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ATTORNEYS FOR THE CITY OF POCATELLO

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY OR FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	**CITY OF POCATELLO'S SUBMISSION OF SUPPLEMENTAL TECHNICAL INFORMATION**

The City of Pocatello ("City" or "Pocatello") hereby submits technical comments prepared by Spronk Water Engineers in support of its previously filed Petition for Reconsideration. The technical information relied upon by the Department was not made available until after the deadline for reconsideration motions and SWE has endeavored to develop technical comments that are responsive to the technical materials relied upon by the Department, as well as to point out logical inconsistencies and lack of record support for various of the methodologies contained in the April 7, 2010 Order.

Respectfully submitted, this 29th day of April, 2010

CITY OF POCATELLO ATTORNEY'S OFFICE

By______________________________
A. Dean Tranmer

WHITE & JANKOWSKI

By______________________________
Sarah A. Klahn

ATTORNEYS FOR CITY OF POCATELLO

CERTIFICATE OF SERVICE

I hereby certify that on this 29th day of April, 2010, I caused to be served a true and correct copy of the foregoing **City of Pocatello's Submission of Supplemental Technical Information** for **Surface Water Coalition Priority Call Case** upon the following by the method indicated:

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Memorandum

TO: Sarah Klahn
Mitra Pemberton

FROM: Spronk Water Engineers, Inc.; Gregory K. Sullivan

DATE: April 29, 2010

RE: April 7, 2010 IDWR Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover (SWE Project No. 155.02.POC)

On April 7, 2010, the Interim Director of the Idaho Department of Water Resources ("IDWR") issued a Final Order Regarding Methodology for Determining Material Injury to Reasonable In-Season Demand and Reasonable Carryover ("April 7th Order" or "Modified Protocol"). The April 7th Order describes IDWR's proposed methodology for administering the delivery call on the Snake River made by the members of the Surface Water Coalition ("SWC").

This memorandum represents our initial comments on certain provisions contained in the Modified Protocol, and we reserve the right to modify these comments and/or provide additional comments based on further review of the April 7th Order. In addition, we reserve the right to provide additional comments after further reviewing the technical information and analysis utilized by IDWR in developing the Modified Protocol, as well as the as-applied implementation of the Modified Protocol.

Use of Historical Diversions to Determine Baseline Water Requirements

The Modified Protocol provides that historical diversions will be used to determine the baseline water requirements of the SWC members. Based on review of hydrologic and climatologic data, the Interim Director determined that the average of the diversions made by the SWC members in 2006 and 2008 should be used as the Baseline Year ("BLY") for making the initial determination at the beginning of the irrigation season of the Reasonable In-Season Demand ("RISD"). The April 7th Order states that the BLY should "represent a year(s) of above average diversion ... 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." April 7th Order at 5, FOF 16.

The information provided by IDWR in the April 7th Order does not support IDWR's position that diversions in years of above average ET and below average precipitation represent the amount of water necessary to meet the crop water needs of the SWC members. To the extent that historical diversions were greater than were necessary to meet the crop water demands, use of those diversions in establishing the baseline water requirements of the SWC will result in curtailment of junior ground water users (or mitigation) in order to provide water in excess of the SWC needs. This is not consistent with full economic development and maximum utilization of Idaho's water resources.

Further, use of above-average historical diversions to represent the SWC irrigation water demands is not consistent with the April 29, 2008 Opinion Constituting Findings of Fact, Conclusions of Law and Recommendation issued by the IDWR Hearing Officer, Gerald F. Schroeder, in the Surface Water Coalition Delivery Call Hearing ("2008 Opinion"). The 2008 Opinion contains the following statements that are instructive on how the administration protocol should be developed:

- [T]he Department must modify the minimum full supply analysis as a method of establishing a baseline of predicted water need for projecting material injury. 2008 Opinion at 51, ¶ XIV 7.

- [I]t 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. Ibid.

- 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. Ibid.

- Within this context there are issues of the reasonableness of diversion and conveyance practices, and the conservation efforts of the water users. Ibid.

- The isolation of a year when there are known facts as to the supply and use may be reasonable if it is subjected to the type of analysis applied by both the surface and ground water users. However, focusing on a single year can only be a starting point, not sufficient without material adjustments. Those adjustments are reflected in the analyses of the ground water users and the surface water users in attempting to establish annual diversion requirements. 2008 Opinion at 51-52, ¶ XIV 7.

- 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. 2008 Opinion at 49, ¶ XIV 2.

- There are scientific approaches well beyond what water was taken and used that the parties have utilized in order to establish the amount of water SWC members actually need to meet full crop years [sic] over time. 2008 Opinion at 51, ¶ XIV 3.

The BLY methodology described in the Modified Protocol is not appropriate for determining the initial water requirements of the SWC members because it does not contain the modifications and adjustments that are necessary to determine the amount of water that is actually needed by the SWC members to meet their crop water demands. Further, the BLY methodology is not consistent with the Hearing Officer's mandate that it be based on an <u>average year of need, subject to adjustment up or down</u>. Instead, the Modified Protocol provides for determination of baseline water needs based on years above average diversions, above average temperatures and ET, and below average precipitation.

Assessment of Predicted Shortages to TFCC

To illustrate the concerns regarding the Modified Protocol, the predicted 2010 shortage to the Twin Falls Canal Company ("TFCC") summarized in the April 14, 2010 letter from IDWR was evaluated by comparing it to the shortage that would result from computing the RISD using (a) a weighted average project efficiency derived from the after-the-fact IDWR monthly project efficiency values described in the April 7th Order, and (b) a reasonable project efficiency computed from a reasonable on-farm application efficiency for TFCC and the reported conveyance loss for the TFCC. These comparisons are shown in **Table 1**.

The baseline RISD of 1,045,382 acre-feet ("af") from the April 14, 2010 IDWR Letter for the TFCC is shown in the first column of numbers in **Table 1**. The baseline RISD was computed as the average of what TFCC diverted in 2006 and 2008. Compared to the forecast 2010 supply for the TFCC of 988,469 af, IDWR projects a shortage to TFCC of 56,913 af (rounded to 56,900 af).

The second column of numbers in **Table 1** shows the irrigation season water demand that would be computed for TFCC based on the average annual crop irrigation requirement ("CIR") and a weighted average after-the-fact project efficiency of 43.6% derived from the monthly IDWR figures (weighted by monthly CIR)[1]. This result, using IDWR's numbers, is a projected RISD of 897,359 af. Comparison of this demand to projected supply of 988,469 af shows that there would be no projected shortage to TFCC in 2010.

The absence of a shortage computed using IDWR's after-the-fact project efficiency is significant because it shows the effect of removing the bias in the Modified Protocol that arises from computing the baseline demand so a to "represent a year(s) of above average diversion … above average temperatures and ET, and below average precipitation." Removal of that bias using IDWR's after-the-fact project efficiency value, as shown in Table 1, is sufficient to eliminate the forecast shortage in 2010.

[1] Derivation of the weighted average after-the-fact project efficiency is described later in the memorandum.

The record in this matter allows IDWR to refine this approach further. As shown in the third column of numbers in **Table 1,** the computed RISD using a reasonable project efficiency can be computed using TFCC efficiency figures contained in the record (a reasonable on-farm application efficiency of 60% and a conveyance of 12%, as reported by Vince Alberdi)[2]. The resulting computed RISD is 738,100 af. Compared to the forecast total supply for the TFCC of 988,500 af, there would be no shortage to TFCC in 2010.

The above analysis of the projected water supply and demand for the TFCC shows that the projected shortage to the TFCC in 2010 described in the April 14 Letter from IDWR is overstated.

The remainder of this memorandum is devoted to discussion of methods to further refine the project efficiencies developed by IDWR, including how those efficiencies should be modified to consider reasonable on-farm application efficiencies and reported conveyance losses.

Review of IDWR Project Efficiencies

The April 7th Order contains monthly project efficiencies that IDWR proposes to use in adjusting the RISD of the SWC members determined at the beginning of the irrigation season. These adjustments will be made approximately halfway through the irrigation season, near the end of the irrigation season, and after the end of the irrigation season.

IDWR will compute adjusted in-season water demands by tabulating the actual CIR in the current year (to the date of the adjustment) for each of the SWC members based on their irrigated area, cropping pattern, and unit CIR data from the USBR Agrimet data. IDWR proposes to divide the monthly CIR values by the monthly project efficiency values listed in FOF 44 of the April 7th Order to compute updated monthly diversion

[2] The reasonable on-farm application efficiency and reported conveyance loss for the TFCC is described later in the memorandum.

requirements. These adjusted diversion requirements will be substituted for the monthly RISD values, and revised annual water requirements will be computed.

In the April 7th Order, IDWR attempts to draw a parallel between its use of project efficiencies and the way that irrigation efficiencies were used by the experts in the SWC Delivery Call litigation:

> 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 the hearing Exhibit. 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.
> FOF 41 at 15-16

Contrary to the above statement, IDWR's "project efficiency" is not the same as the "system efficiencies" developed by the SWC and Pocatello experts during the SWC Delivery Call litigation. IDWR's "project efficiency" fails to incorporate a "reasonableness" evaluation as required by Idaho law and the 2008 Order. As such, the project efficiencies for some of the SWC members are too low, as illustrated in Table 1 for the TFCC, with the result that shortages to the SWC members are over-predicted.

By contrast, both the Pocatello experts and the SWC experts estimated on-farm efficiency and conveyance loss in order to translate the CIR into the amount of water that is needed at the river headgate to meet crop demands. Reasonable project efficiency should be computed as the product of reasonable on-farm efficiency multiplied by reasonable conveyance efficiency (1 - conveyance loss). Applying a reasonableness test to computation of the project efficiencies helps avoid a windfall for seniors through over-prediction of shortages.

Use of after-the-fact project efficiencies in administration as proposed by IDWR is inappropriate because it has the potential to reward inefficient operation and may result in unnecessary curtailment or mitigation of junior ground water users to provide additional supplies to the senior users that are not actually needed to meet crop demands. This is contrary to maximum utilization and full economic development.

To illustrate the differences between reasonable project efficiency and the after-the-fact project efficiency derived by IDWR, several analyses were performed as described herein.

Problems with Use of Monthly Project Efficiencies

The monthly project efficiencies computed by IDWR are shown in **Table 2**. A chart illustrating the monthly project efficiencies is shown at the bottom of **Table 2**. The values shown in **Table 2** were taken from the supporting information provided by IDWR on April 21, 2010. Included in those materials was a spreadsheet containing a table entitled "Summary of Corrected Average PE Values – 2001:2008." It was assumed that IDWR intends to replace the monthly project efficiencies in FOF 44 of the April 7th Order with the corrected values.

One of the problems with IDWR's use of project efficiencies lies in the way that the after-the-fact project efficiency was computed. Computing an after-the-fact project efficiency based on the CIR divided by the volume of water diverted is appropriate when that calculation is performed on a seasonal basis. However, this method is not appropriate for computing after-the-fact project efficiency based on monthly or other short-term data. The reason is that using the CIR in the numerator of the calculation does not consider the portion of the diversion that may have gone into soil moisture, but was not immediately consumed.

For example, consider an irrigator that diverted 100 acre-feet in April, and 20 acre-feet was consumed and 40 acre-feet went into soil moisture storage. Using IDWR's definition, the computed after-the-fact efficiency for April would be 20% (20 af / 100 af). However, the real after-the-fact efficiency would have been 60% ([20 af + 40 af] / 100 af), as the water that went into soil moisture storage was made available for later consumption.

IDWR's method of computing monthly after-the-fact project efficiency can result in quirky and somewhat nonsensical results. Such results are evident in the IDWR project efficiency values shown in **Table 1** that bounce around from month to month and user to user, and include some very low values at the beginning and end of the irrigation season, and also include two values in excess of 100% in April.

IDWR's proposed use of monthly after-the-fact project efficiencies in administration has the potential to result in unintended dramatic swings in computed diversion demands. This is illustrated in the two charts included in **Figure 1** for the TFCC. The green lines in the upper chart depict the average (dotted line) and maximum (solid line) monthly values of CIR. The black lines show the monthly diversion requirements that would be computed by dividing the monthly CIR values by IDWR's proposed monthly project efficiencies.

The lower chart in **Figure 1** shows the difference between the average and maximum CIR values and the average and maximum computed diversion requirements. The difference between the monthly average and maximum CIR values for TFCC is less than 20,000 af. However, these modest differences in CIR translate into substantial differences in diversion requirements at the beginning and end of the irrigation season when the project efficiencies determined by IDWR are low. IDWR's project efficiency of 11% in October unreasonably dictates that every acre-foot of CIR in October requires 9 af of diversion demand to meet it. It is similarly unreasonable that the difference between an average and dry October would result in 100,000 acre-feet of additional diversions that are needed by TFCC in that month.

Due to the problems described above regarding the use of varying monthly project efficiencies, we propose that IDWR develop seasonal project efficiencies to use in administering the SWC delivery call.

Annual After-The-Fact Project Efficiencies

IDWR's table of monthly after-the-fact project efficiencies includes a line at the bottom showing the arithmetic average of monthly values. The arithmetic average of the monthly values is of limited use because it weights the low efficiency values at the beginning and end of the season, when relatively less water is being diverted and consumed, the same as the values during the middle of the irrigation season. It is more meaningful to compute a weighted-average efficiency with the weighting based on monthly CIR or the monthly diversions. Alternatively, the seasonal or annual after-the-fact project efficiency can be computed as the annual crop water requirement divided by the annual diversions. Both approaches should give similar results.

Weighted-average annual after-the-fact project efficiencies were computed for each of the SWC members by weighting the monthly efficiency values by the monthly CIR data contained in the supporting data for the April 7th Order. Derivation of the weighted average values is shown in **Table 3**.

IDWR computed after-the-fact project efficiencies based on the average of monthly values from wet, average, and dry years during the period from 2000 – 2008. During years of adequate water supply, there is limited incentive for the irrigators under most of the SWC systems to conserve water. In those years, the SWC members typically establish a full or near full "allocation" of water for their irrigators, and the irrigators may use up to the full allocation, whether or not full amount is needed to satisfy their crop demands[3]. Irrigating with more water than is necessary to meet crop demands can make

[3] The SWC members typically set annual irrigation allocations for their members based on long-standing practice. In general, the "full" irrigation allocations have remained relative steady over time despite the substantial advancements in on-farm irrigation through conversions to sprinklers and advances in irrigation water management.

on-farm management of the irrigation supply easier (e.g., farmers need not change irrigation sets as frequently). However, over-diversion of water for ease of irrigation should not be the basis for curtailment of junior ground water users, and is not consistent with maximum utilization of the resource.

To the extent that IDWR insists on using after-the-fact project efficiencies in administration, these should be computed using only data from dry years when the SWC members were more efficient than during average or wet years.

Annual Reasonable Project Efficiencies

The reasonableness of the project efficiencies developed by IDWR was assessed by comparing them to project efficiencies derived from (a) on-farm irrigation efficiencies used by IDWR or the SWC experts, and (b) conveyance losses reported by the SWC members.

Reasonable on-farm irrigation efficiencies were computed for the each of SWC members based on (a) sprinkler application efficiencies contained in the January 29, 2008 Order in the A&B Delivery Call matter, and (b) the gravity irrigation application efficiency used by the SWC experts. These sprinkler and gravity irrigation efficiency values are summarized in **Table 4**.

In evaluating the delivery call by the B Unit of the A&B Irrigation District ("A&B Delivery Call"), IDWR assessed the adequacy of the B Unit water supply assuming that the irrigators in that system could operate at an overall project efficiency of 75%. See A&B Order at 12, FOF 50. This overall project efficiency figure included a 3% conveyance loss in the B Unit. Dividing the 75% overall efficiency by a 97% conveyance efficiency results in a 77% on-farm application efficiency for the B Unit.

IDWR based its estimate of on-farm application efficiency in the B Unit on the following ranges of reported application efficiencies for sprinklers:

Sprinkler System	Application Efficiency
Stationary lateral (wheel or hand move)	60 – 75%
Solid set lateral	60 – 85%
Center pivot lateral	75 - 85%

See A&B Order at 12, FOF 47.

IDWR used the 75% overall project efficiency as part of its determination of whether the B Unit was suffering irrigation water shortages as a result of the impact of pumping by junior ground water users. There is no reason why a similar approach should not be used in evaluating the SWC Delivery Call

The A&B Order did not include a finding regarding the application efficiency for gravity irrigation methods because there is very little use of this application method under the B Unit. However, there was general agreement between the Pocatello experts and the SWC experts as to reasonable on-farm application efficiencies for gravity irrigation. The Pocatello experts used gravity application efficiencies ranging from 55% to 60% in their water budget analyses (see 9/26/2007 Franzoy Report at 11, Table 5). The SWC experts used an average gravity irrigation efficiency of 55% in the SWC delivery call (see 11/7/2007 Rebuttal Report of Direct Testimony and Expert Report of Gregory Sullivan and Eugene Franzoy at 3). The SWC experts used a gravity application efficiency of 60% in the A&B delivery call (see 7/16/2008 A&B Irrigation District Expert, Table 4-7). For purposes of illustration, a reasonable gravity application efficiency of 55% was assumed in deriving on-farm application efficiencies for the SWC members for the analyses described herein.

Weighted average reasonable on-farm application efficiencies for the SWC members were computed using the IDWR and SWC on-farm efficiencies described above, and irrigated areas for each SWC members supplied by center pivot sprinklers, other sprinklers, and gravity methods. The irrigated area data came from the September 26, 2007 expert report of Gene Franzoy that was submitted in the SWC Delivery Call hearing on behalf of Pocatello. The resulting weighted average reasonable on-farm irrigation efficiency figures are summarized at the bottom of **Table 4**, and range from 60.3% for the TFCC to 74.1% for the NSCC.

Reasonable project efficiencies were computed based on the product of the reasonable on-farm efficiencies from **Table 4** and the conveyance losses reported by the SWC members, as contained in the September 26, 2007 SWE expert report. The on-farm efficiencies, conveyance losses, and computed reasonable project efficiencies are shown in **Table 5**. The computed reasonable project efficiencies were compared to the weighted average project efficiencies from the April 7th Order in **Table 3**. A chart illustrating the project efficiency figures is shown at the bottom of **Table 5**.

The results in **Table 5** show that the after-the-fact project efficiencies for A&B, AFRD2, BID, Milner and MID are equal to or greater than the computed reasonable project efficiencies. This means that these users are operating toward the upper end of the ranges of recognized efficiencies for sprinkler and gravity methods. For purposes of administering the delivery call, these users should be expected to continue their efficient operation.

Conversely, the after-the-fact project efficiencies for the NSCC and the TFCC shown in **Table 4** are substantially lower the computed reasonable project efficiencies. This means that both NSCC and TFCC are operating at efficiencies that are lower than expected and lower than what is reasonable. The following is a summary of the computed reasonable and after-the-fact project efficiencies for TFCC and NSCC

**Summary of Reasonable Project Efficiencies
And Project Efficiencies from April 7th Order (corrected)
NSCC and TFCC**

Project Efficiency	NSCC	TFCC
Reasonable	49.6%	53.0%
April 7th Order	39.6%	43.6%
Difference	-10.0%	-9.4%

The above differences between the reasonable and after-the-fact project efficiencies result in significant differences in computed diversion requirements using the administration protocol described in the April 7th Order. The average annual CIR computed by IDWR over the 2000 – 2008 period was 347,000 acre-feet per year ("af/y") for NSCC and 391,000 af/y for TFCC (derived from data in DS & RISD Calculator.xlsx from IDWR). Dividing these average annual CIR amounts by the weighted average project efficiency gives the estimated average annual diversion requirement. The following is a summary of the average annual diversion requirements for NSCC and TFCC computed using reasonable project efficiencies and the after-the-fact project efficiencies from the April 7th Order.

**Summary of Annual Diversion Requirement
Based on Reasonable Project Efficiencies
And Project Efficiencies from April 7th Order
NSCC and TFCC**

Annual Diversion Demand Based On	NSCC	TFCC
Reasonable Project Efficiency	700,000	739,000
April 7th Order Project Efficiency	877,000	897,000
Difference	177,000	158,000

Each percentage point difference in project efficiency translates into a difference in the annual diversion requirement of 17,700 af/y for NSCC and 16,900 af/y for TFCC.

The project efficiencies computed by IDWR for NSCC and TFCC are lower than what is reasonable. Determination of shortages to NSCC and TFCC for purposes of curtailment or mitigation should be based on seasonal values of reasonable project efficiency of at least 50% for NSCC and 53% for TFCC.

All project efficiencies used in administering the SWC Delivery Call should continue to be reviewed in the future to consider the effect of continued conversions to sprinklers.

Proposed Method for Computing RISD, Shortage and Mitigation Requirement

We propose that IDWR determine the baseline water demand for each of the SWC members using an approach that is similar to the method that it has proposed for making mid-season and post-season adjustments to the RISD. The proposed methodology would involve the following steps:

1. Compute the average annual CIR based on (a) actual irrigated area, (b) cropping pattern, and (c) the average annual unit CIR amounts for the various crops.
2. Compute the annual RISD necessary to meet the crop water demands based on the average annual CIR volume from Step 1 divided by an annual "administrative project efficiency" (see below).
3. Compare the annual RISD from Step 2 to the available water supply (sum of project natural flow supply plus available storage water) to compute the shortage and required mitigation at the beginning of the season.
4. Recalculate the RISD, shortage, and mitigation requirement during and after the irrigation season based on actual CIR determined using Agrimet ET and precipitation data.

The proposed methodology for computing the RISD, shortage, and mitigation requirements would be consistent with the 2008 Opinion and would be consistent with the water budget approaches that were proposed by the experts in the SWC Delivery Call litigation.

Determination of Administration Project Efficiency

A reasonable project efficiency would be computed for each of the SWC members based on the product of the conveyance efficiency (1 minus the conveyance loss) and the reasonable on-farm efficiency. The computed reasonable project efficiency would be compared to annual after-the-fact project efficiency computed from recent water use data and CIR calculations (e.g., during the last 10 years), and the lesser of the two efficiency figures should be designated as the "administration project efficiency" to be used in computing the RISD for the SWC members.

The reasonable conveyance losses and reasonable on-farm application efficiencies should be computed as follows:

Reasonable Conveyance Loss

The conveyance losses in the SWC systems are knowable, and IDWR has the capability to develop reliable estimates of reasonable conveyance losses for each of the SWC members. Conveyance losses should be determined based on records provided by the Districts, and from interviews of the District managers and staff. Most of the SWC members measure deliveries to the users under their respective systems. Some of the members use these records to compute the conveyance losses in their systems. Even when the SWC members do not explicitly tabulate their losses, they generally have a good understanding of the amount of conveyance losses in their systems based on the difference between what they divert and what they deliver.

The Worstell Method should not be used to compute conveyance losses because (a) it was found to be unreliable by the Hearing Officer during the SWC Delivery Call hearing, and (b) it does not consider non-seepage losses and miscellaneous inflows to the conveyance system.

It is important that the conveyance loss figures used in determining the diversion requirements for the SWC members reflect careful operation of their distribution systems, and do not include avoidable operational spills and other avoidable non-seepage losses. In dry years when the ground water users are required to provide replacement supplies to mitigate potential injury from their pumping, they should not have to provide mitigation water that will be lost to avoidable conveyance losses.

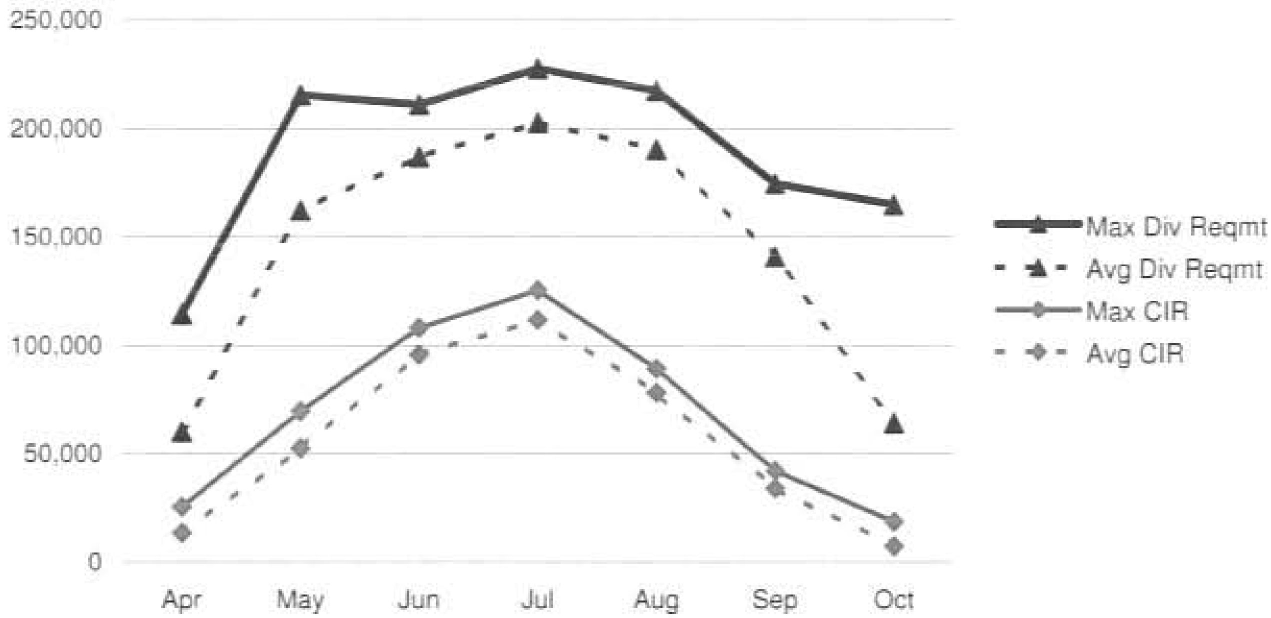
Reasonable On-Farm Application Efficiency

IDWR should determine an area-weighted average annual on-farm irrigation efficiency for each of the SWC members based on the various application methods used in their service areas. These calculations should utilize sprinkler application efficiencies from the

A&B Order, and a gravity application efficiency in the range of 55% to 60% based on the consensus of the Pocatello and SWC experts during the SWC Delivery Call hearing.

Figure 1

Average and Maximum CIR and Diversion Requirements
Computed Using IDWR Modified Protocol
Twin Falls Canal Company



Difference Between Average and Maximum CIR and Diversion Requirements
Twin Falls Canal Company

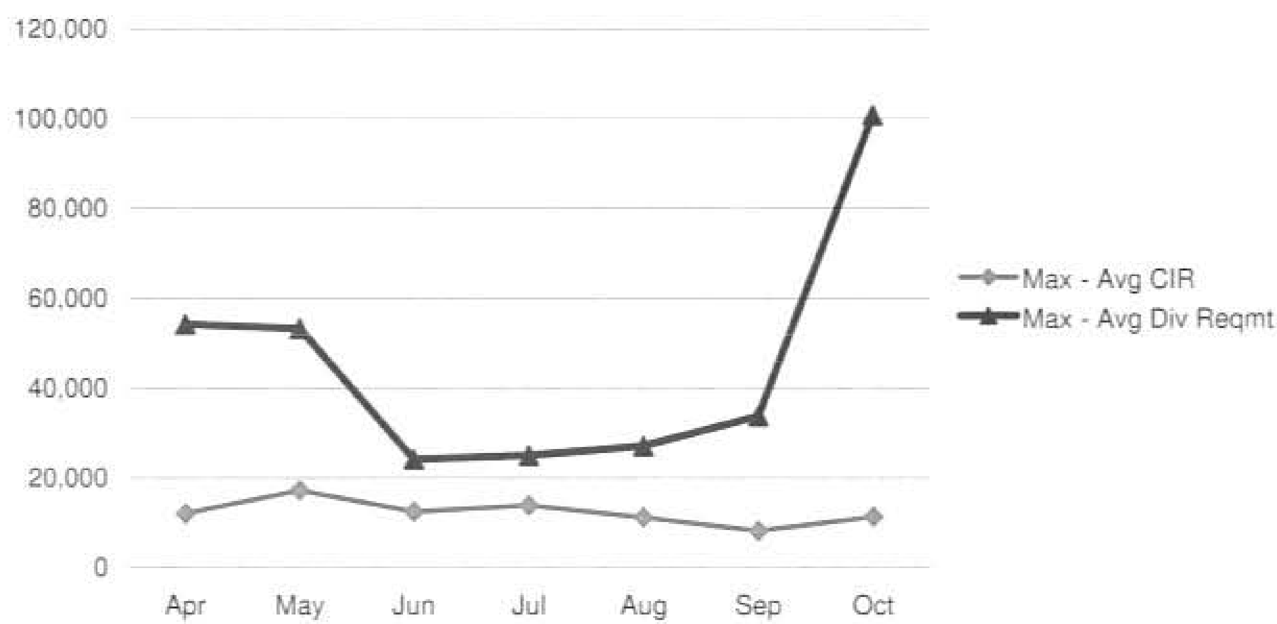


Table 1

Forecast 2010 Shortages Computed by Various Methods
Twin Falls Canal Company

	(10) Using BLY from April 7th Order	(11) Using Proj Effcy From 4/7/2010 Order	(12) Using Reas. Project Efficiency
(1) Assumed Conveyance Loss			12%
(2) Reasonable On-Farm Efficiency			60%
(3) **Project Efficiency**	n/a	**43.6%**	**53%**
Reasonable In-Season Demand (af)			
(4) Irrigated Area (ac)		183,589	183,589
(5) CIR (in)		25.6	25.6
(6) Crop Water Demand (af)	n/a	391,481	391,481
(7) **Reasonable In-Season Demand (af)**	**1,045,382**	**897,359**	**738,102**
(8) **Forecast 2010 Supply (af)**			
Natural Flow	747,391		
Storage	241,078		
Forecast 2010 Supply (af)	**988,469**	**988,469**	**988,469**
(9) **Forecast Shortage (af)**	**56,913**	**0**	**0**

Notes

(1) Assumed conveyance loss for analysis purposes.
(2) Area-weighted reasonable average on-farm efficiency from Table 3.
(3) Project efficiency computed as (1 - conveyance loss) (1) x Reasonable On-Farm Efficiency (2).
(4) Irrigated area from Exhibit 4310 Estimate of Non-irrigated acres w/in the TFCC Service Area, Table 10 [25], SPF - 3/20/07.
(5) Average annual TFCC CIR from Table 2,
(6) Crop water demand computed as Irrigated Area (4) x CIR (5).
(7) RISD computed as Crop Water Demand (6) / Project Efficiency (3).
(8) Forecast 2010 TFCC water supply from 4/14/2010 IDWR Letter re: Surface Water Coalition Delivery Call.
(9) Forecast 2010 Supply (8) minus RISD (10).
(10) Computed shortage reported in 4/14/2010 IDWR Letter using baseline water requirement from April 7th Order FOF 29.
(11) Computed shortage using average annual Crop Water Requirement and weighted average project efficiency (3) derived from 4/7/2010 IDWR Order.
(12) Computed shortage using average annual Crop Water Demand (6) and project efficiencies (3) computed from assumed conveyance losses (1) and reasonable on-farm efficiency (2).

Table 2

Monthly Project Efficiencies
from April 7, 2010 Final SWC Order

Month	A&B	AFRD2	BID	Milner	Minidoka	NSCC	TFCC	Avg
Apr	1.08	0.24	0.27	1.36	0.17	0.14	0.22	0.50
May	0.42	0.28	0.31	0.59	0.27	0.28	0.32	0.35
Jun	0.64	0.40	0.48	0.62	0.50	0.44	0.51	0.51
Jul	0.79	0.44	0.56	0.66	0.64	0.49	0.55	0.59
Aug	0.68	0.38	0.42	0.56	0.48	0.39	0.41	0.47
Sep	0.51	0.26	0.32	0.49	0.35	0.30	0.24	0.35
Oct	0.16	0.41	0.11	0.34	0.11	0.22	0.11	0.21

Note

(1) From supporting data for April 7, 2010 IDWR Order; DS & RISD Calculator.xlsx
Values from table entitled, "Summary of Corrected Average PE Values - 2001:2008.

Monthly Project Efficiencies

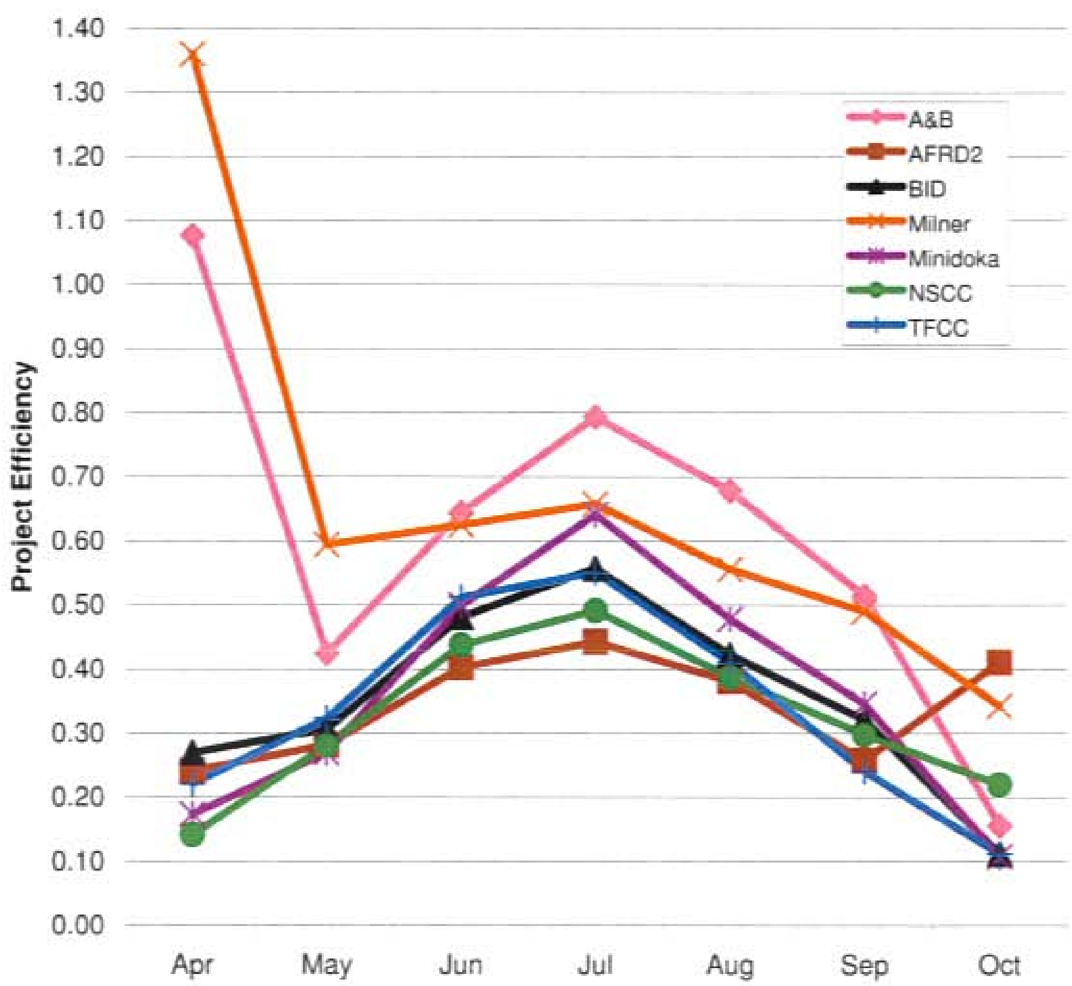


Table 3

Monthly Crop Irrigation Requirements
and Weighted Average Project Efficiency

(1) **Average Monthly Crop Irrigation Requirements (CIR)**

Month	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Apr	0.07	0.07	0.10	0.08	0.06	0.06	0.06
May	0.24	0.28	0.30	0.30	0.25	0.27	0.29
Jun	0.53	0.53	0.57	0.55	0.55	0.52	0.53
Jul	0.71	0.65	0.67	0.60	0.72	0.64	0.61
Aug	0.46	0.48	0.41	0.40	0.43	0.48	0.42
Sep	0.21	0.25	0.20	0.18	0.20	0.23	0.18
Oct	0.02	0.05	0.02	0.04	0.02	0.04	0.05
Annual	2.25	2.31	2.27	2.14	2.22	2.25	2.13

(2) **Monthly Project Efficiency**

Month	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Apr	108%	24%	27%	136%	17%	14%	22%
May	42%	28%	31%	59%	27%	28%	32%
Jun	64%	40%	48%	62%	50%	44%	51%
Jul	79%	44%	56%	66%	64%	49%	55%
Aug	68%	38%	42%	56%	48%	39%	41%
Sep	51%	26%	32%	49%	35%	30%	24%
Oct	16%	41%	11%	34%	11%	22%	11%
(3) **Wtd Avg**	**67.2%**	**37.4%**	**44.4%**	**62.6%**	**48.9%**	**39.6%**	**43.6%**

Notes

(1) Derived from supporting data for April 7, 2010 IDWR Order; DS & RISD Calculator.xlsx.
(2) From supporting data for April 7, 2010 IDWR Order; DS & RISD Calculator.xlsx.
(3) Average of monthly project efficiencies weighted by monthly CIR.

Table 4

Weighted Average Annual Reasonable On-Farm Efficiencies
Surface Water Coalition Members

(1) **On-Farm Efficiencies for Sprinklers (from 1/29/2008 A&B Order)**

Sprinkler Type	Low	High	Avg
Center Pivot	75.0%	85.0%	**80.0%**
Wheel or Hand Move	60.0%	75.0%	**67.5%**
Solid Set	60.0%	85.0%	**72.5%**
Avg for Non-Center Pivot	60.0%	80.0%	**70.0%**

(2) **On Farm Efficiciency for Gravity Irrigation (from 11/7/2007 SWC Rebuttal Report)**

	Low	High	Avg
Furrow Irrigation	30.0%	80.0%	**55.0%**

(3) **SWC Irrigated Acres and Application Method (from 9/26/2007 Franzoy Report)**

Application Method	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
Center Pivot	4,290	27,939	7,183	5,207	12,057	88,115	29,829
Other Sprinkler	6,395	12,854	28,073	4,927	48,526	48,977	19,221
Gravity	3,952	21,568	12,387	3,200	14,510	16,974	147,111
Total	14,637	62,361	47,643	13,334	75,093	154,066	196,161

(4) **Area-Weighted Average Reasonable On-Farm Efficiencies**

	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
On-Farm Efficiency	**68.9%**	**69.3%**	**67.6%**	**70.3%**	**68.7%**	**74.1%**	**60.3%**

Notes

(1) On-farm efficiencies for sprinklers from 1/29/2008 Order in A&B Delivery Call (p. 12).
(2) On-farm efficiencies for gravity irrigation from 11/7/2007 SWC Rebuttal Report to Expert Report and Direct Testimony of Gregory Sullivan (p. 3).
(3) Irrigated area by application method from 9/26/2007 Franzoy Expert Report (Table 5).
(4) Weighted average reasonable farm irrigation efficiency (weighted by application method).

Table 5

Reasonable Project Efficiencies Compared to Project Efficiencies from 4/7/2010 Final SWC Order

	A&B	AFRD2	BID	Milner	MID	NSCC	TFCC
(1) Reasonable On-Farm Efficiency	69%	69%	68%	70%	69%	74%	60%
(2) Reported Conveyance Loss	17%	48%	35%	20%	35%	33%	12%
(3) Reasonable Project Efficiency	57.2%	36.0%	43.9%	56.2%	44.7%	49.6%	53.0%
(4) IDWR Project Efficiency (weighted avg)	67.2%	37.4%	44.4%	62.6%	48.9%	39.6%	43.6%
(5) Proposed Administration Project Efficiency	67.2%	37.4%	44.4%	62.6%	48.9%	49.6%	53.0%

Notes

(1) Area-weighted average on-farm efficiency using (a) sprinkler efficiencies from 1/29/2008 A&B Order, (b) gravity efficiency from 11/7/2007 SWC Rebuttal Report, and (c) irrigated area from 9/26/2007 Franzoy Report. See Table 4 for derivation of area-weighted average on-farm efficiency.

(2) Reported conveyance loss from District records and/or testimony of District managers as described in 9/26/2007 Spronk Water Engineers expert report prepared for the City of Pocatello. These conveyance losses include seepage losses and operational spills.

(3) Reasonable On-Farm Efficiency (1) x (1 minus Reported Conveyance Loss (2)[decimal]).

(4) CIR-weighted average project efficiency from April 7, 2010 Final SWC Order.

(5) Greater of (3) or (4).

Reasonable Project Efficiency vs. Weighted Average Project Efficiency from 4/7/2010 Final SWC Order