG or any other outstanding issues in the proceeding.

Section 1: Baseline Year Update

The IDWR staff recommended:

- Update the BLY irrigation demand used to determine Reasonable In-Season Demand (RISD) from the current average of diversion demands for the 2006, 2008, and 2012 (06/08/12) irrigation seasons to the diversion demand for the 2018 irrigation season.
- Update the BLY irrigation demand used to determine Reasonable Carryover for each SWC member from the current average of diversion demands for the 06/08/12 irrigation seasons to the diversion demand for the 2018 irrigation season.

[1] Summary of Recommended Technical Revisions to the 4th Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover for the Surface Water Coalition (IDWR, December 23rd 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

In my opinion the recommendation to replace average diversions for the 06/08/12 irrigation seasons with single-year diversions in 2018 as the BLY does not have an adequate technical basis, and alternatives should be considered due to the following:

1. IDWR should consider rank within the period-of-record (POR) and select an average of years closer to the rank of the 06/08/12 BLY selected in 2015. IDWR staff presented analysis to the TWG for individual years 2018 and 2020 for consideration as the updated BLY. Either of these individual years are inadequate to represent reasonably dry baseline conditions for SWC diversions.

   When the average of diversion demands for the 06/08/12 irrigation seasons was selected as the BLY in 2015, the 06/08/12 average ranked between 7th and 8th highest for diversions, or about the 55th percentile (based on a normal distribution), for the POR 2000-2015 (**Figure 1**). IDWR staff presented analysis of Demand Shortfall calculations using 2018 and 2020 as an alternative BLY as they were both found to individually meet all the BLY criteria as shown in **Table 1**. For the POR 2000-2021 the diversion demand for 2018 and 2020 rank 3rd and 2nd, respectively, highest for diversions out of the 22 years, or about the 90th and 95th percentile (based on a normal distribution) for the POR (**Figure 2**).

   In a hindcast analysis by IDWR staff, the higher rank in BLY SWC diversions appears to cause a huge shift in the type of water year (i.e. wet, average, dry, very dry) where Demand Shortfalls are calculated. The hindcast showed a Demand Shortfall much more frequently in average and even wet years in addition to every dry or very dry year. When you compare the distribution of SWC total diversion demands for the POR 2000-2015 compared to 2000-2021 in **Figures 1** and **2**, however, it is apparent that they are very similar with mean diversions of 3.16 maf and 3.2 maf, respectively. The standard deviation is also very similar for the POR 2000-2015 compared to 2000-2021 at 178,089 af and 178,587 af, respectively. The selection of the BLY is meant to be conservative as defined by the BLY criteria. The shift to SWC diversions of a much higher rank (compared to the previous BLY) like 2018 or 2020 translates to a much higher level of conservatism and is not technically justified given the similarity between mean diversions and the standard deviation for the 2000-2021 POR versus the 2000-2015 POR.

   The Methodology Order states that the BLY can be a year or an average of years that meet the BLY criteria (**Table 1**). IDWR staff considered rank within the POR when they recommend keeping the 2002 and 2004 average Heise natural flows as the Supply in the Reasonable Carryover calculation from the 4th Amended Methodology Order for the 2022 update[2]. The average of diversion demands for the 2006 and 2018 (06/18) irrigation seasons meet all the BLY criteria as shown in **Table 1** and is closer to the 55th percentile based on a normal distribution for diversions 2000-2021 similar to the rank of the BLY 06/08/12 (**Figures 1** and **2**) as applied in the 4th Amended Methodology Order. The BLY of 06/18 has a better technical basis than the proposed update to 2018 as the BLY.

Table 1. Baseline Year and Baseline Year Criteria

BLY Criteria	BLY Avg 06/18	BLY 2018	BLY 2020	Avg 2000-2021
Abv Avg SWC Diversions	3.22 maf	3.38 maf	3.53 maf	3.20 maf
Abv Avg GDD	2575 units	2550 units	2600 units	2495 units
Abv ET	1265 mm/d	1275 mm/d	1280 mm/d	1245 mm/d
Blw Avg Precipitation	3.9 in	2.6 in	2.7 in	4.5 in
Abv Avg SWC Supply	8.52 maf	9.00 maf	8.10 maf	7.70 maf

[2] Proposed Modification of the Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: Reasonable Carryover (IDWR, presentation slide no. 4, December 9th, 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

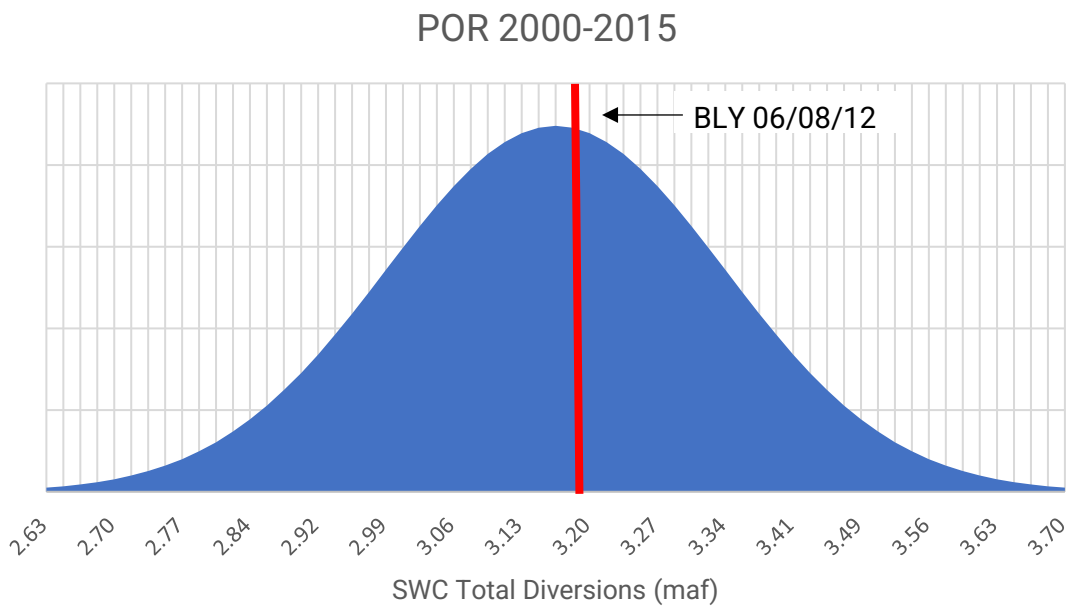


Figure 2. Normal distribution of SWC Total Diversion over the POR 2000-2015, the *red line* shows where the selected BLY 06/08/12 for the 4th Methodology Order falls within the normal distribution.

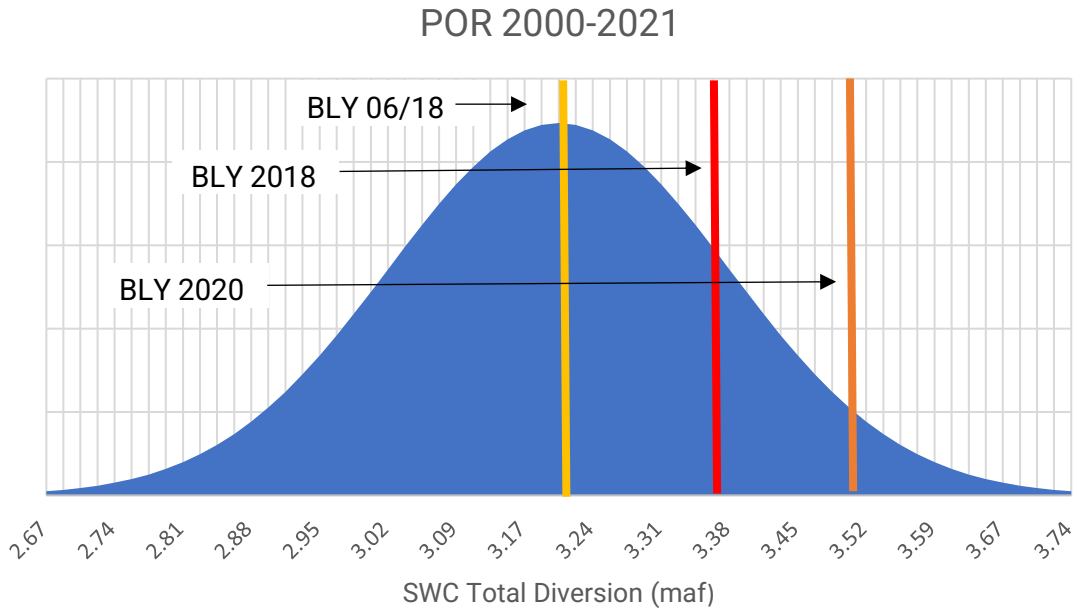


Figure 2. Normal distribution of SWC Total Diversion over the POR 2000-2021, the *yellow line*, *red line*, and *orange line* show where the proposed BLY 06/18, 2018 and 2020 falls within the normal distribution, respectively.

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

2. Another reason a better alternative would be to use diversion demands for the 06/18 irrigation seasons for the BLY is that there were unique hydrologic circumstances in 2018 that I don't believe represent the typical dry year. The 2017/2018 snowpack was very high and water year forecasts and early season streamflow led to positive water supply forecasts which resulted in a record amount of aquifer recharge in 2018. IDWR staff acknowledged the technical difficulties in sorting out surface water adjustments like recharge in applying the Methodology Order. The combination of large volumes of widely distributed canal recharge, often in relatively rarely used or new systems, may have exacerbated uncertainty in the adjustment. The positive water supply outlook may have also resulted in less stringent surface water administration and ultimately higher diversions than the crop water need alone would predict. Consequently, using gross diversions in 2018 as the BLY effectively overstates surface water irrigation demand. IDWR staff presentations and a review of Twin Falls Agrimet station data also showed the 2018 irrigation season is the only year in the 1992-2021 POR with a zero-precipitation total for July-September. The fact that almost any individual water year will have some unique circumstance is a good reason for continuing to define the BLY based on an average of years as the Methodology Order does currently.
3. An additional reason for using a specific percentile (or rank) within the POR when establishing a BLY, and for using an average of years, is that the process for selection of the BLY otherwise appears arbitrary and subjective. If IDWR staff are presented with multiple years within the POR that fit the criteria for a BLY, and there is no guidance or standard method for selecting a single BLY, the ultimate selection becomes purely subjective. Using an average of years that targets a prescribed rank is a more objective and technically defensible process.

Section 2: Forecasting Natural Flow Supply

IDWR staff did not make a recommendation on updating April and July regression models to improve their predictive power for natural flow supply. The staff did make presentations to the TWG on natural flow forecasting models that showed the Twin Fall Canal Company (TFCC) model is degrading in the R^2 value. This degradation is significant in that the R^2 values is an expression of the explanatory power of the forecast model. The TFCC natural flow forecast models also started with the lowest R^2 values based on the previously revised forecast. The technical information presented to the TWG indicated that a revised natural flow method for TFCC should be evaluated and a recommendation for an improved method should be made. However, given the extremely compressed timeframe for staff and TWG members to conduct a thorough evaluation I understand why a recommendation was not made at this point.

Lynker's technical memorandum included as addendum to IDWR staff recommendations in 2015[3] laid out an alternative forecast model approach that I continue to think should be further investigated. The approach is creating a regression relationship or alternative model that forecasts the physical natural flow supply with subsequent allocation of that physical supply among the rights of the SWC. The technical basis for this suggestion is that water rights administration creates a non-continuous and non-normally distributed dependent variable in the regression analysis. This is likely the reason it is difficult to find a high performing regression model for TFCC.

The process for natural flow forecast model revision should also be standardized in-terms of defining how frequently a thorough re-evaluation of the predictors and models is done (i.e. 3-yrs, 5-yrs, if R^2 value drops below a threshold). This should include re-evaluating previously tested predictors over the new POR, as well as, casting a new net of total predictors for consideration by the TWG. While the TFCC model stands out in needing a refinement all of the models could be improved if sufficient time for the analysis were allowed. Several of the models utilize a depth to groundwater measurement as a predictor from a specific Sentinel Well flagged by a separate TWG (IGWA-SWC)[4], as likely impacted by American Falls Reservoir level.

[3] Recommended Revisions to the Surface Water Coalition Methodology (DWR, March 16th, 2015)
[4] IGWA/SWC Steering Committee TM: 2021 Sentinel Well Recommendations (IGWA/SWC TWG, August 20th, 2021)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

Section 3: Near-Real-Time METRIC for ET

The IDWR staff did not make a recommendation on utilizing near-real-time METRIC for determining Crop Water Need (CWN) in the RISD calculation. The application of METRIC in the determination of crop demands deals with a complex dataset that requires complex processing. Given the magnitude of the task to incorporate METRIC data I understand the staff not making a recommendation at this time. The IDWR staff should keep track of the calculation utilizing the METRIC data in parallel to the current CWN calculation method as way to continue to evaluate its use. The Department's Eastern Snake Plain Aquifer (ESPA) model already utilizes METRIC data for consumptive use calculations used for model input data. Given the complexity of the METRIC data I also recommend further investigation into the method behind the calibration and processing of the dataset to determine how and to what extent the METRIC data can be validated at the field-scale or if there are common misrepresentations that should be considered in the process of data quality assurance checks. This should be done in coordination with validation efforts by the Department on their ESPAM Metric calibration and processing.

The IDWR staff presentation regarding near-real-time METRIC application identified a significant shortcoming in the current method for calculating CWN as the fact that the most up-to-date crop data is from the previous year and that SWC irrigated acre datasets sometimes represent service areas, not the actual irrigated land[5]. Non-irrigated acres should not be considered in determining the irrigation supply necessary for SWC members[6]. The METRIC data could first be used to create a standard review process for the Methodology Order Step 1 submittal of irrigated acres by the SWC entities. IDWR staff should use a precise determination of irrigated acreage irrespective of whether it uses METRIC in the calculation of CWN. With IDWR staff only checking against the total acres for the decreed place of use, there is little to no incentive to keep the spatial data for the irrigated acres up to date. The METRIC data would be available for the current irrigation season and can be used to assess actual irrigated land. Some of the preliminary analysis by IDWR staff using METRIC data illustrated that through processing they were able to identify about 15,000 acres within the TFCC irrigated acres dataset that should not qualify as irrigated. The mischaracterized acres were all minor areal corrections but over a large service area such as TFCC added up to a significant amount of erroneous total acres. This just highlights the importance of spending the time to get an accurate picture of irrigated acres for an accurate RISD calculation. As previously noted in Lynker's 2015 comment letter the 5% change standard for SWC submittals should be reconsidered in light of large districts like TFCC where a 5% error in the irrigated acres can result in calculation of tens of thousands of acre-feet of erroneous mitigation obligation. Liz Cresto an IDWR staff member on the TWG in 2015 also made a similar recommendation in her comment letter attached to the staff memorandum.

Neither the 2015 nor the 2022 TWG has provided an opportunity to address concerns regarding supplemental groundwater use. This is a critical aspect of the RISD calculation and was one of the specific technical items cited for revision by the District Court. Analysis of supplemental groundwater use is likely critical to accurately applying METRIC in the RISD calculation.

Section 4: Project Efficiency

The IDWR staff recommended:

- Update the project efficiency value used to calculate monthly reasonable in-season demand from a rolling average of the previous eight years to a rolling average of the previous fifteen years.

[5] Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time Metric (IDWR, presentation slide no. 8, November 17th 2022)
[6] Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover-pg 4

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

The technical basis for the IDWR staff recommendation was based on there being an extended POR available. TWG discussions and subsequent presentations identified other issues that should be considered in Methodology applications of project efficiency (PE) to RISD calculation.

1. There is higher uncertainty in the April and October project efficiency values. April and October represent months during the irrigation season when the method of calculating RISD strictly as a function CWN and PE is less reliable because CWN is often not the driving factor in diversions[7].
2. Project efficiency among SWC entities are almost all flat or declining (6 out of 7 entities), which is contrary to what would be expected with technology advancements and constrained water supplies[8].

Change in Project Efficiency (2001-2021) (percentage point change)	
A&B	-4.6%
AFRD2	-3.6%
BID	-1.0%
Milner	-12.6%
Minidoka	+12.2%
NSCC	-3.0%
TFCC	+1.8%

3. Scatter plots by SWC entity comparing Annual Crop Water Need to Annual Diversions show Crop Water Need is limited as a predictor given the low explanatory power indicated by the low R^2 values in the analysis[9].

Regarding the mid-season calculation of RISD, the sensitivity and appropriate use of CWN as a predictor for in-season demands for SWC entities should be evaluated. Technical analysis to the TWG showed that this is not a strong relationship[10]. This disconnect should be evaluated by the TWG so a recommendation can be made. The trends in declining PE are concerning in that they are contrary to our expectations given the direction technology advancements and constrained water supply. The declines in PE are significant in that any decline in PE will result in increased demands and subsequently increased calculated Demand Shortfalls. The IDWR staff presentation on PE illustrated how the very minor change in PE resulting from extending the POR for the average translated to tens of thousands of acre-feet differences in the Short Fall determination[11]. Sullivan (e-mail to TWG 12/21/2022) found that when analyzing monthly PE the low PE in some months cause monthly demands calculated based on CWN/PE to be very sensitive to changes in CWN. I agree with Sullivan's recommendation that given the outside influences and uncertainty in some of the monthly PE values IDWR staff should consider using a seasonal PE value in computing monthly diversion demands. I also agree with Sullivan's recommendation that consideration should be given to PE values that better reflect reasonable and efficient operations of SWC members. Given the observed declining trends in PE and the historically wide range in operational PE by entity it is hard to know when SWC supplies are short under reasonable and efficient operations. This is consistent with Lynker's 2015 recommendation for an investigation into trends among entities related to PE factors.

[7] Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover-pg 18
[8] Greg Sullivan e-mail, Updated Comparison of Adjusted Diversion and Crop Water Needs for SWC Members, to TWG December 21, 2022
[9] Analysis in Greg Sullivan datasheet "2022-12-21 SWC Diversions and CWN.xls"
[10] Analysis in Greg Sullivan datasheet "2022-12-21 SWC Diversions and CWN.xls"
[11] Proposed Modification of the Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover: Project Efficiency (IDWR, presentation slide no. 15, November 28th, 2022)

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301

Given the compressed timeframe around the 2022 TWG meeting there was not sufficient time for the TWG members to analyze or address these outstanding issues. Additional time should be set aside for the TWG to conduct an analysis and make a recommendation.

Section 5: Steady State v. Transient

The Department staff did not make a recommendation on using transient model simulation for determining curtailment priority dates in the Methodology. The IDWR staff presented to the TWG the following:

1. Technically the steady state application is not consistent with the variable curtailment dates and mitigation volumes under the Methodology.
2. Transient analysis shows that in-season shortfalls can generally not be met at Time of Need by in-season curtailment.
3. There is a huge difference in resulting determination of the curtailment priority date if a steady state v. transient model is applied.
4. Under a transient model application any Demand Shortfall above ~100K af would result in aquifer wide curtailment

It is not clear what additional analysis the Department staff need to conduct to make a recommendation on steady state v. transient model application. What is clear is that this represents a huge uncertainty to the water users and how they make planning and management decisions moving forward.

Lynker
5445 Conestoga Court, Suite 100
Boulder, Colorado 80301



Proposed Modification to Method for Determining Reasonable In-Season Demand for the Surface Water Coalition: Use of the Near Real Time METRIC

Presented by Ethan Geisler, Kara Ferguson, & Matt Anders

December 1, 2022

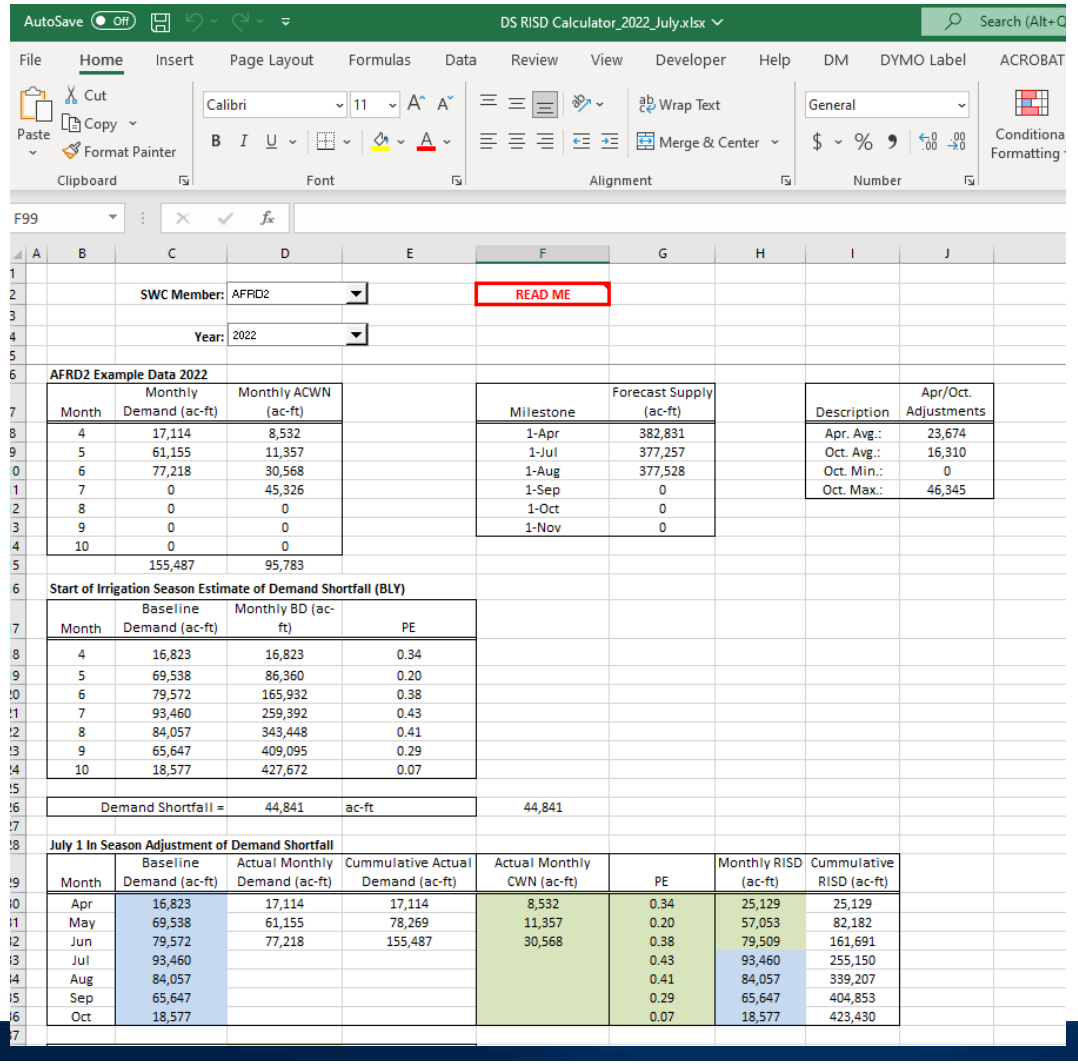
IDAHO DEPARTMENT OF WATER RESOURCES

IDWR SWC Website

- SWC Delivery Call Related Documents
  - https://idwr.idaho.gov/legal-actions/delivery-call-actions/SWC/

- 4th Amended Methodology Order
  - https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-DC-2010-001/CM-DC-2010-001-20160419-Fourth-Amended-Final-Order-Regarding-Methodology-for-Determining-Material-Injury-to-Reasonable-In-Season-Demand-and-Reasonable-Carryover.pdf

SWC Demand Shortfall Calculator



DS RISD Calculator_2022_July.xlsx

SWC Member: AFRD2

Year: 2022

READ ME

AFRD2 Example Data 2022

Month	Monthly Demand (ac-ft)	Monthly ACWN (ac-ft)
4	17,114	8,532
5	61,155	11,357
6	77,218	30,568
7	0	45,326
8	0	0
9	0	0
10	0	0
	155,487	95,783

Milestone	Forecast Supply (ac-ft)
1-Apr	382,831
1-Jul	377,257
1-Aug	377,528
1-Sep	0
1-Oct	0
1-Nov	0

Description	Apr/Oct. Adjustments
Apr. Avg.:	23,674
Oct. Avg.:	16,310
Oct. Min.:	0
Oct. Max.:	46,345

Start of Irrigation Season Estimate of Demand Shortfall (BLY)

Month	Baseline Demand (ac-ft)	Monthly BD (ac-ft)	PE
4	16,823	16,823	0.34
5	69,538	86,360	0.20
6	79,572	165,932	0.38
7	93,460	259,392	0.43
8	84,057	343,448	0.41
9	65,647	409,095	0.29
10	18,577	427,672	0.07

Demand Shortfall = 44,841 ac-ft 44,841

July 1 In Season Adjustment of Demand Shortfall

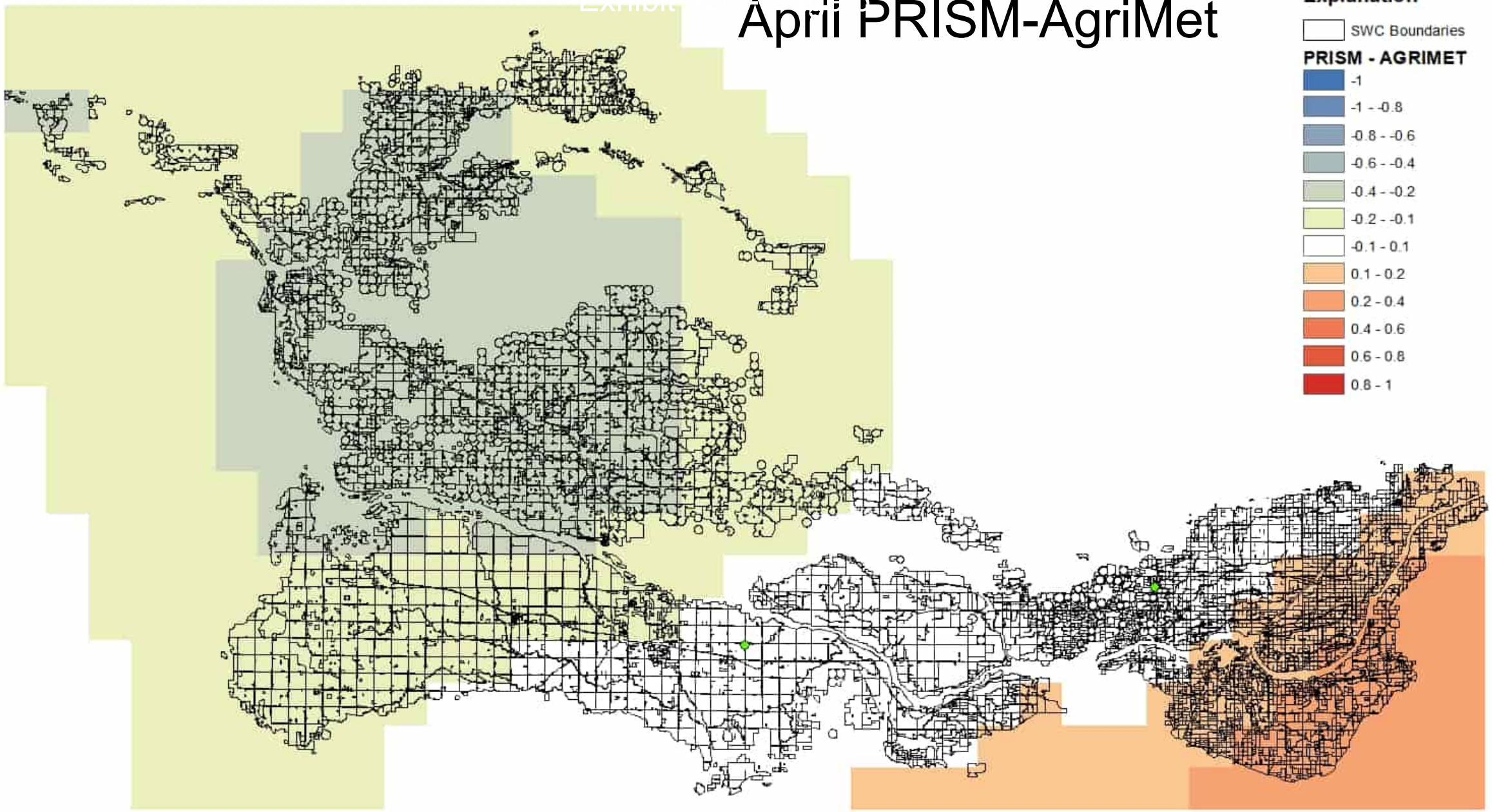
Month	Baseline Demand (ac-ft)	Actual Monthly Demand (ac-ft)	Cummulative Actual Demand (ac-ft)	Actual Monthly CWN (ac-ft)	PE	Monthly RISD (ac-ft)	Cummulative RISD (ac-ft)
Apr	16,823	17,114	17,114	8,532	0.34	25,129	25,129
May	69,538	61,155	78,269	11,357	0.20	57,053	82,182
Jun	79,572	77,218	155,487	30,568	0.38	79,509	161,691
Jul	93,460				0.43	93,460	255,150
Aug	84,057				0.41	84,057	339,207
Sep	65,647				0.29	65,647	404,853
Oct	18,577				0.07	18,577	423,430

PRISM – AgriMet Difference Analysis for 2021

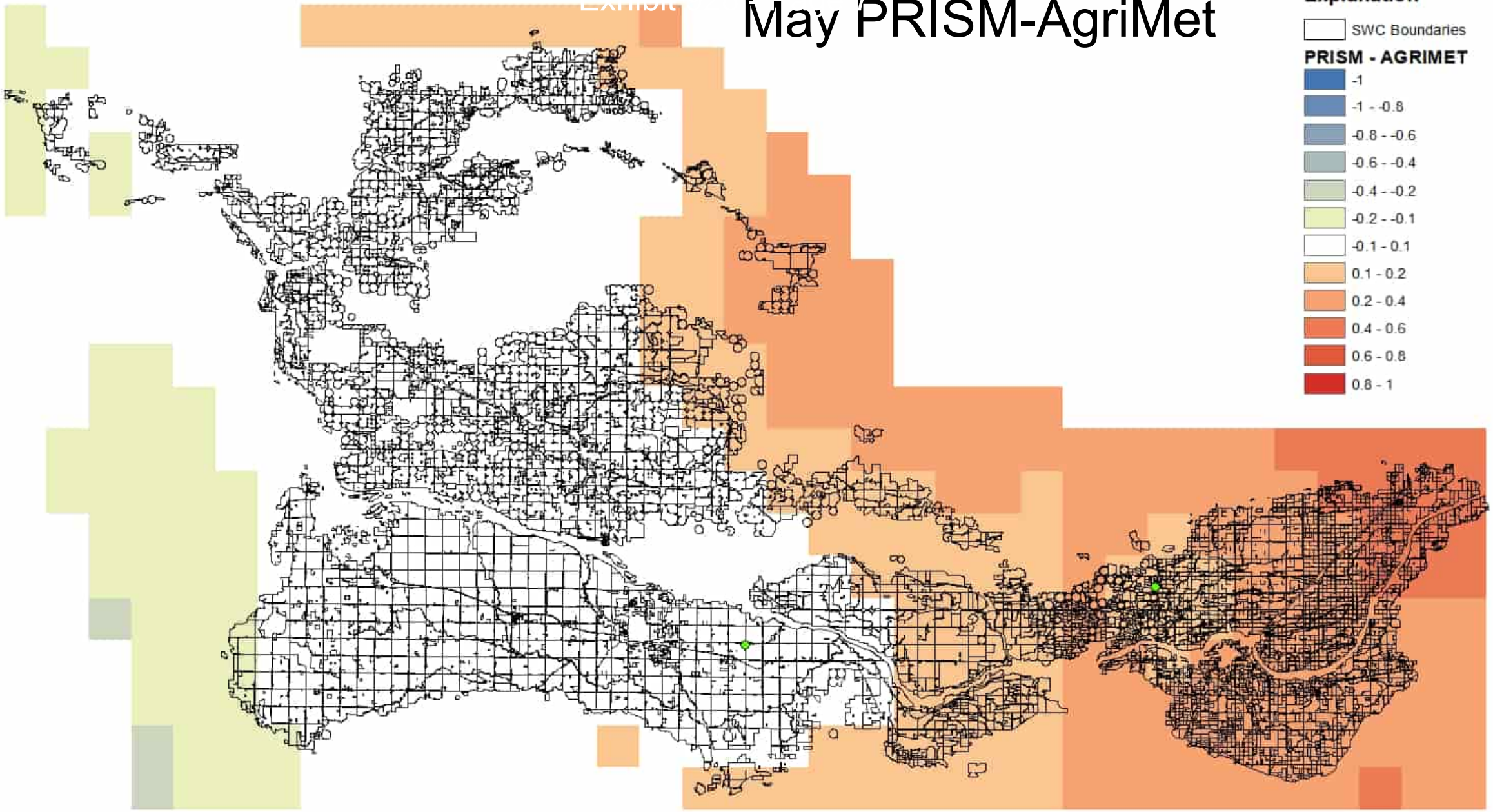
PRISM – AgriMet Difference Analysis for 2021

- Value (in inches) represent the difference between Effective precipitation from PRISM minus Effective Precipitation from AgriMet
- Same Effective precipitation method was used for both methods
- Twin Falls AgriMet was included for:
  - TFCC, AFRD2, NSCC, Milner
- Rupert AgriMet was included for:
  - A&B, Burley, MID
- Negative value in the graph below indicates Agrimet Effective precipitation was higher and would therefore decrease Crop Water Need more than PRISM for that month
- White background indicates the difference was between -0.1 and 0.1 inches

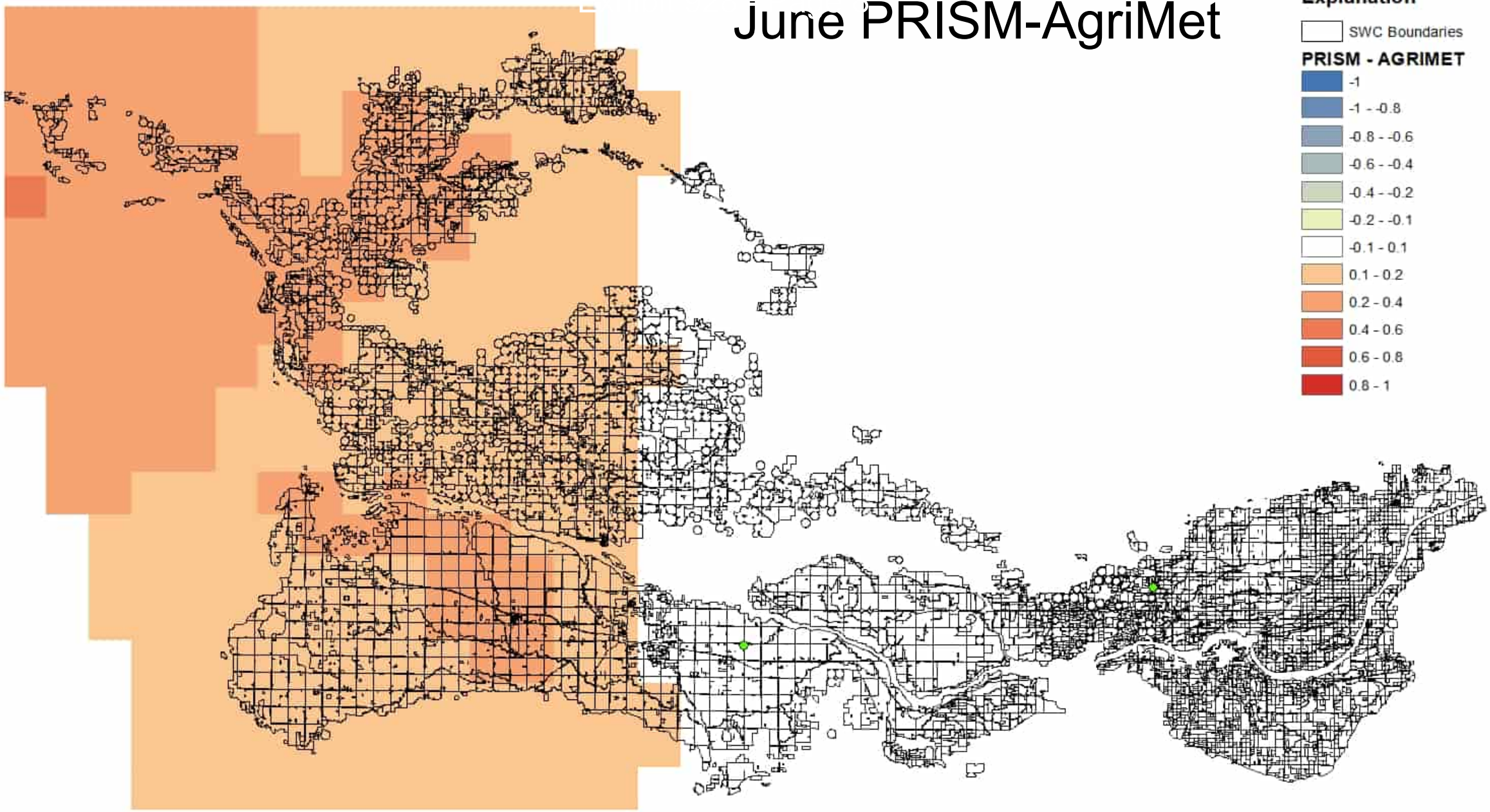
April PRISM-AgriMet



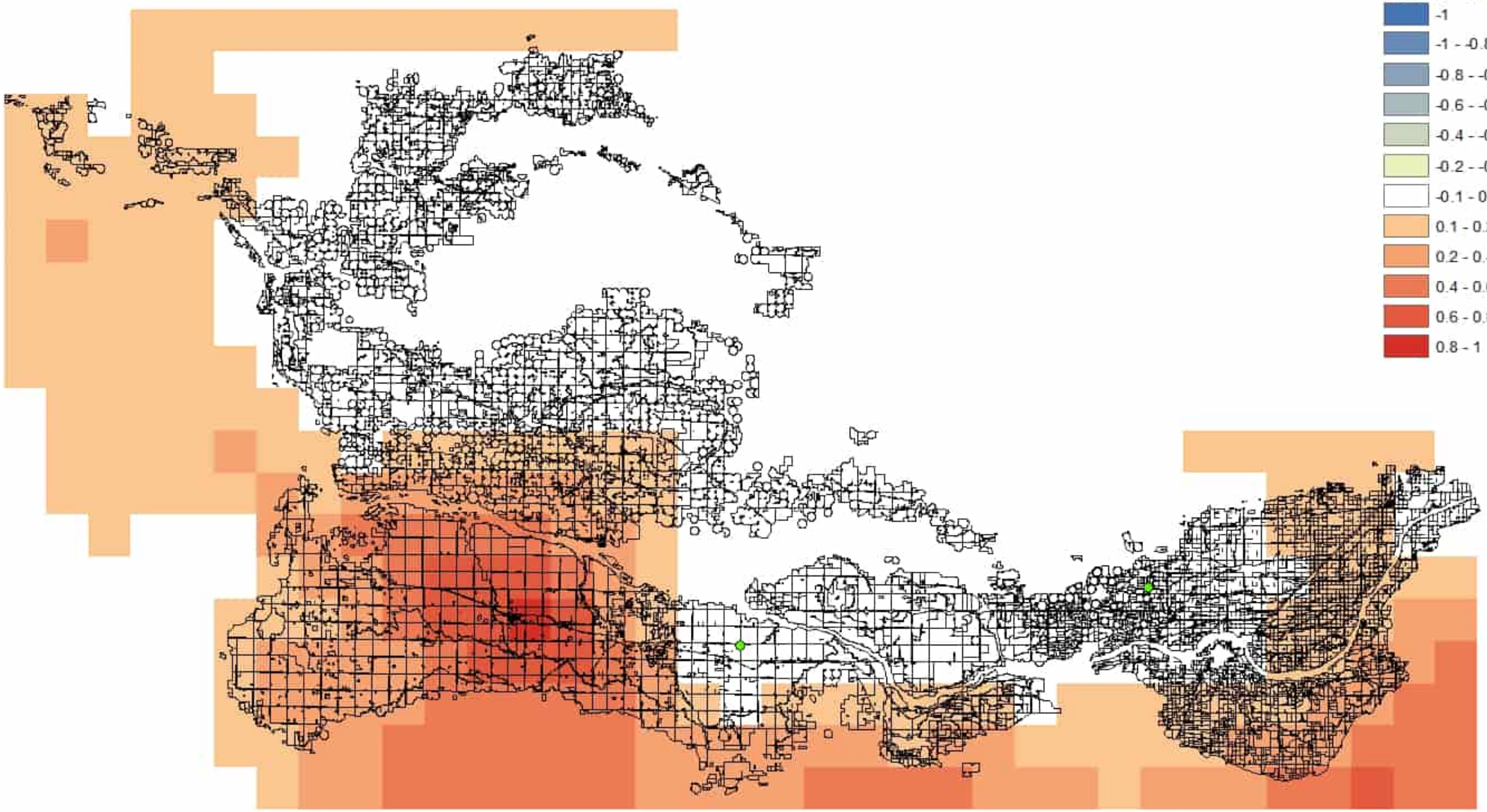
May PRISM-AgriMet



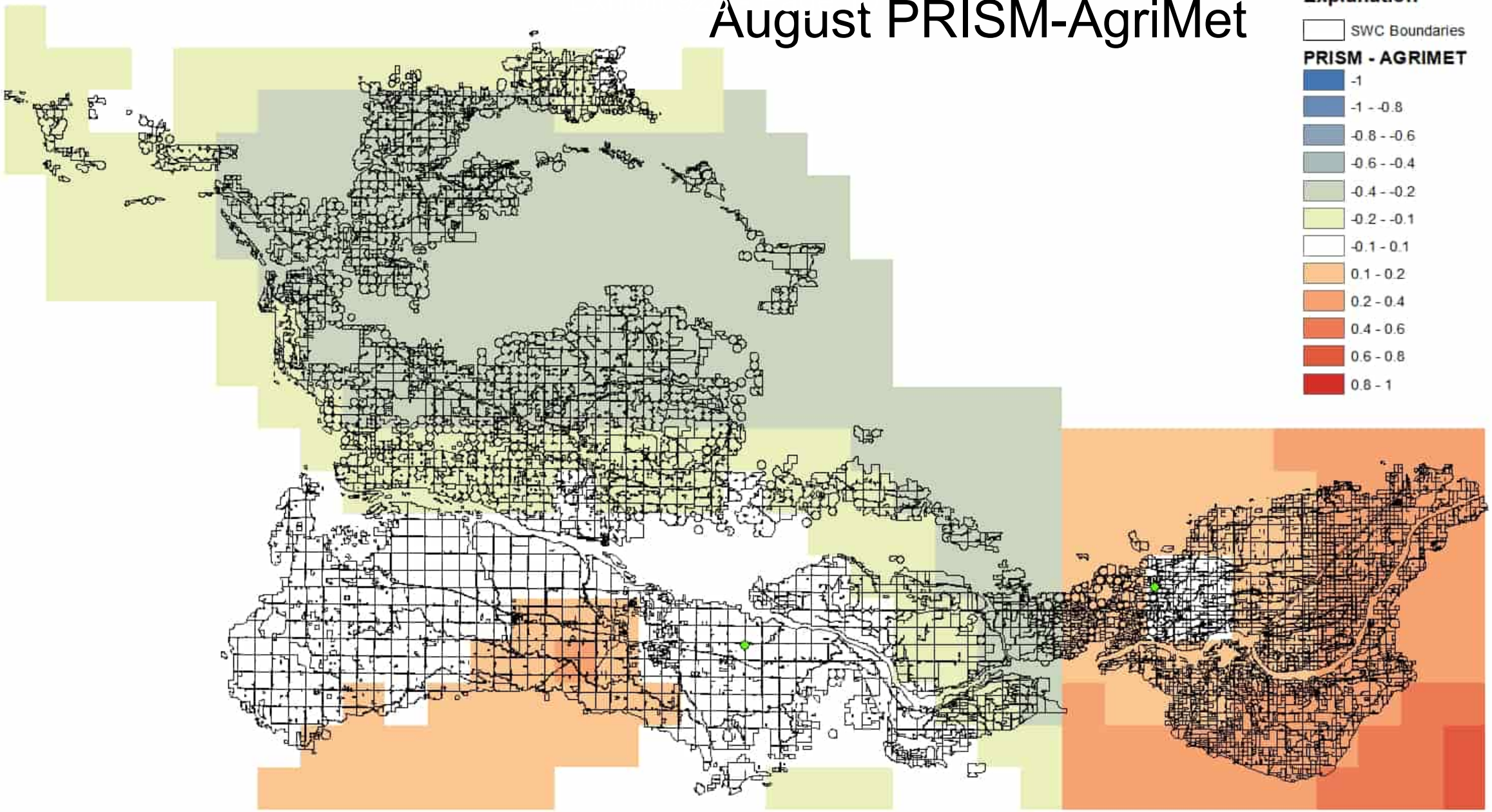
June PRISM-AgriMet



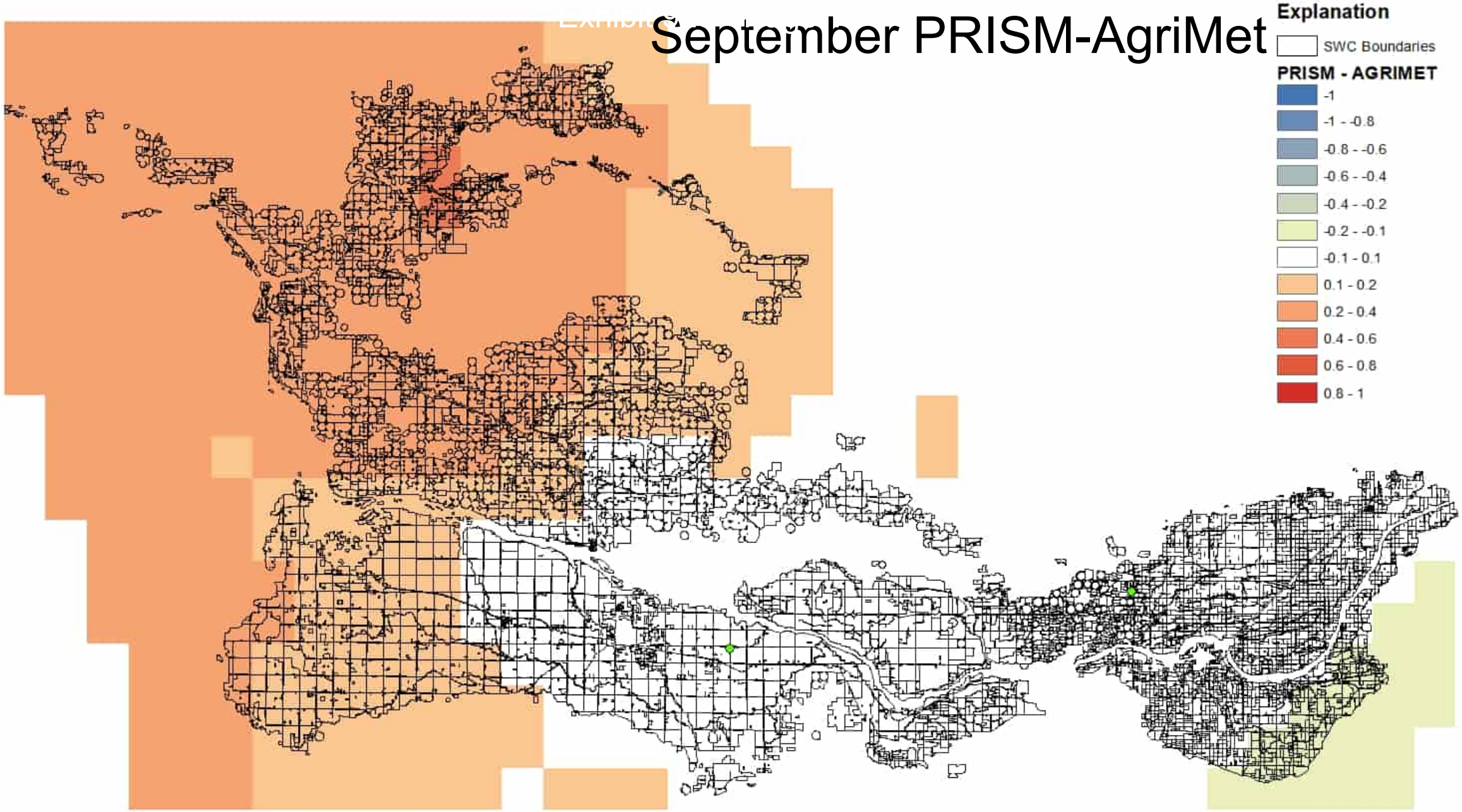
July PRISM-AgriMet



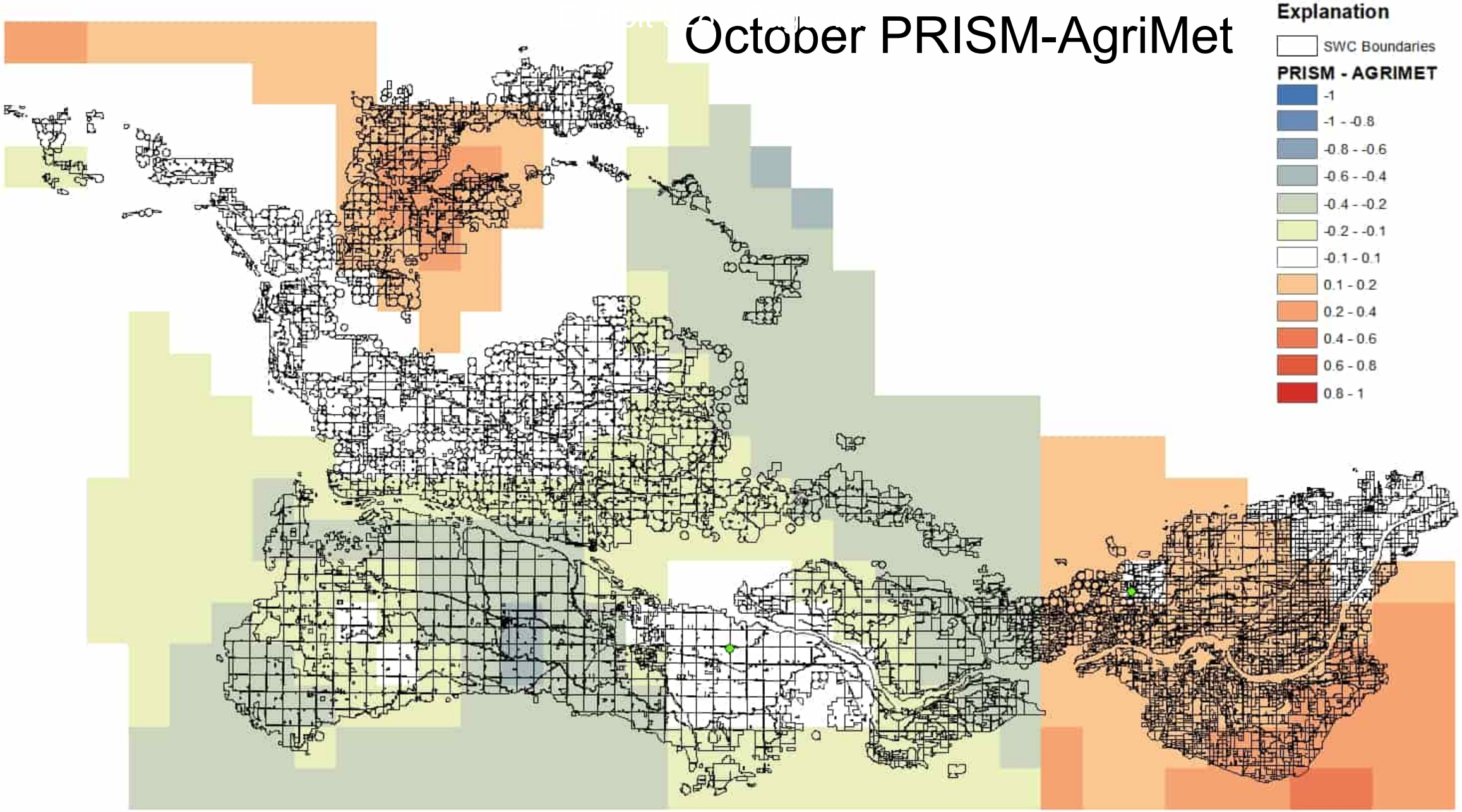
August PRISM-AgriMet



September PRISM-AgriMet



October PRISM-AgriMet



SWC Irrigated Acres

Current Method Crop Water Need

$CWN_{crop} = (ET_{crop}$- Effective Precipitation) * $Acres_{crop}$

- AgriMet ET
- Daily data from Rupert & Twin Falls stations.

- AgriMet Precipitation
- Daily data from Rupert & Twin Falls stations.
- Calculate monthly effective precipitation.

- USDA Crop Data Layer (CDL)
- Remove data speckling and assign the majority crop in each polygon.
- ~~Remove non-irrigated land from CDL using the IDWR Irrigated Lands Dataset.~~
- Clip CDL to SWC service areas.
- Determine the 3-year average crop mix percentage
- Acres of Each Crop = Crop Mix % * Acres From Methodology

Proposed Method NRT METRIC Crop Water Need

CWN = (ET - Effective Precipitation) * Acres

- NRT METRIC
- Remove non-irrigated land
- Normalize “ET – Effective Precipitation” to AF/Acre for each SWC member

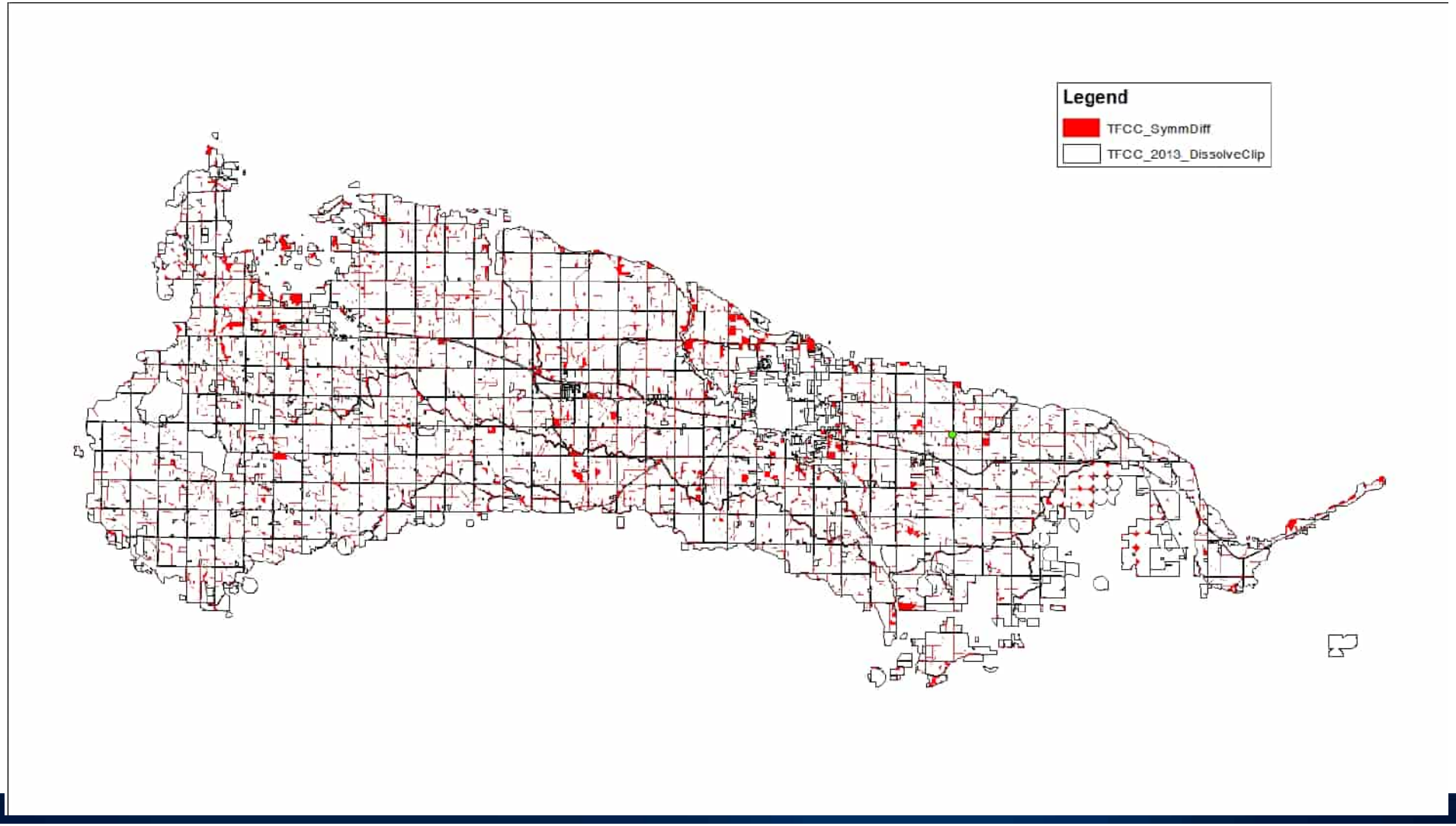
- Irrigated acres from methodology

- Oregon State University Prism Precipitation
- Calculate monthly effective precipitation

SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	CDL Processing Acres (2021)	NRT METRIC Processing Acres (2021)	Methodology Acres
A&B	PPU	2010	21,976	22,025	21,625	15,924
AFRD2	PPU	2010	69,279	69,105	68,384	62,361
Burley	SWC	2013	46,035	46,167	44,139	46,035
Milner	PPU	2010	14,844	13,302	13,233	13,335
Minidoka	SWC	2022	75,340	75,136	71,073	75,340
NSCC	PPU	2010	224,463	224,684	220,937	154,067
TFCC	SWC	2013	194,732	195,342	179,456	194,732

Example – Non-Irrigated Acres Removed From TFCC



Methodology Reference

- Irrigated Acres (Page 35 of Methodology)
  - Step 1:
    - Department staff will review submitted shapefiles and modify them as necessary to ensure that:
      - (1) the total acreage count does not exceed the decreed number of acres;
      - (2) all of the irrigated land is located within the decreed place of use; and
      - (3) acres are not counted more than once due to overlapping polygons within a shapefile or between shapefiles submitted by different SWC members.
    - Because the SWC members can best determine the irrigated acres within their service area, the SWC should be responsible for submitting the information to the Department.
      - If this information is not timely submitted, the Department will determine the total irrigated acres based upon past cropping patterns and current satellite and/or aerial imagery.
      - If a SWC member fails or refuses to identify the number of irrigated acres within its service area by April 1, the Department will be cautious about recognizing acres as being irrigated if there is uncertainty about whether the acres are or will be irrigated during the upcoming irrigation season.

SWC Irrigated Acres

SWC Member	Created by SWC or IDWR PPU	Date of Shapefile	Shapefile Acres	If Remove Non-Irrigated Acres with 2011 Irrigated lands Dataset	If Remove Non-Irrigated Acres with 2017 Irrigated lands Dataset	Methodology Acres
A&B	PPU	2010	21,976	21,585	21,634	15,924
AFRD2	PPU	2010	69,279	68,368	66,606	62,361
Burley	SWC	2013	46,035	44,113	44,168	46,035
Milner	PPU	2010	14,844	13,239	13,202	13,335
Minidoka	SWC	2022	75,340	71,295	72,016	75,340
NSCC	PPU	2010	224,463	220,953	218,498	154,067
TFCC	SWC	2013	194,732	179,486	180,956	194,732

SWC Irrigated Acres

- IDWR Irrigated Lands Datasets
  - 2010-2017
  - 2021 complete in 2024?

Questions?

(208) 287-4816
ethan.geisler@idwr.idaho.gov

(208) 287-4937
kara.ferguson@idwr.Idaho.gov

(208) 287-4932
matthew.anders@idwr.Idaho.gov

SWC Methodology Acres

Year	SWC Member	Acres	Source
2022	A&B*	15,924	SRBA Partial Decree
2022	AFRD2	62,361	SRBA Partial Decree
2022	BID	46,035	2013 SWC shapefile
2022	Milner	13,335	SRBA Partial Decree
2022	Minidoka	75,340	2022 SWC shapefile
2022	NSCC	154,067	SRBA Partial Decree
2022	TFCC	194,732	2013 SWC shapefile

* A&B acres include:

- 1-14 =14637 acres
- Beneficial Use claims (1-10237, 1-10238, 1-10239, 1-10240) = 111.7
- Enlargement (1-10225, 1-10241) = 1175.2

Pacific Northwest Project
Technical Information Memorandum



DATE: May 30, 2023

TO: Mr. Gary Spackman, Director, IDWR
SE Idaho Groundwater District Boards-Managers

FROM: Darryll Olsen, Ph.D., Pacific NW Project*

SUBJECT: Supplemental Technical Memorandum for:
Policy White Paper Review for Economic Impacts Surrounding Water Right-Water Supply Restrictions to Groundwater Appropriators, Irrigation Sector Operations

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Given the pending decisions affecting groundwater and surface-water irrigation allocations in South-East Idaho, the Pacific NW Project is providing supplemental information to the initial Policy White Paper (January 2023), further highlighting key economic impacts associated with water right-water supply curtailments/regulations affecting groundwater irrigators (see attached Table 1).

This information should better inform water managers. the IWRD Director, Gov. Brad Little, Idaho legislators, and other key parties (including the media/press) about the probable economic impacts affecting water supply curtailments to South-East Idaho groundwater pumpers with junior appropriation water rights. At best, the economic impacts should be viewed as the assets at risk to Idaho and the five-county study area.

The IDWR is taking a very cautious approach to protecting surface water right allocations;[1] so being, an equally cautious approach to recognizing, and appreciating, probable economic impacts to groundwater allocations restrictions should be employed as well. The regional/state economic impacts are very real, and they provoke the need to call for a workable course of action to deal with both groundwater and surface-water irrigation needs.

This Technical Memorandum raises the following questions:

1. What is the significance of Irrigated Agriculture or the Irrigated Agriculture Industry in Idaho and the primary project area?

3030 W. Clearwater, Ste. 205-A, Kennewick, WA
509-783-1623, DOlsenEcon@aol.com

[1] The IDWR relies on judicial/cultural review of definitions for "material injury" and "reasonable use" to formulate its initial 2023 water allocation rule. While the approach retains justification, it does not bar discretionary decisions by the IDWR Director. Current above average flow conditions could be given greater deference in determining the difference between a "material injury" versus an "empirical injury," where reduced water supply impacts cannot be physically observed on the ground.

2. What does the current water supply situation in SE Idaho suggest (per Table 2 attached)?

3. How is "material injury" to senior water rights considered versus "empirical injury?" What does this mean for the current decision-making situation?

4. What types of economic impact measures and methods are used in this Technical Memorandum and the White Paper?

5. How are irrigated acreage impacts derived? What does this mean in terms of curtailed groundwater acres relative to surface supplies, acre-ft. and acres?

6. What does the economic impact analysis indicate affecting household income, revealed as direct and secondary (regional impacts)?

7. How should near-term versus long-term economic impacts be best understood?

8. What about water resources policy? What can the director do or consider given legal and conventional water resources management rules?

9. If *empirical impacts* are highly improbable, or difficult to measure, should that factor be given consideration by the IDWR director in determining reasonable protection for senior appropriator water rights? Does the weight of the probable economic impacts further support a "do no harm" approach?

10. The White Paper speaks to "internal" and "external" factors affecting groundwater and surface-water allocation conflicts in SE Idaho. What does this mean?

*Principal Investigator:

Darryll Olsen, Ph.D., Regional Planner/Resource Economist.

- About 35 years of experience preparing/directing all types of water resources economic impact projects and policy issues (Western U.S.).
- Principal economist for Argonne National Laboratory-FERC water resources project evaluations—hydro power, NED and RED impacts.
- Extensive economic evaluation work with Utah Dept. of Water Resources, water supply delivery projects; including water right change/transfers.
- Board Representative for Columbia-Snake River Irrigators Association; lead economic, technical, legislative, and litigation projects.
- Board Director, Badger Mt. Irrigation District (Ag. Irrigation, Domestic Irrigation-Household Water Service).
- Principal Author, RCW 90.80, Water Conservancy Boards in WA State; evaluated and/or approved hundreds of water right changes/transfers.
- Contributing Author, RCW 90.90, Columbia R. Basin Water Supply Act.

Table 1. Estimated Household Income Impacts—State and Subject Area for Irrigated Agriculture, 2021$, with Junior Water Rights Curtailment, At Risk Acres in Primary Southeast Idaho Area

Economic Sector	Direct Impacts	Estimated Irrigated Ag. %	Adjusted Direct Sector Values	Secondary* Income Adjusted Multiplier**	Direct & Secondary Total Impact Area
Idaho					
Farm Production	$1,699,000,000	85%	$1,444,150,000	1.5	$2,166,225,000
Ag. Services	$426,178,000	80%	$340,942,400	1.3	$443,225,000
Food Processing	$1,508,185,000	85%	$1,281,957,250	3.3	$4,230,459,000
State Total Impact:	**$3,633,363,000**	------	**$3,067,049,650**	**2.2**	**$6,839,909,000**
Bingham Co.					
Farm Production	$48,489,000	90%	$43,640,100	1.5	$65,460,000
Ag. Services	$30,467,000	90%	$27,420,300	1.25	$34,275,000
Food Processing	$72,221,000	90%	$64,998,900	2.9	$188,497,000
County Total Impact:	**$151,177,000**	------	**$136,059,300**	**2.1**	**$288,232,000**
Bonneville Co.					
Farm Production	$34,279,000	90%	$30,851,100	1.5	$46,277,000
Ag. Services	$10,367,000	90%	$9,330,300	1.25	$11,663,000
Food Processing	$197,406,000	92%	$181,613,520	2.9	$526,679,000
County Total Impact:	**$242,052,000**	------	**$221,794,920**	**2.6**	**$584,619,000**
Clark Co.					
Farm Production	$2,000,000	75%	$1,500,000	1.5	$2,250,000
Ag. Services	$1,000,000	75%	$750,000	1.25	$937,500
Food Processing	$100,000	75%	$75,000	2.9	$217,500
County Total Impact:	**$3,100,000**	------	**$2,325,000**	**1.6**	**$3,405,000**
Jefferson Co.					
Farm Production	$22,300,000	90%	$20,070,000	1.5	$30,105,000
Ag. Services	$21,888,000	90%	$19,699,200	1.25	$24,624,000
Food Processing	$56,752,000	92%	$52,211,840	2.9	$151,414,000
County Total Impact:	**$100,940,000**	------	**$91,981,040**	**2.2**	**$206,143,000**
Power Co.					
Farm Production	$37,219,000	90%	$33,497,100	1.5	$50,246,000
Ag. Services	$11,128,000	90%	$10,015,200	1.25	$12,519,000
Food Processing+	$40,000,000	92%	$36,800,000	2.9	$106,720,000
County Total Impact:	**$88,347,000**	------	**$80,312,300**	**2.1**	**$169,485,000**
Total Multi-County:	**$585,616,000**		**$532,472,560**	**2.4**	**$1,252,000,000**

Estimated annual household income impact for Multi-County Area: About $1,500/irrigated acre, crop/pasture.
Estimated annual household income for impact of 150,000 acres multi-county impacts: $225,000,000.
Estimated annual household income for impact of 400,000 acres multi-county impacts: $600,000,000.

* Secondary or regional impacts include indirect and induced impacts, associated with direct sector production inputs (inter-sector purchases throughout the regional economy) and related purchases from community services.

** Bureau of Economic Analysis (BEA) RIMS II economic sector multipliers have been adjusted to avoid inter-sector double counting of of income streams (production revenues). Adjustments made by Pacific NW Project.

+ Food processing sector data for Power County are a "place holder" estimate to avoid IRS disclosure issues; it may be a conservative estimate.

Sources:

White Paper (January 2023) data, tables, and methodology and sources cited therein; see attached White Paper.
U.S. Bureau of Economic Analysis (BEA), Regional and Local Data Bases and Apps., multiple data bases for state and county NAICS sector data, for 2021 (2022). Household income data includes farm proprietor, labor income, agricultural services, and food processing. Generally cited under "BEAR Facts" data bases and apps (multiple BEA website locations, updated annually; detailed regional multipliers prepared for the state and five-county primary subject area by BEA I-O modelers, May 2023; review of NASS Idaho State Agricultural Data, 2022 (National Agricultural Statistics Service).

NOTE: Food processing sector for Power County is a "place holder" estimate to avoid IRS disclosure issues; some corporate income is included in the state-county areas. Main access site initiated at: https://apps.bea.gov/regional/bearfacts/, and sites referenced therein (includes state GDP and household income and employment estimates).

Table 2
Northwest River Forecast Center, Water Supply Forecast, Snake River Control Points
April-September Forecast Flows-KAF: May 27, 2023.

Control-Monitoring Point	KAF Probability of Average Flows (50%)	KAF Probability of 90% Exceedence of Low Flows	Low vs Average Flows Difference KAF
Near Heise ID--April-Sept*			
5-13-2023	4,107	3,999	108
	107% of Ave.		
Near Shelley ID--April-Sept			
5-13-2023**	5,289	5,087	202
	108% of Ave.		
American Falls Dam--April-Sept			
5-13-2023	3,179	2,977	202
	121% of Ave.		
King Hill--April-Sept			
5-13-2023	2,793	2,667	126
	82% of Ave.		
Swan Falls--April-Sept			
5-13-2023	2,996	2,874	122
Estimated Difference Between Shelly and King Hill--KAF	2,496	2,420	76

IDWR April 2023 Forecast, April-July 2023

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	BLY 2018	Shortfall
A&B	14,833	135,411		150,244	64,192	0
AFRD2	115,223	387,853	1,000	504,076	453,890	0
BID	109,313	221,713	5,130	336,156	262,211	0
Milner	18,347	88,047		106,393	58,417	0
Minidoka	156,468	342,620	8,370	507,458	354,851	0
NSCC	457,802	819,773	-7,750	1,269,825	1,026,661	0
TFCC	820,663	232,606	-6,750	1,046,519	1,121,717	75,200
			Total Projected Demand Shortfall (AF)			75,200

*** Estimated volume flows Near Heise at 4,107, for the April-Sept period, 107% of average flows are estimated.**

Sources: NOAA, Northwest River Forecast Center, Water Supply Forecast Listing, 5-27-2023; IDWR, Flows Forecast April 1, 2023.

Observations:

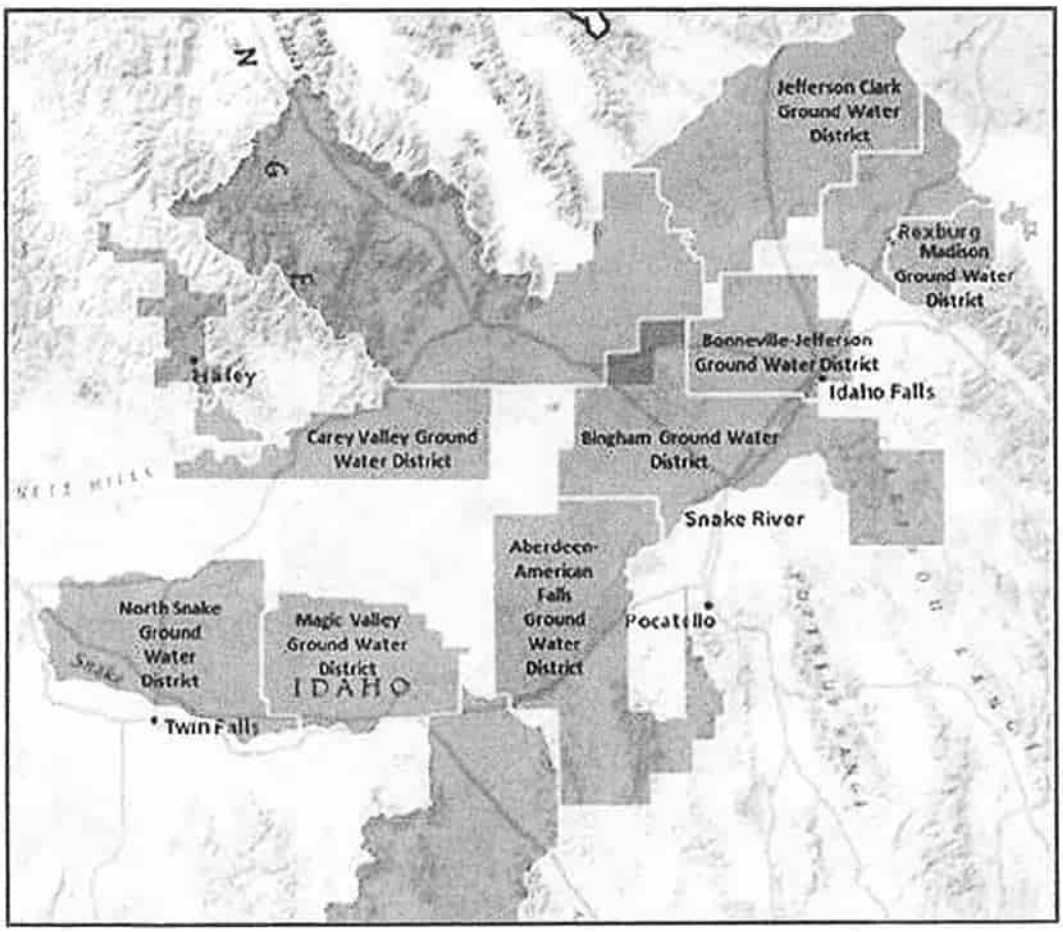
1) The estimated acre-ft./acre water demand/use for the Twin Fall Canal Company at 5.76 act-ft./acre, Total Supply, with forecast supply at 5.37 acre-ft./acre. Total irrigated acres are about 194,732.

This suggests that 3.5 acre-ft./acre could be net crop consumptive use, with 2.26 acre-ft./acre applied to carriage use/loss with some return flows; or about 40% of total dedicated supply demand.

2) For conversion to groundwater curtailment levels, it requires approximately 3 acre-ft./acre to supply 1 acre-ft. at TFCC. Conversion/impact rate is still under review for the Snake River Plain Acquifer.

Southeastern Idaho Water Resources Management Impacts

Surface-Groundwater Irrigation Demands



A Policy White Paper Review

Prepared By
Darryll Olsen, Ph.D.
Pacific Northwest Project

Prepared For:
Bingham Groundwater District
January 2023

In Summary

1. Idaho's Irrigated Agriculture Industry—Cannot be Replaced.

Idaho's Irrigated Agriculture Industry—composed of direct agricultural production, agricultural services, and food processing—sustains valuable regional, national, and international markets. It is a benchmark for agricultural producers throughout the world. State political leaders should appreciate that loss of any part of it cannot be replaced.

2. Irrigation Water Supply—the Big Picture.

Idaho's Irrigated Agriculture Industry does not exist in a geographical vacuum. Western Industry assets and the Irrigated Agriculture Industry are facing unprecedented water supply challenges. This is being exacerbated by climate change impacts, turning important Industry producers into *climate change refugees*. The Pacific Northwest retains a relatively stable water supply.

3. Surface and Groundwater Conflicts in Southeastern Idaho.

The water supply conflicts in Southeastern Idaho have evolved after decades of successful Industry growth. Conflict has revolved around changing conjunctive surface and groundwater supplies strained by increasing demands, and long-term drought. Without implementing new water management options, 150,000 acres of irrigated land will be in jeopardy.

4. Idaho's Irrigated Agriculture Industry—How Valuable Are We?

a. Idaho's Irrigated Agriculture Industry relies on about 3.4 million acres, with a farmgate value of about $6.4 billion.

b. The five-county Focus Area (Bingham, Bonneville, Clark, Jefferson, and Power counties), consists of about 843,000 acres, with a farmgate value of about $1.1 billion. "Target acres" within the Focus Area represents about 150,000 acres.

c. The statewide Industry provides about $8.8 billion in total, annual household income.

d. The Focus Area creates about $1.1 to $1.6 billion in total household income (regional-statewide impacts).

e. The irrigated land market value for 150,000 acres is about $862,000,000 to $1.7 billion, generating about $15-30 million in property tax revenues.

f. The loss of 150,000 acres would reduce household income by about $268 million.

5. Reducing Conflict—Action Items for the Idaho Legislature and Executive Office.

a. Pragmatic institutional, operational, and infrastructure measures—do exist.

b. State funding role—provide a 10-year "fixed" program for $175 million, for enhanced water management in the Focus Area.

6. Final Thoughts.

Southeastern Idaho's long-standing surface-groundwater conflict is best resolved by the state's Irrigated Agriculture Industry. Otherwise, less sympathetic interests will enter the picture.

Southeastern Idaho Water Resources Management Impacts
Surface-Groundwater Irrigation Demands

1. Idaho's Irrigated Agriculture Industry—Cannot be Replaced.

Idaho's Irrigated Agriculture Industry ("Industry") is composed of direct irrigated agriculture production, agricultural services, and food processing sectors. It has been developed across the span of three centuries, and it sustains regional, national, and international markets. It is a benchmark for agricultural producers throughout the world. State political leaders should embrace the reality that it cannot be replaced; nor should it be taunted by avoidable risks.

The pressing concern is on the Eastern Snake Plain Aquifer (ESPA) Area, where four of the groundwater districts are most directly affected, along with surface water irrigators who are part of the conjunctive water use, water supply regime (see Figures-Maps 1, 2, and 3 attached).[1]

For Idaho's elected leadership, three important factors should be better understood:

1) Climate change has significantly added to state water resources problems; and it has forced a future generation of Western production agriculture to turn toward the Pacific Northwest. This has some potential opportunities for the region and state.

2) The economic impact to the Southeastern Idaho Region is highly significant. Its prevalence should be respected, not taken as a given.

3) All pragmatic management measures must be employed to avoid a 150,000-acre plus impact to either surface or groundwater irrigators. The economic magnitude of such a predicament should make political leaders' heads spin.

So, a complex set of economic, technical, and ecological factors beg the questions of what can local water resources managers and state political leaders do to bring about pragmatic water supply-delivery management actions, and to what extent should state leadership accept fiscal responsibility to keep Idaho's Irrigated Agriculture Industry from being diminished?

Answering the technical question may require some realization that cultural change and new mindsets may bring benefits for all parties concerned. A second question suggests that a realistic fiscal criterion should be adopted to justify legislative decisions to allocate capital budget funds.

2. Irrigation Water Supply—the Big Picture.

Idaho's Irrigated Agriculture Industry does not exist in a vacuum.

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[1] The American-Falls-Aberdeen, Bingham, Bonneville-Jefferson, and Jeferson-Clark Districts; with key counties being Bingham, Bonneville, Clark, Jefferson, and Power.
Also see attached Figure-Maps 1, 2, and 3.

Western irrigation assets and the Irrigated Agriculture Industry are facing unprecedented water supply challenges, reflecting changing water demands and dwindling supplies. For better or worse, elected officials are now making "hard" predictions regarding what to expect from climate change in key agricultural regions.[2] This includes forecast changes in much of California, the Colorado River system, and within the Greater Columbia-Snake River Basin area.[3]

This change means Western Industry asset decisions must embrace that climate change is becoming an inalterable reality, and each Western sub-region embodies a different set of risks affected by increasing climate change trends. To some degree, water supply uncertainty can be reasonably understood among the different regions, and industry managers are now formulating future action plans.[4]

So, what does this mean, more specifically, for the situation in Idaho and the Eastern Snake Plain Aquifer (ESPA) Area?

There are both direct water supply-aquifer recharge impacts, and the increasing Western Industry desire to leave highly water-stressed regions in California and literally seek refuge in all parts of the Pacific Northwest. The first constraint is empirically internal to Southeastern Idaho—how should declining surface-groundwater supplies to be allocated, or managed? This is an added complication to a well-known dilemma.

The second concern is external in origin. The irrigation sector *climate change refugees* see a future—in Idaho, Oregon, and Washington. They are actively surveying the Greater Columbia-Snake River systems, seeking available water supplies—for their long-term future. This should not be necessarily perceived as a "threat" for the Industry, given more capital, joint ventures, and market outlets may be offered to Idaho irrigators.

3. Surface and Groundwater Conflicts in Southeastern Idaho.

Keep in mind that water supply conflicts in Southeastern Idaho represent decades of successful Irrigated Agriculture Industry growth. The Industry, and political leaders, should not lose sight of that fact.

The technical issue surrounds surface-groundwater conjunctive use along the Eastern Snake Plain Aquifer Area, stretching westward from the far corner of Southeastern Idaho to the Magic Valley Region (see Figure-Map 3 attached). Since the 1950s, groundwater pumping has operated with surface water diversions. Aquifer recharge has been, and is, derived from surface water flows

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[2] Such as, recent changes to reallocate the Colorado River system, significantly requiring water "conservation" actions in major irrigated agriculture regions like the Imperial Valley and Central Valley (CA). In effect, the Colorado Compact has been (is being) renegotiated.

[3] U.S. Bureau of Reclamation, USBR SECURE Water Availability in the West, U.S. Dept. of the Interior, WA-DC, January 2021; Bonneville Power Administration, BPA RMJOC-II Report, 2018; Office of Columbia River, Ecology, "Long-Term Water Supply and Demand Forecast," Olympia, WA, August 2022.

[4] This situation has been best characterized by Columbia-Snake River Irrigators association (CSRIA), "A White Paper Review, Climate Change and Western Irrigation Assets," August 2022, Kennewick, WA.

from the Upper Snake River system, from tributary seepage, and incidental recharge from surface water conveyance systems. The surface water flows are protected as senior water rights, whereas the groundwater flows depend on more junior vintage rights. The groundwater "return flows" re-enter the Snake River, where it is used by surface water irrigators in the Magic Valley Region (see Figure-Map 3).

The most immediate Snake River reach area being affected by groundwater pumping is north of American Falls Reservoir, including the five-county Focus Area. Significant groundwater development began in the early 1950s, continuing until a moratorium in 1992. Through the 1980s, when roughly 90% of the groundwater irrigation had been developed, the river reach gains and aquifer levels held steady, peaking in 1985. Extended drought periods in the 1990s and 2000s led to rapid declines, but readjusted to a reduced level since 2010, with varying fluctuation following precipitation trends (see attached Figure 4). This condition brings a great deal of uncertainty for irrigators.

Both surface and groundwater managers now struggle to meet the demands of our prosperous Irrigated Agriculture Industry; the struggle coincides with low system operating budgets and the need for technological improvements to water delivery and application infrastructure. Opportunities to make better use of river flows to conserve groundwater exist, but infrastructure and management changes are fiscally out of reach for most surface water systems. Given the increasing severity of water supply shortages and the implementation time line for new infrastructure and management regimes, action needs to be immediately initiated. The public benefit from improved water resources management more than justifies an investment of public funds to expedite technological adoption, as is occurring throughout the west.

4. Idaho's Irrigated Agriculture Industry—How Valuable Are We?

The "Irrigated Agriculture Industry" depicts the direct agricultural production, agricultural services, and food processing sectors of the state and regional economies. These sectors are the economic engine of irrigated agriculture, affecting numerous other economic sectors; collectively, the sectors are the direct impact sectors, with indirect and induced impacts throughout the state and regional economies.

Economists and regional planners use various measures of economic activity to express the significance of industries or projects to an economy. For this White Paper, the preference is to target the value of the Irrigated Agriculture Industry in terms of state and regional household income; the regional income based on county income data attached to the irrigation acres, and further tied to estimates of irrigated acres that could be at greater risk for either surface water or groundwater sources.

Attached is the detailed Analysis Methodology applied to derive reliable estimates for making decisions affecting the surface and groundwater resources for the Southeastern Idaho Region under review here. Also attached are the more detailed analysis tables used to calculate the allocated irrigation production and resulting household income (Table 1 and 2).

The first step is to define irrigated agriculture production values.[5]

a. Direct Farmgate Production Value:

- At the state level, irrigated acres reside across 3.4 million acres.
- The direct farmgate production value is about $6.4 billion.
- At the multi-county level, about 843,000 irrigated acres are farmed.[6]
- This comprises about $1.1 billion of direct production value.

The second step is to estimate household income values (2020$):

b. State and Regional Annual Household Income:

- The statewide Industry provides about $3.5 billion in direct household income.
- Including all direct and secondary (indirect-induced) impacts, about $8.8 billion in household income is generated.
- At the multi-county level, the direct Industry income impact is about $624 million.
- Total regional income created is about $1.3 to $1.6 billion with an estimated regional to statewide impact range.
- The 150,000 target acres provide about $233-$291 million in household income. This could be attributable to either surface or groundwater acres (or both).

Another economic impact consideration is to estimate irrigated land values within the Focus Area. While it may be asserted that changes to land use could actually increase some land values, this is done at the expense of removing irrigated acres, losing a portion of this land value sector.

c. Land Market Value:

- The land market value within the multi-county area, for a targeted 150,000 irrigated acres is about $862 million to $1.7 billion, largely depending on whether land is distressed (lacks adequate irrigation water). This estimate also attempts to avoid irrigated lands that are in the "path" of new residential/commercial development.
- The market range accepted is about $10,500-$16,500 per acre, with an "index" value set at $11,500 per acre.

d. County Property Taxes:

- Irrigated property taxes reflect multiple assessment factors and outlay obligations. Based on an average weighted value for the counties, for the Focus counties, a range of about $15-30 million is estimated, for 150,000 acres (many assumptions at play).

So, the above economic value estimates, or impact measures, undeniable affirm the high impact of the Industry to the Focus Area and targeted irrigated acres at risk. No small deal.

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[5] The production value for U.S. agricultures has varied widely during the past decade, see Figure 2 attached.

[6] The groundwater water Focus Area here is Bingham, Bonneville, Clark, Jefferson, and Power counties.

5. Reducing Conflict—Action Items for the Idaho Legislature and Executive Office.

State legislators and the Executive Office are no strangers to difficult economic and social issues. Their constituents are often eager to throw to them seemingly intractable problems. Some may argue that the situation cannot be successfully resolved. But that is not the case.

a. Administrative and Infrastructure and Management.

- The state of Idaho retains a relatively benevolent water code, where loss of water rights (relinquishment) can be avoided under conservation actions, water right leases for change/transfers, and water right mitigation measures. This may involve changing some cultural norms, but it does not involve loss of water rights or water access to effectively farm crops.

- Even more important, the Director of the Idaho Department of Water Resources (IDWR) wants to work with the Industry, not against it, to reach satisfactory solutions.

- The surface and groundwater right irrigators *still have* a viable list of operational measures that can be employed to improve water distribution system management and on-farm water application efficiencies. This is fortunate.

b. How Much Should the Legislature (and Irrigators) Spend?

- The legislature, and junior water right holders, should assume fiscal responsibility for meeting new water management objectives. It could be argued that several hundred-of-millions of dollars in land values are on the table, and that should influence what is deemed to be acceptable to spend. It sets a higher range bar to judge the value of expenditures.

- Establishing a "fixed" time horizon for implementing a plan is very important. Senior and junior water right holders cannot "horse around" with uncertainty. That timeline and task protocol schedule must be determined soon, and religiously held firm.

- A recommendation needs to be made. It would be appropriate to establish a ten-year implementation schedule, with a $175 million budget, for varying appropriations each year. The $175 million is approximately one-tenth of the land market values within the five-county area.

- Improved distribution system management should be a priority in the stressed river reaches of most direct need—specifically in the areas north of American Falls.

6. Final Thoughts.

The long-standing water supply issue in Southeastern Idaho needs to be settled by Idaho's Irrigated Agriculture Industry, before others enter the picture.

Western water law is under siege by interests that are unsympathetic to irrigated agriculture. Across the Western U.S., cries for greater regulatory intervention are being made by frustrated or bias state regulators, environmental groups, and Tribes. Even some irrigators are turning to courts to comply with, or modify, earlier vintage water supply agreements that can no longer survive under the effects of climate change or sustained irrigation water demands. And Idaho is no stranger to calls for added fish flows from Endangered Species Act (BiOp) inriver, fish flow targets.

Some of the regulatory and statutory proposals call for a complete overhaul of state water rights, management, and regulation. Even from the University of Utah College of Law, comes a call for re-adjudicating existing water rights, to give priority to socio-ecological "needs." In Washington, the state's water management authority has proposed legislative recommendations, to restrict measures for water right change/transfers and marketing that do not address environmental justice and social equity issues (as defined by the state). This has been coined "Critical Water Theory," where all state administrative actions constrict or uncritically control water rights, particularly those in private sector hands.[7]

Idaho is unique in that junior and senior water right holders have usually sought a high level of collaboration, and they are working with a state water management agency that clearly wants to resolve problems for the Irrigated Agriculture Industry.[8] This period of grace may be short-lived, and a reasoned mindset may fade away or be disrupted by others.

[7] University of Utah, S.J. Quinney College of Law, "Climate Change and Water Law Scholarship," Utah Law Digital Commons, 2020; Water Resources Program, Ecology, "Trust, Transfers, and Water Banking Legislative Report," Draft Recommendations, August-September 2022, Olympia, WA.

[8] Some point to the Yakima River Basin, WA, Yakima Integrated Plan (YIP), as a "model" of collaboration. But most improvements to date are "ecological" in nature, and the most significant water supply mitigation for irrigators has come from direct irrigator development of access to "dead storage" in the upper basin. The overall YIP is multidecadal in structure and costs billions of dollars.

ATTACHMENTS

1. Analysis Methodology for State-Regional Irrigated Agriculture Industry Household Income Impacts.

2. Table 1. Estimated Farmgate Production Value.

3. Table 2. Estimated Household Income Impacts.

4. Table 3. Estimated Markey Irrigated Land Values and Property Tax Values.

5. Figure 1. Groundwater Focus Districts.

6. Figure-Map 2. Easter Snake Plain Aquifer Area-1.

7. Figure-Map 3. Eastern Snake Plain Aquifer Area-2.

8. Figure 4. Climate Analysis for Blackfoot-Neeley Reach Gain/loss.

9. Figure 5. Agricultural Production Prices Received and Costs Index.

Analysis Methodology for State-Regional Irrigated Agriculture Industry Household Income Impacts[9]

There exist ample data and modeling experience to analyze the impacts of Irrigated Agriculture to the state and regional economies. The basic approach used in this White Paper is to determine income impacts relying on: 1) Agricultural Census-NASS and Economic Research Service data; 2) U.S. Bureau of Economic Analysis (BEA) data sets for income by place of use and detailed sectors; and 3) available state and regional input-output and IMPLAN model multipliers for the Irrigated Agriculture Industry (agricultural production, agricultural services, and food process sectors).

While several descriptive, irrigation/agricultural economic statistics are often cited, the Industry's contribution to household income is rarely expressed in total household income impacts at either the state or regional level. This type of estimate requires estimating the allocation of direct production to irrigated agriculture, and the use of input-output analysis multipliers (usually) to estimate aggregated industry sector secondary impacts (direct, indirect, and induced impacts from the Industry). The resulting estimates likely fall within an acceptable range.[10]

In summary, the steps used to calculate household income from the Industry are described below:

- By state and county, total agricultural production values (2017-18) are obtained from the Ag. Census-NASS data, and Economic Research Service for annual data series (where available). These data sources breakdown crop/livestock production value contributions by commodities and specialty crops by state/county.

- The NASS data sources have data (20017-18) for irrigated acres by state and farms, with and without irrigated acreage. Irrigation includes pasture ground for beef/livestock.

- The U.S production value (crops and livestock) did not increase between 2017 and 2021. Since that time, aggregate production value increased by about 30% (see Figure 5).

- Using the above data and related state sources, estimates of production value by commodities and specialty crop, bay state and counties, are prepared, that are allocated to irrigation lands (both primary and secondary production). This includes crop/livestock production.

- The estimated production value percentages linked to irrigated agriculture must take into account dry-land versus irrigation production, where no irrigation is used. There are no

[9] Also see Table 2 footnotes and analysis comments.

[10] This White Paper represents the fourth time that the Pacific NW Project has estimated Western Irrigated Agriculture impacts, as generally described herein. Consequently, greater confidence in the methodology has been obtained over time, including revised data assumptions and receipt of peer review comments from public and private sector economists (per previous analysis); nevertheless, all assumptions or analytical errors are solely the responsibility of the Pacific NW Project. The numbers and analysis presented are perceived as providing decision makers with useful information for water resources management in Idaho.

direct irrigation production data to make precise estimates, so qualitative or judgment-based assumptions must be applied, taking into account state-regional production data and conditions. The estimated irrigation-production allocations are presented in Table 1.

- An estimated percent of production value allocated to irrigated agriculture then can be applied to household income created by agricultural production, agricultural services, and food processing sectors (see Table 2). The allocations are combined to derive direct household income to the state and region (counties). These estimates are highly reliable, based on BEA 2020 income data.

- Economic sector linkages among the agricultural production, agricultural services, and food processing sectors are relatively direct and uniform; as such, the application of the production value estimates to direct household income among the sectors is considered a reasonable estimate as well. In particular, higher levels of income derived from irrigated agriculture (versus non-irrigated agriculture) are expected, and the impacts to agricultural services and food processing are usually higher as well.

- Using input-output model (IMPLAN and state sources where available) multipliers for the state and select region, value added (and income) multipliers have been calculated for the combined economic sectors of the Irrigated Agriculture Industry. The multipliers are then applied to the direct income estimates (see Table 2 and discussion therein). In previous studies the multipliers used here reflect several years of estimation and review, and the overall approach has been previously discussed with IMPLAN modelers and other conversant with I/O applications.

- The direct and secondary linkages among the economic sectors are relatively stable over time, although efficiencies in production and newly developed production products will increase the multipliers impacts. As such, it could be assumed that the multiplier levels considered here (VA multipliers and household income estimates) may be conservative. Future estimates would benefit from new IMPLAN modeling work that may marginally change the impact estimates.

Table 1. Estimated Farmgate Production Value--Total and for Irrigated Agriculture, 2018

State	Market Value Crops	Market Value Livestock	Total $ Ag. Production	Estimated Acres Irrigated Land*	Market Est. Irr. Ag. %	Estimated $$ Irrigated Land*
Idaho/Crops**	$3,210,800,000	$4,356,600,000	$7,567,400,000	3,398,100	85%	$6,432,290,000
Potatoes				335,000		
Hay-Forage				1,510,000		
Sugar Beets				168,000		
All Corn				418,100		
All Cattle Nos.		2,435,100				
Inventory						
County/Crops**						
Bigham	$352,322,000	$100,822,000	$453,144,000	333,894	90%	$407,829,600
Potatoes				67,300		
Hay-Forage				92,700		
Sugar Beets				21,800		
All Corn				5,720		
All Cattle Nos.		97,760				
Inventory						
Bonneville	$110,833,000	$57,029,000	$167,862,000	131,620	90%	$151,075,800
Potatoes				NA		
Hay-Forage				21,600		
All Corn				NA		
All Cattle Nos.		58,100				
Inventory						
Clark	$19,233,000	$66,628,000	$85,861,000	31,600	75%	$64,395,750
Potatoes				NA		
Hay-Forage				12,500		
All Corn				NA		
All Cattle Nos.		8,130				
Inventory						
Jefferson	$172,865,000	$121,692,000	$294,557,000	198,300	90%	$265,101,300
Potatoes				31,000		
Hay-Forage				81,980		
All Corn				5,160		
All Cattle Nos.		84,800				
Inventory						
Power	$210,861,000	$24,581,000	$235,442,000	147,746	90%	$211,897,800
Potatoes				43,850		
Hay-Forage				11,300		
Sugar Beets				15,200		
All Corn				12,900		
All Cattle Nos.		27,500				
Inventory						
County						
Totals:	$866,114,000	$371,000,790	$1,236,866,000	843,160	89%	$1,100,810,740
Potatoes				142,150		
Hay-Forage				220,080		
Sugar Beets				37,000		
All Corn				18,060		
All Cattle Nos.		276,290				
Inventory						

* Includes irrigated pasture.
** Major crops considered for State/County production.

Sources: NASS, 2017 Census of Agriculture, State and County Data, Idaho; and NASS Statistical Highlight, IDA, 2020.
NASS: National Agricultural Statistics Service, Data Series for Idaho and Counties.

NOTE: Percentage estimate of market value tied primarily to irrigated agriculture (including cattle production) from Pacific Northwest Project. Assumes relatively small percentages of non-irrigated wheat-pasture, other.

Table 2. Estimated Household Income Impacts--Groundwater Subject Area for Irrigated Agriculture, 2020$.

State	Direct Impact Sectors: Farm Production	Ag Services	Food Processing	Total Ag. Industry	Est. Irr. Ag. %	Est. Irr. Ag.	Multiplier: Est. Income	Total Impact
Idaho	$2,354,384,000	$322,461,300	$1,446,332,000	$4,123,177,300	85%	$3,504,700,705	2.5	$8,761,752,000
		(70% Serv. Est.)						
County								County-Statewide
Bigham	$115,256,000	$24,251,500	$66,862,000	$206,369,500	90%	$175,414,080	2.1	$368,370,000
		(70% Serv. Est.)					2.5	$516,000,000
Bonneville	$60,781,000	NA	$198,521,000	$259,302,000	90%	$233,371,800	2.1	$490,080,780
							2.5	$583,430,000
Clark	$5,115,000	NA	$67,000	$5,182,000	75%	$3,886,500	1.8	$6,996,000
							2.0	$7,773,000
Jefferson	$47,772,000	$23,249,350	$54,942,000	$125,963,350	90%	$113,367,020	2.1	$238,070,700
		(95% Serv. Est.)					2.5	$283,417,550
Power	$68,193,000	$10,701,900	$30,000,000	$108,894,900	90%	$98,005,410	2.1	$205,811,300
		(90% Serv. Est.)					2.5	$245,013,500
								County-Statewide
TOTAL:	$297,117,000	$58,202,750	$350,392,000	$705,711,750	----	$624,044,810	----	$1,309,328,780
								$1,635,634,050

Estimated annual household income impact for Multi-County Area: $1,550/irrigated acre, crop and pasture.
Estimated annual household income impact for Statewide Area: $1,940/irrigated acre, crop and pasture.
Estimated annual household income for impact of 150,000 acres multi-county impacts: $232,500,000.
Estimated annual household income for impact of 150,000 acres state-wide impacts: $291,000,000.

U.S. Bureau of Economic Analysis (BEA), Regional and Local Data Bases and Apps, multiple data bases for state and county NAICS sector data, for 2020 (2022). Household income data includes farm proprietor, labor income, agricultural services, and food processing. Generally cited as "BEAR Facts" data bases and apps (multiple BEA web site locations, updated annually..

NOTE: Food processing sector for Power County is a "place holder" estimate to avoid IRS disclosure issues; some corporate income is included in the state-county areas. Main access site initiated at: https://apps.bea.gov/regional/bearfacts/, and sites referenced therein (includes state GDP and household income).

NOTE: Regional-state household income multipliers based on IMPLAN and state input-output modeling for multiple areas, including WA-ID-CA and the Columbia Basin areas focusing on Production Irrigated Agriculture industry (production agriculture, agricultural services, and food processing combined sectors). Multiple analyses where considered. The modeling runs were relying on 1998-2013 data; the intersector linkages remain relatively stable over time, as such the multiplier estimates used here are deemed reasonable for the needs of this Policy White Paper. We note that the concentration of food processing for the counties is high, and this sector retains higher multiplier values, than the production irrigated agriculture sector alone. We note as well that more recent impact analyses for irrigation manufacturing and services suggest higher range multipliers.

For IMPLAN modeling purposes, the above sectors are combined (direct impact), with indirect-induced impacts calculated from the joint sector modeling (Pacific Northwest Project approach). Previously working with IMPLAN group modeling staff and regional IMPLAN modeling economists, this review considered both income and value added (VA) multiplier use, recognizing structural differences. Nevertheless, the VA multiplier is applied here in an attempt to reflect the full household income impacts associated with labor income, all forms of proprietary income, and associated land income (rent), and taxes contributed to additional statewide income. In effect, all income. The U.S. BEA Regional Input-Output Modeling System, RIM II Guidebook, defines value added income as generated from compensation, payments to government (taxes), and investment returns--essentially all income impacts.

Regional impact sources include: Pacific Northwest Project, "The Economic Importance of Western Irrigated Agriculture, 2015," White Paper Review, Prepared for the Family Farm Alliance, Kennewick WA (available at CSRIA.org and FFA web site). Statewide VA multipliers in the 2.0 to 2.5 range.

Office of Financial Management/UW, "The 2012 Washington Input-Output Study," OFM-Olympia-WA, Forecasting & Research, 2021. Used by State of Washington for estimating biennial budget impacts, multipliers for agriculture and food processing (employment multipliers at 1.5-3.3, often associated with income multipliers).

Entrix, Inc., "Economic Contribution of Agriculture Irrigated by the Columbia Basin Project," Prepared for the Columbia Basin Irrigation Dists., 2010, Entrix, Inc, Vancouver, WA. Multi-County and Statewide VA multipliers in the 1.8 to 2.4 range (some multi-state "linkage" indicated).

Columbia-Snake River Irrigators Association/IRZ Consulting, "Economic Impacts from Irrigation Development, East-Low Canal, Columbia Basin Project," Prepared for Office of Columbia River-Adams County, CSRIA, Kennewick WA 2013. (Regional and Statewide VA multipliers in the 1.5 to 2.0 range.

Congressional Research Service, "California Agricultural Production and Water Use, CRS, WA-DC, 2015. Statewide employment multipliers estimated at 2.2, usually associated with income multipliers.

Minnesota IMPLAN Group, Inc., "2004-2007 WA State IMPLAN Modeling Data Multipliers Reports," MIG, Stillwater, MN, 2007. Agriculture and food processing VA multipliers in the 1.4 to 2.4 range, not including dairy processing.

Numerous technical articles on I/O Model multipliers, such as Irrigation Association, "Economic Impact of the Irrigation Services Industry," 2021, IA. National employment multipliers in the 2.3 range (usually associated with income multipliers).

IMPLAN Blog, Understanding IMPLAN Multipliers, 2020, IMPLAN, Blog.IMPLAN.com, and other regional economic impact articles on internet sites.

Table 3. Estimated Market Irrigated Land Values and Benchmark County Property Tax Values

County Area	Market Values for 2018-2022 Sales, $/Acre Estimated Range $	Est. Index Value	Focus Area Acres	Total Est. Value	Land Value 50% Imputed Use Value	Est. Tax Rate Per $100 Taxable Value	Est. County Tax Revenue @ 100%	Est. County Tax Revenue @ 50%
Multi-County Area	$10,500-16,500	$11,500 (weighted est.)	150,000	$1,725,000,000	$862,500,000	1.75%	$30,187,500	$15,093,750
Bigham						2.16%	—	—
Bonneville						4.60%	—	—
Clark						1.03%	—	—
Jefferson						1.63%	—	—
Power						2.21%	—	—
TOTAL:	$10,500-16,500	$11,500 (weighted est.)	150,000	$1,725,000,000	$862,500,000	1.75%	$30,187,500	$15,093,750

Estimated market value range indicates $10,150-16,500 per acre. Approximately 50 market transactions reviewed for the 2018-2022 period.
Irrigated transactions reviewed as land with some infrastructure included (irrigation, farm buildings), no residential structures.
Irrigated transactions reviewed as land not in development path of existing communities and commercial development (location proximity considered).
Estimated irrigated land values above assume adequate crop water duties; index value should be considered relatively conservative estimate, given active demand for agricultural lands (for various production needs).

Sources include: Idaho Land Sales & Prices, Acre-Value, "Sold Land," https://www.acrevalue.com/sales/ID (covers 2018-2022 period).
Several state-wide real estate office listings, "Land and Farm" and "Landsearch" web sites; and Ag. Census data from NASS sites (conservative values).
Https://www.tax-rates.org/idaho/property-tax; data from Associated Tax Payers of Idaho, www.ati-taxinfo.com and personal communications with county Treasurers' Offices and online site information, November-December 2022.

Figure-Map 1. Groundwater Focus Districts.

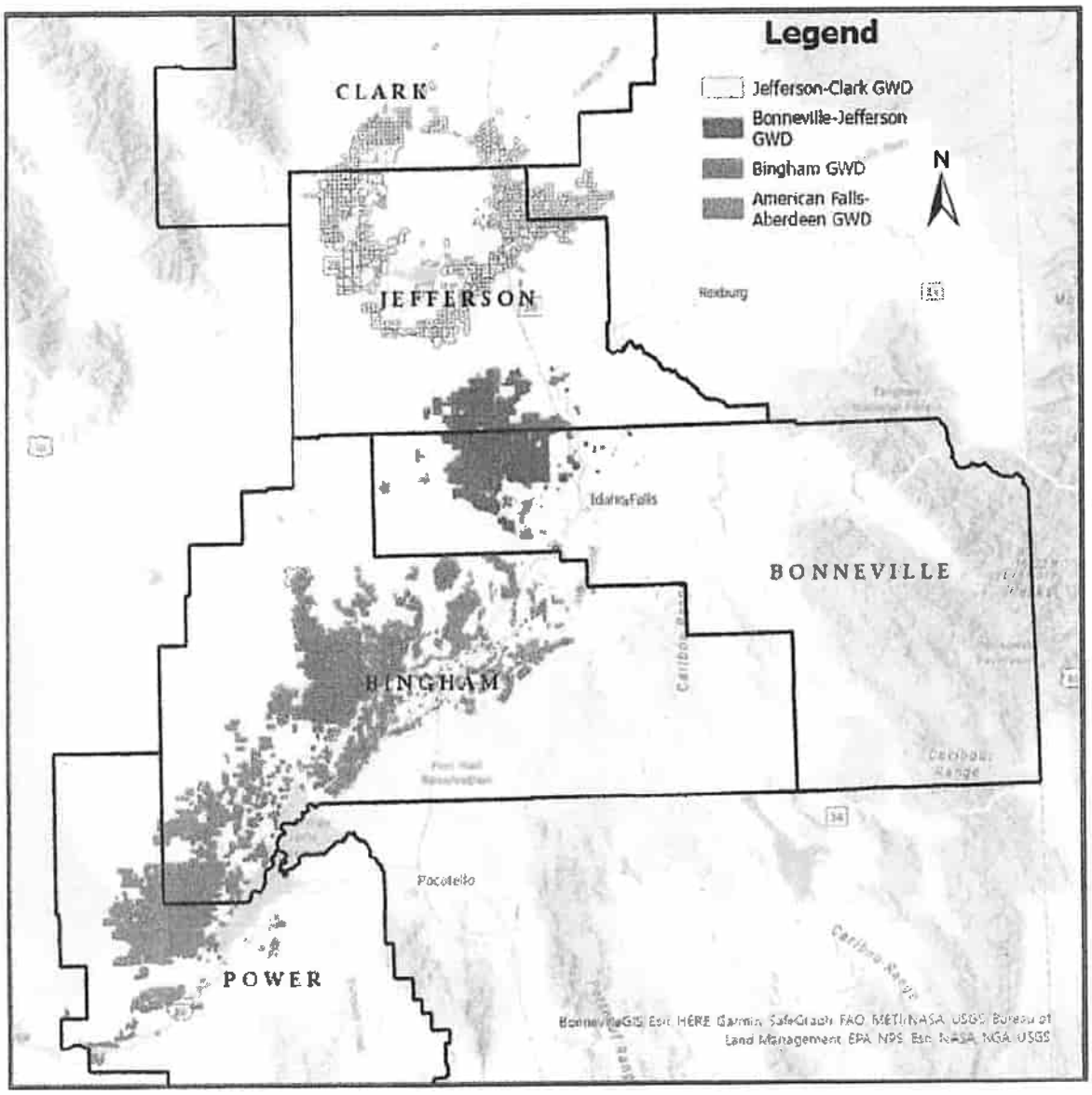


Figure-Map 2. Eastern Snake Plain Aquifer Area-1.

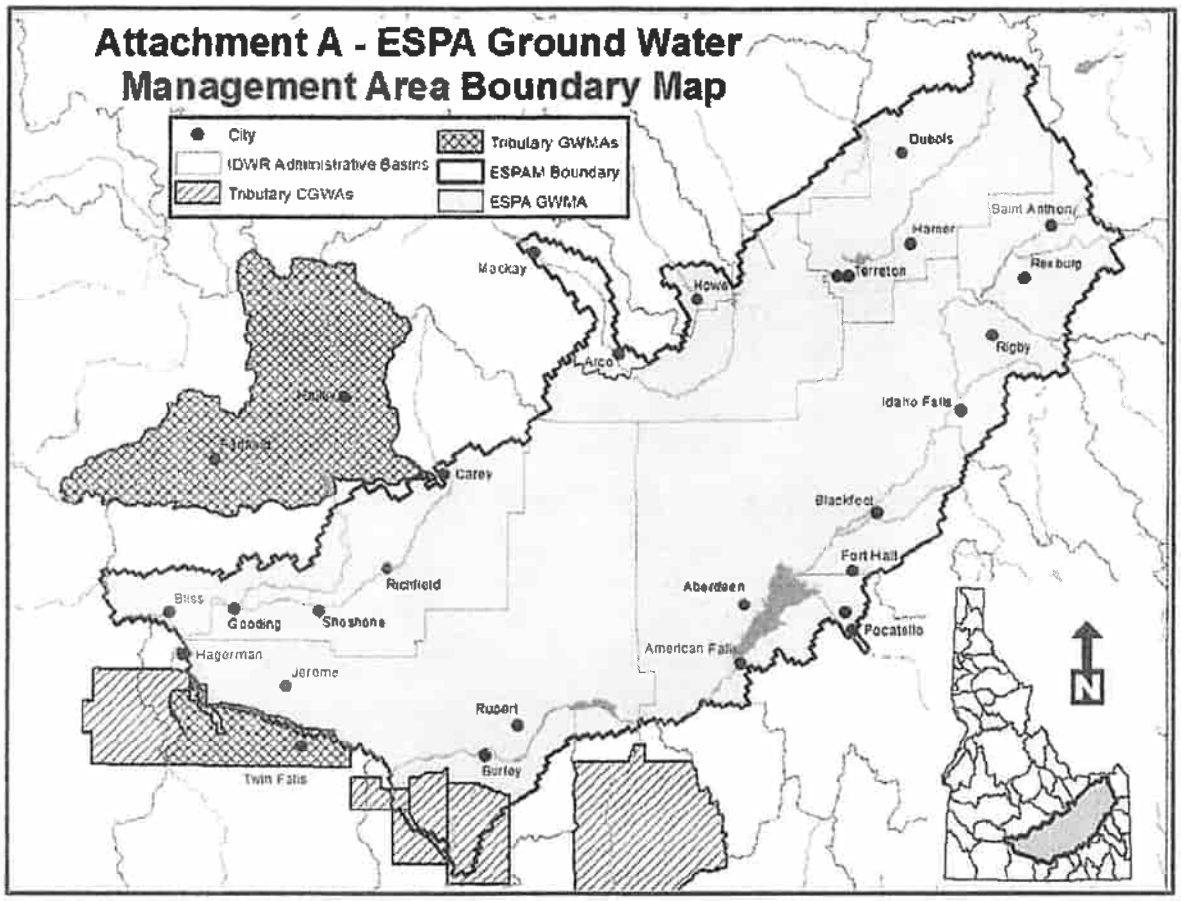


Figure-Map 3. Eastern Snake Plain Aquifer Area-2.

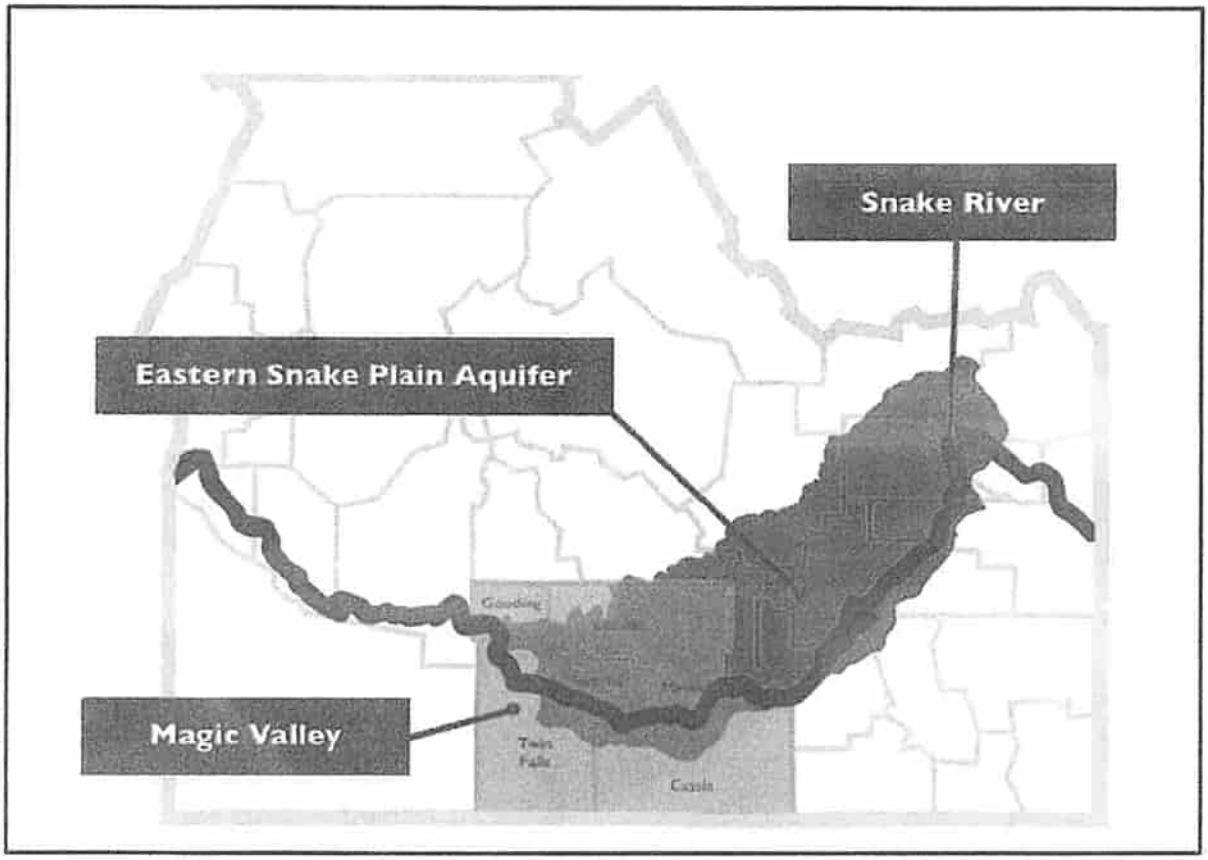


Figure 4. Climate Analysis of Blackfoot to Neeley Reach Gain/Loss.

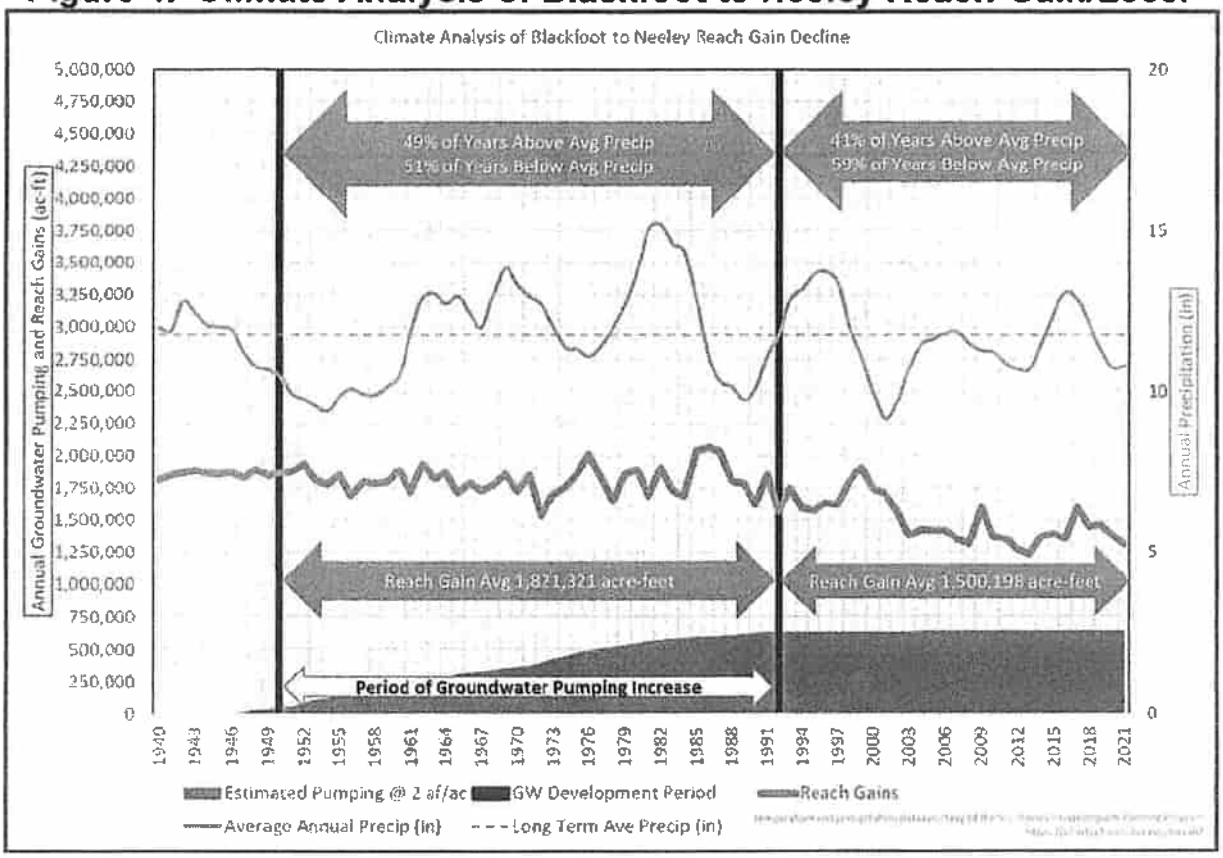
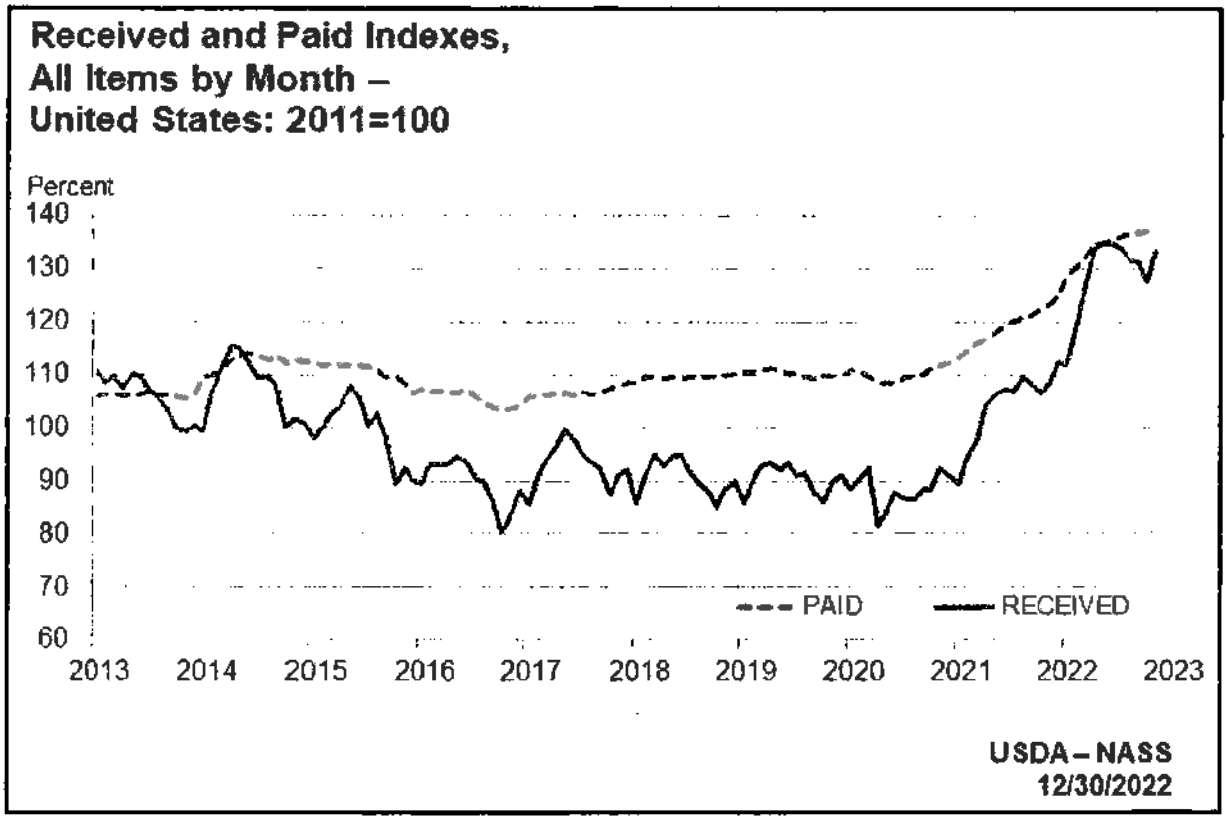


Figure 5. U.S. Agricultural Production, Prices Received and Costs Index.



RAÚL R. LABRADOR
ATTORNEY GENERAL

SCOTT L. CAMPBELL
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
KAYLEEN R. RICHTER, ISB No. 11258
Deputy Attorneys General
Idaho Department of Water Resources
P.O. Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
kayleen.richter@idwr.idaho.gov

Attorneys for Respondents

IN THE DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

IDAHO GROUND WATER APPROPRIATORS, INC., Petitioner, vs. IDAHO DEPARTMENT OF WATER RESOURCES, and GARY SPACKMAN in his capacity as the Director of the Idaho Department of Water Resources. Respondents.	Case No. CV01-23-13173 **NOTICE OF LODGING THE AGENCY TRANSCRIPT AND RECORD WITH THE AGENCY**
IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	

TO: THE DISTRICT COURT AND THE PARTIES OF RECORD

In accordance with I.R.C.P. 84(j), YOU ARE HEREBY NOTIFIED that the agency record and transcript, having been prepared pursuant to I.R.C.P. 84(f), (g), and (i), are lodged with the Idaho Department of Water Resources for the purpose of settlement.

A copy of the agency transcript and record filed with the Department have been uploaded to the Department's website. The parties may visit https://idwr.idaho.gov/legal-actions/district-court-actions/igwa-v-idwr-cv01-23-13173/ and follow their browser's document download procedure to obtain a copy of the agency transcript and record after expanding the accordion labeled "Agency Transcript and Record" and clicking on the PDFs titled "Agency Hearing Transcript on Appeal" and "Agency Record on Appeal" and the zipped file titled "Officially Noticed Documents."

The parties have fourteen (14) days from the date of this notice to file any objections to the transcript and record. The agency's decision on any objection timely filed along with all evidence, exhibits, and written presentations on the objection shall be determined by the agency within fourteen (14) days and included in the record. If no objections are filed within that time, the transcripts and record shall be deemed settled. Subsequently, the agency will lodge the settled transcripts and record with the District Court pursuant to I.R.C.P. 84(k).

DATED this 30th day of August 2023.

STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL



GARRICK L. BAXTER
Deputy Attorney General
Attorneys for Respondents

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 30th day of August 2023, I caused to be served a true and correct copy of the foregoing *Notice of Lodging the Agency Transcript and Record With the Agency*, via iCourt E-File and Serve, upon the following:

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
tj@racineolson.com
elisheva@racineolson.com

Candice M. McHugh
Chris M. Bromley
MCHUGH BROMLEY, PLLC
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

Sarah A. Klahn
Maximilian C. Bricker
SOMACH SIMMONS & DUNN, P.C.
sklahn@somachlaw.com
mbricker@somachlaw.com

John K. Simpson
Travis L. Thompson
MARTEN LAW LLP
jsimpson@martenlaw.com
tthompson@martenlaw.com

W.Kent Fletcher
FLETCHER LAW OFFICE
wkf@pmt.org

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
icourt@olsentaggart.com

Dylan Anderson
Dylan Anderson Law PLLC
dylan@dylanandersonlaw.com



GARRICK L. BAXTER
Deputy Attorney General

Electronically Filed
9/13/2023 4:33 PM
Fourth Judicial District, Ada County
Trent Tripple, Clerk of the Court
By: Eric Rowell, Deputy Clerk

Thomas J. Budge (ISB# 7465)
Elisheva M. Patterson (ISB#11746)
RACINE OLSON, PLLP
201 E. Center St. / P.O. Box 1391
Pocatello, Idaho 83204
Ph: (208) 232-6101
tj@racineolson.com
elisheva@racineolson.com

Attorneys for Idaho Ground Water Appropriators, Inc. (IGWA)

DISTRICT COURT OF THE STATE OF IDAHO

FOURTH JUDICIAL DISTRICT

ADA COUNTY

IDAHO GROUND WATER APPROPRIATORS, INC., Petitioner, vs. IDAHO DEPARTMENT OF WATER RESOURCES, and GARY SPACKMAN in his capacity as the Director of the Idaho Department of Water Resources. Respondents.	Case No. CV01-23-13173 **IGWA'S OBJECTION TO THE AGENCY RECORD AND TRANSCRIPT**
IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	

Idaho Ground Water Appropriators, Inc. ("IGWA"), acting for and on behalf of North Snake Ground Water District, Magic Valley Ground Water District, Carey Valley Ground Water District, American Falls-Aberdeen Ground Water District, Jefferson-Clark Ground Water District, Madison Ground Water District, and Henry's Fork Ground Water District, through counsel, respectfully objects, pursuant to Rule 84(j) of the Idaho Rules of Civil Procedure and paragraph 7 of the Court's Procedural Order dated August 16, 2023, to the agency record and transcript filed by the Idaho Department of Water Resources ("Department") in this matter on August 30, 2023. There are two main reasons for this objection: (1) certain documents are missing from the record; and (2) certain pre-marked exhibits were duplicative and so the transcript should be clarified to reference the admitted exhibit.

INTRODUCTION

IGWA's Petition for Judicial Review challenges actions taken by the Idaho Department of Water Resources ("IDWR") in IDWR Docket No. CM-DC-2010-001, which is a contested case that began in 2005 and has been ongoing ever since. The contested case broadly involves the Surface Water Coalition (SWC) delivery call. This action involves one component of the contested case—the "Methodology Order" used to predict material injury and administer junior-priority groundwater rights under the SWC call.

The Methodology Order has undergone several amendments. IGWA's present petition for judicial review challenges the Fifth Methodology Order issued April 21, 2023, the April As-Applied Order issued the same day, and several orders issued in connection with an evidentiary hearing on the Fifth Methodology Order and the April As-Applied Order held in June of 2023.

Because this Fifth Methodology Order is the latest of a series of iterations of the Methodology Order, and because expert testimony at the hearing referenced prior versions of the Methodology Order, it is appropriate to include prior iterations of the Methodology Order in the agency record for judicial review. The Fourth Methodology Order was admitted at the hearing as Exhibit 306. Prior versions of the Methodology Orders were not admitted as evidence but were relied upon and referenced in IGWA's expert report (Exhibit 837A).

In addition, the agency record omits certain documents and a hearing transcript that were created in connection with IDWR Docket No. CM-DC-2010-001 and referenced in IGWA's Post-Hearing Brief filed June 16, 2023, in this matter.

DOCUMENTS MISSING FROM THE RECORD

The agency record filed by the Department did not include the following documents that IGWA seeks to have included because they are relevant to IGWA's petition for judicial review. Copies of these documents are attached hereto.

1. *Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, issued by the Department on April 7, 2010.

2. *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, issued by the Department on June 23, 2010.

3. *Third Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, issued by the Department on April 16, 2015.

4. *Ground Water Districts' Brief in Support of Motion for Stay, Motion for Injunctive Relief, Motion to Compel, Motion for Expedited Decision, and Application to Show Cause*, filed May 19, 2023, in Ada County Case No. CV01-23-08187. This brief was incorporated by reference in section 4 of IGWA's Post-Hearing Brief.

5. *Declaration of Thomas J. Budge in Support of Ground Water Districts' Brief in Support of Motion for Stay, Motion for Injunctive Relief, Motion to Compel, Motion for Expedited Decision, and Application to Show Cause*, filed May 19, 2023, in Ada County Case No. CV01-23-08187. This declaration contains documents in the agency record that were cited and relied upon in IGWA's district court brief which, as explained above, is incorporated by reference in section 4 of IGWA's Post-Hearing Brief.

The documents cited in paragraphs number 4 and 5 pertain to IGWA's argument raised in prehearing filings, at the hearing, and in IGWA's post-hearing brief concerning the Department's non-compliance with the Idaho Administrative Procedure Act ("APA"), due process violations, and discovery violations. At the hearing, the Director shut down the presentation of evidence concerning these matters. First, at the onset of the hearing the Director reiterated his earlier limitation on materials and testimony made in the May 5, 2023 *Order Denying the Appointment of an Independent Hearing Officer and Motion for Continuance and Limiting Scope of Depositions* and *Notice of Materials Department Witnesses May Rely Upon At Hearing and Intent to Take Official Notice*, stating:

> [T]he testimony that I receive in this particular hearing will be limited to the factual components that were a part of the development and writing of the Fifth Methodology Order. . . . Now, there may be other areas that [sic] exploration that are outside of the methodology order, itself, and those areas if there is examination regarding those areas, I will allow objections. And will rule on those objections depending on the relevance to the Fifth Methodology Order.

Tr. Vol. I, 22:7-11; 19-24.

When Bingham Ground Water District attempted to make an offer of proof regarding the APA non-compliance and due process violations, to introduce two exhibits, Exhibits 340 and 354, the Director denied the offer in this exchange:

> Hearing Officer: Okay. Mr. Anderson, I'm not even accepting this. I will tell you that I am always meeting with staff trying to establish priorities as to what I need to work on and what I don't need to work on, and that's what I'm doing here.
>
> Mr. Anderson: Well, I'm not intending to try to make you a witness, Director. I just – this is information that was disclosed to us as a part of a request.
>
> Hearing Officer: That's fine. And we supplied this information in good faith, but I don't see anything in this that would either establish any nefarious intent or any reason to bring this document that was – I've never seen this document that I'm aware of. SWC discussion points, main discussion points, I've never seen any of this, and I think it's because it was part of settlement, and I was excluded from those discussions. So my string of emails here and what's included simply was an attempt on my part to say what do we need to prioritize and work on in the many responsibilities that the Department and the Director has, and that was the intent of these emails. And we disclosed them in good faith, and I guess, from my perspective, for you to even insinuate that there was something nefarious, I find to be offensive, and I won't let it in. Thank you.

Tr. Vol. IV, 1032:4-1033:5.

Notwithstanding, because IGWA not only raised these issues but also took a position on these issues, consistent with *County Highway District v. Brooke View, Inc*., 162 Idaho 138, 140-41 (2017), the issues are preserved for appeal. And the agency record should be augmented to include the documents referenced above so that IGWA can properly apprise the court of the issues on judicial review concerning compliance with the APA.

CORRECTION TO THE TRANSCRIPT

On May 30, 2023, a week before the start of the June 6th Department hearing, the parties submitted and exchanged witness lists and pre-marked exhibits. The pre-marked exhibits,

collectively, were numerous (approximately 250 documents identified). The parties attempted to identify and consolidate common exhibits, but time constraints hampered these efforts. As a result, Ms. Sukow was questioned and testified about Exhibit 197, however this exhibit was not admitted. Rather, Exhibit 829, which is substantially[1] the same as Exhibit 197, was admitted later. Ms. Sigsted also testified about Exhibit 829 but was also identified differently. To clarify the record, IGWA requests the following corrections be made to the transcript:

1. T. Vol. I, p. 76, L. 1-5:

   (Exhibit ~~197~~ 829 marked.)

   Q. (BY MR. BUDGE) Let me have you turn to ~~Exhibit 197~~ Exhibit 829. Jennifer, do you recognize this document? It's labeled "~~Attachment 1,~~ Table 3-1. Results of Jaxon Higgs Analysis on IGWA's Proportionate Share ~~Modeling,~~ Related to Reach Gain Benefits and Acres Curtailed for the ~~May 2023 Curtailment~~ April 2023 As-Applied Order."?

2. T. Vol. III, p. 644, L. 16-18:

   Q: Thank you. Let's move next to Section 3.4.4, and if you can just explain this section and ~~the Table 3-1~~ Exhibit 829.

Respectfully submitted this 13th day of September, 2023.

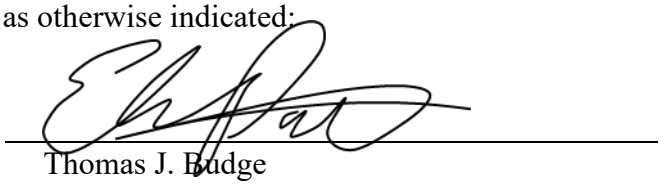
RACINE OLSON, PLLP

By:_____
Elisheva M. Patterson
Attorneys for IGWA

[1] The only difference between Exhibit 197 and admitted Exhibit 829 is the title; the substantive chart and footnote content is the same. Exhibit 197 is attached to this objection for reference. Exhibit 829 is located at R. 2111, and Table 3-1 is located at R. 2411.

CERTIFICATE OF SERVICE

I hereby certify that on this 13th day of September, 2023, I served the foregoing document on the persons below via email or as otherwise indicated:



Thomas J. Budge

Clerk of the Court ADA COUNTY DISTRICT COURT	iCourt
Director Gary Spackman Garrick Baxter Sarah Tschohl IDAHO DEPT. OF WATER RESOURCES 322 E Front St. Boise, ID 83720-0098	gary.spackman@idwr.idaho.gov garrick.baxter@idwr.idaho.gov sarah.tschohl@idwr.idaho.gov file@idwr.idaho.gov
John K. Simpson Travis L. Thompson MARTEN LAW P. O. Box 63 Twin Falls, ID 83303-0063	tthompson@martenlaw.com jsimpson@martenlaw.com jnielsen@martenlaw.com
W. Kent Fletcher FLETCHER LAW OFFICE P.O. Box 248 Burley, ID 83318	wkf@pmt.org
Kathleen Marion Carr U.S. DEPT. INTERIOR 960 Broadway Ste 400 Boise, ID 83706	kathleenmarion.carr@sol.doi.gov
David W. Gehlert Natural Resources Section Environment and Natural Resources Division U.S. DEPT. OF JUSTICE 999 18th St., South Terrace, Suite 370 Denver, CO 80202	david.gehlert@usdoj.gov

Matt Howard U.S. BUREAU OF RECLAMATION 1150 N Curtis Road Boise, ID 83706-1234	mhoward@usbr.gov
Sarah A Klahn SOMACH SIMMONS & DUNN 2033 11th Street, Ste 5 Boulder, Co 80302	sklahn@somachlaw.com dthompson@somachlaw.com
Rich Diehl CITY OF POCATELLO P.O. Box 4169 Pocatello, ID 83205	rdiehl@pocatello.us
Candice McHugh Chris Bromley MCHUGH BROMLEY, PLLC 380 South 4th Street, Suite 103 Boise, ID 83 702	cbromley@mchughbromley.com cmchugh@mchughbromley.com
Robert E. Williams WILLIAMS, MESERVY, & LOTHSPEICH, LLP P.O. Box 168 Jerome, ID 83338	rewilliams@wmlattys.com
Robert L. Harris HOLDEN, KIDWELL, HAHN & CRAPO, PLLC P.O. Box 50130 Idaho Falls, ID 83405	rharris@holdenlegal.com
Randall D. Fife City Attorney CITY OF IDAHO FALLS P.O. Box 50220 Idaho Falls, ID 83405	rfife@idahofallsidaho.gov
Skyler C. Johns Nathan M. Olsen Steven L. Taggart OLSEN TAGGART PLLC P.O. Box 3005 Idaho Falls, ID 83403	sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com

Dylan Anderson DYLAN ANDERSON LAW PLLC P.O. Box 35 Rexburg, Idaho 83440	dylan@dylanandersonlaw.com

RAÚL R. LABRADOR
ATTORNEY GENERAL

SCOTT L. CAMPBELL
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
KAYLEEN R. RICHTER, ISB No. 11258
Deputy Attorneys General
Idaho Department of Water Resources
P.O. Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
kayleen.richter@idwr.idaho.gov

Attorneys for Respondents

IN THE DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT OF

THE STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

IDAHO GROUND WATER APPROPRIATORS, INC., Petitioner, vs. IDAHO DEPARTMENT OF WATER RESOURCES, and GARY SPACKMAN in his capacity as the Director of the Idaho Department of Water Resources. Respondents, and AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT, A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY, CITY OF POCATELLO, CITY OF BLISS, CITY OF BURLEY, CITY OF CAREY, CITY OF DECLO, CITY OF DIETRICH, CITY OF	Case No. CV01-23-13173 **RESPONSE TO OBJECTION; ORDER SETTLING THE AGENCY TRANSCRIPT AND RECORD**

GOODING, CITY OF HAZELTON, CITY OF HEYBURN, CITY OF JEROME, CITY OF PAUL, CITY OF RICHFIELD, CITY OF RUPERT, CITY OF SHOSHONE, AND CITY OF WENDELL, BONNEVILLE-JEFFERSON GROUND WATER DISTRICT, and BINGHAM GROUNDWATER DISTRICT, Intervenors.
IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY

TO: THE DISTRICT COURT AND THE PARTIES OF RECORD

On August 30, 2023, the Idaho Department of Water Resources ("Department") served its *Notice of Lodging the Agency Transcript and Record with the Agency* ("*Notice*") in this matter pursuant to I.R.C.P 84(j). The *Notice* gave the parties fourteen (14) days from the date of the *Notice* to file any objection to the agency transcript and record. On September 13, 2023, *IGWA's Objection to the Agency Record and Transcript* ("*IGWA's Objection*") was filed.

RESPONSE TO OBJECTION

A. Agency Record

IGWA's Objection requests that five documents be added to the record. These documents are:

1. *Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, issued by the Department on April 7, 2010.
2. *Second Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, issued by the Department on June 23, 2010.
3. *Third Amended Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover*, issued by the Department on April 16, 2015.
4. *Ground Water Districts' Brief in Support of Motion for Stay, Motion for Injunctive Relief, Motion to Compel, Motion for Expedited Decision, and Application to Show Cause*, filed May 19, 2023, in Ada County Case No. CV01-23-08187. This brief was incorporated by reference in section 4 of IGWA's Post-Hearing Brief.
5. *Declaration of Thomas J. Budge in Support of Ground Water Districts' Brief in Support of Motion for Stay, Motion for Injunctive Relief, Motion to Compel, Motion for Expedited Decision, and Application to Show Cause, filed May 19, 2023, in Ada County Case No. CV01-23-08187*.

IGWA states that the documents should be included in the record because "they are relevant to IGWA's petition for judicial review." *IGWA's Objection* at 3.

Idaho Rule of Civil Procedure 84(f)(1)(A) states "When statute provides what must be contained in the official record of the agency on judicial review, the agency must prepare the record as provided by statute."

Idaho Code § 67-5249(2) sets forth the scope of the agency record in this proceeding. It states:

> (2) The record shall include:
> (a) all notices of proceedings, pleadings, motions, briefs, petitions, and intermediate rulings;
> (b) evidence received or considered;
> (c) a statement of matters officially noticed;
> (d) offers of proof and objections and rulings thereon;
> (e) the record prepared by the presiding officer under the provisions of section 67-5242, Idaho Code, together with any transcript of all or part of that record;
> (f) staff memoranda or data submitted to the presiding officer or the agency head in connection with the consideration of the proceeding; and
> (g) any recommended order, preliminary order, final order, or order on reconsideration.

While subsection (2)(a) states the record shall include "briefs" and (2)(g) states the record shall include "any . . . final order," implicit in the statute is that the "briefs" and the "order" must have been submitted or issued as part of the administrative hearing. Otherwise, *all* briefs and *any* order from *any or all* legal matters must be included in the record. That interpretation of the statute is absurd.

After reviewing all five of IGWA's requested additions, the Director concludes that the documents identified by IGWA do not meet the criteria outlined in Idaho Code § 67-5249 because they were not briefs or final orders submitted as part of the administrative hearing. Accordingly, the Director finds the record should not include the documents.

B. Agency Transcript

IGWA's Objection seeks clarification of the record through "correction" of two portions of the agency transcript. *IGWA's Objection* at 5. *IGWA's Objection* does not contain any allegations that the agency transcript inaccurately reflects the testimony given during the administrative hearing. After reviewing IGWA's requested transcript

modifications, the Director concludes that the agency transcript accurately reflects the testimony given during the administrative hearing and finds that the agency transcript is accurate without modification. The concerns expressed by IGWA regarding exhibit numbers are best addressed in briefing, not by changing a transcript to something that does not accurately reflect the testimony.

ORDER

IT IS HEREBY ORDERED that the agency transcript and record are now deemed settled pursuant to I.R.C.P. 84(j).

IT IS FURTHER ORDERED that, pursuant to I.R.C.P. 84(j), *IGWA's Objection to the Agency Record and Transcript* and this order shall be included in the agency record on the petition for judicial review. The Department shall provide the parties with a copy of the settled agency transcript and record.

DATED this 27th day of September 2023.

MATHEW WEAVER
Director
Idaho Department of Water Resources

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 27th day of September 2023, I caused to be served a true and correct copy of the foregoing *Response to Objection; Order Settling the Agency Transcript and Record*, via iCourt E-File and Serve, upon the following:

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
tj@racineolson.com
elisheva@racineolson.com

Dylan Anderson
DYLAN ANDERSON LAW
dylan@dylanandersonlaw.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
johns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
icourt@olsentaggart.com

Candice M. McHugh
Chris M. Bromley
MCHUGH BROMLEY, PLLC
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

W. Kent Fletcher
FLETCHER LAW OFFICE
wkf@pmt.org

John K. Simpson
Travis L. Thompson
MARTEN LAW LLP
jsimpson@martenlaw.com
tthompson@martenlaw.com

Sarah A. Klahn
Maximilian C. Bricker
sklahn@somachlaw.com
mbricker@somachlaw.com



GARRICK L. BAXTER
Deputy Attorney General

RAÚL R. LABRADOR
ATTORNEY GENERAL

SCOTT L. CAMPBELL
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
KAYLEEN R. RICHTER, ISB No. 11258
Deputy Attorneys General
Idaho Department of Water Resources
P.O. Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
kayleen.richter@idwr.idaho.gov

Attorneys for Respondents

IN THE DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

IDAHO GROUND WATER APPROPRIATORS, INC., Petitioner, vs. IDAHO DEPARTMENT OF WATER RESOURCES, and GARY SPACKMAN in his capacity as the Director of the Idaho Department of Water Resources. Respondents, and AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT, A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY, CITY OF POCATELLO, CITY OF BLISS, CITY OF BURLEY, CITY OF CAREY, CITY OF DECLO, CITY OF DIETRICH, CITY OF GOODING, CITY OF HAZELTON, CITY OF HEYBURN, CITY OF JEROME, CITY OF PAUL, CITY OF RICHFIELD, CITY OF	Case No. CV01-23-13173 **AGENCY'S CERTIFICATE OF RECORD AND EXHIBITS**

RUPERT, CITY OF SHOSHONE, AND CITY OF WENDELL, BONNEVILLE-JEFFERSON GROUND WATER DISTRICT, and BINGHAM GROUNDWATER DISTRICT, Intervenors.
IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY

TO: THE DISTRICT COURT AND THE PARTIES OF RECORD

I, Mathew Weaver, Director of the Idaho Department of Water Resources, do hereby certify that the above and foregoing record and hearing exhibits listed and produced were compiled under my direction, and are a true and correct record of the pleadings, papers, proceedings, and hearing exhibits offered and admitted therein as shown in the table of contents and index to this record.

DATED this 27th day of September 2023.



MATHEW WEAVER
Director
Idaho Department of Water Resources

003243

RAÚL R. LABRADOR
ATTORNEY GENERAL

SCOTT L. CAMPBELL
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
KAYLEEN R. RICHTER, ISB No. 11258
Deputy Attorneys General
Idaho Department of Water Resources
P.O. Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
kayleen.richter@idwr.idaho.gov

Attorneys for Respondents

IN THE DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT OF

THE STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

IDAHO GROUND WATER APPROPRIATORS, INC.,

Petitioner,

vs.

IDAHO DEPARTMENT OF WATER RESOURCES, and GARY SPACKMAN in his capacity as the Director of the Idaho Department of Water Resources.

Respondents,

and

AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT, A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY, CITY OF POCATELLO, CITY OF BLISS, CITY OF BURLEY, CITY OF CAREY, CITY OF DECLO, CITY OF DIETRICH, CITY OF GOODING, CITY OF HAZELTON, CITY OF HEYBURN, CITY OF JEROME, CITY OF PAUL, CITY OF RICHFIELD, CITY OF RUPERT, CITY OF SHOSHONE, AND CITY OF

Case No. CV01-23-13173

NOTICE OF LODGING THE SETTLED AGENCY TRANSCRIPT AND RECORD WITH THE DISTRICT COURT

WENDELL, BONNEVILLE-JEFFERSON GROUND WATER DISTRICT, and BINGHAM GROUNDWATER DISTRICT, Intervenors.
IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY

TO: THE DISTRICT COURT AND THE PARTIES OF RECORD

On August 30, 2023, the Idaho Department of Water Resources ("Department") served its *Notice of Lodging the Agency Transcript and Record with the Agency* ("*Notice*") in this matter pursuant to I.R.C.P 84(j). The Notice gave the parties fourteen (14) days from the date of the *Notice* to file any objection to the agency transcript or record.

On September 13, 2023, *IGWA's Objection to the Agency Record and Transcript* was filed. IGWA requested certain additions to the agency record and corrections to the agency transcript. The Department's *Response to Objection; Order Settling the Agency Transcript and Record* is filed concurrently herewith, and the transcript and record are deemed settled pursuant to I.R.C.P. 84(j).

YOU ARE HEREBY NOTIFIED that the settled record is being filed with the District Court pursuant to I.R.C.P. 84(k), through iCourt e-filing and by providing one (1) DVD containing documents in OCR format, dated September 27, 2023. A copy of the agency transcript and record filed with the Department have been uploaded to the Department's website. The parties may visit https://idwr.idaho.gov/legal-actions/district-court-actions/igwa-v-idwr-

cv01-23-13173/ and follow their browser's document download procedure to obtain a copy of the agency transcript and record after expanding the accordion labeled "Settled Agency Transcript and Record" and clicking on the PDFs titled "Settled Agency Hearing Transcript on Appeal" and "Settled Agency Record on Appeal" and the zipped file titled "Officially Noticed Documents."

DATED this 27th day of September 2023.

STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL



GARRICK L. BAXTER
Deputy Attorney General
Attorneys for Respondents

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 27th day of September 2023, I caused to be served a true and correct copy of the foregoing *Notice of Lodging the Settled Agency Transcript and Record with the District Court*, via iCourt E-File and Serve, upon the following:

Thomas J. Budge
Elisheva M. Patterson
RACINE OLSON, PLLP
tj@racineolson.com
elisheva@racineolson.com

Dylan Anderson
DYLAN ANDERSON LAW
dylan@dylanandersonlaw.com

Skyler C. Johns
Nathan M. Olsen
Steven L. Taggart
OLSEN TAGGART PLLC
johns@olsentaggart.com
nolsen@olsentaggart.com
staggart@olsentaggart.com
icourt@olsentaggart.com

Candice M. McHugh
Chris M. Bromley
MCHUGH BROMLEY, PLLC
cbromley@mchughbromley.com
cmchugh@mchughbromley.com

W. Kent Fletcher
FLETCHER LAW OFFICE
wkf@pmt.org

John K. Simpson
Travis L. Thompson
MARTEN LAW LLP
jsimpson@martenlaw.com
tthompson@martenlaw.com

Sarah A. Klahn
Maximilian C. Bricker
sklahn@somachlaw.com
mbricker@somachlaw.com



GARRICK L. BAXTER
Deputy Attorney General

RAÚL R. LABRADOR
ATTORNEY GENERAL

JOY M. VEGA
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
GARRETT F. HENSLEY, ISB No. 12922
Deputy Attorney General
Idaho Department of Water Resources
PO Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
garrett.hensley@idwr.idaho.gov

Attorneys for Respondent

IN THE DISTRICT COURT OF THE SEVENTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF BINGHAM

JERRY D. BINGHAM and VALERIE H. BINGHAM, Petitioners, vs. IDAHO DEPARTMENT OF WATER RESOURCES, Respondent.	Case No. CV06-26-1801 **NOTICE OF LODGING THE AGENCY RECORD AND TRANSCRIPT WITH THE AGENCY**

TO: THE DISTRICT COURT AND THE PARTIES OF RECORD

In accordance with I.R.C.P. 84(j), YOU ARE HEREBY NOTIFIED that the agency record and transcript, having been prepared pursuant to Idaho Code § 67-5249 and I.R.C.P. 84(f)(1)(A), 84(g), and 84(i), are lodged with the Idaho Department of Water Resources for the purpose of settlement.

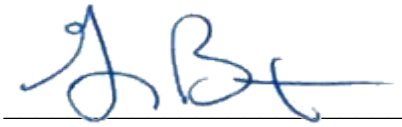
A copy of the agency record and transcript filed with the Department have been uploaded to the Department's website. The parties may visit https://idwr.idaho.gov/court-action/cv06-26-1801/ and follow their browser's document download procedure to obtain a copy of the agency

record and transcript after clicking on the PDFs titled "Agency Record on Appeal" and "Agency Transcript on Appeal," and the zipped data files titled "Agency Record Excel Files."

The parties have fourteen (14) days from the date of this notice to file any objections to the record or transcript. The agency's decision on any objection timely filed along with all evidence, exhibits, and written presentations on the objection shall be determined by the agency within fourteen (14) days and included in the record. If no objections are filed within that time, the record and transcript shall be deemed settled. Subsequently, the agency will lodge the settled record and transcript with the District Court pursuant to I.R.C.P. 84(k) and the Court's September 23, 2026 *Procedural Order*.

DATED this 7th day of October 2026.

STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL



GARRICK L. BAXTER
Deputy Attorney General

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 7th day of October 2026, I caused to be served a true and correct copy of the foregoing *Notice of Lodging the Agency Record and Transcript With the Agency*, via iCourt E-File and Serve, upon the following:

Reed W. Larsen
Cooper & Larsen Chartered
reed@cooper-larsen.com

Bradley R. Cahoon
Dentons Durham Jones Pinegar P.C.
brad.cahoon@dentons.com

Damien M. Schiff
Pacific Legal Foundation
dschiff@pacificlegal.org



GARRICK L. BAXTER
Deputy Attorney General

Electronically Filed
10/21/2026 11:47 AM
Seventh Judicial District, Bingham County
Pamela W. Eckhardt, Clerk of the Court
By: Brandee Cammack, Deputy Clerk

Reed W. Larsen (3427)
Cooper & Larsen Chartered
151 N. 3rd Ave., Suite 200
Pocatello, Idaho 83201
Telephone: (208) 235-1145
Facsimile: (208) 235-1182
reed@cooper-larsen.com

Bradley R. Cahoon (8558)
Dentons Durham Jones Pinegar P.C.
111 S. Main St., Suite 2400
Salt Lake City, Utah 84111
Telephone: (801) 375-6600
brad.cahoon@dentons.com

Damien M. Schiff* (Cal. Bar No. 235101)
Pacific Legal Foundation
555 Capitol Mall, Suite 1290
Sacramento, California 95814
916.419.7111
dschiff@pacificlegal.org

**Pro hac vice pending*

Attorneys for Petitioners

DISTRICT COURT OF THE STATE OF IDAHO

SEVENTH JUDICIAL DISTRICT

BINGHAM COUNTY

JERRY D. BINGHAM and VALERIE H. BINGHAM, Petitioners, vs. IDAHO DEPARTMENT OF WATER RESOURCES, Respondent, and IDAHO GROUND WATER APPROPRIATORS, INC., CITY OF	Case No. CV06-26-1801 **PETITIONERS' OBJECTIONS TO THE LODGED AGENCY RECORD**

POCATELLO, AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT, A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY,

Intervenors.

Petitioners Jerry and Valerie Bingham, by and through their counsel of record, respectfully object, pursuant to Rule 84(j) of the Idaho Rules of Civil Procedure and paragraph 7 of the Court's Procedural Order, to the agency record lodged with Respondent Idaho Department of Water Resources ("Department") in this matter, as follows.

SPECIFIC GROUNDS FOR OBJECTION:
OMISSION OF REQUIRED EVIDENCE

Petitioners object to the omission from the lodged agency record in this case of the documents comprising the settled agency record for the Sixth Final Order Regarding Methodology, dated July 29, 2023—specifically, those documents listed at pages iv through xiii of the Settled Agency Record on Appeal, *Idaho Ground Water Appropriators, Inc. v. Idaho Dep't of Water Resources*, Case No. CV01-23-13173 (Fourth Judicial Dist. filed Sept. 27, 2023).[1] In the lodged record in this case, the Department included only the *Sixth Methodology Order* and the transcript of the associated administrative hearing, without including any of the record upon which the Department based the methodology order. The evidence considered and relied upon by the Department in reaching its findings of fact and conclusions of law in the *Sixth Methodology Order* is—as the Department itself has stated in its rejection of Petitioners' request for reconsideration, hearing, and stay—directly relevant to this Petition for Review. Under Idaho Code § 67-5249(3)(e), the agency record "shall include...[a]ll evidence received or considered" by the agency. As noted, the lodged record contains the *Sixth Methodology Order* itself and the related hearing transcript, but it omits the evidence the Department received or considered in issuing that order. This Court's review of the Department's *Sixth Methodology Order*, as it relates to Petitioners'

[1] The record is available at: https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CV01-23-13173/CV01-23-13173-20230927-Settled-Agency-Record-on-Appeal.pdf.

challenge to the Department's curtailment order, should include the record that the Department relied upon to formulate the methodology order. This record would materially assist the Court in determining whether the Department's methodology, and in turn the curtailment orders issued pursuant to the methodology, violate the Idaho law of prior appropriation. Accordingly, Petitioners request that the lodged record be augmented to include the documents comprising the settled agency record for the *Sixth Methodology Order*.

Petitioners also object to the omission of the Department's Staff Memorandum, dated December 30, 2025, filed with the Department's Notice of Compliance with Order to Provide Staff Memo in *In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A&B Irrigation District*, No. CM-DC-2010-001.[2] Idaho Code § 67-5249(3)(j) mandates that "[s]taff memoranda or data submitted to the presiding officer or the agency head in connection with the consideration of the proceeding" be included in the record. This Department staff memorandum outlines the calculation of curtailment priority dates relevant to the Department's curtailment orders issued pursuant to the delivery call of the Surface Water Coalition. The issues of how this calculation is determined, and the calculation's relationship to the law of prior appropriation, are central to Petitioners' challenge to the Department's curtailment order. Accordingly, Petitioners request that the lodged record be augmented to include the Department Staff Memorandum.

CONCLUSION

The lodged record is incomplete and insufficient under Idaho Code § 67-5249 without the evidence considered by the Department in adopting the governing *Sixth Methodology Order*, and the Departmental staff explanation as to which priority dates should be curtailed pursuant to the Surface Water Coalition's delivery call. Therefore, Petitioners respectfully object to the lodged record, and request that the Department include the foregoing documents in the settled agency record.

[2] The Department's Staff Memorandum is included within the appendix of documents filed in conjunction with Petitioners' motion to stay, *see* Decl. of Reed W. Larsen, Exh. C, and is available online at: https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/CM-DC-2010-001/CM-DC-2010-001-20251230-Notice-of-Compliance-With-Order-to-Provide-Staff-Memo.pdf.

DATED: October 21, 2026.

Respectfully submitted,

Reed W. Larsen
Bradley R. Cahoon
Damien M. Schiff

/s/
Reed W. Larsen
Counsel for Petitioners

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 21st day of October, 2026, I caused a true and correct copy of the foregoing OBJECTION TO THE LODGED AGENCY RECORD to be served upon the following individuals via electronic mail and/or iCourt File & Serve:

Director of IDWR Garrick L. Baxter Garrett F. Hensley 322 E. Front Street, Suite 648 Boise, ID 83702 file@idwr.idaho.gov garrick.baxter@idwr.idaho.gov garrett.hensley@idwr.idaho.gov	Matt Howard U.S. Bureau of Reclamation mhoward(@usbr.gov
Travis L. Thompson Abby R. Bitzenburg Norman M. Semanko Garrett M. Kitamura Parsons, Behle & Latimer tthompson@parsonsbehle.com abitzenburg(@parsonsbehle.com nsemanko(@parsonsbehle.com gkitamura@parsonsbehle.com	Sarah A. Klahn Maximilian C. Bricker Somach, Simmons & Dunn sklahn@somachlaw.com mbricker@somachlaw.com
Thomas J. Budge Racine Olson tj@racineolson.com	Candice McHugh Chris Bromley McHugh Bromley, PLLC emchugh@mchughbromley.com cbromley@mchughbromley.com
David Gehlert ENRD DOJ 999 18th St. South Terrace, Ste. 370 Denver, CO 80202 david.gehlert@usdoj.gov	Rich Diehl City of Pocatello rdiehl@pocatello.us
Robert E. Williams Williams, Meservy & Lothspeich, LLP rewilliams@wmlattys.com	Skyler C. Johns Nathan M. Olsen Steven L. Taggart Olsen Taggart, PLLC sjohns@olsentaggart.com nolsen@olsentaggart.com staggart@olsentaggart.com

Zachary H. Jones City Attorney, City of Idaho Falls zjones@idahofalls.gov	Dylan Anderson DylanAnderson Law, PLLC dylan@dylanandersonlaw.com
Robert L. Harris Holden, Kidwell, Hahn & Crapo, PLLC rharris@holdenlegal.com	

/s/ Reed W. Larsen
Reed W. Larsen

RAÚL R. LABRADOR
ATTORNEY GENERAL

JOY M. VEGA
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
GARRETT F. HENSLEY, ISB No. 12922
Deputy Attorneys General
Idaho Department of Water Resources
PO Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
garrett.hensley@idwr.idaho.gov

Attorneys for Respondent

IN THE DISTRICT COURT OF THE SEVENTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF BINGHAM

JERRY D. BINGHAM and VALERIE H. BINGHAM, Petitioners, vs. IDAHO DEPARTMENT OF WATER RESOURCES, Respondent, and IDAHO GROUND WATER APPROPRIATORS, INC., CITY OF POCATELLO, AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY, Intervenors.	Case No. CV06-26-1801 **AGENCY DECISION ON OBJECTION AND ORDER SETTLING THE AGENCY RECORD AND TRANSCRIPT**

On October 7, 2026, the Idaho Department of Water Resources ("Department") served its *Notice of Lodging the Agency Record and Transcript with the Agency* ("*Notice*") in this matter pursuant to I.R.C.P. 84(j)(1). The *Notice* gave the parties fourteen (14) days from the date of the

Notice to file any objection to the agency record or transcript. On October 21, 2026, Jerry and Valerie Bingham (the "Binghams") filed *Petitioners' Objections to the Lodged Agency Record* ("*Objection*"). No other objections were filed. In accordance with I.R.C.P. 84(j) and the Court's September 23, 2026 *Procedural Order*, the following constitutes the Department's decision on objections to the agency record and order settling the agency record and transcript.

In considering the *Objection*, the Department refers to Idaho Code § 67-5249(3), which governs the contents of an agency record on appeal; it states:

> The record shall include:
> (a) The recording of the hearing;
> (b) All notices of the hearing and other conferences conducted by the presiding officer;
> (c) All prehearing orders;
> (d) All motions, pleadings, briefs, petitions, requests, and intermediate rulings;
> (e) All evidence received or considered;
> (f) A statement of all matters officially noticed and any related notices;
> (g) All offers of proof and objections and rulings thereon;
> (h) All proposed findings and requested orders;
> (i) Any transcript of the hearing, if prepared;
> (j) Staff memoranda or data submitted to the presiding officer or the agency head in connection with the consideration of the proceeding;
> (k) Any recommended order, preliminary order, final order, or order on reconsideration; and
> (l) All matters placed on the record after an ex parte communication pursuant to section 67-5253, Idaho Code.

BACKGROUND

The agency record was prepared in connection with a request for judicial review of the Director's August 24, 2026 *Order Denying Jerry D. and Valerie H. Binghams' Petition for Reconsideration and Request for Hearing* and July 21, 2026 *Order Revising April 2026 Forecast Supply and Continuing May 14, 2026 Curtailment Order (Methodology Steps 5 & 6)*. *Pet. for Jud. Rev.* ¶ 3. Additionally, judicial review, "to the extent that such review is necessary and

collateral to review of the above-referenced orders," was also requested in connection with the following orders:

1. *Order Amending Curtailment List to Include Unmitigated Ground Water Rights*, issued June 17, 2026;
2. *Final Order Curtailing Ground Water Rights Junior to October 11, 1900*, issued May 14, 2026;
3. *Final Order Regarding April 2026 Forecast Supply (Methodology Steps 1–3)*, issued April 16, 2026;
4. *Final Order Curtailing Ground Water Rights Junior to August 15, 1952*, issued December 8, 2025;
5. *Final Order Establishing 2025 Reasonable Carryover (Methodology Step 9)*, issued November 21, 2025;
6. *Order Revising July 2025 Forecast Supply (Methodology Steps 7–8)*, issued September 11, 2025;
7. *Final Order Curtailing Ground Water Rights Junior to October 11, 1900*, issued July 25, 2025; and
8. *Sixth Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover* ("*Sixth Methodology Order*"), issued July 19, 2023.

Id. ¶ 4.

ANALYSIS

The *Objection* is broken into two requests. First, the Binghams object to the omission of several hundred documents from the agency record related to the issuance of the *Sixth Methodology Order*. *Objection*, at 2. The Binghams specifically seek the inclusion of all documents listed on pages iv through xiii of the table of contents of the *Settled Agency Record on Appeal* filed in *Idaho Ground Water Appropriators, Inc. v. Idaho Department of Water Resources*, Ada County Case No. CV01-23-13173. *Id.* The Director finds that all independently listed documents on pages iv through xiii of the *Settled Agency Record on Appeal* relate to the issuance of the *Sixth Methodology Order*. In the interest of ensuring a complete record that

encompasses all evidence considered, this objection is sustained. These documents will be added to the record.

Second, the Binghams object to the omission of a December 30, 2025 Department staff memorandum from the agency record. *Objection*, at 3. The Binghams rely on Idaho Code § 67-5249(3)(j), which requires the agency record to include "[s]taff memoranda or data submitted to the presiding officer or the agency head in connection with the consideration of the proceeding." The Binghams' reliance on this provision is misplaced. The December 30, 2025 staff memorandum was requested by and submitted to Hearing Officer Gerald F. Schroeder, not to the Director. The Director issued all of the orders the Binghams seek to challenge in this judicial review proceeding, not Hearing Officer Schroeder. The memorandum was not submitted to or considered by the Director in connection with any of the orders the Binghams seek to challenge. Because the December 30, 2025 staff memorandum was submitted to Hearing Officer Schroeder and was not considered by the Director in issuing the orders challenged by the Binghams, it does not fall within the statutory requirement. Accordingly, the Binghams' objection to the omission of the December 30, 2025 Department staff memorandum is overruled and their request to augment the agency record with the memorandum is denied.

ORDER

IT IS HEREBY ORDERED that *Petitioners' Objections to the Lodged Agency Record* is sustained in part and overruled in part, consistent with the foregoing. The Department shall include in the agency record on appeal the documents for which the objection was sustained.

IT IS FURTHER ORDERED that pursuant to I.R.C.P. 84(j)(3), *Petitioners' Objections to the Lodged Agency Record* and this order shall be included in the agency record.

IT IS FURTHER ORDERED that with the additions to the record ordered above, the agency record and transcript are now deemed settled. In accordance with the Court's September 23, 2026 *Procedural Order*, the Department shall lodge the settled agency record and transcript on appeal with the Court no later than November 4, 2026.

DATED this 4th day of November 2026.



MATHEW WEAVER, Director
Idaho Department of Water Resources

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of November 2026, I caused to be served a true and correct copy of the foregoing *Agency Decision on Objection and Order Settling the Agency Record and Transcript*, via iCourt E-File and Serve, upon the following:

Reed W. Larsen
Cooper & Larsen Chartered
reed@cooper-larsen.com

Damien M. Schiff
Pacific Legal Foundation
dschiff@pacificlegal.org

Travis L. Thompson
Abby R. Bitzenburg
Norman M. Semanko
Garrett M. Kitamura
PARSONS BEHLE & LATIMER
tthompson@parsonsbehle.com
abitzenburg@parsonsbehle.com
nsemanko@parsonsbehle.com
gkitamura@parsonsbehle.com

Bradley R. Cahoon
Dentons Durham Jones Pinegar P.C.
brad.cahoon@dentons.com

Thomas J. Budge
RACINE OLSON, PLLP
tj@racineolson.com

Sarah A. Klahn
Maximilian C. Bricker
SOMACH SIMMONS & DUNN, P.C.
sklahn@somachlaw.com
mbricker@somachlaw.com



GARRICK L. BAXTER
Deputy Attorney General

RAÚL R. LABRADOR
ATTORNEY GENERAL

JOY M. VEGA
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
GARRETT F. HENSLEY, ISB No. 12922
Deputy Attorneys General
Idaho Department of Water Resources
PO Box 83720
Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
garrett.hensley@idwr.idaho.gov

Attorneys for Respondent

IN THE DISTRICT COURT OF THE SEVENTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF BINGHAM

JERRY D. BINGHAM and VALERIE H. BINGHAM, Petitioners, vs. IDAHO DEPARTMENT OF WATER RESOURCES, Respondent, and IDAHO GROUND WATER APPROPRIATORS, INC., CITY OF POCATELLO, AMERICAN FALLS RESERVOIR DISTRICT #2, MINIDOKA IRRIGATION DISTRICT A&B IRRIGATION DISTRICT, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, TWIN FALLS CANAL COMPANY, Intervenors.	Case No. CV06-26-1801 **AGENCY'S CERTIFICATE OF RECORD**

I, Mathew Weaver, Director of the Idaho Department of Water Resources, do hereby certify that the above and foregoing record was compiled under my direction, and is a true and correct record of the pleadings, papers, and proceedings offered and admitted therein as shown in the table of contents and index to this record.

DATED this 4th day of November 2026.



MATHEW WEAVER, Director

RAÚL R. LABRADOR
ATTORNEY GENERAL

JOY M. VEGA
Chief of Energy and Natural Resources Division

GARRICK L. BAXTER, ISB No. 6301
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Boise, Idaho 83720-0098
Telephone: (208) 287-4800
Facsimile: (208) 287-6700
garrick.baxter@idwr.idaho.gov
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On October 7, 2026, the Idaho Department of Water Resources ("Department") served its *Notice of Lodging the Agency Record and Transcript with the Agency* ("*Notice*") in this matter pursuant to I.R.C.P. 84(j)(1). The *Notice* gave the parties fourteen (14) days from the date of the *Notice* to file any objection to the agency record. On October 21, 2026, Jerry and Valerie

Bingham filed *Petitioners' Objections to the Lodged Agency Record*. No other objections were filed. On November 4, 2026, the Director issued his *Agency Decision on Objection and Order Settling the Agency Record and Transcript*. The agency record and transcript are now deemed settled.

YOU ARE HEREBY NOTIFIED that the settled agency record and transcript are being filed with the District Court pursuant to I.R.C.P. 84(k) and the Court's September 23, 2026 *Procedural Order*, through iCourt e-filing. However, pursuant to I.R.E.F.S. 5(o), the data files and officially noticed file folders included in the agency record have been placed on a USB flash drive and mailed to the Bingham County District Court for conventional filing.

A copy of the settled agency record and transcript filed with the Court, including the data files and officially noticed file folders, has been uploaded to the Department's website. The parties may visit https://idwr.idaho.gov/court-action/cv06-26-1801/ and follow their browser's document download procedure to obtain a copy of the settled agency record and transcript after clicking on the PDFs titled "Settled Agency Record on Appeal" and "Settled Agency Transcript on Appeal," and the zipped file titled "Settled Record Files."

DATED 4th day of November 2026.

STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL



GARRICK L. BAXTER
Deputy Attorney General

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 5th day of November 2026, I caused to be served a true and correct copy of the foregoing *Notice of Lodging the Settled Agency Record and Transcript with the District Court*, via iCourt E-File and Serve, upon the following:

Reed W. Larsen
Cooper & Larsen Chartered
reed@cooper-larsen.com

Damien M. Schiff
Pacific Legal Foundation
dschiff@pacificlegal.org

Travis L. Thompson
Abby R. Bitzenburg
Norman M. Semanko
Garrett M. Kitamura
PARSONS BEHLE & LATIMER
tthompson@parsonsbehle.com
abitzenburg@parsonsbehle.com
nsemanko@parsonsbehle.com
gkitamura@parsonsbehle.com

Bradley R. Cahoon
Dentons Durham Jones Pinegar P.C.
brad.cahoon@dentons.com

Thomas J. Budge
RACINE OLSON, PLLP
tj@racineolson.com

Sarah A. Klahn
Maximilian C. Bricker
SOMACH SIMMONS & DUNN, P.C.
sklahn@somachlaw.com
mbricker@somachlaw.com



GARRICK L. BAXTER
Deputy Attorney General