REBUTTAL REPORT OF

DIRECT TESTIMONY AND EXPERT REPORT OF GREGORY SULLIVAN AND EUGENE FRANZOY

In The Matter of Distribution of Various Water Rights Held by or for the Benefit of A&B, AFRD2, BID, MID, MIL, MID, NSCC and TFCC

November 7, 2007

INTRODUCTION

This is a rebuttal of the Direct Testimony and Expert Report by Gregory Sullivan and Eugene Franzoy on behalf of the City of Pocatello. This rebuttal report was prepared by Steven Thurin and John Koreny, HDR Engineering, Inc. and Charles Brockway, Brockway Engineering, Inc. at the request of the Surface Water Coalition (SWC).

Mr. Sullivan's water supply evaluation generally concludes that the SWC has not experienced shortages and has had a water surplus even during a sequence of drought years. On page 59, line 22, of his Direct Testimony, Mr. Sullivan states "*Our water budget analysis from 1990-2004 showed a single shortage, that being to AFRD#2 in 2004 of approximately 2,500 acre-feet*", and on page 65, line 10, he states *"Our water budget analyses for 2006, a year when water supply conditions were substantially improved over 2005, demonstrate there were no irrigation water shortages suffered by the SWC members, and therefore no injury in 2006."*

We examined Mr. Sullivan's Direct Testimony and the submitted background information that he uses to formulate his opinion concerning the SWC water supply requirements. Our conclusions are that Mr. Sullivan's irrigation requirement and shortage calculations are flawed by a number of serious errors and incorrect assumptions. These flaws render his conclusions concerning SWC water supply requirements and historic water supply shortages unusable. Mr. Sullivan's calculations and methods conclude that the three largest of the SWC members experienced a combined and cumulative shortage of only 21,000 AF during the entire 1990-2006 period. This is in spite of the historical evidence that shows that TFCC, NSCC, and AFRD2 curtailed their headgate deliveries to the members by between 10 and 40 percent in seven years during this period. The total failure of Mr. Sullivan's calculations to show shortages that the SWC Expert Report estimates at more than 2.4 MAF is strong evidence of the serious flaws in his analysis and strong evidence that his water requirement estimates are unusable for estimating actual SWC water needs or shortages.

The following sections present a technical evaluation of Mr. Sullivan's water supply/demand analysis and shortage calculations, and highlight the following problems and errors:

- Use of achievable efficiency instead of actual efficiency
- Conveyance losses not based on appropriate data or analytical methods

- Use of an annual irrigation requirement calculation
- Soil moisture budget based on an annual water budget
- Supplemental wells owned by farmers not available to SWC entities to offset demand.
- Limitation of SWC acreage and not accounting for water used by individual farmers on lands within a farm unit, or share
- Statement that all carryover must be used with no storage saved for next year's demands.
- Incorrect adjustments to carryover storage and failure to adjust supply for water purchased under a rental agreement by the SWC to augment supply.

A. Mr. Sullivan uses achievable efficiency instead of actual efficiency. This is not the standard in Idaho or in any other state for the purpose of administering water rights.

On-farm efficiency is a measure of the efficiency of applying water to the field to meet irrigation requirement. Losses occur during the application of water due to evaporation and percolation below the root zone, as well as runoff and other losses. These losses tend to be greater for gravity application than for sprinkler irrigation methods. In addition to application method, slope, soil characteristics, topography, and other factors all affect on-farm efficiency.

Mr. Sullivan uses what he calls an 'achievable' on-farm irrigation efficiency estimate for each SWC member. The achievable efficiency is based on the examination and calculations of farm efficiency prepared by Mr. Franzoy, and documented in Mr. Franzoy's Expert Report and testimony, and is a calculated, not actual, determination of how much water is needed to irrigate a crop in the field. Mr. Sullivan uses the achievable efficiency numbers to estimate the water requirements of the SWC members, and to estimate whether they have experienced water supply shortages during the period 1990-2006. He recommends the assumption's use in mitigating the effects of depletions by junior priority upstream ground water users on SWC water supplies. This recommendation comes despite the admission by both Mr. Sullivan and Dr. Franzoy (during their depositions) that achievable efficiency is not used for the purpose of administering water rights in any state.

There is no definition or duty of water requirement in the Idaho statutes that require that farm irrigation efficiencies be based upon an achievable efficiency. As explained in Mr. Young's Rebuttal Report, the Idaho Conjunctive Management Rules (CMR) do not require or mention an achievable efficiency standard. The efficiency standard for the irrigation industry is farm irrigation efficiencies obtainable with the present available application equipment, conveyance infrastructure, soils, topography, crop types, labor and application methodology using management skills adapted to the local setting. Mr. Franzoy and Mr. Sullivan do not estimate what the SWC members' actual or operational on-farm efficiencies are, nor does Mr. Sullivan explain why historical irrigation diversions and farm headgate delivery amounts have been so much larger than he estimates are required, based on his achievable efficiencies. It should be noted that both Mr. Sullivan and Mr. Franzoy testified in their depositions that the SWC entities do not waste water. Mr. Sullivan's use of a theoretical *"achievable"* efficiency results in a false and improper reduction of the amount of water the SWC needs to apply and divert to meet their irrigation requirements.

There are a number of errors and inconsistencies in Mr. Sullivan's use of achievable efficiency. He used 'achievable efficiency' uniformly during the entire irrigation season and made no allowance for decreases in farm irrigation efficiency during the early and late irrigation season. As a matter of practice, this is impossible, because application systems designed and constructed with the capacity to meet peak irrigation demand are less efficient in the early and late season because the water demands of the crops are lower. **Exhibit 8200**, below shows the difference between the actual on-farm efficiencies estimated by Dr. Brockway and the *"achievable"* efficiencies provided by Mr. Sullivan. The table also provides comparable, weighted irrigation efficiencies, based on the percentage of sprinkler and gravity-irrigated areas and a range of farm application efficiencies (FAE) from Dreher and Tuthill, 1996. In the case of each of the SWC members except A&B, the differences between Mr. Sullivan's achievable efficiencies and the estimated actual SWC efficiencies are large enough to result in Mr. Sullivan significantly under-estimating water supply requirements.

Exhibit 8200 Comparison of SWC Field Efficiencies

Gravity and Sprinkler Irrigation%			Weighted FAE*, based on Percent Gravity and Sprinkler			Brockway Field Efficiency		Sullivan Field Efficiency
SWC Member	Percent Gravity	Percent Sprinkler	Low	High	Avg	Max	Avg	Achievable
AFRD2	35	65	43.0	84.6	63.8	70	65	74
A&B	27	73	44.6	85.1	64.9	80	73	73
MIL	25	75	45.0	85.3	65.1	60	57	75
MID	19	81	46.2	85.7	65.9	60	56	74
BID	26	74	44.8	85.2	65.0	67	63	71
TFCC	75	25	35.0	81.8	58.4	62	59	62
NSCC	12	88	47.6	86.2	66.9	72	67	78

	Low	High	Average
Range of Furrow Irrigation Field Application Efficiency*	30	80	55
Range of Sprinkler Irrigation Field Application Efficiency*	50	87	68.5

* Field application efficiency, from K. Dreher and D. Tuthill "Report Regarding Evaluation of Irrigation Diversion Rates IDWR" to SRBA Court August 15, 1996

The estimated field efficiencies provided in the SWC Expert Report were developed by Dr. Brockway, based upon decades of experience with the SWC members' irrigation systems. Field application efficiencies are influenced by physical attributes of the field as well as the mechanics and hydraulics of the application equipment. Field application efficiencies vary within the season and are generally lower during the early and late periods of the irrigation season. Irrigation early in the season may occur on bare ground, especially if winter precipitation has been low, in order to prepare the ground for planting. This is especially true for bean fields. On bare ground, the irrigation requirement is likely to be very nearly zero, thus the irrigation efficiency is also close to zero. Maximum operational field efficiencies are experienced during the peak water use periods when consumptive use is high and deep percolation is lower. Higher operational field efficiencies can be achieved on level fields with application rates exactly matched to the soil intake rates. SWC entities are composed of a large number and variety of existing farms and fields with variable soils, slopes, topography and management inputs. This does not allow maximum efficiencies to be realized all times, because application rates and crop demands will vary widely. Specific information for each SWC member is summarized below:

Description of SWC Field Efficiency Characteristics

A&B: The A portion of the A&B irrigation district is served by pumping from the Snake River to lands which were originally all irrigated by furrow. Topography of these lands is relatively uniform with average field sizes and length of run. An estimated 73 percent of the irrigated area is now served by sprinkler, primarily side roll systems. Compared with the Dreher and Tuthill average furrow and sprinkler-weighted efficiency, Dr. Brockway has found that actual, operational field application efficiencies are relatively higher on the A&B Irrigation District because of uniform soils and field slopes. The monthly efficiencies assigned to A&B by Dr. Brockway, range from 60 to 80 percent, with an average of 73 percent.

AFRD2: The American Falls Reservoir District #2 has a long delivery system with smaller fields and primarily sandy soils. AFRD2 is approximately 65 percent sprinkler irrigated. For these reasons, the maximum operational field application efficiencies (of 70 percent) are a little above the Dreher and Tuthill weighted average; however, the early and late season efficiencies (ranging to 55 percent) estimated by Dr. Brockway are lower, resulting in a near average seasonal farm application efficiency of 65 percent.

BID: Burley Irrigation District is located in an area with above average field slopes, loamy soils and considerable urbanization within the service area. The water supply is pumped from lower elevations to the irrigated land. This has resulted in many smaller fields necessitating a higher percentage of side roll sprinkler systems. This district was therefore estimated to be experiencing somewhat lower maximum and average seasonal field application efficiencies, compared to the Dreher and Tuthill weighted average. The monthly efficiencies assigned to BID by Dr. Brockway, range from 55 to 67 percent, with an average of 63 percent.

Milner: Milner Irrigation District is a pumped open channel system with loamy to silt loam soils. The distribution system is relatively long with irregular fields and field slopes are above average. This district was estimated to have slightly below average field application efficiencies, compared to the Dreher and Tuthill weighted average. The monthly efficiencies assigned to Milner by Dr. Brockway, range from 50 to 67 percent, with an average of 57 percent.

MID: Soils on the Minidoka Irrigation District vary from sandy loams to loamy sand with intake rates higher than the finer loam soils. High water tables are prevalent over most of the MID area, however slopes are relatively flat. Although MID is approximately 81 percent sprinkler irrigated, field irrigation efficiencies are lower than average on the MID, compared to the Dreher and Tuthill weighted average. The monthly efficiencies assigned to MID by Dr. Brockway, range from 50 to 60 percent, with an average of 56 percent.

NSCC: The Northside Canal Company irrigates predominantly sandy soils although with a relatively high percentage of sprinkler irrigated land. Slopes are variable and a high percentage of sprinkler irrigation is performed with center pivot systems. High sprinkler field irrigation efficiencies are not possible because of the soil percolation rates and variable slopes. However, the high percentage of sprinkler irrigation allows an overall project field efficiency near the weighted average from Dreher and Tuthill. The monthly efficiencies assigned to NSCC by Dr. Brockway, range from 60 to 72 percent, with an average of 67 percent.

TFCC: Soils on the Twin Falls Canal Company lands are primarily silt loams and the majority of lands include moderate to flat and uniform slopes. Approximately 75% of the irrigated area is still furrow irrigated, however, the field application efficiencies for furrow irrigation are judged to be higher than average and the remainder of the irrigated land that is sprinkler irrigated land will experience higher than average sprinkler efficiencies. The Twin Falls tract incorporates a long distribution system and is able to capture and re-divert some of the field runoff and ground water return flow. These factors result in an overall project field application efficiency which is about average for the Dreher and Tuthill furrow/sprinkler ratio. The monthly efficiencies assigned to TFCC by Dr. Brockway, range from 50 to 62 percent, with an average of 59 percent.

B. Mr. Sullivan's conveyance losses are not based on appropriate data or any uniform analytical method.

The amount of diverted water that leaves the canals and laterals between the river diversion and the farm headgate is called the conveyance loss. Conveyance losses include seepage through the bottom and sides of the canals and laterals, evaporation from the canal surface, and operational losses. In large, long, unlined canal systems that traverse unconsolidated soils and coarse-grained sediments, these losses can be a significant portion of the total volume of water diverted. The SWC projects were designed, constructed, and are operated based primarily on unlined, open canals. In the case of all of the SWC projects except A&B and Milner, each SWC member conveys water through hundreds of miles of canals and laterals, some of which are more than 50 feet wide. Water leaks out of these canals and helps to provide recharge to the ESPA aquifer and reach gains to the Snake River.

In estimating conveyance losses, Mr. Sullivan makes use of estimates that he says are provided by the canal company and irrigation district managers (Report of Testimony, Page 40, line 22, *"we didn't compute the loss percentage, but rather we relied on loss information provided by the canal company managers."*), but in several cases his estimates are too low to be reasonable, given the size and length of the SWC canal and lateral systems. This causes Mr. Sullivan's water requirement estimates to be too low to meet the actual demand needed by the SWC.

Although he does not mention it in his testimony, a review of his report and exhibits establishes that Mr. Sullivan did not rely upon the testimony of the managers of MID and BID for a conveyance loss number. Contrary to his testimony, in the case of MID and BID, he arbitrarily adjusted down the estimates provided by the managers (for MID from 45-50% to 35%; for BID from 45% to 35%) Mr. Sullivan's conveyance loss for TFCC (12%) was based on the number presented by the manager of TFCC, Vince Alberdi, ***in his deposition***. Mr. Alberdi has informed us that the conveyance loss mentioned in his deposition was only meant to be an estimate of the loss on one small portion of the system and did not represent the losses for the entire conveyance system. Mr Alberdi also stated that his estimate of conveyance loss was for times of adequate supply and did not account for increases in losses associated with dry periods. In our experience, given that the TFCC system has over 850 miles of unlined canals and laterals that are unlined, there is no justification for using such a low loss rate. In fact, such a low loss rate is near the loss rate for a lined canal. Mr. Sullivan, in his deposition testimony, could not give an example of any other irrigation system utilizing over 850 miles of canals and laterals that incurred a conveyance loss as low as 12%.

Mr. Sullivan's downward adjustment of MID's and BID's conveyance losses, when he thought the managers' estimates were too high, and his use of a 12% loss rate for TFCC, which he admitted was lower than any similar canal system with which he is familiar, show a lack of objectivity in determining actual canal losses. In the case of NSCC, on Page 148, line 11 and 12 of his deposition, Canal Company manager Ted Diehl specifically states that NSCC losses are *"probably more"* than the 33 percent figure used by Mr. Sullivan. In the case of AFRD2, Mr. Sullivan's estimate is very close to the conveyance loss estimated using methods recognized by IDWR. In the case of Milner and MID, and based on experience with these districts and the relatively short length of their systems, the losses estimated by the irrigation district managers and used by Mr. Sullivan would significantly over-estimate the actual conveyance losses. Each of these examples illustrates the unreliability of Mr. Sullivan's estimates.

The overall effect of Mr. Sullivan's use of inaccurate canal conveyance losses is a significant underestimation of SWC irrigation diversion requirements. As shown in **Exhibit 8201** below, Mr. Sullivan's conveyance losses average almost 500,000 acre-feet per year less than those quantified using the Worstell method in the SWC Expert Report. The estimated losses used in the SWC Expert Report were developed by digitizing the canals and laterals on ortho-rectified aerial photos, determining the canal widths and geometry, and computing seepage losses based on mapped soil types using the Worstell analytical method. This physically-based method provides far more accurate estimates of SWC conveyance losses than does the simple, rough-estimate of losses provided by Mr. Sullivan. Worstell is an accepted method for estimating conveyance losses and is recommended by the IDWR in the publication, "Guidelines for the Evaluation of Irrigation Diversion Requirements", dated 1991.

Exhibit 8201. Comparison between Sullivan's assumed conveyance losses and SWC estimates

Irrigation District or Canal Company	Total Length of Canals and Laterals (miles)	SULLIVAN ANALYSIS		SWC EXPERT ANALYSIS		COMPARISON	
		Percent Conveyance Loss Assumed	Average Annual Losses 1990-2006 (acre ft)	Average Percent Losses Mar-Oct 1990-2006	Average Losses Mar-Oct 1990-2006 (acre ft)	Average Loss (%) = (Sullivan-HDR)/HDR	Average Loss (acre ft) = Sullivan - HDR
A&B	107	17%	9,471	37%	20,551	-54%	-11,080
AFRD2	508	48%	204,132	48%	199,307	1%	4,825
BID	286	35%	85,102	44%	107,879	-21%	-22,777
Milner	45	20%	10,170	18%	9,288	10%	882
Minidoka	476	35%	124,973	22%	77,463	60%	47,510
NSCC	847	33%	338,984	57%	586,136	-42%	-247,152
TFCC	860	12%	128,302	34%	361,025	-65%	-232,723
Totals	**3,129**		**901,134**		**1,361,649**		**-460,515**

C. Mr. Sullivan uses an annual, not a monthly water budget.

Mr. Sullivan uses of a simple annual water budget accounting to attempt to estimate SWC irrigation requirements and shortages. An annual budget incorrectly assumes that monthly natural flow surpluses in the beginning and end of the irrigation season can be used to meet deficits in the middle of the irrigation season. An annual water budget also incorrectly assumes that the SWC entities can perfectly time deliveries to match available supplies to irrigation requirements, and would require precise forecasting of the actual crop demand throughout the season and during the following years.

Mr. Sullivan's uses an annual budget while, at the same time, he uses monthly crop irrigation requirements data and recognizes that consumptive irrigation requirements vary significantly during the irrigation season. If one recognizes the seasonal variation in crop irrigation demand, it logically follows that a monthly water budget would be needed to accurately evaluate when the precipitation and applied natural flow and storage water was effective in meeting the irrigation requirements. By using an annual accounting, every bit of precipitation and water applied during the season is treated as though it is able to meet irrigation requirements throughout the season. Thus, using an annual water budget, water that is applied in April is accounted as though it helps satisfy irrigation requirements in August. And rainfall in October helps satisfy irrigation requirements in the previous April. In many cases, by carrying over soil moisture, he even assumes that extra water applied throughout the current irrigation season meets some of the irrigation requirements during the next year. This is clearly not the case. SWC irrigation diversion requirements vary from near zero in March of some years, to more than 800,000 acre-feet per month in July of some years. The diversion of a large amount of natural flow water in March or April of a year with limited early-season crop water requirements will not help to satisfy the high diversion requirements in July or August of that, or subsequent years. The extra water diverted and applied in March and April will have run off the farm area and/or percolated past the root zone, and will not be available to crops in the middle of the season.

This annual water budget assumption is particularly unfair to the SWC if the *"surpluses"* calculated by Mr. Sullivan are the result of his previously discussed incorrect conveyance loss and irrigation efficiency estimates, since these factors will tend to compound the under-estimation of diversion requirements.

The SWC irrigation systems are designed and constructed to provide the delivery of large amounts of water during times of peak demand. During the middle of the irrigation season, SWC members carefully schedule irrigation applications to meet current and short-term future irrigation requirements. During times of abundant natural flow (and particularly early or late in the season), some users may apply slightly more water than is immediately needed, in the hope that some of it will be held in soil moisture storage and be effective in meeting irrigation requirements in subsequent days. In reality, at times of high demand in the SWC area, soil moisture tends to be depleted approximately on a weekly to bi-weekly basis and so the ability to store water during times of surplus is very limited. Some of the extra water diverted early or late in the season is needed to maintain the water surface in the canals to allow flow into laterals and provide water all the way to the end of the canals. Thus a significant volume of water diverted and applied in excess of irrigation requirements early or late in the season is not effective in meeting irrigation requirement deficits during the middle of the season.

The SWC Expert Report irrigation diversion requirement and water supply shortage evaluation in Chapters 9 and 10 uses a monthly, rather than an annual timestep water budget approach. The relative effect of using an annual water budget, compared with a monthly one, varies depending upon the water supply situation of the year being analyzed. In water-short years like 2001 through 2004, when spring natural flows were not very large and little early-season over-irrigation occurred, up to 97 or 98 percent of the SWC-diverted water was effective in satisfying irrigation diversion requirements (including conveyance losses and on-farm losses). However, in high spring runoff years like 1998, only about 87 percent of the diverted water is effective. Overall, using an annual water budget approach to estimate diversion requirements and shortages will tend to under-estimate irrigation diversion requirements by about 8 percent. Since the shortages estimated in the SWC Expert Report only average about 10 percent over the 1990-2006 period, Mr. Sullivan's use of an annual accounting with 8 percent lower diversion requirements will significantly and incorrectly limit the SWC water demands and the irrigation shortages experienced by the SWC members.

D. Mr. Sullivan's soil moisture budget assumes that any surplus irrigation or precipitation during the irrigation season will go into the soil and be available during this and the next irrigation season.

Mr. Sullivan's incorporates a soil moisture budget to supply water to meet crop demand. His use of an annual water budget approach assumes that surplus irrigation from one irrigation season is stored in the soil within the root zone and is effective in meeting irrigation diversion requirements throughout the season and in the next season. In reality, excess water during the early or late season is not available to meet irrigation requirements during the middle of the season. March and April precipitation will likely be effective in meeting a significant portion of those two months' diversion requirements. Assuming that irrigation surplus from the previous year also contributes to meeting early season irrigation requirements will tend to over-estimate or double-count the effectiveness of early season soil moisture storage in meeting requirements. This is because, if the soil moisture is truly full from the previous season, early season precipitation (and irrigation application) in March and April would simply run off the soil or force previously infiltrated moisture into the groundwater, rather than helping to satisfy the irrigation requirements in subsequent months. This is a mistake in Mr. Sullivan's method. If a soil moisture budget is used, the analysis must be performed on a time-step that is matched to the soil moisture capacity and crop demands so that the soil moisture budget realistically tracks the wetting and drying cycle of the soil column and the effectiveness of soil moisture storage in meeting varying irrigation requirements. Mr. Sullivan's use of an annual soil moisture budget greatly over-estimates the actual supply of water that can be stored in the soil column during wet periods and used during dry periods.

E. Mr. Sullivan's calculations are dependant upon supplemental wells owned by individual farmers being available to the SWC entities to offset demand. There is no data available to support Mr. Sullivan's assumption that each private well diverts an average of 1 acre foot per acre of irrigation water each year.

On Page 38, line 15 and following of his Direct Testimony, Mr. Sullivan states "In lieu of pumping data, we assumed that the members pumped an average of 1 acre-foot for each acre of land served by supplemental wells. Based on a typical irrigation application requirement ranging between 3.0 and 3.5 acre-feet per acre, the assumed 1.0 acre-feet per acre represents pumping approximately one-third of the irrigation demand for the lands served by supplemental wells." The result of Mr. Sullivan's calculations is that he is reducing SWC diversion demand by his estimated use of ground water by individuals owning private ground water rights. Mr. Sullivan's assumptions concerning the ability of SWC members to use supplemental groundwater wells to meet irrigation requirements is unsupported by the actual situation regarding ownership and use of the wells. The SWC has no control or ownership of supplemental ground water rights owned by individual farmers in the districts and canal companies. SWC managers are responsible for delivering water associated with their users' Snake River water rights and storage contracts. If individual landowners elect to utilize groundwater supplies that may be available to them, that may be direct evidence that the SWC water supply is inadequate to meet the needs of its water users. However, their use of their individual groundwater supplies is an issue completely removed from the SWC's control or knowledge, and it does not alter the legal requirement for the SWC entities to allocate and deliver water in an equitable fashion to all of their water users. . Additionally, Mr. Sullivan made no examination to assess the priority dates of these water rights, the terms of the water rights (many supplemental ground water rights can only be used when the primary water supply is not available), whether these rights are associated with wells that actually exist, whether each right has an associated pump and power supply, whether the wells are operational, or whether the wells could supply water to lands within the SWC service areas. Groundwater supplies are not part of the SWC water supplies for the lands covered by the water rights that are the subject of this water call, and it is not appropriate to use them in the diversion requirement or water supply shortage calculations.

F. Mr. Sullivan's alternative calculations improperly understate SWC acreage, and do not account for water used by individual farmers on lands within a farm unit, or shares transferred between farmers.

As an alternative calculation, Mr. Sullivan, relying on the expert testimony and report of Scott King, reduces SWC acreage from that recommended by IDWR in the Snake River Basin Adjudication. The testimony and report of Scott King are the subject of a separate rebuttal that will not be repeated here, but Mr. Sullivan did no independent analysis to determine actual irrigated acres within each SWC entity. For example, owners of many of the acres he is suggesting to remove from the SWC service areas have transferred or leased their water rights to other irrigated acres located within the entity Mr. Sullivan did not perform any independent analysis of actual irrigated acres located within each entity and his alternative calculation is based solely on the work of Scott King.

G. Mr. Sullivan states that the storage of water is not a beneficial use and advocates that the reasonable storage carryover provisions of the CMR should be ignored and that all carryover must be used with no storage saved for next year's demands.

On Page 26, line 20 and following of his Expert Testimony, Mr. Sullivan states that *"the SWC should not be entitled to storage for the sake of storage, because having water in storage is not a beneficial use."* This opinion is in direct conflict with the planning and design of large water supply storage reservoirs throughout the western United States and other countries. Local, state, and federal agencies have been building and operating multiple-year storage reservoirs for almost 100 years, based on the concept that water held in storage was a beneficial use. At the time this report is being prepared, the state of Idaho is evaluating options to construct additional storage in the upper Snake River Basin, including potential redevelopment of Teton Reservoir at a cost of hundreds of millions of dollars. If one wants to store water in Idaho, IDWR requires that one obtain a water right to divert water into storage. Obviously- storage is a beneficial use- otherwise the State and Federal Government and Private entities would not have spent the billions of dollars needed to construct and maintain it. This highlights the value of storage compared to other types of supply. To reserve the water for dry periods, except to the extent that they provide flood control benefits, large storage reservoirs are normally kept as full as possible. They are drawn down during dry years (and multiple dry years), then refill during wet periods. Operational spill is part of the cost of storing water so that it can be used during times when it is needed. Even when spilled, the carryover water is still being beneficially used. The previously stored water is still retained from year-to-year, making it unnecessary to refill the space during subsequent years. This increases the amount of natural flow remaining for junior rights, including, in this case, those of the ground water users. Operational spill is part of the reservoirs' hydrologic design, because in other years, the water that is carried over will provide critically needed supply during an extended drought.

This is illustrated in **Exhibit 8203**, which depicts the combined reservoir storage for the Palisades Project from Table 21 in Reclamation's 1946 Palisades Project Planning Report. In the period 1920 through at least 1923, the reservoirs filled and spilled each year. Carryover in this period is only used indirectly, because there is abundant supply available. But in the period 1930 through 1937, supply is short and every acre-foot of water that is carried over into 1930 and through 1933 contributes to reducing the shortages that occurred in 1934 and 1935. If all of the 2.1 MAF of carryover had been released and/or used in 1929, there would have been 2.1 MAF less supply available during the ensuing drought years, and the water supply shortages would have been 2.1 MAF greater.

Water supply planning depends upon carryover storage to improve the reliability of supplies during multiple year droughts. In any given year there is no accurate way to predict whether the system is entering a dry period, so good water resources management principles dictate holding as much water in storage as is reasonably possible. For example, the water managers for the upper Snake Basin did not know what year a drought would begin, and certainly did not know in 1929 the magnitude and duration of the impending 1930s drought. But they did know that having carryover storage kept in reserve reduces the risk of future shortage and provides the option to have that storage available when it is needed. The SWC carryover storage reduces the risk, frequency, and severity of water supply shortages, making their supply more reliable and more valuable. Carryover also allows additional natural flow to be available the next season for junior users (because the space does not need to be refilled). Mr. Sullivan's statement that "*having water in storage is not a beneficial use*" is in error.

If Mr. Sullivan's viewpoint prevails, then there is little incentive to surface water users to build and maintain storage reservoirs in areas where there is conjunctive management of surface and ground water. The other alternative to reservoirs is to only have natural flow rights, in which case **all** of the winter flow would be lost and none of it would be used for beneficial purposes. This highlights the dangerous precedent that Mr. Sullivan is attempting to set by defining any reservoir storage that is not directly used for irrigation as non-beneficial.

Further indication of Mr. Sullivan's inaccurate understanding of the importance of carryover storage is provided by his recommendation that the CMR provisions concerning reasonable carryover should be ignored or changed. He recommends that the impacts of junior priority ground water users on SWC water supplies all be accounted for within the season when shortages occur. What this fails to anticipate is that, during certain of these water short years, it is likely that there will not be sufficient mitigation water available for the junior groundwater users to provide to offset SWC shortages. This is particularly true if carryover storage has been depleted through its use in a profligate manner, without regard for the potential for future shortage conditions. The CMR provision requiring reasonable carryover provides at least some minor protection to the SWC's depleted water supplies.

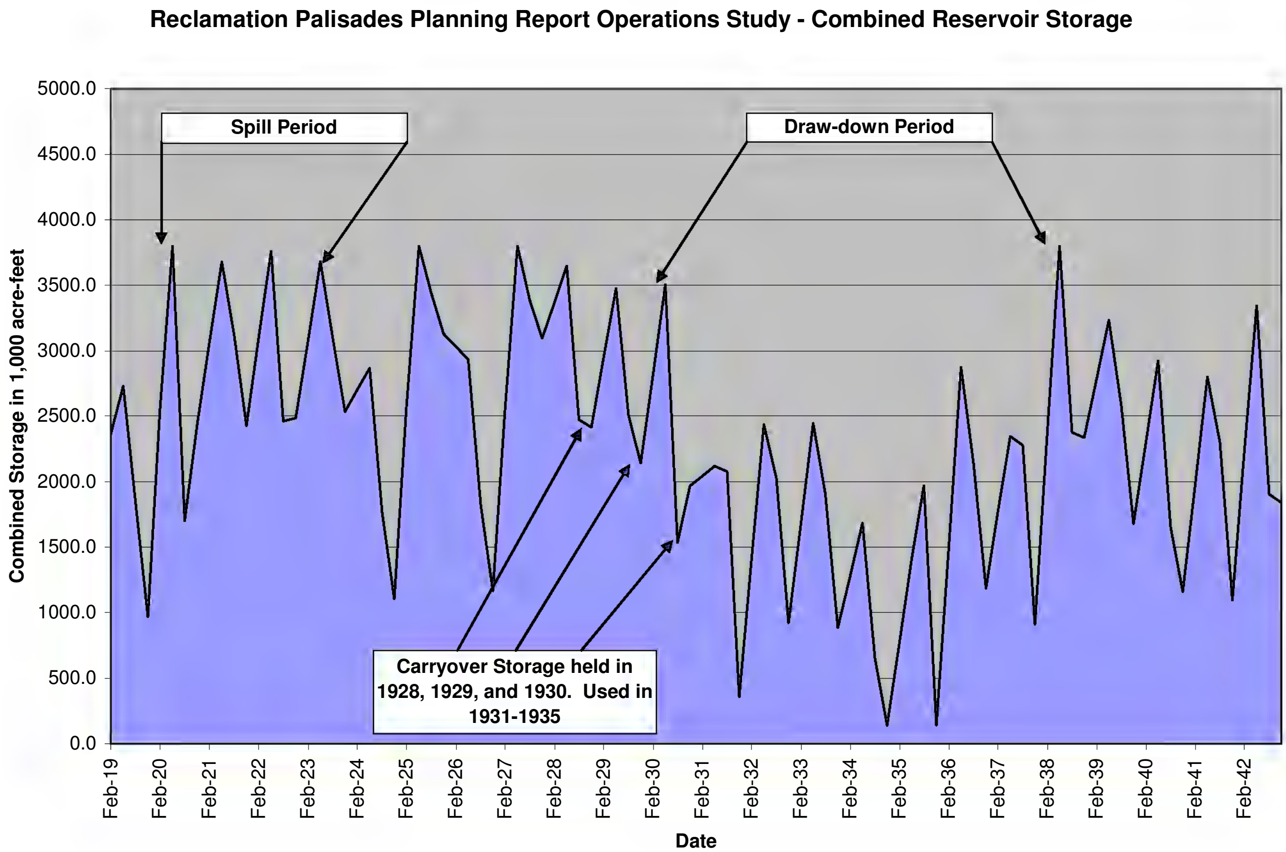

Exhibit 8203 Combined reservoir storage for the Palisades Project from Table 21 in Reclamation's 1946 Palisades Project Planning Report

H. Mr. Sullivan makes incorrect adjustments to carryover storage in order to minimize SWC diversion requirements and fails to properly account for water purchased by the SWC under a rental agreement.

Mr. Sullivan's water budget analysis shown in the Excel spreadsheets used to develop the tables in Exhibit 3007 assumes that water that SWC members rented (purchased) from the water bank is part of their available supply. This water was only available to the SWC because first it was available in the WD01 rental pool, and second they paid to use it from the rental pool. Actually, these purchases are evidence that the SWC members' supplies are not adequate, in that they have been forced to obtain additional water to self-mitigate for supply shortages. Purchased water should not be included in their supply in the calculation of SWC shortages.

Mr. Sullivan's water budget analysis utilizes end of year carryover storage to offset his calculated shortages. For example, this is shown on Table 7 of Exhibit 3007, where his calculated shortage for AFRD2 during 2004 of 21,143 acre-feet is reduced (by using all 18,617 acre-feet of carryover storage) to 2,526 acre-feet. He does not adjust the carryover storage to incorporate this assumed use, presumably because AFRD2's storage approximately filled in the next year. He does not determine whether their storage would have filled if they had utilized this carryover to meet shortages. Instead his calculations assume that the full amount of carryover storage is available to be used again next year. The same error is shown in Tables 8 and 10 of Exhibit 3007. Because Mr. Sullivan's calculated shortages are erroneously small, the error associated with the assumption that carryover adjustments do not affect subsequent years' storage, has a relatively small impact. If his calculations included the full extent of SWC shortages, his assumption that SWC storage volumes are not affected when the reservoirs come close to filling would significantly underestimate shortages.

I. Mr. Sullivan's methodology and results are not reasonable and do not reflect SWC actual diversion and curtailment records. Mr. Sullivan's analysis shows surplus supply during years when the SWC had shortages and curtailed deliveries.

Mr. Sullivan shows the largest surpluses during years when the SWC experienced shortages and curtailed deliveries. This is a strong indication of the level of inaccuracy associated with Mr. Sullivan's analysis. As shown in **Exhibit 8204**, NSCC reduced deliveries to the second and third segregations (by up to 40 percent) in 1992, 1993, 1994, 2001, 2002, 2003, and 2004. Mr. Sullivan's analysis shows hundreds of thousands of acre feet of *"Excess at River Headgate"* for each of these years. TFCC reduced deliveries to the headgate by up to 33 percent in 1992, 1994, 2001, 2002, 2003, and 2004 and has rented up to 40,000 AF of water to make up for deficits. Again, Mr. Sullivan's analysis for TFCC shows hundreds of thousands of acre feet of surplus for each of these years. AFRD2 reduced their headgate deliveries by up to 20 percent or more in 1992, 1993, 1994, 2001, 2002, 2003, and 2004. Mr. Sullivan's analysis shows up to 36,000 acre feet of surplus for these years, and a single year shortage of 21,000 acre-feet (approximately 5 percent of their average delivery). These curtailments would not have been imposed if they did not have shortages in those years. These shortages were large enough that they should have been seen in an accurate water budget analysis. Additionally, BID and MID have restricted deliveries to their water users in the 1990 through 2006 period. Mr. Sullivan's analysis does not indicate that this should have been necessary. Each of the companies depleted its valuable carryover storage below 15 percent of capacity at least once during the 1990 – 2006 analysis period, and TFCC, AFRD2, and A&B completely drained their reservoir storage, attempting to satisfy their irrigation demands.

The only SWC shortages that Mr. Sullivan identifies are minor deficiencies in the supplies of AFRD#2, MID, and BID during the 2001 through 2004 period (Sullivan Expert Report, Tables 7, 8, and 10, Exhibit 2007). He finds that all of the shortages except a single shortage year of 2,500 acre-feet by AFRD in 2004 could have been eliminated by using rental water and by reducing the SWC members' carryover storage. If the SWC members' irrigation diversion requirements were completely met so that they have surplus water, as Mr. Sullivan has reported, these supply reductions, cutoffs, curtailments, and extreme reservoir drawdowns would not have been necessary. Mr. Sullivan offers no explanation of why TFCC rented 40,000 AF of water during 2007 and other water during other years at a cost of many hundreds of thousands of dollars. Simply put, Mr. Sullivan's results do not reflect the reality that the SWC has experienced shortages and periods when they did not have enough supply and had to curtail deliveries.

Exhibit 8204 Comparison of Sullivan Calculation of Excess Supply or Shortage (AF) with SWC Calculation (AF) and Historical Curtailment

Year	AFRD2			
	Sullivan Calculation of Excess Supply or (Shortage)	SWC Calculation of Shortage	Historical Curtailment Headgate Deliveries	Historical Curtailment Percentages
1992	-	(93,600)	1/2	20%
1993	10,769	(30,866)	1/2	10 to 20%
1994	36,737	(33,721)	1/2	20%
2001	-	(54,533)	1/2	20%
2002	8,681	(53,787)	1/2	20%
2003	4,365	(64,900)	1/2	20%
2004	(21,143)	(138,875)	1/2, plus shutdown	> 20%

Year	NSCC			
	Sullivan Calculation of Excess Supply or (Shortage)	SWC Calculation of Shortage	Historical Curtailment Headgate Deliveries	Historical Curtailment Percentages
1992	281,514	(218,253)	1/2 to 7/16*	20 to 30%*
1993	488,434	(53,667)	5/8 to 7/16*	0 to 30%*
1994	469,653	(72,918)	5/8 to 1/2*	0 to 20%*
2001	276,012	(215,821)	1/2*	20%*
2002	256,638	(220,973)	0.54 to 3/8*	14 to 40%*
2003	301,430	(165,223)	1/2*	20%*
2004	253,154	(206,899)	7/16*	30%*

* Curtailment to the Second and Third segregations

Year	TFCC			
	Sullivan Calculation of Excess Supply or (Shortage)	SWC Calculation of Shortage	Historical Curtailment Headgate Deliveries	Historical Curtailment Percentages
1992	183,008	(227,013)	3/4 to 5/8 to 1/2	up to 17 to 33%
1993	349,232	(56,904)	3/4	None
1994	282,048	(95,862)	3/4 to 5/8	up to 17%
2001	204,172	(151,609)	3/4 to 5/8 to 1/2	up to 17 to 33%
2002	246,482	(98,348)	3/4 to 5/8	up to 17%
2003	281,825	(54,953)	5/8	17%
2004	230,666	(128,163)	5/8 to 1/2	17 up to 33%