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	**FINAL ORDER REGARDING METHODOLOGY FOR DETERMINING MATERIAL INJURY TO REASONABLE IN-SEASON DEMAND AND REASONABLE CARRYOVER**

FINDINGS OF FACT

I. Procedural Background

1. On September 5, 2008, the Director of the Department of Water Resources ("Director" or "Department") issued a final order in this matter ("2008 Final Order"), in which he ruled on all issues raised at hearing, with the exception of stating his methodology for determining material injury to the Surface Water Coalition's ("SWC") reasonable in-season demand ("RISD") and reasonable carryover. R. Vol. 37 at 7386.[1]

2. On July 24, 2009, the Honorable John M. Melanson issued his *Order on Judicial Review*, which found that the Director's decision to bifurcate his orders was unlawful under the IDAPA. *Order on Judicial Review* at 32. The court remanded this issue "for further proceedings consistent with this decision." *Id.* at 33. Petitions for rehearing were filed by the City of Pocatello ("Pocatello") and the Idaho Ground Water Appropriators, Inc., North Snake Ground Water District, and Magic Valley Ground Water District (collectively referred to herein as the "IGWA"). At times, this order will refer to IGWA and Pocatello collectively as "ground water users" or "GWU."

3. On March 4, 2010, the court issued its *Order Staying Decision on Petition for Rehearing Pending Issuance of Revised Final Order*. The order was issued pursuant to Idaho

[1] For purpose of convenience, all citations in this Final Order are to material that was admitted during the hearing and is part of the final agency record on appeal, which was lodged with the Fifth Judicial District Court on February 6, 2009.

Appellate Rule 13(b)(14) and tasked the Director to issue a final order determining material injury to RISD and reasonably carryover by March 31, 2010. On March 29, 2010, the court extended the deadline to April 7, 2010. *Order Granting Unopposed Motion for Extension of Time to File Order on Remand.*

4. The purpose of this Final Order is to set forth the Director's methodology for determining material injury to RISD and reasonable carryover to members of the SWC.

II. Methodology For Determining Material Injury To Reasonable In-Season Demand

A. Background to Reasonable In-Season Demand

5. The May 2, 2005 Amended Order ("May 2005 Order") and its progeny used the concept of a minimum full supply to quantify the amount of water members of the SWC needed during an irrigation season to ensure a reasonable supply. The minimum full supply was established by reviewing diversion records over a fifteen-year period (1990-2004), and selecting a single year with the smallest annual diversion amount that had full headgate deliveries without leasing any storage space. R. Vol. 37 at 7065. The year that best fit these criteria was 1995. *Id.* at 7066.

6. The May 2005 Order and its progeny were the subject of a fourteen-day hearing before hearing officer Gerald F. Schroeder ("Hearing Officer"). During the hearing, the Department presented its use of the minimum full supply analysis for determining material injury to in-season diversions. The parties presented competing proposals that were based on a water budget method. R. Vol. 37 at 7096.

7. In his April 29, 2008 *Opinion Constituting Findings Of Fact, Conclusions Of Law And Recommendation* ("Recommended Order"), the Hearing Officer stated that he could not reconcile the water budget methods advanced by the parties. R. Vol. 37 at 7096-97. The Hearing Officer stated that "the Department must modify the minimum full supply analysis as a method of establishing a baseline of predicted water need for projecting material injury." R. Vol. 37 at 7098. Reasons for modifying the Director's method were as follows:

> Predictions of need should be based on an average year of need, subject to adjustment up or down depending upon the particular water conditions for the irrigation season. This is the initial concept behind the minimum full supply. The development of an acceptable baseline subject to adjustment for changing conditions retains the value of having senior rights while providing some level of protection against unnecessary curtailment. The concept is good, but the minimum full supply identified by the Director has no defenders from the parties. A brief summary of objections to the Director's minimum full supply can be stated:
>
> > a. It is based on a wet year. To get to an average moisture year an adjustment would be necessary to determine how much greater the minimum full supply would be if the weather equated to an average year when an adequate amount of water was delivered.

b. It is based on a decade old year that does not reflect current efficiencies such as the increased use of sprinkler irrigation and computer monitoring or changes in the amount of land irrigated.

c. It has an emphasis on supply rather than need. That is the amount of water that provided full headgate deliveries. Those may or may not have been needed in that wet year.

R. Vol. 37 at 7096.

8. For purposes of future administration, the Hearing Officer provided the following guidance:

a. To the extent 1995 is utilized it should be adjusted to determine how much the need for irrigation water was depressed by the well-above average precipitation and how much less loss from evaporation there would have been from depressed temperatures compared to a normal temperature year. This would result in an increase in the baseline utilized by the Director. The objection that arriving at a baseline by using the amount delivered in a specific year emphasized supply rather than need is worthy of consideration. However, the evidence does not establish waste in the use of water in 1995. Absent evidence of waste it is appropriate to assume that the water was applied to a beneficial use.

b. If there have been significant cropping changes resulting in either greater or less need for water, those should be factored. This is an area of caution. Cropping decisions are matters 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.

c. Changes in facilities, diversion, conveyance, and irrigation practices from earlier years should be considered, e.g. the extent to which conversions to sprinklers have affected water use over time. This again must be considered with caution to avoid rewriting a water right through the process of determining a baseline water need for predictions of material injury. There may be legitimate reasons to revert to gravity flow in the future or change other practices.

d. Analysis of soil conditions to determine how water is retained or lost is a factor. Soil may hold water to be used by crops in the future. The fact that water may be applied to the ground when there are no plants growing does not mean the water is wasted. That depends on the nature of the soil and the amount of soil. Some soil retains water well, other does not. This affects the timing and extent of water delivery.

e. 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.
>
> **f. Calculation of a water budget should be based on acres, not shares.** The allocation of water within a district is a matter of internal management, but the calculation of a water budget in determining if there will be curtailment should be based on acres not shares.
>
> **g. Full headgate delivery for Twin Falls Canal Company should be calculated at 5/8 inch instead of 3/4 inch.** 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.[2]

R. Vol. 37 at 7099-7100 (emphasis in original).

9. According to the Hearing Officer, "it is time for the Department to move to further analysis to meet the goal of the minimum full supply but with the benefit of the extended information and analysis offered by the parties and available to its own staff." R. Vol. 37 at 7098. In the 2008 Final Order, the Director recognized the Hearing Officer's recommendations and stated his intention of adjusting his future analysis for determining material injury to RISD and reasonable carryover. R. Vol. 39 at 7386.

10. The methodology for determining material injury to 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 take into account a different baseline year or baseline years.

[2] This recommendation was accepted by former Director Tuthill in his Final Order. R. Vol. 39 at 7392. In his July 24, 2009 *Order on Judicial Review*, Judge Melanson found that the Director exceeded his authority in making this determination. *Order on Judicial Review* at 31. The court based its decision on the filing of the *Director's Report* in the Snake River Basin Adjudication, which "recommend[ed] ¾ of an inch per acre." *Id.* at 31. In its *Opening Brief on Rehearing*, IGWA asked the court to "clarify that the Director has the authority to determine that in times of shortage Twin Falls Canal Company may not be entitled to its full decreed (or recommended amount)[.]" This issue has been stayed and held in abeyance until after the Director issues his final order regarding his methodology for determining material injury to RISD and reasonable carryover. *Order Staying Decision on Petition for Rehearing Pending Issuance of Revised Final Order* at 3.

B. Brief Overview of the Methodology for Determining Material Injury to the SWC's Reasonable In-Season Demand and Reasonable Carryover

11. 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 – FS

12. Reasonable carryover shortfall will be computed by taking the difference between reasonable carryover and actual carryover, where reasonable carryover is defined as the difference between a baseline year demand and projected typical dry year supply.

- Reasonable Carryover Shortfall = Actual Carryover – Reasonable Carryover

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

C. Reasonable In-Season Demand

i. Considerations for the Selection of a Baseline Year

14. A BLY is a year(s) that represents demands and supplies that can be used as a benchmark to predict need in the current year of irrigation at the start of the irrigation season. The purpose in predicting need is to project an upper limit of material injury at the start of the season.

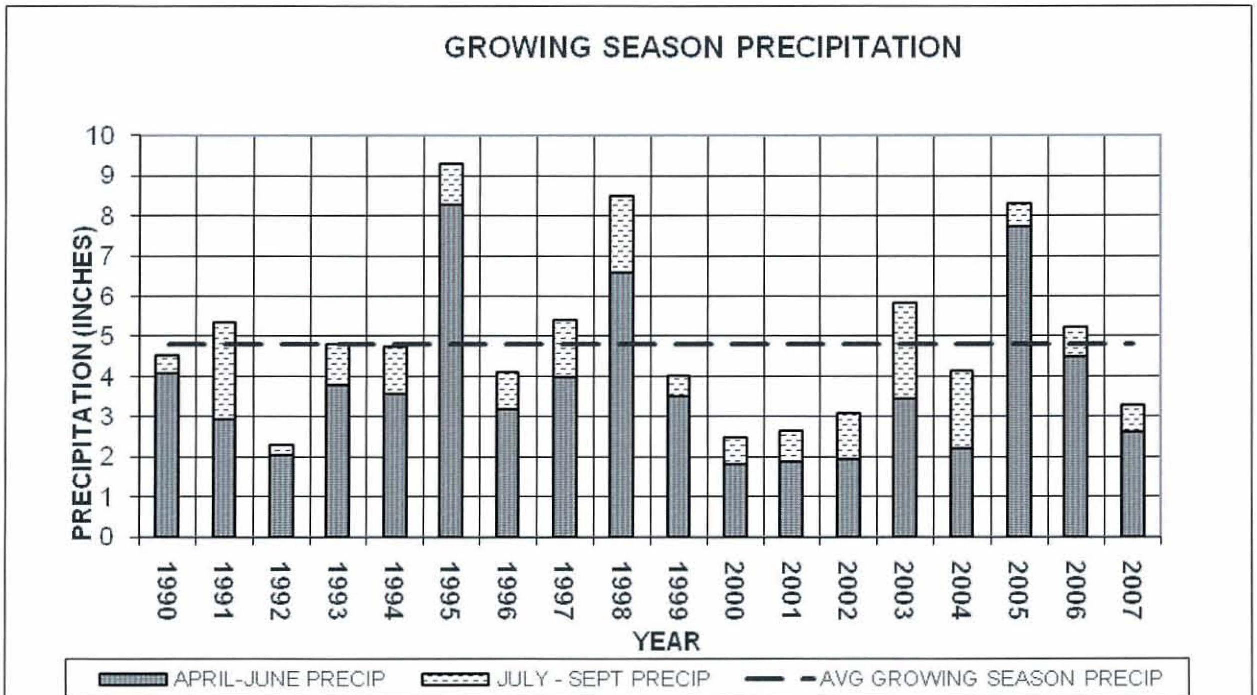
15. A BLY is selected by analyzing three factors: (1) climate; (2) available water supply; and (3) irrigation practices. R. Vol. 37 at 7098. To capture current irrigation practices, identification of a BLY is limited to years subsequent to 1999. *Id.* at 7096.

16. The historic diversion volumes from the BLY, along with the predicted supply forecast at the start of the irrigation season, are used to predict the initial in-season demand shortfall, where demand shortfall is the difference between the BLY demand ("BD") and the FS. Demand shortfall increases in magnitude the greater the difference between BD and FS; 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 a year(s) exactly representing average conditions is used for predicting demand shortfall at the start of the season, which turns out to be a high demand season, demand shortfall will be under estimated at the start of the season. Therefore, a BLY should represent a year(s) of above average diversion, and to avoid years of below average diversions. Above average diversion year(s) selected as the BLY should also represent 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.

a. Climate

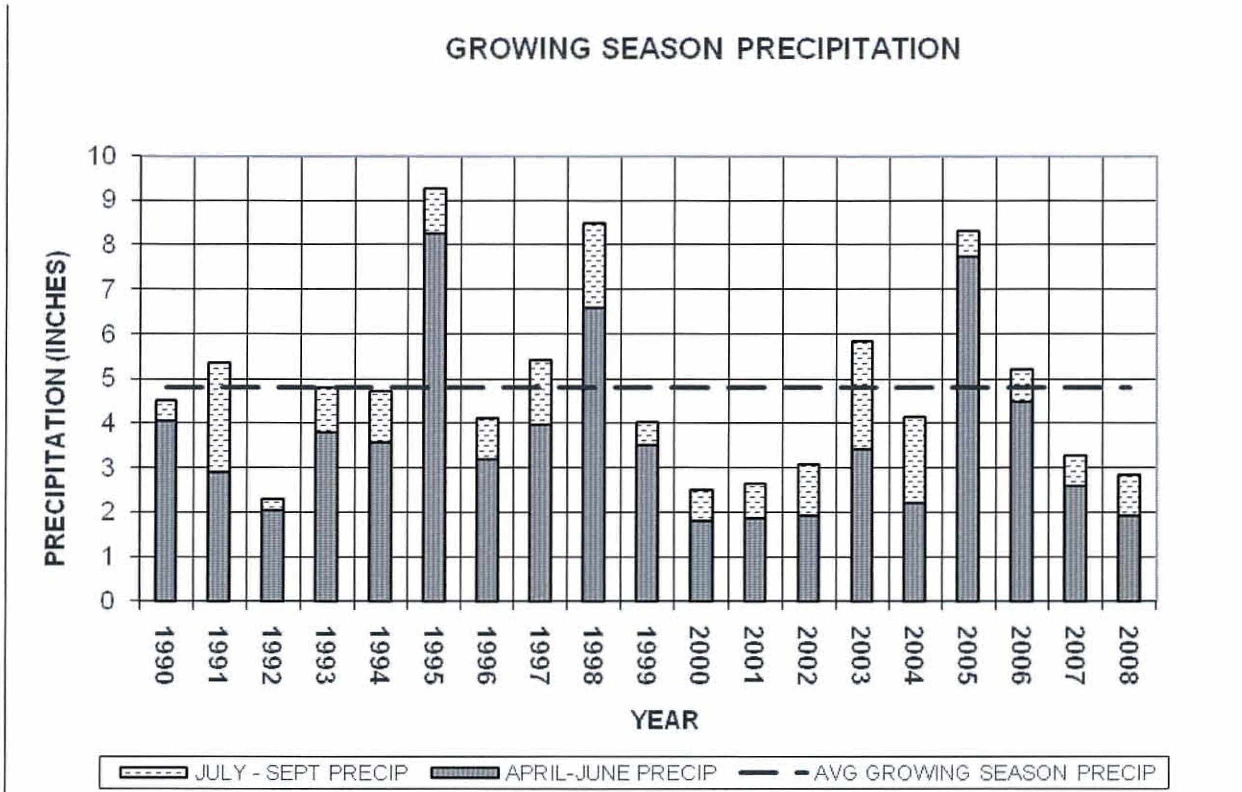
17. For the methods outlined herein, climate is represented by precipitation, ET, and growing degree days.

18. Precipitation. Water, in all phases, introduced to Idaho from the atmosphere is termed precipitation. During the growing season, precipitation has a substantial influence on crop water need both as a source of water to growing crops and as an influencing factor on ET. 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. *Id.* at 12. Since 2000, the year 2006 received the nearest to average of growing season precipitation (April through September) relative to the 1990 through 2007 average, with 5.22 inches out of 4.79 inches for the average, or 109% of average. No other years were within +/- 10% of average.



Growing Season Precipitation at Twin Falls Weather Station 1990–2007.[3]

[3] Graph created from raw AgriMet precipitation data. Examples of the use of AgriMet precipitation data in the record may be found at: Ex. 3007 at 21; Ex. 8000, Vol. II at 6-2:6-4; Ex. 8000, Vol. IV at AU-2.



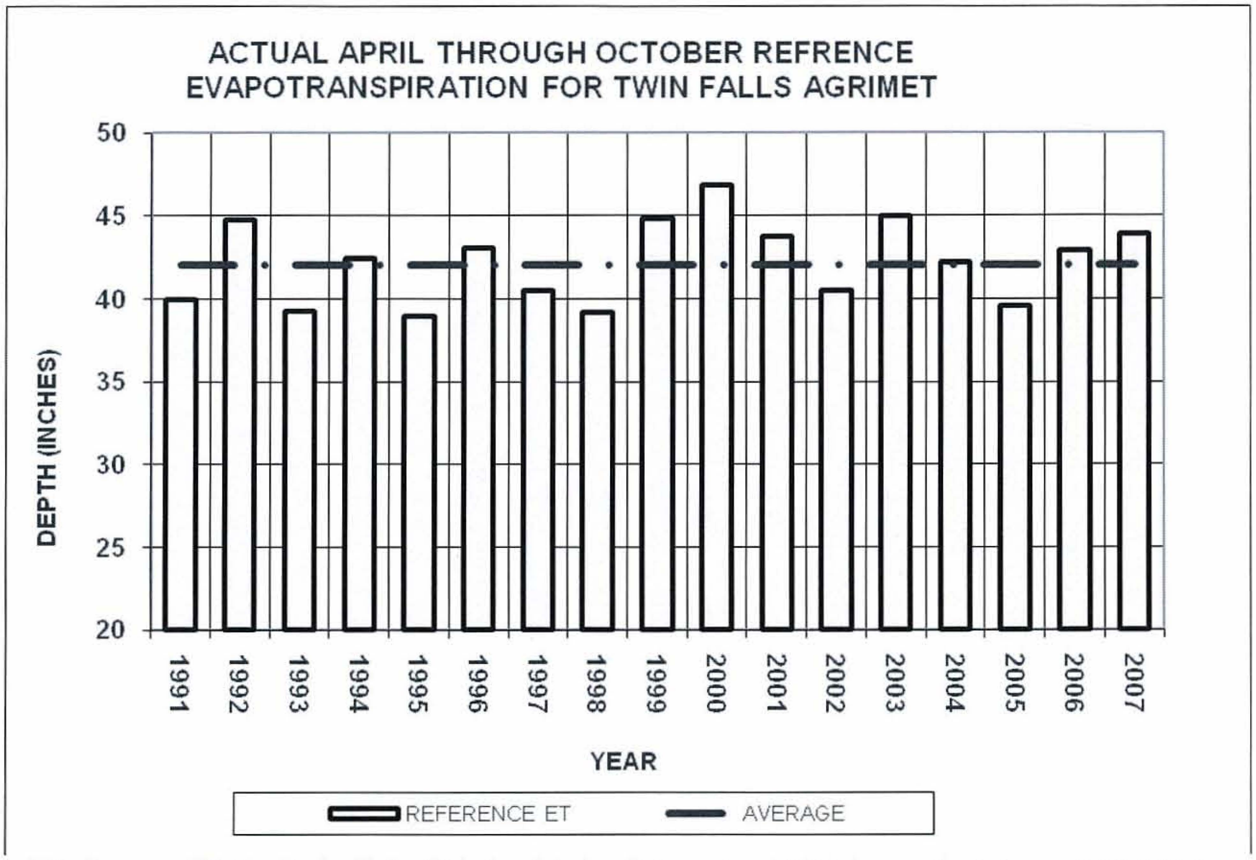
Growing Season Precipitation at Twin Falls Weather Station 1990–2008.[4]

19. Evapotranspiration. ET is a combined variable that describes the amount of water that evaporates from the ground from irrigation and transpires from vegetation. 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 GWU proposed the use of ET values from Allen Richard G. 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.

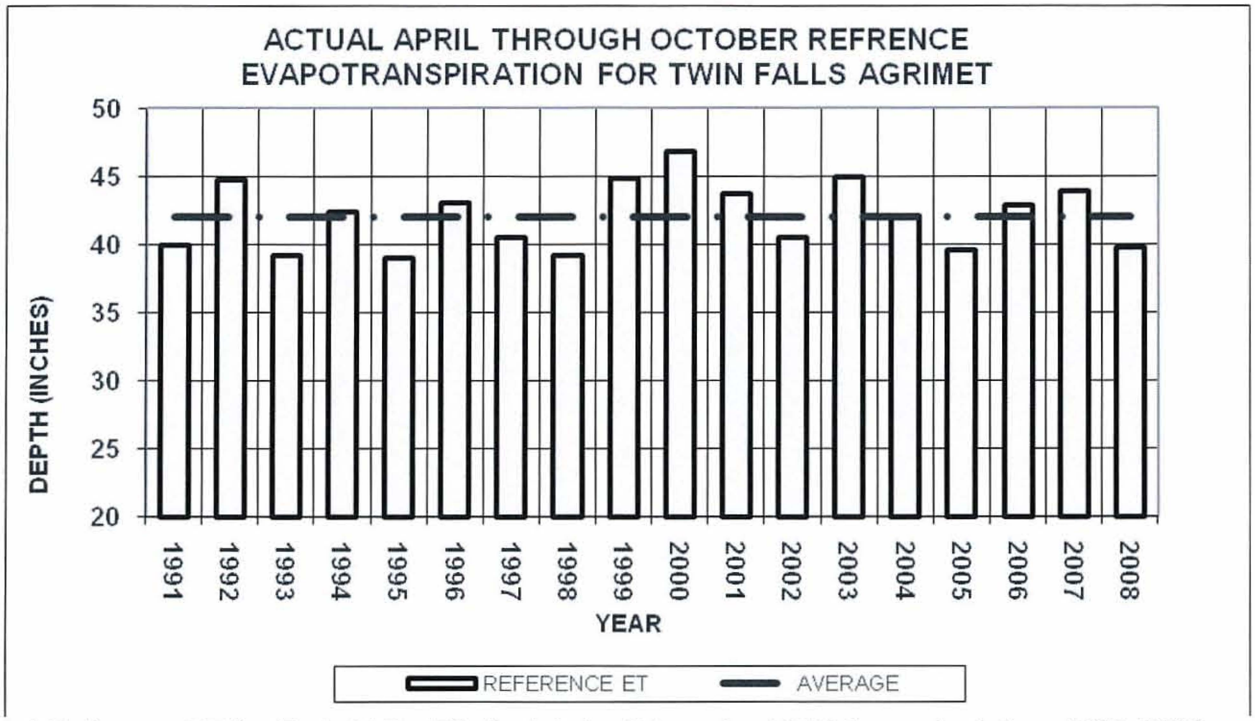
20. The use of reference ET calculated using ETIdaho for the Twin Falls (Kimberly) AgriMet site as an indicator of overall crop water need for a season is appropriate for purposes of comparison of historical average water need between seasons. Similar use of ETIdaho crop irrigation requirement data for AgriMet stations were employed in some of the expert reports submitted during hearing. *See* Ex. 3007 at 21. The ETIdaho method includes the contribution of effective precipitation in the reference ET calculation, and is a strong measure of the actual reference ET as opposed to the traditional potential ET, or the amount of ET the reference crop would use if water were not a limiting factor. ETIdaho is used here for the specific task of selecting appropriate BLY candidates. Total April through October reference ET for the period of record

[4] The record established at hearing was current through the year 2007. Since that time, Water District 01 has finalized its accounting for the 2008 irrigation season; thereby making the use of 2008 data appropriate. Water District 01 has not yet finalized its accounting for the 2009 irrigation season. For purposes of this order, the Director will specifically denote instances in which he uses 2008 data.

from the Twin Falls (Kimberly) AgriMet site is shown below. Since 2000, the years of 2000, 2001, 2003, 2006 and 2007 have been years of above average ET.



Actual Reference ET for Twin Falls (Kimberly) AgriMet using ETIdaho methodology 1991-2007.



Actual Reference ET for Twin Falls (Kimberly) AgriMet using ETIdaho methodology 1991-2008.

21. Growing Degree Days. Growing degree days provide a way to characterize 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 indicates 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. Above average years since 2000 include: 2000, 2001, 2002, 2003, 2006, and 2007.

Year	GDD: April-Sept	% of Average	Year	GDD: April-Sept	% of Average
1991	2,095.4	86%	2000	2,591.3	107%
1992	2,610.7	107%	2001	2,600.8	107%
1993	2,004.7	82%	2002	2,465.6	101%
1994	2,516.8	103%	2003	2,585.4	106%
1995	2,257.8	93%	2004	2,428.9	100%
1996	2,418.6	99%	2005	2,320.1	95%
1997	2,478.4	102%	2006	2,601.9	107%
1998	2,422.2	100%	2007	2,657.7	109%
1999	2,294.9	94%			
		Average GDD:		2,432.4	

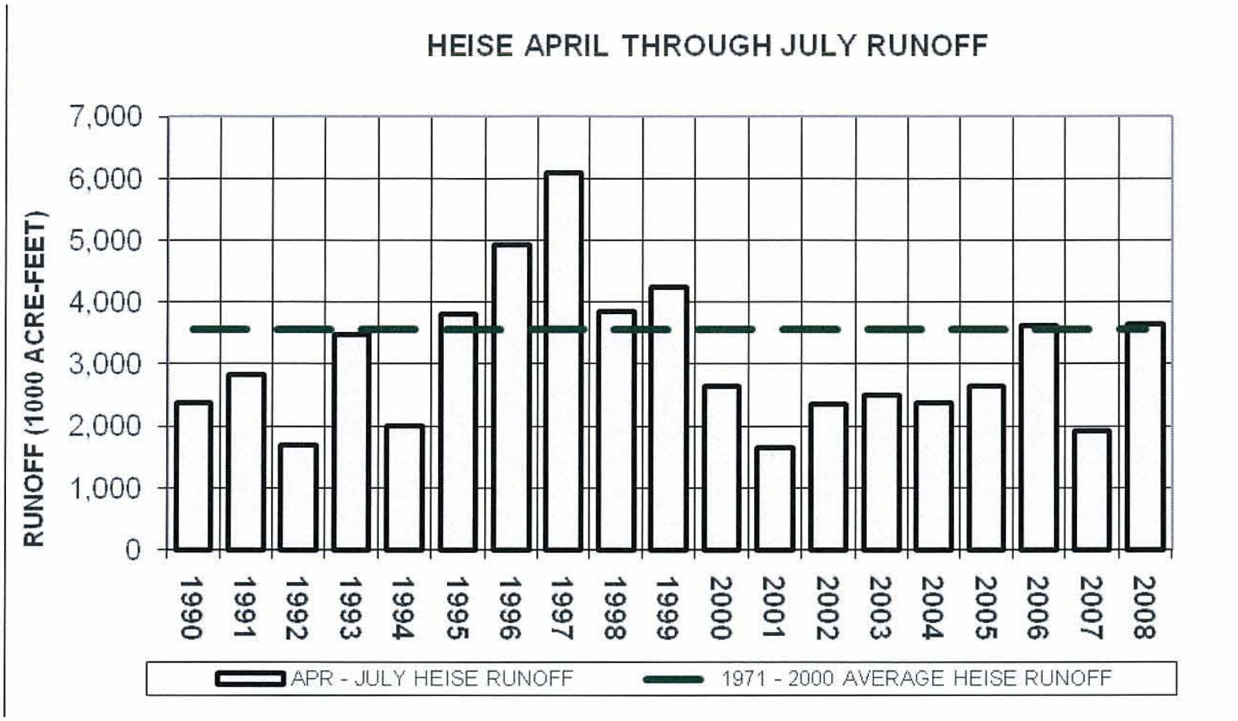
Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1991-2007, Ex. 3024 at 10.

Year	GDD: April-Sept	% of Average	Year	GDD: April-Sept	% of Average
1991	2,095.4	86%	2000	2,591.3	107%
1992	2,610.7	107%	2001	2,600.8	107%
1993	2,004.7	83%	2002	2,465.6	101%
1994	2,516.8	104%	2003	2,585.4	106%
1995	2,257.8	93%	2004	2,428.9	100%
1996	2,418.6	100%	2005	2,320.1	95%
1997	2,478.4	102%	2006	2,601.9	107%
1998	2,422.2	100%	2007	2,657.7	109%
1999	2,294.9	94%	2008	2,382.9	98%
		Average GDD:		2,429.7	

Growing Degree Days ("GDD") for Twin Falls (Kimberly) AgriMet Site 1991-2008.

b. Available Water Supply

22. 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. The predictions made in this forecast are a good indicator of the total available irrigation water supply for a season. R. Vol. 37 at 7071. The April through July volume represents the amount available for diversion into storage reservoirs and also serves as an indicator of natural flow supplies. *Id.* at 7066. The figure below shows actual unregulated flow volumes at Heise for 2000-2007 and the Joint Forecast volume for 2008. Since the 2000 irrigation season, and recognizing that diversions for each individual member of the SWC are different, 2006 and 2008 are the only years in which water supply was not severely limited. The thirty-year average is indicated by the dashed line.



April through July Unregulated Flow Volume at Heise, 1990-2008. Ex. 8000, Vol. II at 6-37:6-38; R. Vol. 37 at 7018-28 (includes 2008 Joint Forecast projection for Heise).

c. Irrigation Practices

23. A BLY must be recent enough to represent current irrigation practices. R. Vol. 37 at 7099-7100. Conditions that should be consistent are the net area of the irrigated crops, farm application methods (flood/furrow or sprinkler irrigation), and the conveyance system from the river to the farm. The type of sprinkler systems should be similar between the BLY and the current year, whether side roll systems, hand lines, or center pivot.

24. Sprinkler systems are currently the predominant application system. *Id.* at 7101-02. In order 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.

25. 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.

ii. Selection of the Initial Baseline Year

26. In evaluating the factors listed above, 2006 satisfies the Hearing Officer's recommendations better than any other single year in the recent record (since 2000).

27. From the standpoint of total annual SWC diversion volumes, 2006 is an appropriate BLY. From 2000-2008, 2006 had total diversions of 97%. If BLY selection is limited to a single

year, 2006 is the best fit in the recent past. However, from the standpoint of annual diversion for individual entities, 2006 was a year of below average diversions for Milner, Minidoka Irrigation District ("MID"), and TFCC, at 82%, 98%, and 96%, respectively (*see* Finding of Fact 29). The selection of a single BLY for all entities is challenging, with all years representing average or near average diversions for some entities, but not others. By selecting a BLY that is comprised of the average of multiple years, a BLY can be selected that best represents the required conditions for each and all entities.

28. With the exception of diversions for Milner, MID, and TFCC, 2006 is an appropriate BLY selection for a single year. The Director finds, however, 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.[5] The 06/08 average has below average precipitation, near average ET, above average growing degree days, and were years in which diversions were not limited by availability of water supply. When compared to a period of record spanning from 1990-2008, the 06/08 diversions were above average; or average when considering a period of record from 2000-2008.[6]

29. Comparison of 2006 diversions to the 2000-2008 overall average, below, indicates that, for the SWC entities, with the exception of Milner, the 2006 diversions were within 4% of average. By comparing the average of 2006 and 2008 (06/08) diversions to the 2000-2008 overall average for the SWC entities, the 06/08 diversion are above the historic average, with the exception of Milner, keeping in mind that the average includes the drought years of 2000-2005.

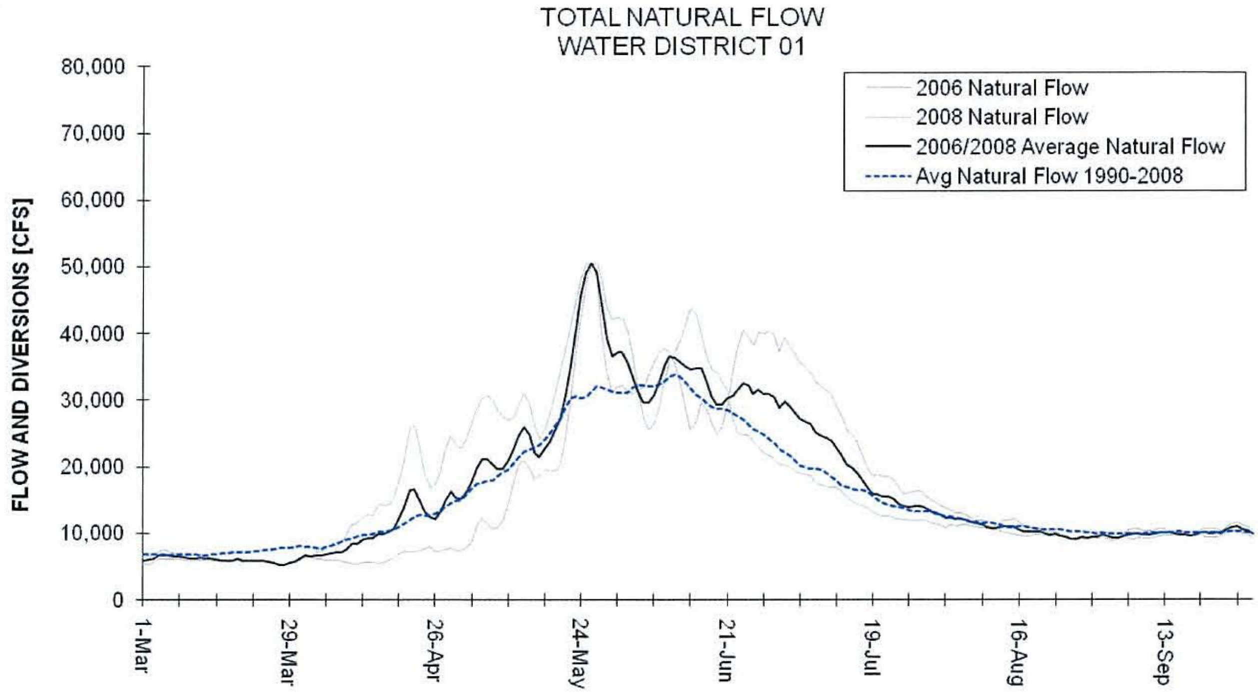
	2000-2008 Avg. Diversions	'06 Total Diversions	'06 % of Avg.	'06/'08 Avg. Total Diversions	'06/'08 % of Avg.
A&B	57,615	57,492	100%	58,492	102%
AFRD2	409,865	410,376	100%	415,730	101%
BID	245,295	247,849	101%	250,977	102%
Milner	50,786	41,671	82%	46,332	91%
Minidoka	358,018	352,269	98%	362,884	101%
NSCC	955,439	963,007	101%	965,536	101%
TFCC	1,031,987	995,822	96%	1,045,382	101%
		Average:	97%		100%

SWC Diversions for 2006; 2006/2008; and 2000 through 2008 Average. Ex. 8000, Vol. IV, Appdx. AS-1-8.

[5] In 2006, TFCC delivered ¾ of a miner's inch. Tr. p. 1601, lns. 1-15.

[6] Former Director Dreher found in the May 2005 Order that "since the year 2000 the Upper Snake River Basin has experienced the worst consecutive period of drought years on record." R. Vol. 8 at 1375, ¶ 78. The drought during this time period was determined by former Director Dreher to have a "probability of recurrence of something in excess of 500 years . . . ." Tr. p. 327, lns. 20-21.

30. Daily natural flow supply for Water District 01 in 2006 and 2008 are depicted below. When averaged together, the 2006 and 2008 natural flow is near the long term average (1990-2008). The long term average is shown as the blue dashed line.



Water District 01 Natural Flow, 2006 and 2008. Ex. 4604.

D. Calculation of Reasonable In-Season Demand

31. 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. Assessment of Water Balance Studies Presented at Hearing

32. Water balance approaches to address the quantity of water needed by members of the SWC were presented in testimony, reports, and exhibits at the hearing. The methodology used for water balance studies provided by the SWC and the GWU experts is summarized in equation form, as set forth in Equation 1, below:

(1) $$Q = \left[\left(\frac{ET_c \times F_c}{E_a} \right) - W_e \right] \times A_{ID} + S_{loss}$$

Where:

Q = irrigation entity diversion requirement,
ET_c = consumptive use of each crop,
F_c = fraction of area of each crop in irrigation entity,
E_a = field application efficiency,
W_e = estimated effective rainfall during growing season,
A_{ID} = irrigated area in irrigation entity, and
S_{loss} = seepage loss from canals.

33. The variables described above were common to both the SWC and GWU water balance analyses, with the following exceptions. The GWU did not account for effective precipitation (W_e). Ex. 3007 at 17-19. Analysis by the GWU included a reduction in the diversion requirement for supplemental ground water used within SWC service areas. *Id.* at 17. Both of these exceptions will be considered for purposes of determining RISD shortfalls.[7]

34. Another component not shown or considered by the parties is the operation loss, or project return flows. SWC experts recognized the lack of data necessary to estimate this factor: "Operational losses and returns within the delivery system were not included in the irrigation diversion estimate since no consistent measured operational waste records are available." Ex. 8000, Vol. II at 9-7.

35. The areal extent of the SWC is large. Obtaining field measurements of canal seepage losses on the vast network of canals and laterals is not presently feasible given the time and resources necessary to complete such a task. The same would be true for determining the true value of farm or field application efficiency. Measuring farm runoff and deep percolation losses out of the crop root zone at a field level scale is also not practical given the time and resources necessary to complete such a task. Lacking measured data for canal seepage losses, farm runoff, and deep percolation, these parameters must be estimated.

36. The Director must exercise his best professional judgment in quantifying inputs to the water balance study. Differences in judgment affect the numerical results. As stated by the Hearing Officer:

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[7] As stated by former Director Dreher, "In making a determination of how much water is needed, I thought is was important to look at all three of those sources [surface water, storage water, and supplemental ground water]." Tr. p. 25, ln. 25; p. 26, lns. 1-2. 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.

> 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. Sullivan Rebuttal Report, November 7, 2007, page 17. The total under the SWC analysis is 3,274,948 acre-feet as compared to the Pocatello analysis of . . . 2,405,861 [acre-feet]. The Director's minimum full supply amount of 3,105,000 falls between the two, though much closer to the SWC analysis.

R. Vol. 37 at 7096.

37. The Hearing Officer also found that the average annual surface irrigation requirements based on 1990 through 2006 for the North Side Canal Company ("NSCC") as calculated by experts for the SWC and GWU differed by 473,217 acre-feet. R. Vol. 37 at 7097. Annual average requirements based on the 1990 through 2006 period for TFCC vary by 310,000 acre-feet. *Id.* These discrepancies do not indicate errors in formulations or calculations, but do demonstrate the range of values in the total irrigation demand that are possible if contributing components to that total demand are calculated using different methods, or with different estimates of unknown parameters.

38. A further example of the range of possible values for seepage loss is shown by comparison of the SWC and GWU expert reports. In the SWC's Exhibit 8201, Pocatello's expert analysis of average annual canal seepage loss is presented as 338,984 acre-feet for NSCC. In the same exhibit, the SWC's expert analysis of average annual seepage loss for NSCC is reported as 586,136 acre-feet.

39. In a 1979 study published by the Idaho Water Resource Research Institute, R.G. Allen and C.E. Brockway determined that conveyance losses for the 1977 diversion volume of 794,930 acre-feet for NSCC was 286,012 acre-feet for 755 miles of canals. Ex. 3060 at 193. Brockway and B.A. Claiborne estimated conveyance losses to be 326,418 acre-feet for the same NSCC system, based on the 1974 diversion volume of 1,117,240 acre-feet. Ex. 3059 at 26.

40. The above seepage loss estimates were all calculated using the Worstell procedure, Ex. 3037 at 38, but range in magnitude by a factor of 1.8 for the two estimates with the highest, but similar, average diversion volumes. Clearly, the magnitudes of the conveyance losses are very sensitive to input parameters selected for use in that procedure.

ii. Project Efficiency

41. Given that the water balance method for estimating annual diversion requirements is subject to varying results based on the range of parameters used as input, an alternate approach is to assume that unknown parameters are practically constant from year-to-year across the entire project. Project efficiency is a term used to describe the ratio of total volumetric crop water need within a project's boundary and the total volume of water diverted by that project to meet 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). By utilizing

project efficiency and its input parameters of crop water need and total diversions, the influence of the unknown components can be captured and described without quantifying each of the components.

42. Project efficiency is calculated as set forth in Equation 2, below:

$$(2) \qquad E_p = \frac{CWN}{Q_D}$$

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.

43. Monthly irrigation 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.

44. 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. Project efficiencies will be calculated on a monthly basis for use in adjusting RISD during the year of evaluation. The tables below present average project efficiencies for each SWC member (2001-2007; 2001-2008), with project efficiencies during that time span greater or less than two standard deviations 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	AVG.
4	0.93	0.19	0.27	1.12	0.17	0.14	0.19	0.43
5	0.42	0.27	0.30	0.62	0.26	0.28	0.32	0.35
6	0.63	0.42	0.47	0.61	0.49	0.44	0.52	0.51
7	0.80	0.44	0.56	0.66	0.65	0.50	0.56	0.60
8	0.69	0.38	0.43	0.55	0.48	0.38	0.41	0.47
9	0.52	0.26	0.32	0.49	0.35	0.30	0.24	0.35
10	0.15	0.46	0.11	0.44	0.11	0.24	0.12	0.23
	0.59	0.35	0.35	0.64	0.36	0.33	0.34	0.42

SWC Member Average Monthly Project Efficiencies from 2001-2007.

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	AVG.
4	0.87	0.18	0.26	1.09	0.16	0.14	0.21	0.42
5	0.41	0.25	0.30	0.55	0.27	0.27	0.31	0.34
6	0.64	0.40	0.48	0.61	0.50	0.43	0.50	0.51
7	0.77	0.44	0.56	0.61	0.64	0.48	0.55	0.58
8	0.65	0.38	0.42	0.54	0.48	0.39	0.41	0.46
9	0.51	0.25	0.31	0.44	0.33	0.29	0.24	0.34
10	0.17	0.37	0.11	0.31	0.10	0.20	0.10	0.19
Season Avg.	0.57	0.32	0.35	0.59	0.35	0.31	0.33	0.41

SWC Member Average Monthly Project Efficiencies from 2001-2008.

iii. Crop Water Need

45. Crop water need ("CWN") is 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. Crop water need is the difference between the fully realizable consumptive use associated with crop development, or ET, and effective precipitation (We) 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 in Equation 3, below:

$$(3) \qquad CWN = \sum_{i=1}^{n} (ET_i - W_e) A_i$$

Where,

CWN = crop water need
ET_i = consumptive use of specific crop type,
W_e = estimated 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.

iv. Evapotranspiration

46. ET has been estimated by experts for the parties using theoretically based equations that calculate ET for an individual crop, thus 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.

47. At hearing, values of ET were estimated by the SWC from AgriMet, Ex. 8000, Vol. IV, Appdx. AU-1, and by the GWU 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. At this time, 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, crop water need, and RISD. In the future, with the development of additional enhancements, ETIdaho may become a more appropriate analytical tool for determining ET.

48. The utilization of AgriMet derived crop specific ET values necessitates crop distribution profiles similar to those described and presented at hearing. R. Vol. 2 at 420-26; Ex. 3007 at 21 & Table 4; and Ex. 3026. The methodology will utilize crop distributions based on distributions from the United States Department of Agriculture's National Agricultural Statistics Service ("NASS"). Ex. 1005 at 1.[8] 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. It is the Department's preference to rely on data from the current season if and when it becomes usable.

49. AgriMet crop water use (i.e. ET) and weather data are available from the Rupert and Twin Falls (Kimberly) stations for use with the closest SWC entity. Using AgriMet data from Rupert for A&B, Burley Irrigation District ("BID"), Milner, and MID provides a reasonable representation of the climate conditions for those entities and are consistent with common standards of practice. Using AgriMet data from Twin Falls (Kimberly) for American Falls Reservoir District No. 2 ("AFRD2"), NSCC, and TFCC provides a reasonable representation of the climate conditions for those entities and is consistent with common standards of practice. Ex. 8000, Vol. IV at AU-2, AU-8.

v. Effective Precipitation

50. Effective precipitation (W_e), or the water in the soil horizon available for crop root uptake, will be estimated from total precipitation (W) utilizing the methodology presented in the USDA Technical Bulletin 1275. Ex. 8000, Vol. IV, Appdx. AU3, AU8. Total precipitation (W) is provided by the USBR as part of its Pacific Northwest Cooperative Agricultural Network, i.e. AgriMet. Ex. 8000, Vol. IV, Appdx. AU3. W_e derived from AgriMet based precipitation values are independent of crop type.

51. 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 crop water need and RISD.

52. As with ET data, AgriMet precipitation data are available from the Rupert and Twin Falls (Kimberly) stations for use with the closest SWC entity. Using AgriMet data from Rupert for A&B, BID, Milner, and MID provides a reasonable representation of the climate conditions for those entities and are consistent with common standards of practice. Using AgriMet data from Twin Falls (Kimberly) for AFRD2, NSCC, and TFCC provides a reasonable representation of the

[8] The ESPA Modeling Committee uses NASS data in the ESPA Model to distribute crop types within the model. *See* Ex. 8000, Vol. 2, Bibliography at II, referencing *Final ESPA Model, IWRRI Technical Report 06-002*.

climate conditions for those entities and is consistent with common standards of practice. Ex. 8000, Vol. IV at AU-2, AU-8.

vi. Summary of Reasonable In-Season Demand Calculation

53. At the start of the irrigation season, RISD is equal to the baseline demand, or total season adjusted diversions for the baseline year(s). When calculated in-season, RISD is calculated by Equation 4, below.

$$(4) \quad RISD_{milestonex\_x} = \sum_{j=1}^{m}\left(\frac{CWN_j}{E_{p,j}}\right) + \sum_{j=m+1}^{7} BD_j$$

Where:

$RISD_{mileston\_x}$ = 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.

54. Water is sometimes diverted into canals and onto crops fields in support of crop development for reasons other than strictly meeting the consumptive requirement of the crop; such as canal wetting, salt leaching, soil wetting, and soil temperature control. April and October represent months during the irrigation season when the method of calculating RISD strictly as a function of CWN and PE is less reliable, because CWN is often not the driving factor in diversions during these bookend months. To account for uncertainty of RISD calculations during those time periods, April and October RISD adjustments have been developed.

55. April RISD Adjustment: In April, calculated RISD, as a function of CWN and PE, can grossly under estimate actual diversion needs. Therefore, for each individual surface water provider, if the calculation of CWN/E_p for the month of April is less than the April average diversion volume over a record of representative years in the recent past, then RISD will be equal to the April average diversion volume. If the calculation of CWN/E_p is greater than the April average, then RISD will equal the calculated CWN/E_p volume.

56. October RISD Adjustment: In October, calculated RISD, as a function of CWN and PE, can either grossly under or over estimate actual diversion needs. For each individual surface water provider, if the calculation of CWN/E_p for the month of October is greater than the October maximum diversion volume, or less than the October minimum diversion volume, over a record of representative years in the recent past, then RISD will be equal to the October average diversion volume, over the same period of representative years. If the calculation of CWN/E_p is less than the October maximum diversion volume, or greater than the October minimum diversion volume, then RISD will equal the calculated CWN/E_p volume.

D. Adjustment of Forecast Supply

57. 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 1

58. 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. 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. R. Vol. 2 at 226. With data from 1990 through the previous water year, a regression equation will be developed for each SWC member by comparing the actual Heise natural flow to the natural flow diverted. *See e.g.* R. Vol. 8 at 1416-22. The regression equation will be used to predict the natural flow diverted for the upcoming irrigation season. *Id.* at 1380. The 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. *Id.*; Tr. p. 65, lns. 6-25; p. 66, lns. 1-2.

59. The storage allocation for each member of the SWC will be estimated by the Department following the Joint Forecast. The reservoir fill and allocation will be predicted by using data from a similar year. The Forecast Supply is the sum of the estimated storage allocation and the predicted natural flow diversion. This volume will be used in the shortfall calculations until better data is available later in the irrigation season.

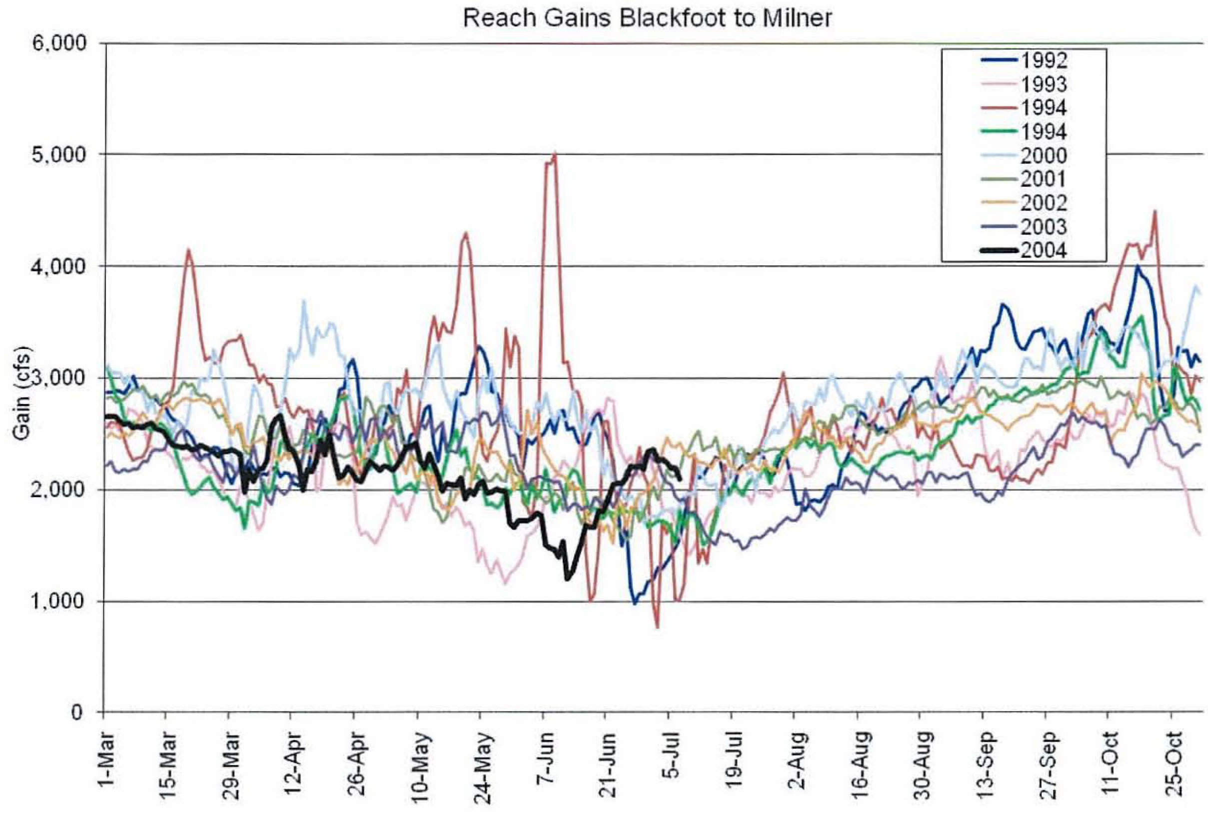
ii. Early to Mid-July

60. In early to mid-July, the Forecast Supply will be adjusted. The reservoirs will typically have filled to their peak capacity for the season and the storage water will have been allocated. The Department's water rights accounting model will be used to 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 gains in the Blackfoot to Milner reach. Reach gains are graphed below, using 2004 as an example. In this case, 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. The adjusted Forecast Supply is the sum of the actual natural flow diversions, the predicted natural flow diversions, and the storage allocation.

iii. Time of Need

61. The July procedure will be repeated shortly before the Time of Need[9] with the updated water rights accounting data.

[9] 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 average demand and the 02/04 supply.



Example reach gain analysis for 2004.

E. Calculation of Demand Shortfall

62. Equation 5, below, is used to determine the amount of predicted demand shortfall during the irrigation season.

$$(5) \qquad DS = RISD - FS$$

Where:

DS = demand shortfall for specified evaluation points throughout the season,
RISD = Reasonable in-season demand from Equation 4, and
FS = forecasted supply for remainder of season after specified evaluation point during the season.

63. 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 in the middle of the season.

III. Methodology For Determining Material Injury To Reasonable Carryover

64. CM Rule 42.01.g provides 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."

A. Projected Water Supply

65. CM Rule 42.01.g provides that the Director "shall consider . . . 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 demand for the following irrigation season at the end of the current irrigation season, the Director must make a projection of need. R. Vol. 37 at 7109 ("Anticipating the next season of need is closer to faith than science."). The average of 2006/2008 BLY will be the projected demand.

66. Similar to projecting demand, the Director must also project supply. The Heise natural flows, for the years 2002 and 2004, were well below the long term average (1971-2000) but were not the lowest years on record. Ex 8000, Vol. II at 6-37:6-28; R. Vol. 8 at 1379-80. 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 fill
- 2004 supply = natural flow diverted + new fill
- Projected supply = average of 2002 supply and 2004 supply

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

67. As described above, reasonable carryover based on projected water supply (2002/2004) and projected demand (2006 BLY; 2006/2008 BLY) are as follows:

	Reasonable Carryover 2006 BLY (Acre-Feet)	Reasonable Carryover 2006/2008 BLY (Acre-Feet)
A&B	16,000	17,000
AFRD2	50,700	56,000
BID	0	0
Milner	100	4,800
Minidoka	0	0
NSCC	54,700	57,200
TFCC	0	29,700

Reasonable Carryover by Entity (2002/2004 supply; 2006 BLY; 2006/2008 BLY).

B. Average Annual Rate of Fill

68. CM Rule 42.01.g states that the Director "shall consider the average annual rate of fill of storage reservoirs . . . ." The average annual reservoir fill serves as a means to evaluate reasonable carryover, calculated as the difference between the projected demand and the projected supply. 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	MID	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%
Average	82%	99%	98%	90%	96%	95%	95%
Std Dev	27%	5%	5%	16%	7%	6%	10%

Annual Percent Fill of Storage Volume by Entity (1995-2007).[10]

[10] *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.

	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%
Average	83%	99%	97%	90%	95%	96%	95%
Std Dev	26%	5%	6%	16%	8%	6%	10%

Annual Percent Fill of Storage Volume by Entity (1995-2008).

C. Average Annual Carryover

69. CM Rule 42.01.g states that the Director "shall consider the . . . average annual carry-over for prior comparable water conditions . . . ." This factor will be taken into consideration when determining reasonable carryover. 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 2008 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	Year	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Very Dry	2001	9,902	4,217	37,430	26,854	55,132	42,421	26,917
<3000 KAF	2007	62,739	7,962	34,639	36,520	61,744	68,947	(21,811)
	2002	30,192	8,570	72,835	14,531	99,488	133,702	32,635
	2004	(3,771)	18,537	47,845	8,735	97,905	19,145	21,551
	2003	9,401	3,649	51,686	6,906	81,673	166,217	(18,169)
	Average	**21,693**	**8,587**	**48,887**	**18,709**	**79,188**	**86,086**	**8,225**
Dry	2000	66,915	20,787	107,425	43,173	160,183	205,510	52,536
3000 – 4000 KAF	2005	36,665	99,097	90,190	37,593	150,623	365,001	64,452
	Average	**51,790**	**59,942**	**98,808**	**40,383**	**155,403**	**285,256**	**58,494**

Average	2006	89,311	107,682	102,873	58,755	182,612	365,672	51,187
4000-4500 KAF	1995	82,567	167,451	134,340	75,451	237,300	441,729	58,675
	Average	**85,939**	**137,566**	**118,607**	**67,103**	**209,956**	**403,701**	**54,931**
Wet	1998	87,250	144,057	109,014	67,777	193,810	494,664	156,433
>4500 KAF	1999	78,312	121,793	168,545	67,147	205,716	454,338	191,501
	1996	85,209	145,019	127,123	70,250	228,786	472,790	111,459
	1997	89,811	114,324	87,073	65,307	202,475	464,715	136,926
	Average	**85,145**	**131,299**	**122,939**	**67,620**	**207,697**	**471,627**	**149,080**

Actual Carryover Volumes by Entity, Sorted by Heise Natural Flow (1995-2007).

Heise April – Sept Natural Flow	Year	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Very Dry	2001	9,902	4,217	37,430	26,854	55,132	42,421	26,917
<3000 KAF	2007	62,739	7,962	34,639	36,520	61,744	68,947	(21,811)
	2002	30,192	8,570	72,835	14,531	99,488	133,702	32,635
	2004	(3,771)	18,537	47,845	8,735	97,905	19,145	21,551
	2003	9,401	3,649	51,686	6,906	81,673	166,217	(18,169)
	Average	**21,693**	**8,587**	**48,887**	**18,709**	**79,188**	**86,086**	**8,225**
Dry	2000	66,915	20,787	107,425	43,173	160,183	205,510	52,536
3000 – 4000 KAF	2005	36,665	99,097	90,190	37,593	150,623	365,001	64,452
	Average	**51,790**	**59,942**	**98,808**	**40,383**	**155,403**	**285,256**	**58,494**
Average	2006	89,311	107,682	102,873	58,755	182,612	365,672	51,187
4000 – 4500 KAF	2008	92,193	102,753	130,762	63,342	182,531	413,408	65,648
	1995	82,567	167,451	134,340	75,451	237,300	441,729	58,675
	Average	**88,024**	**125,962**	**122,659**	**65,849**	**200,814**	**406,936**	**58,504**
Wet	1998	87,250	144,057	109,014	67,777	193,810	494,664	156,433
>4500 KAF	1999	78,312	121,793	168,545	67,147	205,716	454,338	191,501
	1996	85,209	145,019	127,123	70,250	228,786	472,790	111,459
	1997	89,811	114,324	87,073	65,307	202,475	464,715	136,926
	Average	**85,145**	**131,299**	**122,939**	**67,620**	**207,697**	**471,627**	**149,080**

Actual Carryover Volumes by Entity, Sorted by Heise Natural Flow (1995-2008).

70. 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 and the 2006/2008 BLY diversion volumes and total reservoir storage space by entity. By dividing the total reservoir space by the 2006 or 2006/2008 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
06 BLY	57,492	410,376	247,849	41,671	352,269	963,007	995,822
06/08 BLY	58,492	415,730	250,977	46,332	362,884	965,536	1,045,382
Total Reservoir Space	137,626	393,550	226,487	90,591	366,554	859,898	245,930

Total Reservoir Space[11] in Comparison to Demand.

D. Reasonable Carryover Shortfall

i. A&B

71. A&B's reservoir space has the lowest average annual rate of fill with the highest variability in fill. *See* Finding of Fact 68. In very dry years, the potential exists that A&B's actual carryover will be less than the reasonable carryover. *See* Finding of Fact 69. A&B has an approximate two-year water supply provided by its total available storage space. *See* Finding of Fact 70. 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 estimated reasonable carryover for A&B (17,000 AF) is appropriate. *See* Finding of Fact 67.

ii. AFRD2

72. AFRD2 has the highest and most consistent reservoir rate of fill of any member of the SWC. *See* Finding of Fact 68. Therefore, any unfilled space in the fall will most likely fill. AFRD2 has, however, an approximate one-year supply available in storage. *See* Finding of Fact 70. In a very dry year, AFRD2's historical carryover volume is often less than the amount needed for reasonable carryover. Because of these factors, the estimated reasonable carryover for AFRD2 (56,000 AF) is appropriate. *See* Finding of Fact 67.

iii. BID & Minidoka

73. In an average demand year, BID and Minidoka will have enough water to meet demands given a low water supply. *See* Finding of Fact 67. *See also* R. Vol. 37 at 7105. Historically, even in very dry years, BID's and Minidoka's carryover have been well above the calculated reasonable carryover and it is unlikely that they will have reasonable carryover shortfalls in the future. *See* Finding of Fact 69. *See also* R. Vol. 37 at 7105. Because of these factors, the estimated reasonable carryover for BID and Minidoka is 0 AF. *See* Finding of Fact 67. *See also* R. Vol. 37 at 7105.

iv. Milner

74. Similar to A&B, Milner's reservoir space had the second lowest average annual rate of fill of all entities with a high degree of variability in fill. *See* Finding of Fact 68. In very dry years, the potential exists that Milner's actual carryover will be less than the reasonable carryover.

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

See Finding of Fact 69. Milner has an approximate two-year water supply available in storage. *See* Finding of Fact 70. Because of its rate of fill, it is likely Milner will experience carryover shortfalls in consecutive dry years. Because of these factors, the estimated reasonable carryover for Milner (4,800 AF) is appropriate. *See* Finding of Fact 67.

v. NSCC

75. 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 68 and 70. In dry years, the potential exists that its reasonable carryover will be less than its actual carryover. *See* Finding of Fact 69. Because of these factors, the estimated reasonable carryover for NSCC (57,200 AF) is appropriate. *See* Finding of Fact 67.

vi. TFCC

76. 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 68 and 70. In dry years, the potential exists that its reasonable carryover will be less than its actual carryover. *See* Finding of Fact 69. In the 2006 irrigation season, supplies were average, but TFCC's demands were below average. *See* Findings of Fact 22 and 29. Therefore, if 2006 is used as the BLY, it will predict zero reasonable carryover for TFCC. *See* Finding of Fact 67. The 2006/2008 BLY average reasonably predicts TFCC's reasonable carryover needs.[12] Because of these factors, the estimated reasonable carryover for TFCC (29,700 AF) is appropriate. *See* Finding of Fact 67.

CONCLUSIONS OF LAW

1. In his September 5, 2008 Final Order, the Director stated his intention to issue a separate, final order "detailing his approach for predicting material injury to reasonable in-season demand and reasonable carryover . . . ." R. Vol. 39 at 7386. On July 24, 2009, the Honorable John M. Melanson issued his *Order on Petition for Judicial Review*, in which he found that the Director's decision to bifurcate the proceedings conflicted with the Idaho Administrative Procedures Act; the court therefore remanded the issue to the Department.

2. Parties to the judicial review proceedings filed petitions for reconsideration with the court for a myriad of issues. Responding to the petition for reconsideration filed by IGWA regarding the issue of bifurcation, the Department stated that "sufficient information exists to issue an order determining material injury to reasonable carryover and reasonable in-season demand." *IDWR Response Brief on Rehearing* at 3 (November 6, 2009). At oral argument on rehearing, the Department requested that the court "hold in abeyance its decision on rehearing until the Director issues the new order and the time for filing a motion for reconsideration and a petition for judicial review of the order has expired." *Order Staying Decision on Petition for Rehearing Pending Issuance of Revised Final Order* at 2 (March 4, 2010). The court therefore ordered the Department to issue a final order determining material injury to reasonable in-season demand and reasonable

[12] Although not as severe, the 2006 BLY also underestimates Milner's reasonable carryover needs. Similarly to TFCC, 2006/2008 reasonably estimates Milner's reasonable carryover.

carryover by March 31, 2010. "Pursuant to I.A.R. 13(b)(14), the Court shall hold in abeyance any final decision on rehearing until such an order is issued . . . ." *Id.* at 3. On March 29, 2010, the court extended the deadline for the Director's order to April 7, 2010. *Order Granting Unopposed Motion for Extension of Time to File Order on Remand.*

3. The purpose of this order is to provide the methodology by which the Director will determine material injury to RISD and reasonable carryover to members of the SWC.

4. "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.

5. 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. The Idaho Supreme Court has recently stated, "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). The CM Rules incorporate all principles of the prior appropriation doctrine as established by Idaho law. CM Rule 20.03.

6. "Priority of appropriation shall give the better right as between those using the water" of the State. Idaho Const. Art. XV, § 3. "As between appropriators, the first in time is first in right." Idaho Code § 42-106. "A prior appropriator is only entitled to the water to the extent that he has use for it when economically and reasonably used. It is the policy of the law of this state to require the highest and greatest possible duty from the waters of the state in the interest of agriculture and for useful and beneficial purposes." *Washington State Sugar v. Goodrich*, 27 Idaho 26, 44, 147 P. 1073, 1079 (1915).

7. It is the policy of this State to integrate the appropriation, use, and administration of ground water with the use of surface water in such a way as to optimize the beneficial use of water: "while the doctrine of 'first in time is first in right' is recognized, a reasonable exercise of this right shall not block the full economic development of underground water resources." Idaho Code § 42-226. *See also* Idaho Const. Art. XV, § 7; *Baker v. Ore-Ida Foods, Inc.*, 95 Idaho 575, 584, 513 P.2d 627, 636 (1973).

8. In *American Falls*, the Court stated as follows:

> The presumption under Idaho law is that the senior is entitled to his decreed water right, but there certainly may be some post-adjudication factors which are relevant to the determination of how much water is actually needed. The 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 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.

American Falls at 877-878, 154 P.3d at 448-449.

9. 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* at 880, 154 P.3d at 451; *Order on Petition for Judicial Review* at 24-25; R. Vol. 37 at 7098 ("Properly applied the minimum full supply approach is an attempt to measure, for purposes of determining if there should be curtailment, the amount of water senior surface water users need to raise crops of their choosing to maturity with the number of cuttings weather conditions will allow.").

10. 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, optimum development of water resources in the public interest, and full economic development. Idaho Const. Art XV, § 7; Idaho Code § 42-226; CM Rule 20 and 42; *Schodde v. Twin Falls Land and Water Co.*, 224 U.S. 107 (1912); *American Falls* at 876-77, 154 P.3d at 447-48.

11. 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 forecasted supply. 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), and will be corrected during the season to account for variations in climate and water supply between the BLY and actual conditions.

12. The years 2000 through 2008 were used to select the initial BLY because it captured current irrigation practices in a dry climate. Based upon his 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 and the climate more forgiving. During periods of drought when junior ground water users are subject to curtailment, members of the SWC should exercise reasonable efficiencies in order to promote the optimum utilization of the State's water resources. Idaho Cost. Art. XV, § 7; Idaho Code § 42-226; CM Rules 20 and 42.

13. 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 the process of predicting and evaluating material injury moves forward, and more data is developed, the methodology will be subject to adjustment and refinement.

14. If 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. If mitigation water in the amount of the projected RISD shortfall cannot be optioned by junior ground water users to the satisfaction of the Director (*see Order on Petition for Judicial Review* at 19), the Director will curtail junior ground water users to make up any deficit. By requiring that junior ground water users have options for 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 required amount of water.

15. 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 purpose of allowing junior ground water users to continue to divert by providing water for mitigation is defeated. The risk of shortage is then impermissibly shouldered by the SWC. Members of the SWC should have certainty entering the irrigation season that mitigation water will be provided at the time of need, or curtailment of junior ground water rights will be ordered at the start of the irrigation season.

16. 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.

17. Currently, the USBR and USACE's Joint Forecast is the best 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. By using one standard error of estimate, the Director purposefully underestimates the water supply that is predicted in the Joint Forecast. The Director further guards against RISD shortage by using the 2006/2008 BLY, which has above average ET, below average in-season precipitation, and above average growing degree days. The 2006/2008 average represents years in which water supply did not limit diversions. 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 junior appropriators to carry. Idaho Cost. Art. XV, § 3; Idaho Code § 42-106.

18. 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 (defined in footnote 9, *supra*). 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. Because the methodology is based upon conservative assumptions and is subject to refinement, the possibility of under-predicting material injury is minimized and should lessen as time progresses. The methodology should provide both the SWC and junior ground water users certainty at the start of the irrigation season.

19. 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.

20. According to CM Rule 42.01.g, members of the SWC are entitled to maintain a reasonable amount of carryover storage water to minimize shortages in "future dry years." Guidance for determining reasonable carryover is also found in CM Rule 42.01.g: "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."

21. While the right to reasonable carryover is provided by CM Rule 42.01.g, the Court in *American Falls* established that there are limitations upon that right:

> 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. 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. This is certainly not unfettered discretion, nor is it discretion to be exercised without any oversight. That oversight is provided by the courts, and upon a properly developed record, this Court can determine whether that exercise of discretion is being properly carried out.

American Falls at 880, 154 P.3d at 451.

22. While CM Rule 42.01.g contemplates reasonable carryover for future dry years, the Hearing Officer determined that "requiring curtailment to reach beyond the next irrigation season involves too many variables and too great a likelihood of irrigation water being lost to irrigation use to be acceptable within the standards implied in *AFRD#2*." R. Vol. 37 at 7109-10. Therefore, a

senior may only seek curtailment of juniors to provide reasonable carryover for a period of one year. *Id.* In his 2008 Final Order, former Director Tuthill accepted the recommendation of the Hearing Officer.

23. In its *Order on Petition for Judicial Review*, the court held that it was incorrect for the Director to categorically limit the right to carryover storage "for more than just the next season . . . ." *Order on Petition for Judicial Review* at 22. The court went on to say, however, that the Director, "in the exercise of his discretion, can significantly limit or even reject carry-over for multiple years based on the specific facts and circumstances of a particular delivery call. Ultimately, the end result may well be the same." *Id.*

24. 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 demand. Next, the Director examines the average annual rate of fill of the storage rights held by members of the SWC to determine each entities' relative probability of fill. Finally, the Director examines the average annual carryover for prior comparable water conditions by reviewing Heise natural flow.

25. If, in the fall, the Director finds that a reasonable carryover shortfall exists, the Director will use the ESPA Model to determine the transient impacts of curtailment (year-to-year). The ESPA Model will be used to determine the yearly impacts of curtailment of junior ground water users, if curtailed from April 1 through March 31.[13] It is this volume of water that junior ground water users must have optioned in the fall in order to start the subsequent irrigation season without an order of curtailment.

26. Recognizing that reservoirs space held by members of the SWC may fill, and in order to prevent the waste of water, junior ground water users are not required to provide the volume of reasonable carryover until after the Day of Allocation (defined in footnote 16, *infra*). Junior ground water users are required to provide reasonable carryover to the SWC until reservoir space held by the entities fills. If the reservoir space does not fill, the results of the transient analysis must be optioned by junior ground water users in the fall. In addition, the Director will determine shortfalls to the SWC's reasonable carryover for the next irrigation season and use the ESPA Model to determine the transient volume of water that must be optioned. This transient obligation is in addition to the subsequent year's transient obligation. *See* Attachment A.

27. By modeling the impacts of curtailments until the reservoir space held by members of the SWC fills, junior ground water users have an accruing mitigation obligation. In this way, the Director is able to account for reasonable carryover for "future dry years." CM Rule 42.01.g.

28. 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

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[13] Version 1.1 of the ESPA Model runs on six-month time steps. Because an irrigation season is nine months long, simulating curtailment for a period of six months would under estimate the impacts of curtailment and unreasonably shift the risk of shortage to the SWC. Because version 1.1 of the ESPA Model cannot simulate curtailment for nine months, it is appropriate to simulate curtailment for one year, as opposed to six months. Because the methodology is subject to refinement, this determination may be revisited if the time steps are changed.

provide the entire RISD shortage because the Joint Forecast allows determination of material injury with reasonable certainty.

29. 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. Because of the uncertainty associated with this prediction, and in the interest of balancing 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. By requiring that junior ground water users have options in place in the fall of the subsequent irrigation season in the amount of the first year of curtailment (accruing from season-to-season until reservoir space fills), the Director ensures that a certain volume of water will be carried over from one season to the next. This allows the SWC to plan for the coming irrigation season, and places the risk of reasonable shortage on junior ground water users. In light of the unpredictable nature of the determination of material injury to reasonable carryover, the use of the ESPA Model imposes a reasonable burden on junior ground water users.

ORDER

Based upon and consistent with the Findings of Fact and Conclusions of Law, the Director hereby orders that, for purposes of determining material injury to reasonable in-season demand and reasonable carryover, the following steps will be taken:

1. <u>Step 1</u>: By April 1, members of the SWC will 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%; provided that the total acreage count does not exceed the number of acres to be irrigated within the decreed place of use. If this information is not timely provided, the Department will determine the total irrigated acres based upon past year cropping patterns and current satellite and/or aerial imagery. The Department will publish 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 will account for supplemental ground water use.

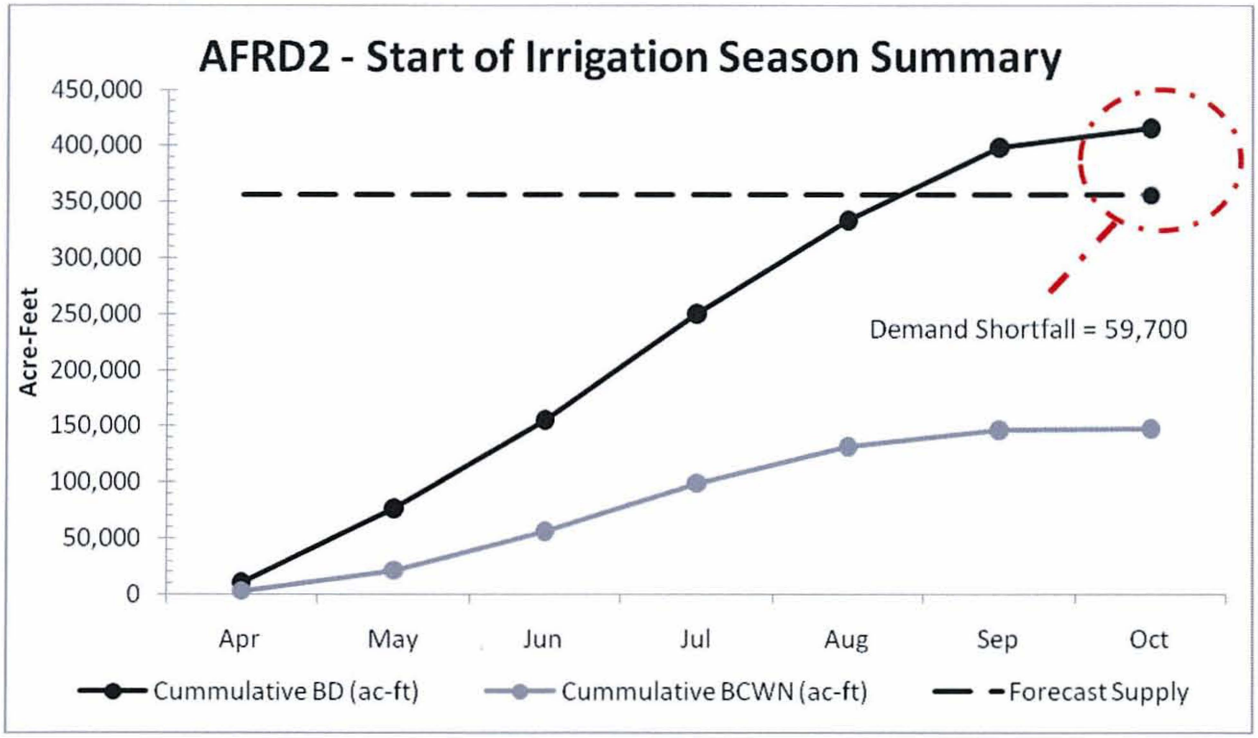
2. Beneficial use cannot occur on lands that are not described in the SWC's water rights. If, however, the acreage count is under reported by more than five percent of the irrigated acreage limit of the water right, then an assessment must be made of the impact of this reduction in use of the water right on any mitigation requirement.

3. <u>Step 2</u>: Starting at the beginning of April, the Department will calculate the cumulative CWN volume 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.

- Cumulative in-season CWN values will be calculated for each member of the SWC, approximately once a month.

4. Step 3: 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 predict and issue a Forecast Supply for the water year and will compare the forecast supply to the baseline demand ("BD") to determine if a demand shortfall ("DS") is anticipated for the upcoming irrigation season. A separate Forecast Supply and DS will be determined for each member of the SWC. See below for an example.[14]



AFRD2 Start of Irrigation Season Summary, Initial Demand Shortfall Prediction.

5. Step 4: If the April DS is greater than the reasonable carryover shortfall from the previous year, junior ground water users will be required to establish, to the satisfaction of the Director, their ability to secure and provide a volume of storage water equal to the difference of the April projected demand shortfall and reasonable carryover shortfall, for all injured members of the SWC. If junior ground water users cannot 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.[15]

[14] For the purposes of the illustrative example, AFRD2 was selected as the water user, a dry year was selected as the irrigation season, and 2006/2008 was selected as the BLY. Forecast supply was calculated utilizing historic natural flow and historic reservoir storage data.

[15] 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. Step 5: Within fourteen (14) days following the publication of Water District 01's initial storage report, which typically occurs soon after the Day of Allocation,[16] 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 provided to members of the SWC at the Time of Need.

7. 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) evaluate the actual crop water needs up to that point in the irrigation season; (2) estimate the Time of Need date; and (3) issue a revised Forecast Supply.

8. 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, projected demand, and the cumulative actual crop water need determined up to that point in the irrigation season. The Director will then issue RISD and revised DS values.

9. Step 7: Shortly before the Time of Need, but following the events described in Steps 5 and 6, the Director will, for each member of the SWC: (1) evaluate the actual crop water needs up to that point in the irrigation season; and (2) issue a revised Forecast Supply.

10. 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, projected demand, and the cumulative actual crop water need determined up to that point in the irrigation season. The Director will then issue RISD and revised DS values.

11. Step 8: At the earliest forecasted Time of Need for any member of the SWC, junior ground water users are required to provide the lesser of the two volumes[17] from Step 4 (May 1 secured water) and Step 7 (RISD volume calculated at the Time of Need). If the calculations from Step 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.

12. 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.

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[16] 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.

[17] This refers to the overall volume for the entire estimate. While the overall volume predicted at the start of the season represents with certainty the upper bound of water that junior ground water users will need to provide to members of the SWC, values predicted at the start of the season may adjust up or down at the time of mid-season re-evaluation.

13. 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 baseline years, and for the refinement and continuing improvement of the method for future use.

14. On or before November 30, the Department will publish 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 publication 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 provide a volume of storage water 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.

15. Step 10: 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. *See* R. Vol. 8 at 1386-87. 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. *See id.* at 1404, ¶ 5. 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. *See id.* at 1404, ¶ 6.

16. Included as an attachment to this order is an illustrative tabulated example, for each SWC entity, for three consecutive water years, illustrating the accounting that will be applied in determining reasonable carryover shortfalls, in-season demand shortfalls, water optioning, and water delivery requirements.

IT IS FURTHER ORDERED that this is a final order of the agency. Any party may file a petition for reconsideration of this final order within fourteen (14) days of the issuance of this order. The agency will dispose of the petition for reconsideration within twenty-one (21) days of its receipt, or the petition will be considered denied by operation of law pursuant to Idaho Code § 67-5246.

IT IS FURTHER ORDERED that pursuant to sections 67-5270 and 67-5272, Idaho Code, any party aggrieved by the final order or orders previously issued by the Director in this matter 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 a hearing was held, the final agency action was taken, the party seeking review of the order resides, or 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) 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* Idaho Code § 67-5273. The filing of an appeal to district court does not in itself stay the effectiveness or enforcement of the order under appeal.

Dated this 7th day of April, 2010.

Gary Spackman

GARY SPACKMAN
Interim Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 8th day of April, 2010, the above and foregoing, was served by the method indicated below, and addressed to the following:

Honorable John M. Melanson Idaho Court of Appeals P.O. Box 83720 Boise, ID 83720-0101	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☐ Email
John K. Simpson BARKER ROSHOLT & SIMPSON, LLP P.O. Box 2139 Boise, ID 83701 jks@idahowaters.com	☒ U.S. Mail, postage prepaid ☐ Hand Delivery ☐ Overnight Mail ☐ Facsimile ☒ Email
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Deborah J. Gibson

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ATTACHMENT A

Year	Step	Milestone	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Total
	10	Carryover Shortfall Volume Optioned	3,000	18,700	0	0	0	0	15,600	37,300
		Volume of storage right that did not fill	90,000	70,000	4,000	45,000	20,000	150,000	70,000	449,000
	3	4/1 Predicted In-Season Shortfall	8,800	59,700	0	0	0	0	102,500	171,000
	4	May 1 additional water to secure by IGWA	5,800	41,000	0	0	0	0	86,900	133,700
	5	Day of Allocation Water Owed	3,000	18,700	0	0	0	0	15,600	37,300
	6	July Predicted In-Season Shortfall	14,400	125,300	0	0	0	0	103,600	243,300
1	8	Time of Need water owed	5,800	41,000	0	0	0	0	86,900	133,700
		Total Water Delivered In- Season	**8,800**	**59,700**	**0**	**0**	**0**	**0**	**102,500**	**171,000**
	9	Final In-Season Shortfall (assuming no water provided by IGWA)	12,600	78,900	0	0	0	19,000	0	110,500
	9	Carryover	11,000	36,000	47,800	8,700	97,900	19,100	50,000	270,500
	9	Reasonable Carryover	17,000	56,000	0	4,800	0	57,200	29,700	164,700
	9	Reasonable Carryover Shortfall	6,000	20,000	0	0	0	38,100	0	64,100
	10	Carryover Shortfall Volume Optioned	3,200	14,400	0	0	0	12,100	6,700	36,400
		Volume of storage right that did not fill	81,000	0	0	9,000	30,000	135,000	28,000	
	3	4/1 Predicted In-Season Shortfall	0	0	0	0	0	0	28,200	28,200
	4	May 1 additional water to secure by IGWA	0	0	0	0	0	0	21,500	21,500
	5	Day of Allocation Water Owed	3,200	0	0	0	0	12,100	6,700	22,000
	6	July Predicted In-Season Shortfall	0	30,300	0	0	0	0	0	30,300
2	8	Time of Need water owed	0	30,300	0	0	0	0	0	30,300
		Total Water Delivered In- Season	**3,200**	**30,300**	**0**	**0**	**0**	**12,100**	**6,700**	**52,300**
	9	Final In-Season Shortfall (assuming no water provided by IGWA)	0	5,900	0	0	0	0	0	5,900
	9	Carryover	33,400	28,000	72,800	14,500	99,500	145,800	39,300	433,300
	9	Reasonable Carryover	17,000	56,000	0	4,800	0	57,200	29,700	164,700
	9	Reasonable Carryover Shortfall	0	28,000	0	0	0	0	0	28,000
	10	Carryover Shortfall Volume Optioned	1,500	9,200	0	0	0	5,100	3,600	19,400
		Volume of storage right that did not fill	0	0	0	0	0	0	0	0
	3	4/1 Predicted In-Season Shortfall	0	8,100	0	0	0	0	66,800	74,900
	4	May 1 additional water to secure by IGWA	0	0	0	0	0	0	63,200	63,200
	5	Day of Allocation Water Owed	0	0	0	0	0	0	0	0
	6	July Predicted In-Season Shortfall	0	0	0	0	0	0	0	0
3	8	Time of Need water owed	0	0	0	0	0	0	0	0
		Total Water Delivered In- Season	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	9	Final In-Season Shortfall (assuming no water provided by IGWA)	0	0	0	0	0	0	0	0
	9	Carryover	36,700	99,000	90,200	37,600	150,600	365,000	64,500	843,600
	9	Reasonable Carryover	17,000	56,000	0	4,800	0	57,200	29,700	164,700
	9	Reasonable Carryover Shortfall	0	0	0	0	0	0	0	0

Illustrative Analysis of Three Consecutive Years of Shortfall Accounting.[1]

[1] Illustrative analysis does not include the revised calculations at the Time of Need as represented by Step 7 in the Order.

Example Transient Analysis of Carryover Shortfall Volumes

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Total
0	8,000	50,000	0	0	0	0	42,000	100,000
1	6,000	20,000	0	0	0	38,100	0	64,100
2	0	28,000	0	0	0	0	0	28,000
3	0	0	0	0	0	0	0	0

Reasonable Carryover Shortfalls (Acre-Feet).

Year	Total Carryover Shortfall	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year7
0	100,000	37,300	16,000	8,600	5,900			
1	64,100		20,400	8,600	4,500	3,100		
2	28,000			9,200	3,800	2,100	1,500	
3	0				0	0	0	0
	Total	37,300	36,400	26,400	0			

Reasonable Carryover Transient Analysis Results over Four Years (Acre-Feet).

Year	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Total
1	3,000	18,700	0	0	0	0	15,600	37,300
2	3,200	14,400	0	0	0	12,100	6,700	36,400
3	1,500	9,200*	0	0	0	5,100	3,600	19,400

Reasonable Carryover Obligation by Junior Ground Water Users for each SWC Member, Proportioned by the Percentage of Total Reasonable Carryover Shortfall from the Original Carryover Shortfall Year.

*AFRD2's space filled in year 2. Subsequently there are no carryover shortfall obligations in year 3 for carryover shortfalls that occurred in year 0 and year 1.