O'Laughlin & Paris LLP

Attorneys at Law

April 11, 2017

Via Email

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814
Email: commentletters@waterboards.ca.gov

Re: Comment Letter – 2016 Bay-Delta Plan Amendment & SED
Oakdale Irrigation District and South San Joaquin Irrigation District
ERRATA TO OID's/SSJID's Joint Comment Letter

Dear Ms. Townsend:

On behalf of Oakdale Irrigation District and South San Joaquin Irrigation District, please find attached an *Errata* to the joint *Comments on the Draft Substitute Environmental Document* along with the referenced attachments. Following our submission on March 10, 2017, an error was discovered on pages 8-9 of the comments with respect to the incorporation of certain graphs contained in a report from consulting engineer Daniel B. Steiner, which was appended to the comments as Attachment 1.

Figures 3-1 and 3-2 of the comments should depict "New Melones End-of-Month Storage September Baseline" and "New Melones End-of-Month Storage September 40% UIF," respectively. However, the graph showing storage in New Melones at 40% UIF was inadvertently incorporated for *both* figures. Figure 3-1 has been changed to properly incorporate the graph provided by Mr. Steiner showing storage in New Melones under Baseline. There were no errors in Mr. Steiner's report.

Attached for your consideration are (1) pages 8-9 of the comments, in their corrected form, and (2) a complete copy of the joint *Comments on the Draft Substitute Environmental Document* in its corrected form. If you have any questions, please do not hesitate to contact our office directly.

Very truly yours,

Tim O'Laughlin

TO/llw

Attachment(s)

cc: *Steve Knell, Oakdale Irrigation District*
Peter Rietkerk, South San Joaquin Irrigation District

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OAKDALE IRRIGATION DISTRICT
&
SOUTH SAN JOAQUIN IRRIGATION DISTRICT

Errata to Comments on the Draft Substitute Environmental Document

Dated: April 11, 2017

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The run by OID and SSJID is mostly the same as the Water Supply Evaluation Model except for the following changes:

1. The model has no reservoir refill criteria, nor minimum carryover storage requirement.

2. The model includes the dissolved oxygen (DO) requirement.

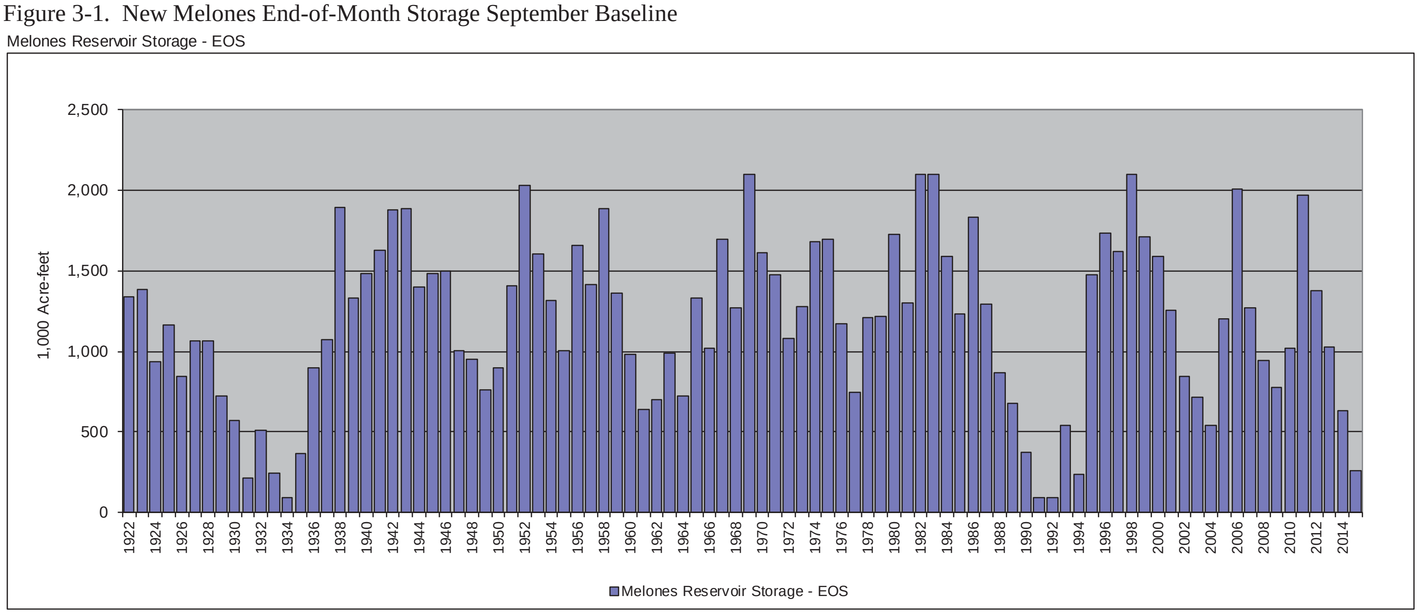
The refill and minimum storage modeling assumptions are dealt with in great detail in the SJTA comments and are incorporated herein. The reason for including the DO requirements is explained above. The results of the model run are below.

a. Storage

i. Baseline

The SWB uses End of Month Storage September (EOMSS) as an illustration metric. The Districts' Baseline run of the Stanislaus River shows a wide variance in EOMSS with significant reservoir drawdown during sequential dry periods. During the significant droughts of the 1930s, 1990s and recent years the reservoir shows near, if not complete emptying. During the drought events of the 1930s and 1990s the reservoir shows a storage of about 80,000 acre-feet; however, this low point is merely for modeling convenience as reservoir storage was maintained at this level through reductions to the Districts' diversions in order to maintain storage and releases to the river. In practical terms, the reservoir would be empty and the river would have a zero release. (Attachment 1, p. 4.)

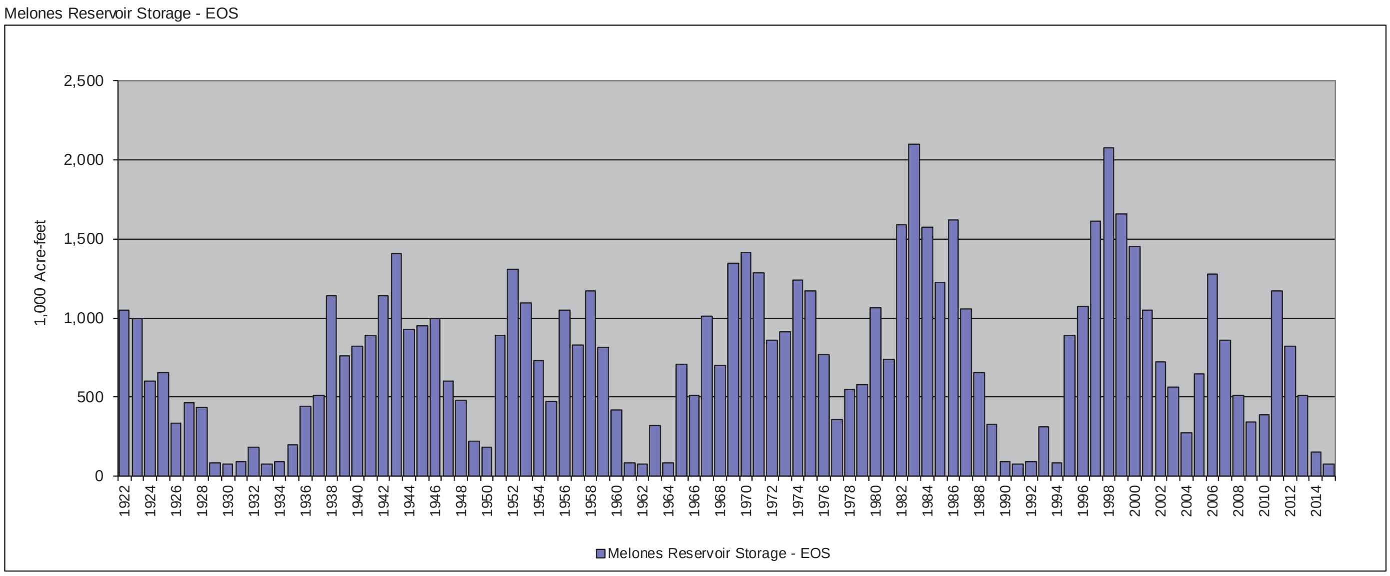
Figure 3-1. New Melones End-of-Month Storage September Baseline



ii. 40% UIF

The 40% UIF run by the Districts illustrates a significant effect to reservoir storage due to the increase in stream requirement. (Attachment 1, p. 10.) The storage is depicted below.

Figure 3-2. New Melones End-of-Month Storage September 40% UIF



These results again depict approximately 80,000 acre-feet of storage in many dry years. This is an artificial condition incorporated into the model in order to ensure it continues running. In practice, the reservoir would be drawn down to zero by the Districts in fulfillment of their water rights.

b. Diversion (OID/SSJID)

i. Baseline

The existing Baseline diversion entitlement to the Districts under their operational agreement with Reclamation (“Formula water”) is 581,000 acre-feet annually for which approximately 522,000 acre-feet annually is needed for land use requirements and operations. (Attachment 1, p. 3.) This does not include diversions to storage, or water transferred/released to help Reclamation meet D-1641 or transferred water, all of which are beneficial uses of water. The following graphic illustrates the annual availability, requirement, and diversion of the Districts’ under Baseline conditions, including the modeling convenience of curtailing the Districts’ diversions to maintain reservoir storage and river releases. The average annual diversion of the Districts is modeled to be 505,000 acre-feet.

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OAKDALE IRRIGATION DISTRICT
&
SOUTH SAN JOAQUIN IRRIGATION DISTRICT

Errata to Comments on the Draft Substitute Environmental Document

Dated: April 11, 2017

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SSJID/OID (Stanislaus River) Comments on WQCP/SED

These comments incorporate the comments made by the San Joaquin Tributaries Authority (SJTA) on the Water Quality Control Plan (WQCP)/Substitute Environmental Document (SED).

1. Baseline Description

The SED uses an incorrect "Baseline," which leads to improper and misleading comparisons throughout the report with respect to the impacts of the proposed LSJR Alternatives. As relevant to the Stanislaus River, the Baseline used in the SED includes the implementation of the Vernalis Adaptive Management Program (VAMP), and the National Marine Fisheries Service (NMFS) Biological Opinion (BO) flow requirements. For the reasons set forth below, this Baseline is improper. To address this error, the Oakdale Irrigation District and South San Joaquin Irrigation District, hereinafter, "the Districts," created a more accurate baseline and conducted additional modeling.

a. VAMP Flows

The Districts recognize that the CEQA Guidelines require an EIR to include a description of the physical environmental conditions in the vicinity of the project that exist "at the time the notice of preparation is published." (Cal. Code Regs., tit. 14, § 15125.)

The VAMP flows should not have been included in the Baseline. VAMP Flows have not been released by Districts since 2011. In the 2006 Bay-Delta Plan: "The Program of Implementation for the Pulse Flow Objectives is amended in the 2006 Plan to allow for staged implementation of the objectives by conducting the Vernalis Adaptive Management Plan (VAMP) until 2011." If the SWB staff believed that it was required to include the VAMP flows in the Baseline due to the timing of the NOP despite being fully aware that VAMP had concluded, then staff should have issued an additional NOP, thereby re-noticing the proposed project under the changed conditions. The Districts incorporate the SJTA's comments on the impropriety of the SWB's failure to file an additional Notice of Preparation (NOP) after the revised NOP that was issued on April 1, 2011. (SJTA Comments.)

The Districts' Baseline does not include the VAMP flows.

b. OCAP-BO Flows

The Biological Opinion on the Long-Term Operation of the Central Valley Project and State Water Project issued by NMFS in 2009 requires the United States Bureau of Reclamation ("USBR" or "Reclamation") to comply with certain flow requirements contained in Appendix 2e of the document for the Stanislaus River. These flows are properly included in the Baseline. However, the USBR is solely responsible for meeting the flow requirements, as they are intended to mitigate the impacts of the New Melones project. (NFMS BO, p. 622-625.) Judge Wanger's decision in *Consol. Salmonid Cases v. Locke* made it abundantly clear that District water could not be used to meet the Appendix 2e flows: "Neither NMFS nor the Bureau [of Reclamation] has discretion to violate [OID and SSJID's] water rights" when attempting to comply with the requirements of Appendix 2e. (*Consol. Salmonid Cases v. Locke* (2011) 791 F. Supp.2d 802, 939.) The SWB modeling takes water from the Districts to meet the OCAP-BO Appendix 2e flows. In so doing, the SWB model depicts an "illegal" operation at New Melones.

c. <u>OID/SSJID Modeled Baseline</u>

OID and SSJID modeled the Baseline with the assistance of Daniel B. Steiner (Attachment 1) using the following criteria:

- California Statewide Integrated Model (CalSIM) hydrology; this is the same as many of the underlying hydrology parameters within the WSE model.

- NMFS BO Appendix 2e flows; this is the same as the WSE model. These flows subsume USBR's permitted instream flows required by D-1485.

- Dissolved Oxygen requirements that are included in Reclamation's permits. These requirements were excluded from the WSE model.

- Vernalis Salinity objective; this is the same as the WSE model.

- CVP contractor deliveries; this is the same as the WSE model although the allocation quantities are slightly different.

- OID and SSJID, land use[1]. The estimates are different than the WSE model as SWRCB Staff have modified the Districts' requirements based on their own analysis.

d. <u>Results</u>

The total volume of water released under the SWB's Baseline is roughly the same as the total volume released under the Districts' Baseline because of several offsetting factors, a couple of those factors being the addition of the Dissolved Oxygen (DO) releases compensating for the deletion of the VAMP flows with in the Districts' analysis. However, the timing of the flows were significantly different. VAMP flows occurred in April-May and the DO releases occur during the summer. The result of this inclusion of VAMP flows in the baseline is to decrease the project's impact during April-May by artificially creating a higher baseline during that period.

Lastly, the SWB Baseline is <u>not</u> a viable operation for New Melones Reservoir. The Districts have stated that it is erroneous to use the Districts' water to meet the obligations of the USBR to the river and its customers. However, for modeling convenience the SWB has assumed reductions to the Districts' diversion entitlements during sequential drought periods to maintain an active New Melones Reservoir while meeting OCAP-BO Appendix 2e flows. The Reservoir would go to zero in 1991, 1992 and 1934. The demands on New Melones Reservoir now are beyond its operating ability.

[1] Does not include water put to storage or water transfer. Based solely on 1988 Agreement.

2. No Project Alternative

The No Project Alternative improperly assumes compliance with D-1641. D-1641 was never fully complied with under the San Joaquin River Agreement (SJRA) up to 2009. After 2009, Reclamation was fully responsible for meeting D-1641 flow requirements and has failed to do so.

The Districts incorporate the SJTA's comments on the No Project Alternative (See SJTA Comments.)

a. D-1641 Flows

In creating a No Project Alternative, the SED relies on CEQA Guideline Section 15126.6:

> "When the project is the revision of an existing regulatory plan, such as the 2006 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan), **the No Project Alterative will be the continuation of the existing plan as currently implemented into the future**. (Cal. Code Regs., tit. 14, § 15126.6(e)(3)(A).) In general, the existing plan and the projects initiated under the existing plan would continue until the new plan amendments are approved. The No Project Alternative analysis must discuss the existing conditions 'as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.'" (Cal. Code Regs., tit. 14, § 15126.6(e)(2).)" (SED, at 15-1 [emphasis supplied].)

In attempting to comply with these provisions of the CEQA Guidelines, the SED assumes "full compliance with the 2006 Bay-Delta Plan, as implemented through D-1641." (SED, at 15-2.) In doing so, the SED ignores the reality that full compliance with D-1641 has never occurred, and never will occur.

As the SWB pointed out in its Delta Flow Criteria Report, 2010:

> "the [2006 Bay-Delta] Plan also includes spring pulse flows (mid-April through mid-May) that vary between 3,110 and 8,620 cfs, however, **those flows have never been implemented** and have instead been replaced with the [VAMP] flow targets for the past 10 years." (2010 Delta Flow Criteria Report, p. 55 [emphasis supplied].)

One of the reasons that the Vernalis flow requirements in D-1641 have never been met during the pulse flow period (except incidentally during flood conditions) is because the VAMP flows were lower than the D-1641 flows. (SED, at 3-13.) Moreover, since the expiration of VAMP, Reclamation has continually failed to meet the D-1641 flow requirements at Vernalis. In a letter from USBR to the SWB dated November 22, 2016, Operations Manager Ronald Milligan explained, "Reclamation has had difficulty meeting D-1641 San Joaquin River flow requirements since the [SJRA] expired in 2011 [and] Reclamation **has not operated to the D-1641 April-May pulse flows** for the San Joaquin River at Vernalis contained in Table 3." (Attachment 6 [USBR Letter to SWRCB, dated Nov. 22, 2016, p. 1].) He further explained that, in the future, USBR will only be able to comply with the flows required by Appendix 2e in the NMFS BO. (Attachment 6 [USBR Letter to SWRCB, dated Nov. 22, 2016, p. 3].) This letter was expanded upon by Mr. Richard Woodley's letter to the SWB stating,

> "Since the expiration of the SJRA, the Board has taken the untenable position that the sole responsibility for the April/May San Joaquin river flows in the Water Quality Control Plan is on Reclamation's New Melones Reservoir, not on an "interim" basis, but until such time as it sees fit to establish an alternative implementation plan, now 17 years since the Board adopted D-1641." (Attachment 6 [USBR Letter to SWRCB, dated Feb. 15, 2017, p.2].)

Reclamation explained that it will not be able to make releases from New Melones to satisfy the flow objectives at Vernalis from Table 3 of the 2006 Bay-Delta Plan, and that it will instead by making releases consistent with the less onerous requirements of Appendix 2e. (Attachment 6.)

Thus, despite the continued applicability of the flow requirements in Table 3 of the 2006 Bay-Delta Plan, there will be no compliance by Reclamation. The SED's assumption of full compliance with these requirements ignores this reality. It also violates the CEQA Guidelines for the No Project alternative, which specify that the No Project alternative shall describe "existing conditions . . . as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved…" (Cal. Code. Regs, tit. 14, § 15126.69(e)(2).)

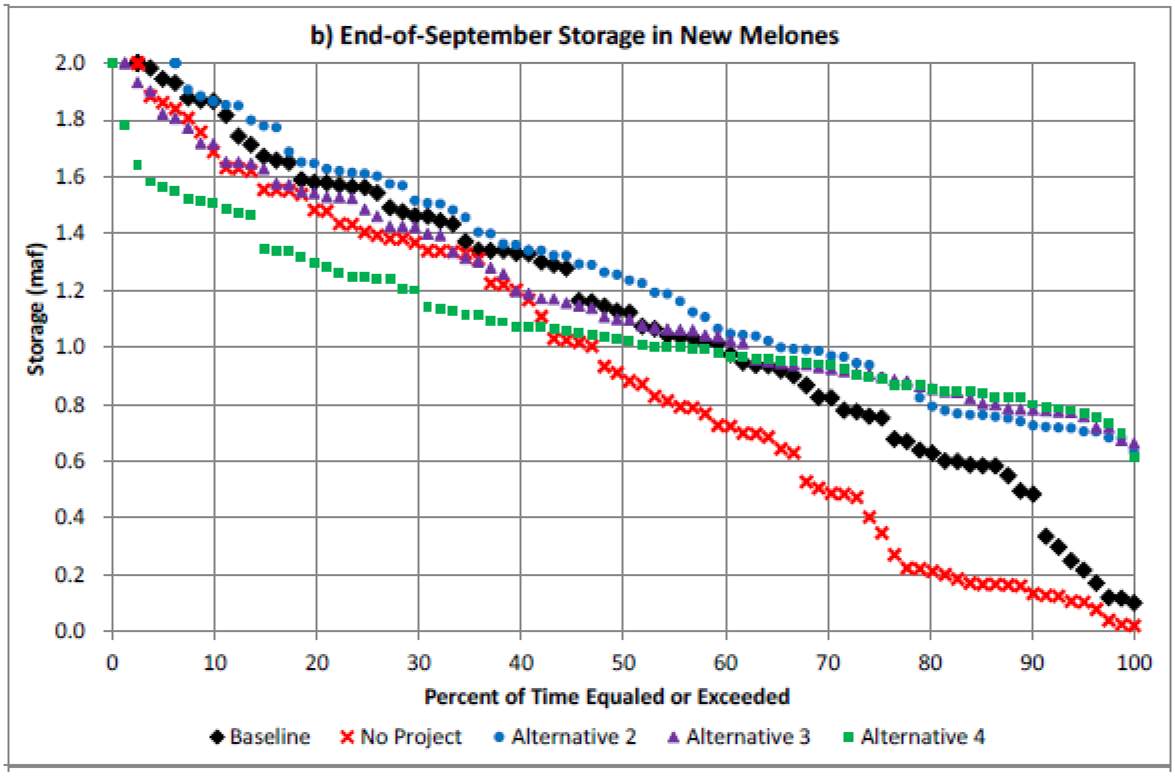
The "No Project Alternative" in the SED does not describe existing conditions, nor does it describe what would reasonably be expected to occur in the foreseeable future. The SWB may not want to admit that D-1641 is not being met, but it cannot sit by and do nothing to enforce its regulation and orders knowing its regulation and orders are being violated and then pretend they are being met in the SED. That is fiction.

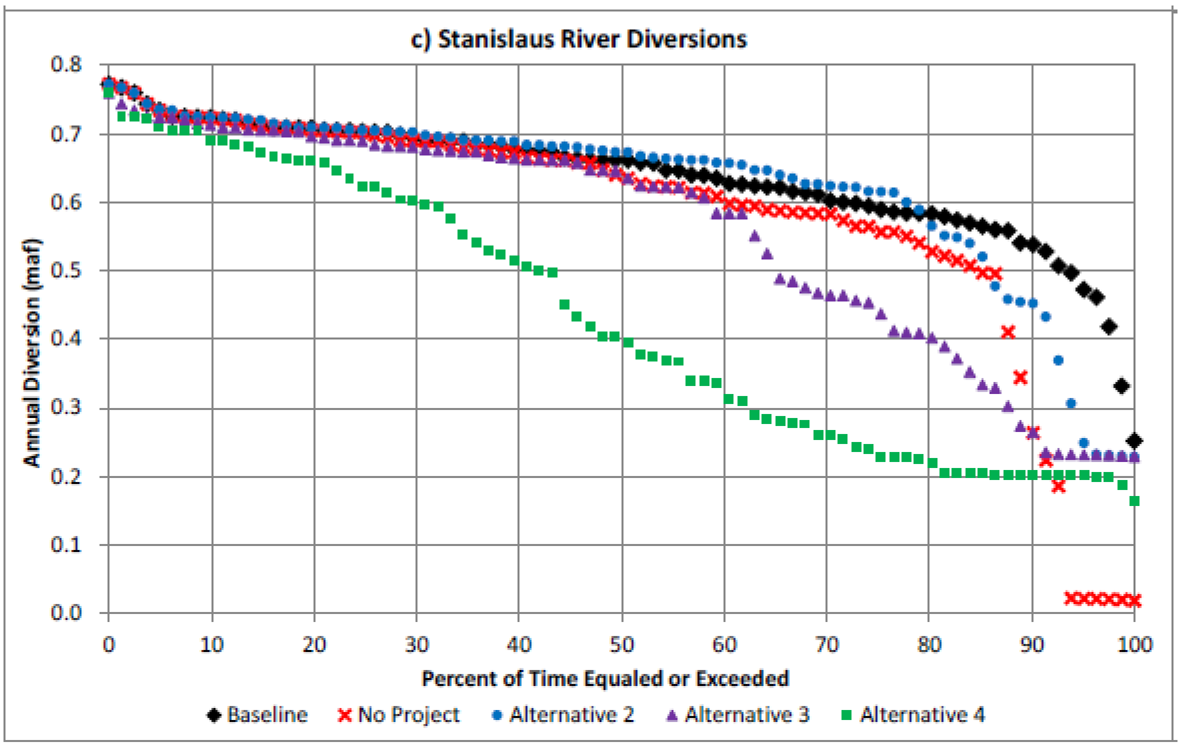
b. <u>SWB Modeling of the No Project Alternative</u>

The analysis distorts the impact of the proposed project by releasing flows from New Melones to meet D-1641 flow objectives. With all the releases coming from New Melones to meet D-1641, plus existing baseline flows, New Melones storage is devastated, deliveries to Central Valley Project (CVP) are significantly reduced, and OID and SSJID water supplies are cut. In fact, the No Project Alternative is no alternative at all because it relies on magic water, meaning water that does not exist in the system or water that is taken from the Districts' supplies to make the model work. Diversions under the No Project Alternative are less than Baseline in approximately 50 percent of the years, and are "substantially reduced" in approximately 15 percent of the years (SED, at 15-4.).

The SWB analysis of the No Project Alternative is contained in Chapter 15. Figure 15-2(b) (New Melones storage) and Figure 15-2(c) (Stanislaus River diversions) are set forth below.

Figure 2-1, SED Figure 15-2(b) and 15-2(c) New Melones Storage (SED, at 5-17)





New Melones storage goes to zero under the No Project Alternative. Zero storage is not a viable operation. The No Project model run by the SWB curtails the senior water rights of the Districts and New Melones storage still hits zero. The senior water rights are cut up to 300,000 acre-feet in a year to maintain these operations. (See Figure 2-1, above) Unfortunately, the SWB forgot two key principles. There is no SWB order requiring OID-SSJID to release or bypass water to meet the 1995 WQCP flow objectives and/or salinity objectives. There is no Endangered Species Act (ESA) requirement to have OID/SSJID release/bypass flow to meet Appendix 2e flows. In fact, there is a Federal Court order specifically finding that Reclamation cannot release/bypass OID/SSJID water. Once again, the SWB ignores reality.

c. Problem

The errors in the "No Project Alternative" impact the analysis performed by the SWB in the SED. The SWB "No Project Alternative" grossly understates the impacts from the proposed alternative because the "No Project Alternative" completely annihilates the Stanislaus River Operations on the Stanislaus River. The SWB manipulated the model to mask the effects of alternatives. The Districts' modeling shows the "No Project Alternative" and the baseline to be approximately the same. The impacts are grossly understated because the "No Project Alternative" is releasing/bypassing substantially more water in the driest years above the baseline.

Table 2-1 – SED Table 15-1 (SED at 15-5)

Table 15-1. Monthly Cumulative Distributions of Baseline Flow and Differences from Baseline for the No Project Alternative for the 82-Year WSE Modeling Period

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Stanislaus Flow at Ripon-Baseline													
10	729	248	224	270	230	308	573	525	292	293	302	311	+/- 258,000
No Project – Percent Difference from Baseline													
10	-3	0	1	9	5	1	82	66	121	98	47	-8	+ 117,000

In 10% of the years, these would be the driest years, the graph above depicts 258,000 acre-feet being released every year. The SWB then expresses the difference between the baseline and the "No Project Alternative" in terms of percentage. So, the percentages have to be applied to the baseline and then multiplied by days and converted into acre feet. The "No Project Alternative" has 375,000 acre-feet going down the river in 10% of the driest years. This explains why storage in New Melones goes to zero and water is taken from the senior water right holders.

Having such huge flows as the basis of the analysis tells the public the proposed project has little impact on the Stanislaus River because the substantial increase in flow under the preferred alternative of 40% unimpaired flow is masked by the false flows under the “No Project Alternative.”

In response to the 2012 Draft of the WQCP/SED, the SJTA explained in great detail how the No Project Alternative was incorrect. (SJTA Comments on 2012 WQCP/SED, p. 48-50.) Yet, the SWB ignored this specific SJTA comment, as they ignored all of the SJTA’s comments.

The purpose of an environmental document required by CEQA is to provide “meaningful public disclosure” of the “potential effects on the environment of a proposed project.” (Pub. Res. Code, § 21002.1), not to purposely misinform the public. The only possible reason for such a mischaracterization on a project that has been ten years in development at a cost of $70,000,000, is to mislead the public of the true impacts.

d. OID and SSJID Analysis of the “No Project”

OID and SSJID have qualitatively examined he SWB No Project Alternative, with one small change to the SWB assumptions. The change was to meet OID and SSJID’s senior rights and take the water out of reservoir storage, or instream flows. The No Project run will result in New Melones Reservoir becoming depleted during several years with the river reduced to a zero release.

3. 40% UIF Flow Requirement

OID and SSJID modeled the 40% UIF requirement. Primary assumptions for the run are as follows:

- CalSim New Melones Inflow
- The greater of RPA 5 Schedules (at Goodwin), or 40% UF applied at Ripon, burdened by reach depletions, no credit for accretions
- DO, flow surrogate
- D1641 Salinity, at Vernalis
- No Vernalis Flow Requirement (replaced by individual tributary contributions), minimum Vernalis 800-1,200 cfs minimum not yet evaluated
- DWR 2015 Reliability Report (2020 LOD) SJR Maze flow and quality, w/o SJRRP
- OID/SSJID Land Use based demand, limited by formula
- CVP Contractors <1,400<1,800> 0/49/155
- Minimum New Melones storage 80,000 acre-feet, OID/SSJID curtailment to maintain

The run by OID and SSJID is mostly the same as the Water Supply Evaluation Model except for the following changes:

1. The model has no reservoir refill criteria, nor minimum carryover storage requirement.

2. The model includes the dissolved oxygen (DO) requirement.

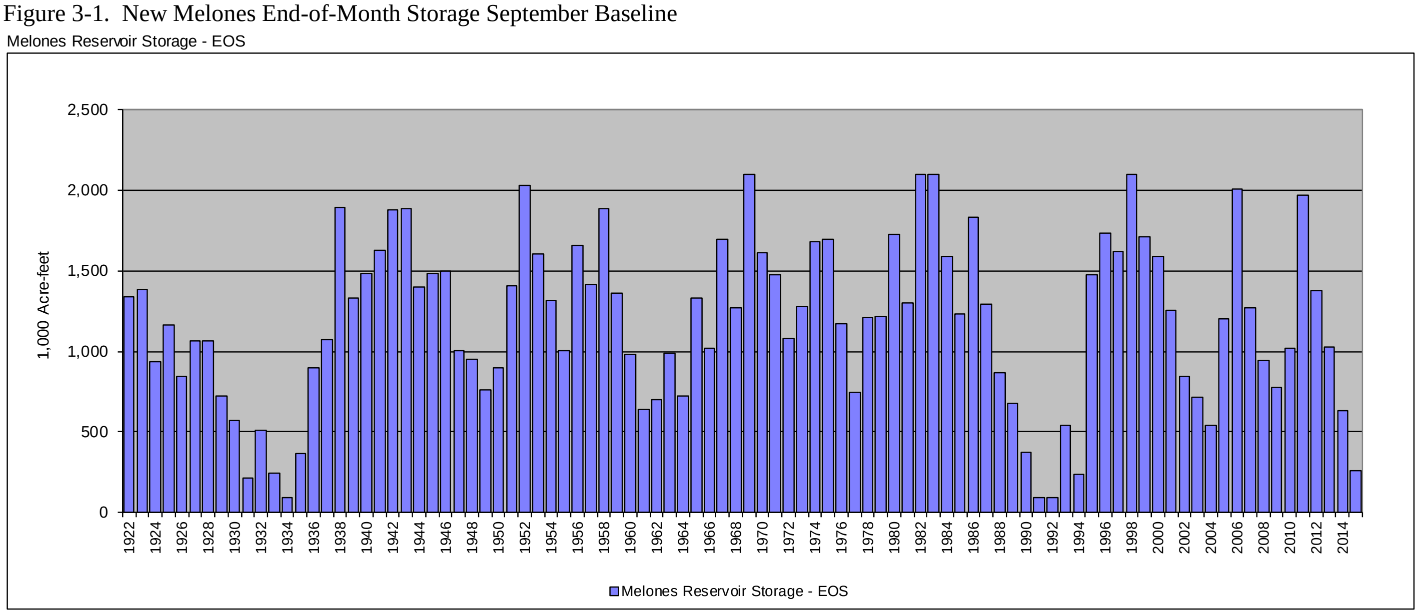
The refill and minimum storage modeling assumptions are dealt with in great detail in the SJTA comments and are incorporated herein. The reason for including the DO requirements is explained above. The results of the model run are below.

a. Storage

i. Baseline

The SWB uses End of Month Storage September (EOMSS) as an illustration metric. The Districts' Baseline run of the Stanislaus River shows a wide variance in EOMSS with significant reservoir drawdown during sequential dry periods. During the significant droughts of the 1930s, 1990s and recent years the reservoir shows near, if not complete emptying. During the drought events of the 1930s and 1990s the reservoir shows a storage of about 80,000 acre-feet; however, this low point is merely for modeling convenience as reservoir storage was maintained at this level through reductions to the Districts' diversions in order to maintain storage and releases to the river. In practical terms, the reservoir would be empty and the river would have a zero release. (Attachment 1, p. 4.)

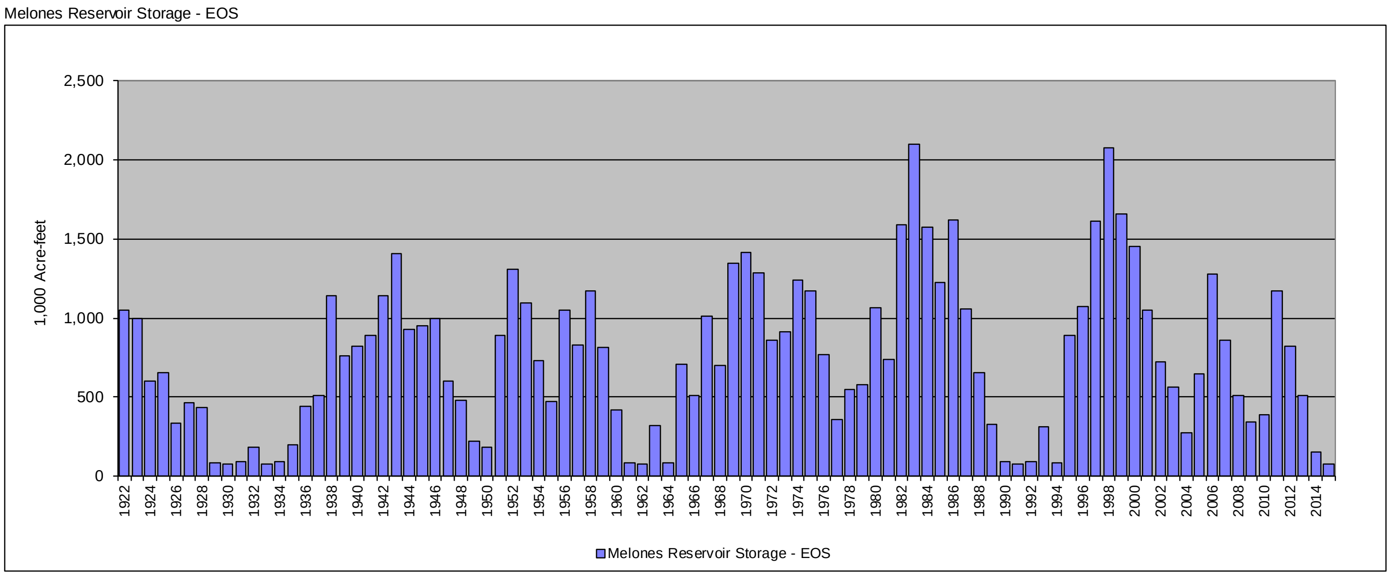
Figure 3-1. New Melones End-of-Month Storage September Baseline



ii. 40% UIF

The 40% UIF run by the Districts illustrates a significant effect to reservoir storage due to the increase in stream requirement. (Attachment 1, p. 10.) The storage is depicted below.

Figure 3-2. New Melones End-of-Month Storage September 40% UIF



These results again depict approximately 80,000 acre-feet of storage in many dry years. This is an artificial condition incorporated into the model in order to ensure it continues running. In practice, the reservoir would be drawn down to zero by the Districts in fulfillment of their water rights.

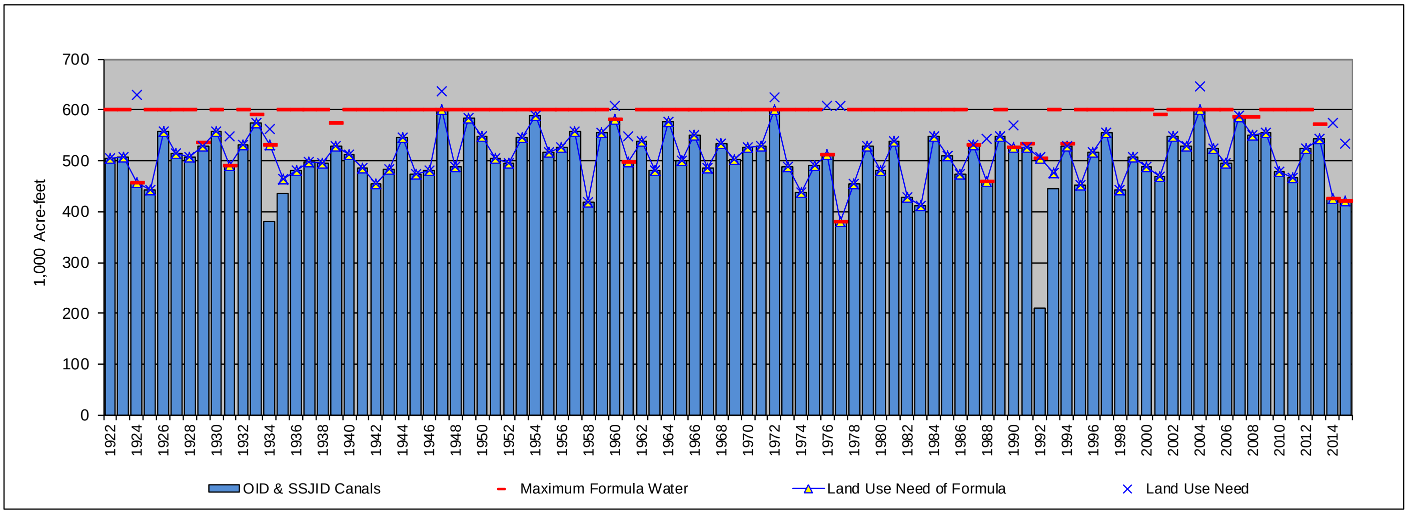
b. Diversion (OID/SSJID)

i. Baseline

The existing Baseline diversion entitlement to the Districts under their operational agreement with Reclamation ("Formula water") is 581,000 acre-feet annually for which approximately 522,000 acre-feet annually is needed for land use requirements and operations. (Attachment 1, p. 3.) This does not include diversions to storage, or water transferred/released to help Reclamation meet D-1641 or transferred water, all of which are beneficial uses of water. The following graphic illustrates the annual availability, requirement, and diversion of the Districts' under Baseline conditions, including the modeling convenience of curtailing the Districts' diversions to maintain reservoir storage and river releases. The average annual diversion of the Districts is modeled to be 505,000 acre-feet.

Figure 3-3. OID/SSJID Baseline Diversions

OID / SSJID Water Use & Commitments

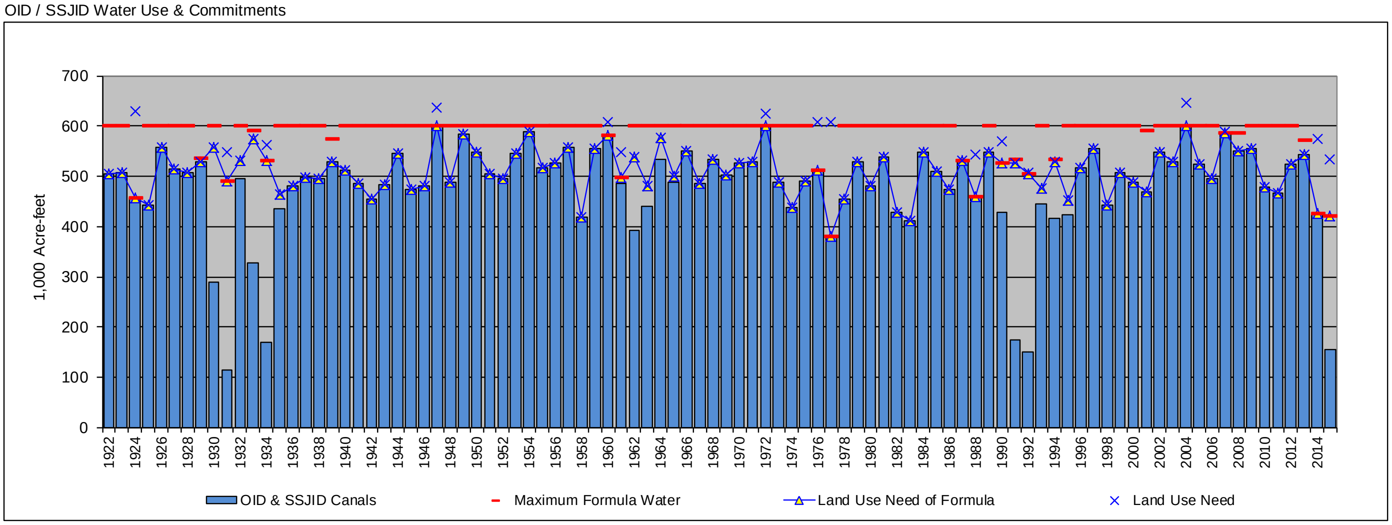


ii. <u>40% UIF</u>

Diversions to the Districts are reduced to 480,000 acre-feet annually with the 40% UIF flow requirement assumption. (Attachment 1, p. 9) The significant increase in drought period diversion reductions are apparent between this graphic and the graphic above.

Figure 3-4. OID/SSJID 40% UIF Diversions

OID / SSJID Water Use & Commitments



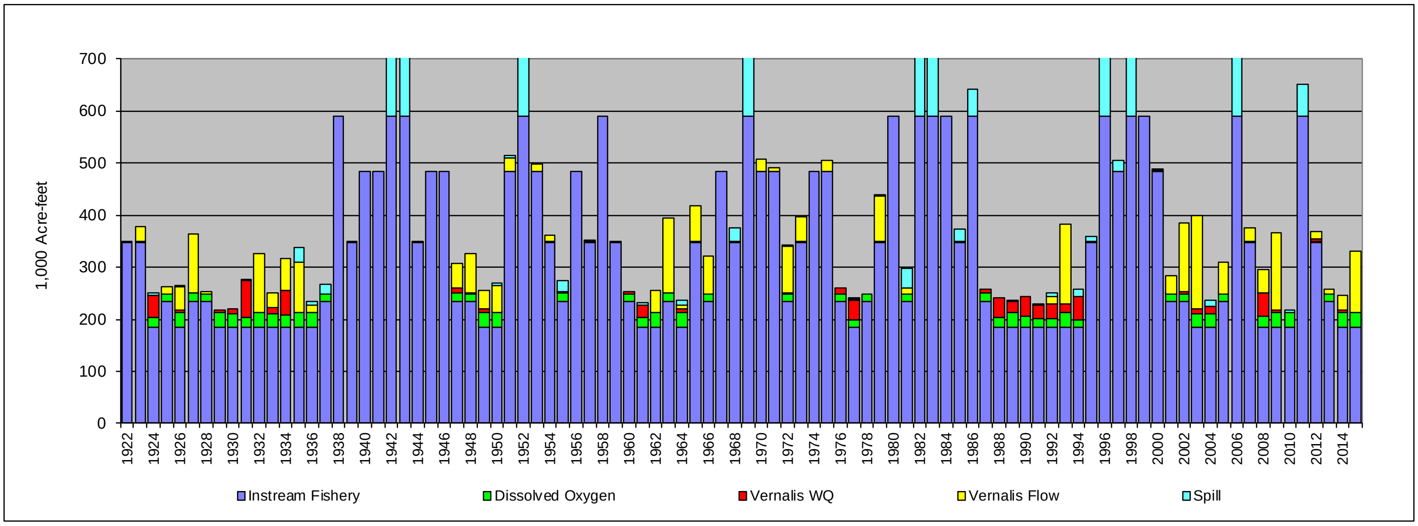
c. River Releases

i. Baseline

Baseline instream releases (including flood control releases) amount to 439,000 acre-feet annually. (Attachment 1, p. 4.) The graph is set forth below.

Figure 3-5. Baseline Goodwin Dam Instream Releases

Goodwin River Releases

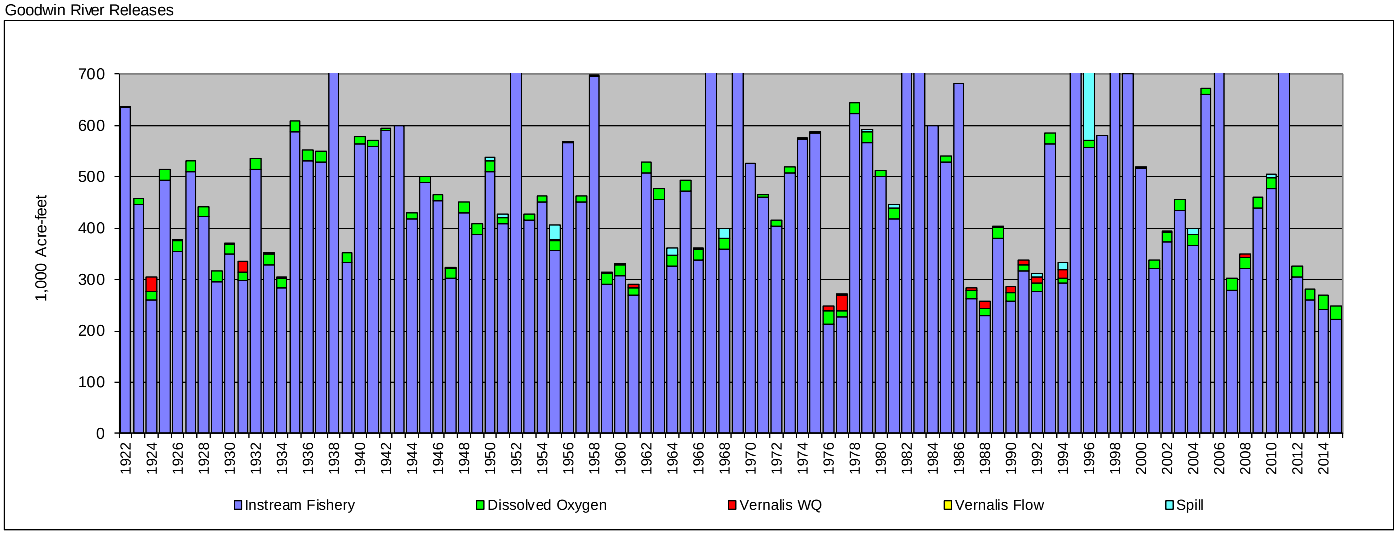


ii. 40% UIF

Under the proposed project as assumed by the Districts, the instream releases increase to 511,000 acre-feet annually. (Attachment 1, p. 8, 10.) An average increase of 70,000 acre-feet annually.

Figure 3-6. 40% UIF Goodwin Dam Instream Releases

Goodwin River Releases

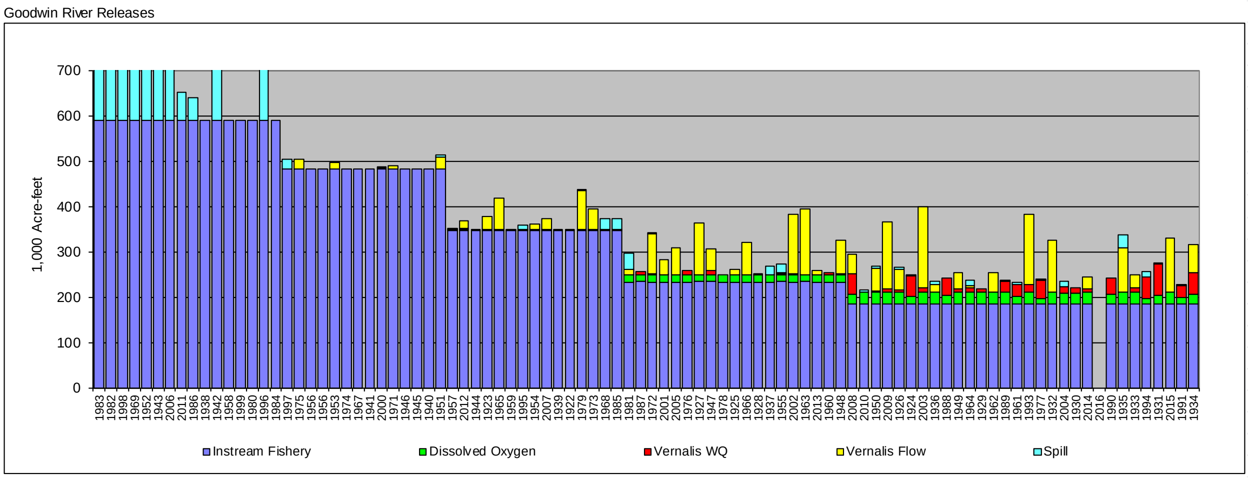


d. Ranking River Releases

i. Baseline

The river release values shown above for the Baseline condition have been recast below in a rank-ordering according to wettest New Melones Index (NMI) to driest New Melones Index, generally representing large water availability years down to smallest water availability years. This representation provides an indication of the frequency of flow in the river. (Attachment 1, p. 6.)

Figure 3-7. Ranking Instream Flows under Baseline

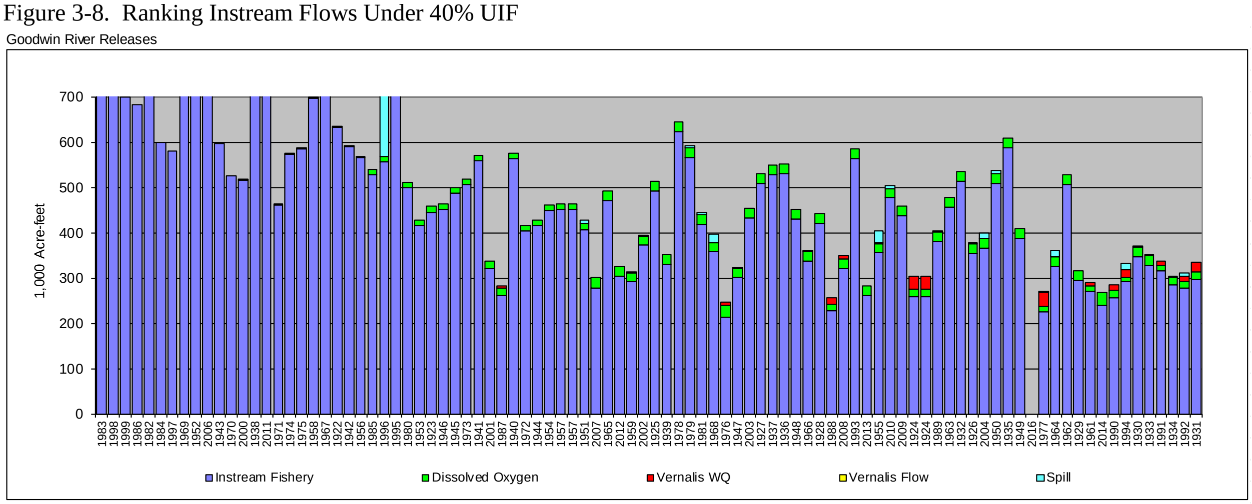


ii. 40% UIF

The river release values for the 40% UIF requirement as assumed by the Districts has also been recast by a rank-ordering according to the (NMI) and is shown below. Results are less demonstrative of a typical wet to dry decrease of annual volume due to the disconnect between the NMI and the February-June-based flow requirement.

With the increase in flow requirements and a commensurate lowering of reservoir storage, spill events at New Melones under the 40% UIF decrease. (Attachment 1, p. 12.)

Figure 3-8. Ranking Instream Flows Under 40% UIF

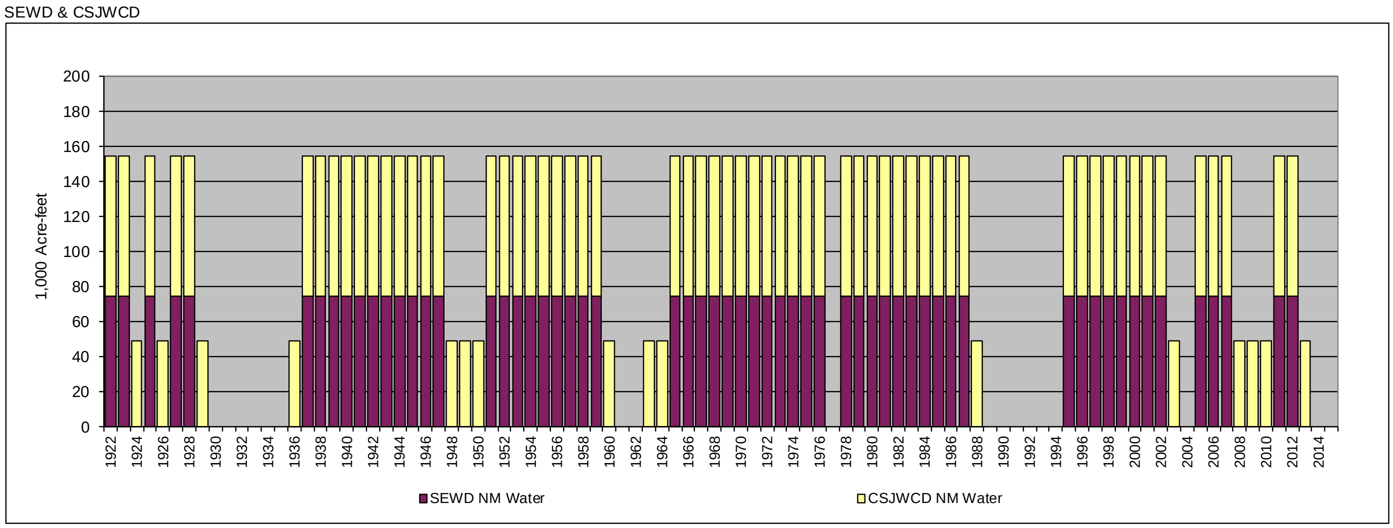


e. Central Valley Project (CVP) Contractors

i. Baseline

Under the Districts' Baseline, CVP contractors receive an average of 107,000 acre-feet annually. There are numerous periods when the CVP contractors will receive no water. (Attachment 1, p. 2-3, 5.)

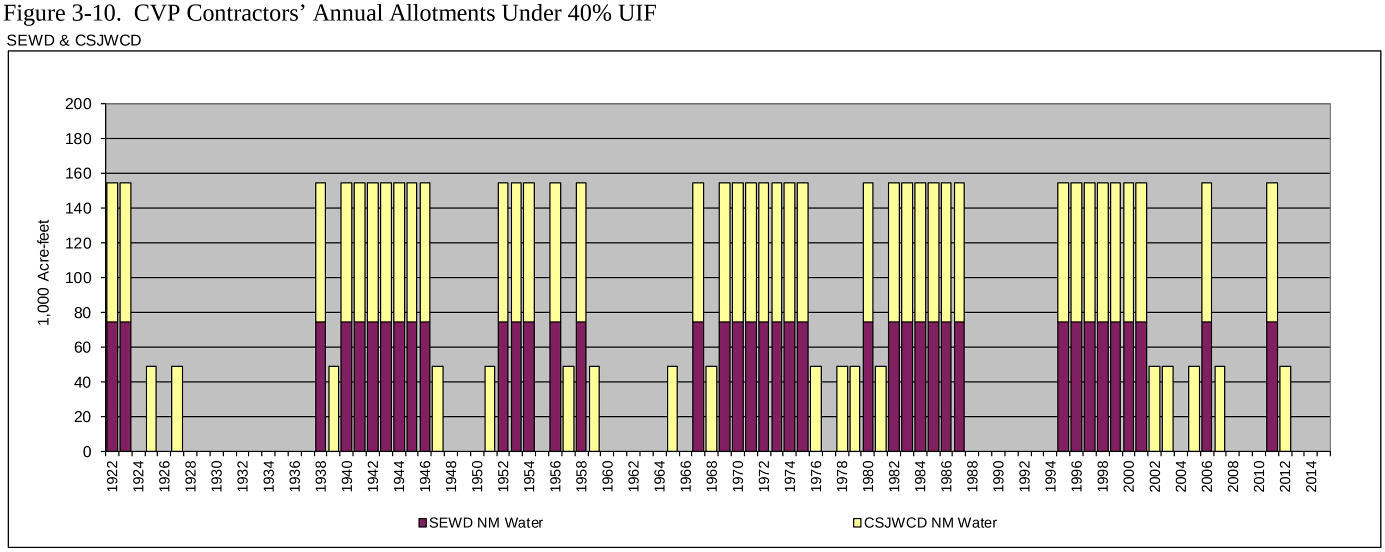
Figure 3-9. CVP Contractors' Annual Allotments Under Baseline



ii. 40% UIF

Under the Districts' modeling of the 40% UIF regime, CVP contractors would receive an average of 74,000 acre-feet annually, with the periods of no water extended in duration. (Attachment 1, p. 11.)

Figure 3-10. CVP Contractors' Annual Allotments Under 40% UIF



The modeling shows prolonged periods of no water, followed by periods of full entitlements. Whether such an operation is feasible or not will be addressed by Central San Joaquin Water Conservation District (CSJWCD) and Stockton East Water District (SEWD).

4. Sequential Dry Years

The greatest impact to OID and SSJID's diversions occur in sequential dry years. A clear example of the impact of sequential dry years can be seen by examining the hydrology from 1924 to 1935. Using the 40% unimpaired flow assumptions contained in the SED, diversions to the Districts would drop to an average of approximately 325,000 acre-feet annually from 1924-1935.[2] The figure below shows the Districts' water right, modeled land use amount for the entire period (1921-2016) and the amount available during 1924-1935. The following figure depicts the shortfall in diversions based on the 1988 Agreement with USBR (600,000 acre-feet annually), and based on land use, approximately 535,000 acre-feet annually.

Figure 4-1. Diversion Shortfalls Based on 1988 Agreement

Diversion in Sequential Dry Years (1924 – 1935)	
Water Right	600,000+ acre-feet annually[3]
Modeled Land Use	535,000 acre-feet annually[4]
40% UIF	325,000 acre-feet annually

This amounts to cutting the Districts' supplies by 275,000 acre-feet annually (based on the 1988 Agreement), or 210,000 acre-feet annually (based on land use), for 16 years. Either way, approximately 70-75,000 acres in OID and SSJID would have to be fallowed (assuming no groundwater pumping). Of course, this figure does not tell the entire story because in many years there would be **no water**.

The following table depicts end of month September storage in New Melones Reservoir under the Districts' modeling. The reservoir is empty in 4 of 16 years under the Districts' modeling of the 40% UIF requirement.

[2] Average annual diversions from 1924 to 1935 computed using data in Appendix F1, Attachment 1, p. 7 (Table 3.)
[3] Based on 1988 Agreement between OID/SSJID and USBR.
[4] Based on land use data in SED.

Figure 4-2. OID & SSJID Modeling of End-of-Month September Storage

1922-1937 End of Month September Storage		
Year	**Baseline TAF[5]**	**40% UIF TAF[5]**
1922	1,343	1,046
1923	1,384	988
1924	940	602
1925	1,167	656
1926	848	377
1927	1,063	464
1928	1,066	434
1929	722	82
1930	574	0
1931	213	0
1932	508	182
1933	244	0
1934	0	0
1935	369	199
1936	897	445
1937	1,073	513

The Districts have long told the SWB that the WQCP must have sequential dry year relief to reasonably balance the competing demands in times of shortage.

[5] SJTA modeling analysis without SWB-assumed carryover over, refill, diversion and flow shifting constraints used in the WSE model for the SED. Any result shown as "0" is indicative of a year when the Districts' diversions under their water rights would have been curtailed to maintain Reclamation's release obligations including river releases. (Attachment 1, p. 8.)

The San Joaquin River Agreement (SJRA) contained sequential dry-year relief:

> "During years when the sum of the current year's 60-20-20 indicator and the previous two years' 60-20-20 indicators is four (4) or less, the SJRGA's members will not be required to provide water above Existing Flow." (SJRA, Section 5.3.)

This off-ramp continued to provide water for instream beneficial uses, even as storage was dropping in the first dry year. It also provided water to instream beneficial uses in the second year, while dropping storage. If, however, the dry period was severe enough (1976-1977) or long in duration 1987-1997, then municipal & industrial (M&I), storage, and agricultural uses were not completely sacrificed for instream uses. The sequential dry year relief worked.

The proposed SWB plan, like D-1641, has no sequential dry year relief. This will require temporary urgency change petitions (TUCP) when the drought hits. The proposed project needs to be revised to include dry year relief.

5. Districts' 40% UIF Compared to SWB's 40% UIF

a. Project Never Modeled by SWB

The SWB never modeled the proposed project, which consists of (1) 30% to 50% unimpaired flow on each of the Stanislaus, Tuolumne and Merced Rivers based on a minimum 7-day running average, (2) 800 to 1,200 cfs base flow at Vernalis based on a minimum 7-day running average, and (3) a minimum monthly average flow rate of 1,000 cfs at Vernalis during the month of October. (SED, at Appx. K, p. 18.)

Instead of modeling these parameters, SWB staff added assumptions to the model, including minimum storage targets and reservoir refill criteria. (SED, at Appx. F1, p. F.1-31 – F.1-32) The SWB staff also created a type of false floor for the model. Instead of using a true 40% unimpaired flow in very dry years, the model assumed that other regulatory requirements that were higher than 40% unimpaired flow would be attained, such as the Appendix 2e flows from the NMFS BO. These assumptions mask the impacts of the project and mislead the public.

b. Storage

End of September storage in the SWB 40% analysis is 1,188,000 acre-feet annually on average. (SED, Appx. F1, F.1-58, p. F.1-125.) This storage level is nearly the same as the Baseline of 1,125,000 acre-feet annually. (SED, at Appx. F1, p. F.1-58), This is a perplexing result because the project proposes to release 40% of the unimpaired flow during the peak run-off period. However, by contriving to keep storage at nearly the same level as Baseline, the SWB avoided the need to address the impacts to hydro-generation, greenhouse gas emissions, recreation in the reservoir and increased water temperatures downstream.

How did the SWB staff do it? The period of 1924 to 1935 is illustrative.

Table 5-1. State Water Board Model Run of 40% UIF recreated by Daniel B. Steiner

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
				NM Storage		OID/SSJID				CVP		
Water Year	SJR Basin WYT	Stanislaus UF	New Melones Reservoir Inflow	NM EOS Storage SWRCB 40%	NM EOS Storage SWRCB Baseline	DBS Land Use	Formula	OID/SSJID Diversion SWRCB 40%	OID/SSJID Diversion SWRCB Baseline	Contractor Allotment SWRCB 40%	Contractor Allotment SWRCB Baseline	Total Goodwin Release SWRCB 40%
	602020	TAF	TAF	TAF	TAF	TAF	TAF	TAF	TAF	TAF	TAF	TAF
								Land Use				
								CO Stor				
Does not change among scenarios				40%	Baseline	Always		Refill	Baseline	40%	Baseline	40%
								Min Diver				
								Formula				
Average				1,188	1,125	520	583	446	510	91	106	524
1922	W	1,431	1,389	1,097	1,340	506	600	507	507	155	155	606
1923	AN	1,130	1,109	1,038	1,340	507	600	512	512	155	155	480
1924	C	261	385	842	822	630	457	252	489	31	78	251
1925	BN	1,225	1,092	844	1,039	444	600	451	461	124	136	493
1926	D	607	619	771	677	559	600	305	553	31	78	320
1927	AN	1,365	1,256	1,041	899	515	600	358	521	87	136	522
1928	BN	951	952	913	935	509	600	522	529	102	78	427
1929	C	517	506	802	639	530	537	261	529	20	24	298
1930	C	732	671	773	495	559	600	314	554	0	16	354
1931	C	316	438	662	169	549	492	217	457	0	3	289
1932	AN	1,355	1,160	894	483	531	600	363	529	4	12	541
1933	D	610	586	782	216	574	591	319	570	1	16	338
1934	C	427	498	717	119	564	532	221	338	0	3	306
1935	AN	1,213	1,082	939	334	464	600	326	467	47	12	470

This graph contains a wealth of information. Carryover storage & refill have been explained in the SJTA's comments. The titles of each column are self-explanatory. (Attachment 1, p. 18.)

In 1926, the unimpaired runoff on the Stanislaus River was 607,000 acre feet. In a year with that type of hydrology, the Districts would be entitled to 600,000 acre-feet pursuant to their 1988 Agreement with USBR (See Column 8). Based on land use, the Districts' demand for that year would be 559,000 acre-feet (See Column 7). In the SWB modeling, the Districts are allocated 305,000 acre-feet (See Column 9). This allocation results in a reduction of 295,000 acre-feet based on the Districts' total allotment under the 1988 Agreement, and a reduction of 254,000 acre-feet based on land use numbers. Under the SWB model, the water that was cut from the Districts goes to carryover storage. In 1926, end of September storage is 771,000 acre-feet (See Column 5), which is 71,000 acre-feet more than the 700,000 acre-feet minimum required by the SWB modelling assumptions, but occurs due to the SWB model's assumption for the use of water which occurs above the minimum storage target. (SED, at Appx. F.1-36.)

Thus, in 1926 under the WSE, the senior water right holders would forego diversions to maintain storage in a junior water right holder's federal storage facility. This effect of propping up storage has profound impacts in 1927. The storage at the end of 1926 would be approximately 300,000 acre-feet lower if the model had assumed compliance with the 1988 Agreement and provided 600,000 acre-feet to the Districts instead of 305,000 acre feet. This would result in 471,000 acre-feet of storage at the end of September. Refill conditions, like carryover storage, require the Districts' diversions to be reduced to increase EOMSS. The minimum diversions highlighted in yellow in the table above indicate those years during which the SWB's requirement for carryover storage would otherwise reduce the Districts' diversion below a level thought minimally required by the Districts, their occurrence a diversion reduction caused by meeting carryover storage.

As shown in the table above, the Districts' diversions are reduced in 10 out of 12 years from 1924-1935, whether through carryover storage requirements or refill criteria, in order to provide storage in New Melones reservoir, a federal facility with junior water rights. During this time, the junior water right holder (Reclamation) continues to provide project water to CVP contractors, to satisfy dissolved oxygen requirements and Appendix 2e flows (See Column 18). All of these requirements are subordinate to the Districts' senior water rights, but the SWB puts the junior rights ahead of the Districts' right by requiring the Districts to fill a CVP facility, so that Reclamation, the most junior water right holder on the system, can meet its CVP contractor demands, dissolved oxygen requirements, Appendix 2e flows and salinity requirements at Vernalis.

In stark contrast to these results, the 40% UIF analysis conducted by the Districts shows New Melones empty at times from 1928-1935, the river with no water and CVP contractors with no water (See Figure 4-2, above). OID and SSJID will not assume the regulatory and statutory obligations of Reclamation in a WQCP proceeding. The SWB has no such authority in a Porter-Cologne proceeding to do so.

c. <u>Diversions</u>

To begin, the SED understates the amount of water currently used by the Districts. Table 2-3 reflects diversions by the Districts based upon an agricultural water management plan (AWMP) from 2012. (SED, at 2-6.) Table 2-3 shows that SSJID diverted a maximum of 259,165 acre-feet (maximum diversions from the Joint Supply Canal in 2004, plus a maximum direct diversion from the Main Canal in 2008), and that OID diverted a maximum 261,896 acre-feet (system inflows for 2007), for a total diversion between the two Districts of 521,061 acre feet. The SED presents this diversion data as the high water mark from the 2012 AWMP. (SED, at 2-6.) However, the numbers do not reflect the Districts' usage. According to District records, from 1998 to 2004, and from 2006 to 2012, the Districts were refilling their Conservation Account in New Melones reservoir pursuant to the 1988 Agreement, which allows for a maximum holding of 200,000 acre feet. In these years, the Districts' yearly allocation of 600,000 acre-feet (or less under certain hydrologic conditions) was fully utilized through the satisfaction of in-district demand, diversions to the Conservation Account, and water transfers.

The model runs done by the Districts and the SWB both generally use 2020 land use as a basis for determining the amount of water needed for diversion to the Districts' canals for irrigation and M&I use. However, the land use estimates are significantly lower than the Districts' senior water rights, which are approximately 750,000 acre-feet annually direct diversion and approximately 350,000 acre-feet annually to storage, and the Districts' agreed-upon diversions under the '88 Agreement of 600,000 acre feet. The diversions to the canals do not reflect diversions to storage (350,000 acre feet), nor water transferred to Stockton East Water District (SEWD), nor water released to help Reclamation meet D-1641. This issue is discussed in greater detail below where the differences between the SWB 40% model runs and the Districts' model runs are explained.

d. Water Temperature

i. Water Temperature Modeling Principles

Water Temperature Modeling Principles

The purpose of this presentation is to explain several principles in modeling the water temperature in the San Joaquin River and its tributaries, using the San Joaquin River Basin-wide Water Temperature Model (aka HEC-5Q) (Attachment 3.)

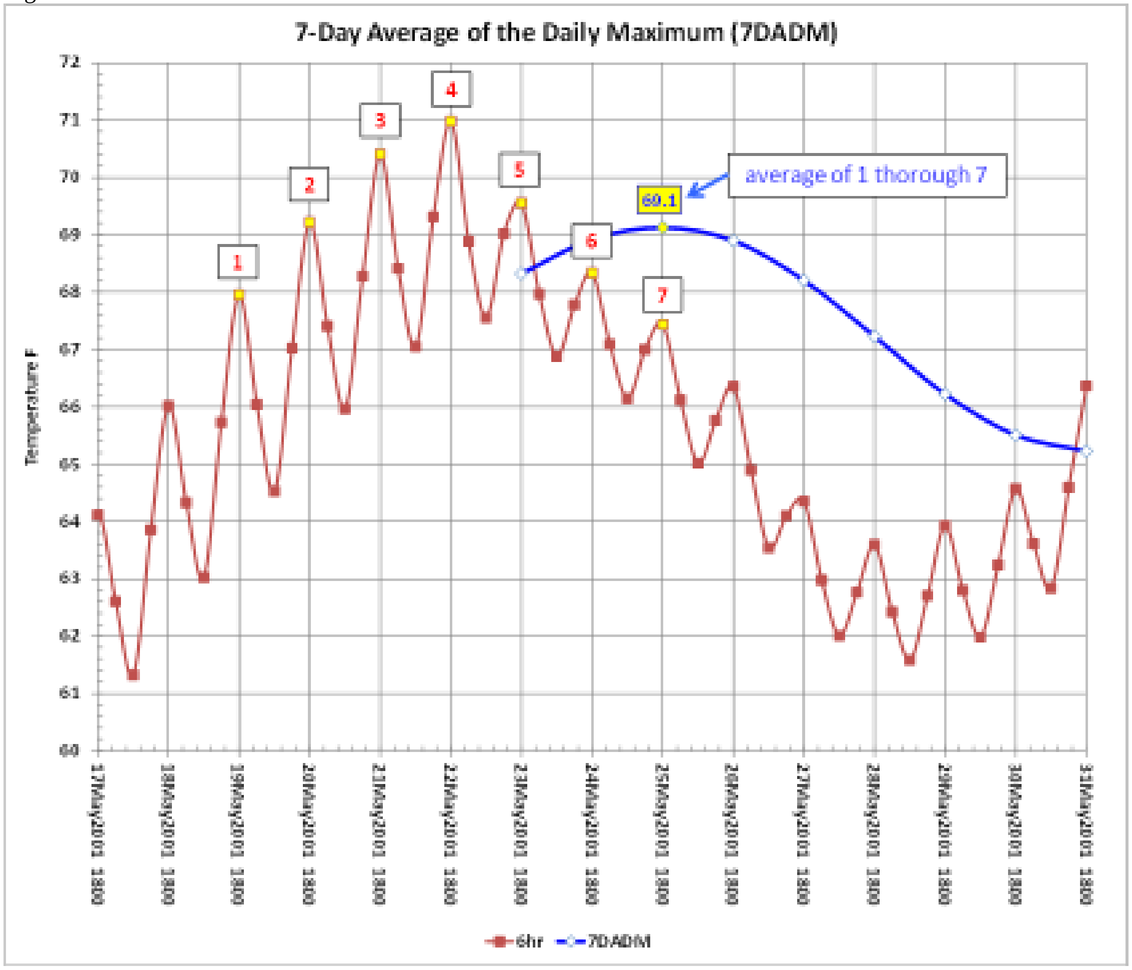
Understanding those principles would hopefully assist in the evaluation and interpretation of modeling results produced in connection with the San Joaquin River/Southern Delta Water Quality Control Plan, 2017.

7-Day Average of Daily Maximum (7DADM)

The HEC-5Q model utilizes a sub-daily time step (6-hour intervals) in order to represent daily maximum and minimum temperatures. The assumption is that minimum temperature occurs at 0600 hour (6 AM) and maximum temperature occurs at 1800 hour (6 PM).

The 7DADM is the arithmetic average of seven consecutive measures of daily maximum temperatures. Usually, the 7DADM for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date. Occasionally, to simplify the computation process, the 7DADM is also computed as the moving running average, i.e., by averaging that day's daily maximum temperature with the daily maximum temperatures of the prior six consecutive days, as shown in the following chart. Regardless how the 7DADM is calculated, it is important to note that the 7DADM does not reflect the entire range of temperature conditions in the river throughout the 7-day period, but rather the most acute conditions. These acute conditions are short in duration, as will be shown in the charts to follow.

Figure 5-1. 7DADM Acute Conditions



Diurnal Temperature Variation

Diurnal temperature variation is the variation between a high temperature and a low temperature that occurs during the same day. The following charts show the diurnal temperature variations at three locations and times in the Stanislaus River. The charts show that acute conditions (e.g., the temperatures within 1 Deg. F of the maximum temperature) are short in duration relative to the rest of the time in the day and that most of the time the temperatures are lower by more than 1° F of the maximum temperature (sometime as much as 5° F, as observed at the confluence in October 2010).

Figure 5-2. Diurnal Temperature Variation on the Stanislaus River above the San Joaquin Confluence

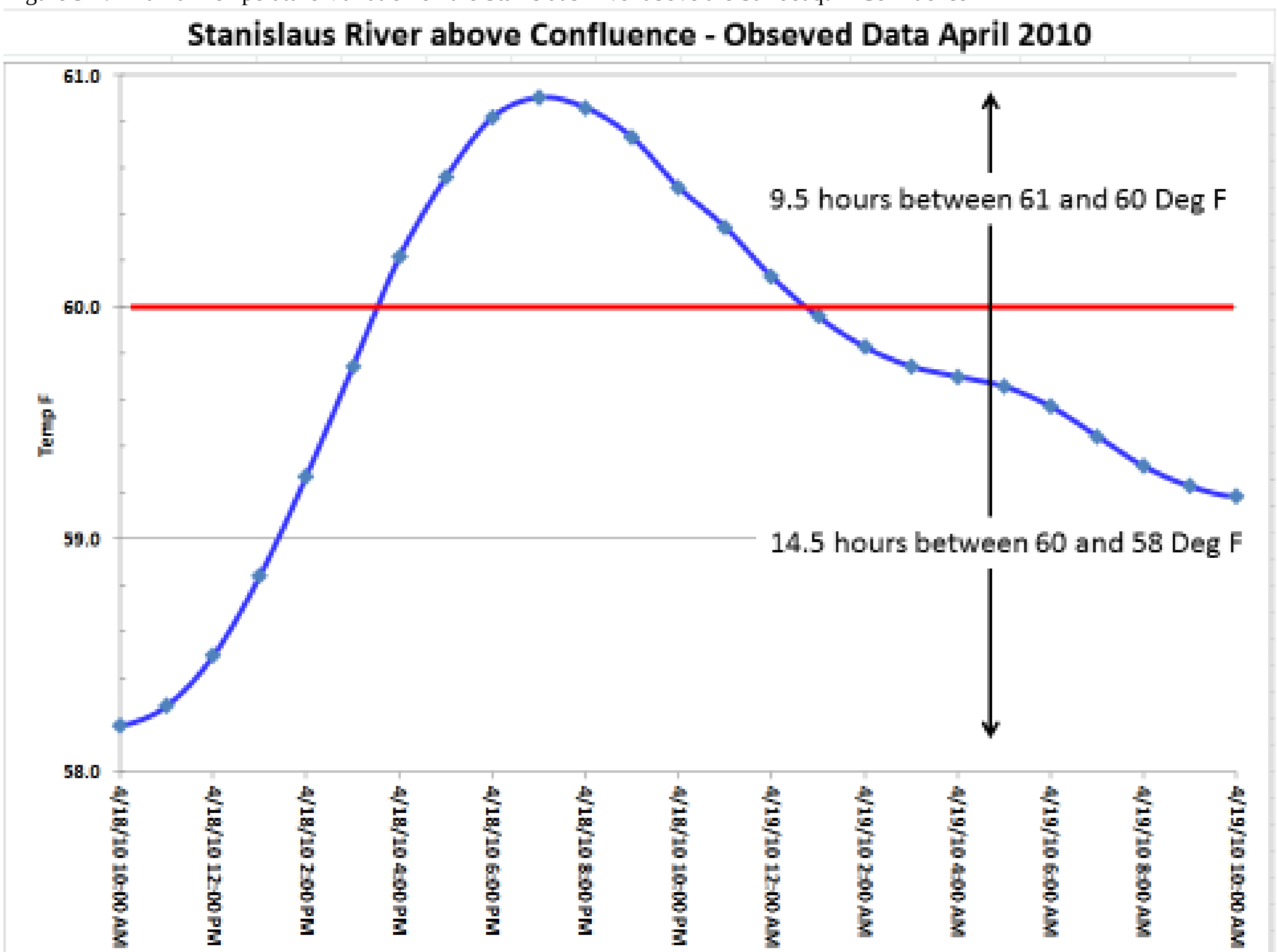


Figure 5-3. Diurnal Temperature Variation on the Stanislaus River above the San Joaquin Confluence October 2010

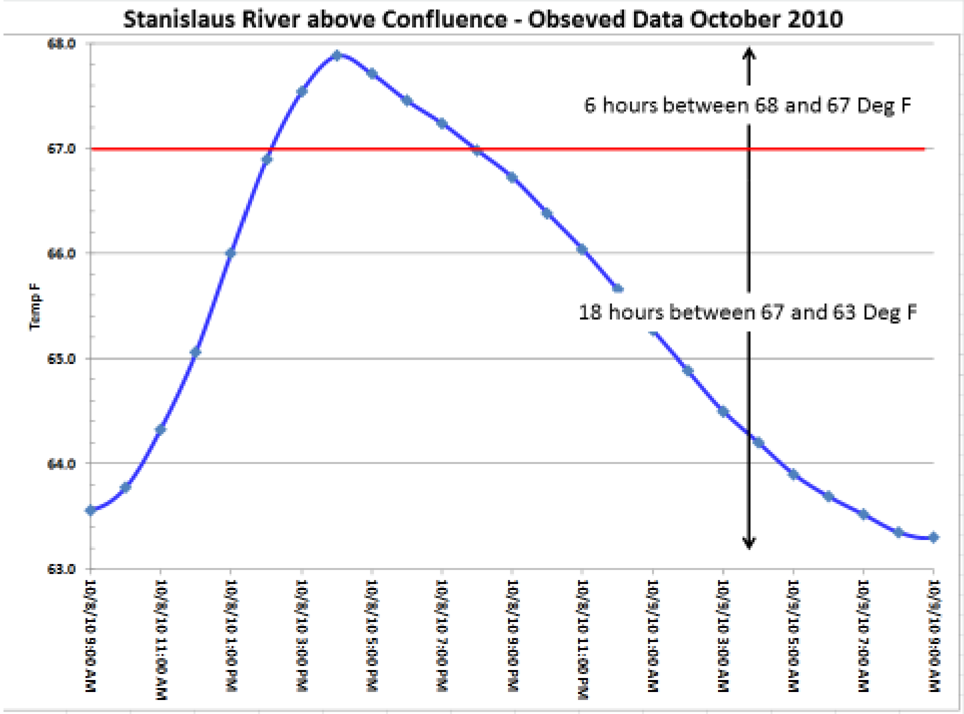
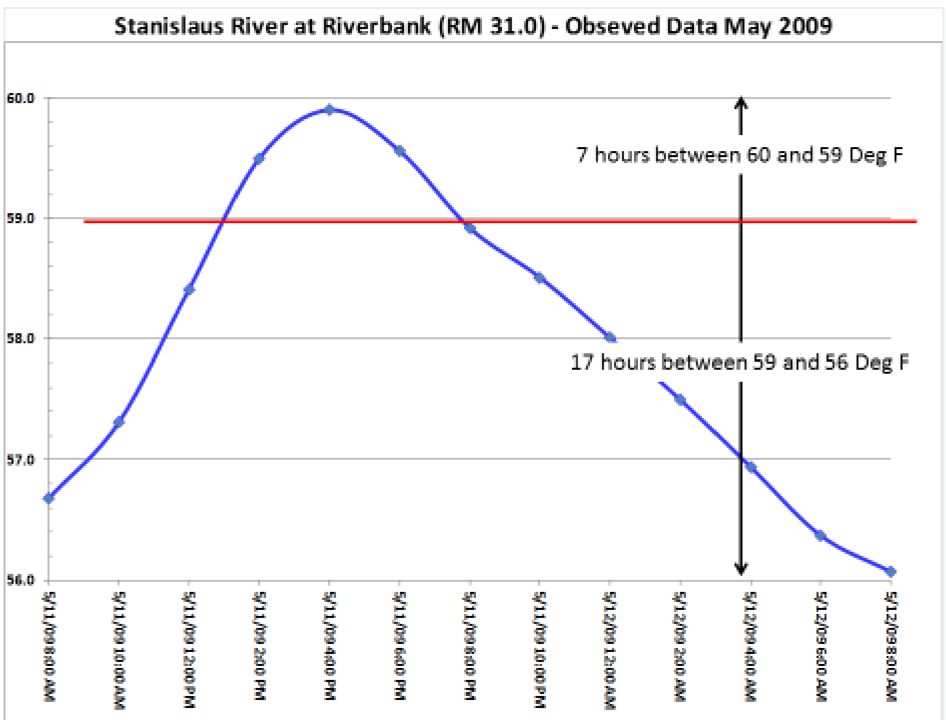


Figure 5-4. Diurnal Temperature Variation on the Stanislaus River at Riverbank



Temperature Duration Curve

A common way to present the duration and magnitude of hydrological conditions in rivers, is by using duration curves. Normally, the duration curve is a plot that shows the percentage of time flow in a stream is likely to equal or exceed (or be lower than) some specified value of interest.

The duration curve is computed by sorting all the values in the data set from largest to the smallest and then assigning for each value its probability (exceedance) based on its ranking within the data set.

In the context of water temperature, one should exercise caution in using 7DADM duration curve as it might be misleading. 7DADM does not provide the full insight to the thermal conditions in a river as it does not include diurnal temperature variation, only daily maximums.

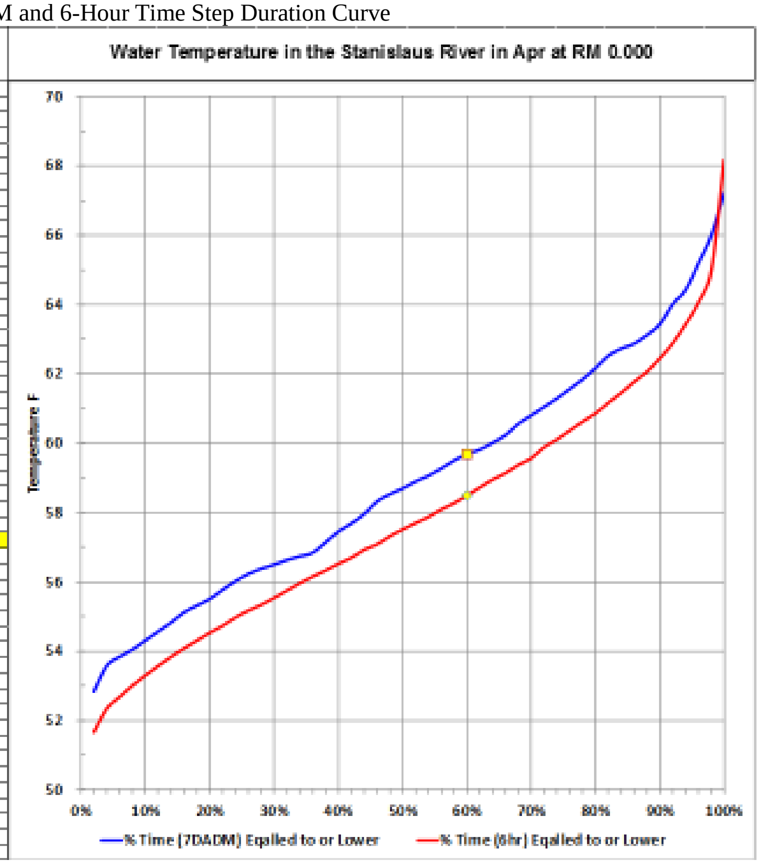
The following chart illustrates that by way of example:

Two duration curves were developed, one based on 7DADM and one based on temperatures computed at a 6-hour time step.

The chart shows that at 60% exceedance level, the water temperature is 58.5 F based on 6-hour time step while it is 59.7 F based on 7DADM. In other words, the 6-hour time step shows cooler temperature than the 7DADM which is more indicative of the actual temperature conditions, statistically speaking.

Figure 5-5. 7DADM and 6-Hour Time Step Duration Curve

% Time Eqalled to or Lower	Temp at 6Hr	7DADM	Diff
2%	51.7	52.8	-1.2
4%	52.3	53.6	-1.2
6%	52.7	53.8	-1.2
8%	53.0	54.0	-1.0
10%	53.3	54.5	-1.0
12%	53.6	54.6	-1.0
14%	53.8	54.8	-1.0
16%	54.1	55.1	-1.0
18%	54.3	55.5	-1.0
20%	54.5	55.5	-1.0
22%	54.7	55.8	-1.0
24%	55.0	56.0	-1.0
26%	55.2	56.2	-1.1
28%	55.3	56.4	-1.0
30%	55.5	56.5	-1.0
32%	55.7	56.6	-0.9
34%	56.0	56.7	-0.8
36%	56.1	56.8	-0.7
38%	56.3	57.1	-0.8
40%	56.5	57.4	-0.9
42%	56.7	57.7	-1.0
44%	56.9	57.8	-1.0
46%	57.1	58.5	-1.2
48%	57.3	58.5	-1.2
50%	57.5	58.7	-1.2
52%	57.7	58.9	-1.2
54%	57.9	59.1	-1.2
56%	58.1	59.3	-1.2
58%	58.3	59.5	-1.2
60%	58.5	59.7	-1.2
62%	58.7	59.8	-1.1
64%	58.9	60.0	-1.1
66%	59.1	60.2	-1.1
68%	59.4	60.6	-1.2
70%	59.6	60.8	-1.2
72%	59.8	61.0	-1.2
74%	60.1	61.5	-1.2
76%	60.4	61.6	-1.2
78%	60.6	61.8	-1.2
80%	60.9	62.2	-1.3
82%	61.2	62.5	-1.4
84%	61.5	62.7	-1.3
86%	61.8	62.9	-1.1
88%	62.1	63.1	-1.1
90%	62.4	63.4	-1.0
92%	62.9	64.0	-1.1
94%	63.4	64.4	-1.0
96%	64.1	65.2	-1.1
98%	65.0	66.0	-1.0
100%	68.2	67.2	1.0

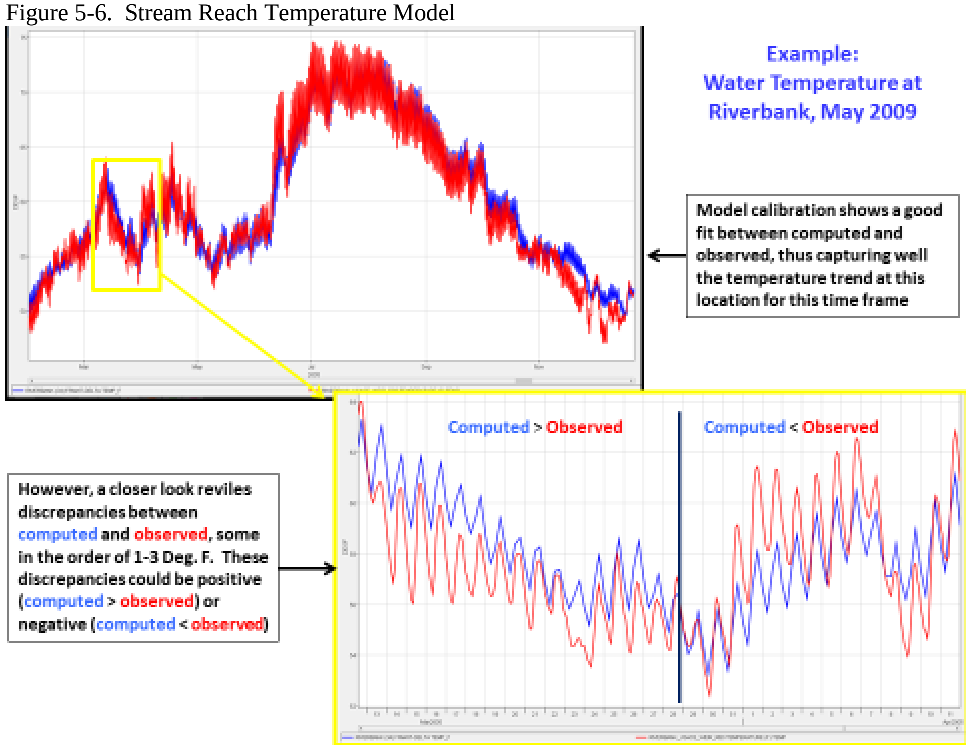


Model Calibration

Calibration of the stream reaches in the model was done by comparing computed and observed time series temperatures both graphically and statistically.

The model generally does an excellent job of reproducing the thermal regime in streams. However, this does not mean that there is a perfect match between computed and observed, as shown in the following example:

Figure 5-6. Stream Reach Temperature Model



Model Calibration - Margin of Error

The measures by which we determine how well the model is calibrated, are:

- Coefficient of Determination (R2)

  R2 is a standardized measure of degree of predictedness or fit. R2 = 1 means a perfect match between computed and observed. The closer R2 to 1, the more fitted the data is. Usually, R2 greater than 0.9 means a very good match.

- Root-Mean-Square Error (RMSE)

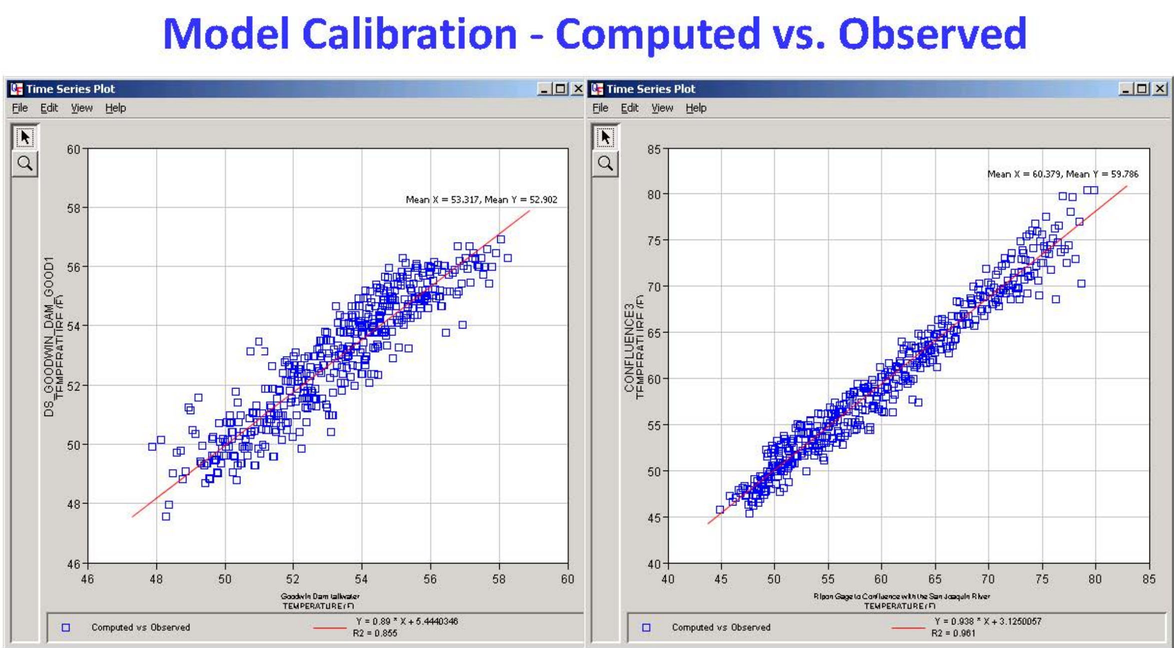
RMSE tells us how concentrated the data is around the line of best fit. The larger the RMSE the more scatter the data is with respect to the line of best fit. RMSE is a term that is embedded in R2.

- Model Bias

  Model bias is defined as the difference between the average computed and observed temperatures. The higher the bias in absolute terms the more skewed the model. Positive Bias designates that computed tends to show higher temperatures than the observed and negative Bias is the opposite.

The following charts show the calibration results for two locations: Below Goodwin Dam and the Confluence.

Figure 5-7. Goodwin Dam and San Joaquin Confluence Calibration Results



Below Goodwin Dam

Average computed =	53.32
Average observed =	52.90
Bias =	0.41
RMSE =	0.94
R^2 =	0.855

Confluence

Average computed =	60.38
Average observed =	59.79
Bias =	0.59
RMSE =	1.85
R^2 =	0.961

Table 5-2. Model Calibration Results at Various Locations

Model Calibration - Computed vs. Observed

Other locations in the Stanislaus River*

Location	River Mile	Water Temperature (degrees F)		
		Avg. Observed	Avg. Computed	Coefficient of Determination (R^2)
Below Goodwin	58	52.90	53.32	0.855
Knights Ferry	54	53.33	53.72	0.907
Orange Blossom	46	55.29	55.28	0.936
Oakdale Rec.	40	55.88	55.96	0.948
Riverbank	31	57.64	58.07	0.955
Ripon	15	60.49	60.40	0.961
Confluence	0	59.79	60.38	0.961

* Source: San Joaquin River Basin Water Temperature Modeling and Analysis, AD Consultants et al 2009.pdf

Model Implementation

The model generally does an excellent job of reproducing the thermal regime in streams. Results show Coefficient of Determination (R2) to be around 0.93 for the Stanislaus, 0.91 for the Tuolumne, 0.93 for the Merced, and 0.98 for the Main-stem SJR at most locations. The model bias defined as the difference between the average computed and observed temperatures was 0.26, 0.67, 0.32 and 0.31 degrees Fahrenheit for the four rivers, respectively. This means that the model is a little bit biased towards higher temperatures.

In conclusion, it should be noted that inaccuracies in model prediction are carried into all the alternatives studied with the model. Therefore, the power of this modeling tool should not be viewed in terms of its capability to perfectly predict the temperatures but rather for comparing alternatives.

ii. SWB Temperature Results

The results shown by the SWB in Chapter 19 of the SED for water temperature fail to materialize in the Districts' analysis because SWB staff did not model the Project, which is 40% UIF based on a 7-day running average. As shown in the Districts' results, the Project causes significant increases in bypass/releases, which results in less storage and higher water temperature. The SWB recognized this problem and developed the refill criteria and carryover storage analysis to once again hide, mask and misinform the public as to the environmental impacts of the Project.

As explained in the SJTA comments, and as acknowledged in the SED, the carryover storage and refill criteria are merely feasible implementations of the Project. The SED states, “[t]hese operational constraints, as components of modeling simulations, do not by themselves comprise a plan of implementation or otherwise carry the weight of regulatory requirements[,] [r]ather, they are included as elements of the modeling simulation to evaluate the feasibility of the LSJR alternatives.” (SED, at Appx. F.1-31.) The Districts’ view the analysis as mitigation for the project.

There is one simple reason to explain why SWB staff never modeled the Project, meaning 40% unimpaired flow based on a 7-day running average, with 1,000 cfs minimum February-June at Vernalis. The reason is evident from the Districts’ analysis above. Rather than creating water temperature benefits (SWB terminology, not ours) the Project would instead cause water temperatures to increase, the opposite effect intended by the SWB.

The SWB results for water temperature are set forth in Table 19-3 and Table 19-4. (SED, at 19-6 and 19-7.) The modeling used by the SWB was WSE. It includes carryover storage of 700,000 af EOMSS, refill, minimum tributary flow releases, 40% UIF seven-day modeled monthly, flow shifting of up to 25% of the February-June flows to July-November. It is important to note that the carryover storage, refill criteria, and flow shifting were not used in the baseline case. Therefore, the expected thermal benefits from those actions cannot be distinguished from potential benefits associated with the proposed flows.

Below is a modified version of Table 19-3. The original table in the SED is very confusing. Since the preferred alternative is 40%UIF, we removed the results of other alternatives to give a cleaner picture of the expected water temperature benefits. SED highlights were originally in green, however have been modified to yellow for clarification.

Table 5-3. Modified version of SED Table 19-3

Stanislaus River		Confluence (RM0)						1/4 River						1/2 River						3/4 River						Below Goodwin (RM58.5)					
		Percent Unimpaired Flow						Percent Unimpaired Flow						Percent Unimpaired Flow						Percent Unimpaired						Percent Unimpaired Flow					
Life Stage	Month / USEPA Criteria (°F)	Base	20%	30%	40%	50%	60%	Base	20%	30%	40%	50%	60%	Base	20%	30%	40%	50%	60%	Base	20%	30%	40%	50%	60%	Base	20%	30%	40%	50%	60%
AM	Sep (64.4)	**10%**						**11%**						**17%**			14%			**67%**						**88%**			12%		
AM	Oct (64.4)	**71%**			12%			**75%**			12%			**82%**			11%			**87%**			12%			**88%**			12%		
R	Oct (55.4)	**3%**						**3%**						**5%**						**17%**						**55%**					
R	Nov (55.4)	**27%**						**27%**						**36%**						**45%**						**64%**					
R	Dec (55.4)	**99%**						**99%**						**97%**						**95%**						**90%**					
R	Jan (55.4)	**99%**						**99%**						**99%**						**99%**						**99%**					
R	Feb (55.4)	**85%**						**85%**						**93%**						**100%**						**100%**					
R	Mar (55.4)	**36%**						**41%**						**53%**			12%			**78%**			11%			**100%**					
CR	Mar (60.8)	**91%**						**92%**						**97%**						**100%**						**100%**					
CR	Apr (60.8)	**78%**						**81%**						**90%**						**99%**						**100%**					
CR	May	**51%**						**61%**						**73%**						**94%**						**100%**					
S	Apr (57.2)	**39%**						**45%**						**64%**						**85%**						**99%**					
S	May	**5%**						**13%**						**31%**						**67%**						**97%**					
S	Jun (57.2)	**0%**						**3%**						**5%**						**27%**						**96%**					
SR	Jun (64.4)	**38%**						**47%**						**56%**						**81%**						**100%**					
SR	Jul (64.4)	**5%**						**8%**						**12%**						**43%**						**100%**					
SR	Aug (64.4)	**5%**						**6%**						**8%**						**47%**						**96%**					

AM = Adult Migration
R = Reproduction (Spawning, Egg Incubation, and Fry Emergence)
CR = Core Rearing
S = Smoltification
SR = Summer Rearing

There are 85 possible locations and water temperature objectives to be attained. At 40% UIF, only nine are attained or met by the SWB threshold of 10% improvement. In addition, the time period for the study is 33 years. In looking at the percentage base for September at ½ river, the objective was attained 17% of the time out of 990, days or 168 days. The proposed project improves it by 14%, or 138 days. This is the temperature benefit in number of days. The same exercise can be done for each green square.

What is interesting to note with the graph is the water temperature benefits occur mainly in September and October. So, how is it that a flow release in February-June results in water temperature benefits in September and October? Two answers. Carryover Storage under the WSE keeps more water in storage and flow shifting moves water that would have been released in Spring to Fall. In other words, the modeling assumptions which are not required by the objectives are driving the temperature benefits.

Table 19-4 depicts the water temperature benefit in terms of Fahrenheit. Table 19-4 is below. Once again, we stripped out the other analysis and focused on the preferred alternative 40%. SED highlights were originally in green, however have been modified to yellow for clarification.

Table 5-4. Modified Version of SED Table 19-4

Stanislaus Average 7DADM	Confluence (RM0)						1/4 River (RM13.3)						1/2 River (RM28.2)						3/4 River (RM43.7)						Below Goodwin (RM58.5)					
	Base (°F)	**Percent Unimpaired Flow**					**Base (°F)**	**Percent Unimpaired Flow**					**Base (°F)**	**Percent Unimpaired Flow**					**Base (°F)**	**Percent Unimpaired Flow**					**Base (°F)**	**Percent Unimpaired Flow**				
		20%	30%	40%	50%	60%		20%	30%	40%	50%	60%		20%	30%	40%	50%	60%		20%	30%	40%	50%	60%		20%	30%	40%	50%	60%
Sep	**69.6**			-0.5			**68.9**			-0.6			**67.3**			-0.7			**63.4**			-0.9			**56.6**			-0.8		
Oct	**62.0**			-1.2			**61.5**			-1.2			**60.4**			-1.3			**58.7**			-1.2			**56.4**			-1.2		
Nov	**56.8**			-0.4			**56.8**			-0.4			**56.6**			-0.5			**56.2**			-0.7			**55.6**			-0.9		
Dec	**50.9**			-0.1			**51.1**			-0.1			**51.2**			-0.2			**51.8**			-0.3			**52.3**			-0.3		
Jan	**49.8**			0.0			**50.0**			0.0			**49.8**			-0.1			**49.6**			-0.1			**49.0**			-0.1		
Feb	**52.5**			-0.5			**52.5**			-0.6			**51.9**			-0.5			**50.7**			-0.3			**48.8**			0.1		
Mar	**56.5**			-0.7			**56.2**			-0.8			**55.2**			-0.8			**53.4**			-0.6			**50.5**			0.1		
Apr	**58.5**			-0.3			**57.9**			-0.3			**56.6**			-0.3			**54.7**			-0.2			**51.8**			0.0		
May	**61.5**			-0.8			**60.8**			-0.8			**59.1**			-0.7			**56.6**			-0.4			**53.0**			0.0		
Jun	**66.8**			-0.8			**66.0**			-0.8			**64.1**			-0.9			**60.3**			-0.7			**53.8**			-0.1		
Jul	**72.8**			-0.9			**72.0**			-0.9			**70.0**			-1.0			**64.8**			-0.9			**55.0**			-0.1		
Aug	**73.0**			0.0			**72.2**			-0.1			**70.2**			-0.1			**65.0**			-0.3			**55.8**			-0.4		

As shown in Table 19-4, the month of October is the only month in which the temperature benefits achieved would meet the SWB significance of 1° Fahrenheit. Further, the criteria of 64.4°F for adult migration is already met, on average, during October under the base case so there is no benefit to further reducing water temperatures for adult migration. The modeled change in temperature at Goodwin during October just barely meets the criteria of 55.4°F for reproduction. During the February-June release time period there are **no** significant improvements to water temperature.

This final table is a compilation of the data from Table 19-3 and 19-4 onto one summary sheet.

Table 5-5. Summary of Tables 5-3 and 5-4.

Data Summary

Month	USEPA Criteria[1]	°F[2]	Percentage Met Base[3]	Percentage Increase[4]	°F Change[5]
October	64.4	62.0	71%	12%	-1.2

¼ River

Month	USEPA Criteria	°F	Percentage Met Base	Percentage Increase	°F Change
October	64.4	61.5	75%	12%	-1.2

½ River

Month	USEPA Criteria	°F	Percentage Met Base	Percentage Increase	°F Change
October	64.4	60.4	82%	11%	-1.3

¾ River

Month	USEPA Criteria	°F	Percentage Met Base	Percentage Increase	°F Change
October	64.4	58.7	87%	12%	-1.2

Below Goodwin

Month	USEPA Criteria	°F	Percentage Met Base	Percentage Increase	°F Change
October	64.4	56.4	88%	12%	-1.2

[1]From SED, at 19-22 (Table 19-3)
[2]From SED, at 19-23 (Table 19-4)
[3]From SED, at 19-22 (Table 19-3)
[4]From SED, at 19-22 (Table 19-3)
[5]From SED, at 19-23 (Table 19-4)

The USEPA criteria is the criteria used by DFW, EPA and the SWB to determine the impairment of the SJR and its tributaries under CWA §303(d). It is being used by the SWB in its SED.

The criteria for adult migration in October is 64.4°. The modeling done by the SWB depicts that 64.4°F will be met 71% of the time at the confluence under the base case. This amounts to 726 days out of 1,023 possible days that water temperatures would be better than the criteria. The modeling indicates a projected increase of 12% or an additional 122 days that water temperature would meet the criteria under the proposed alternative. So, 122 days that were above 64.4°F are now at or below 64.4°F. The change in water temperature to obtain those additional 122 days is 1.2°F.

In essence, the entire water temperature benefit on the Stanislaus River can be summarized as:

Table 5-6. Stanislaus River Temperature Benefit Summary

OCTOBER									
Confluence		**¼ River**		**½ River**		**¾ River**		**Goodwin**	
Days	Degrees	Days	Degrees	Days	Degrees	Days	Degrees	Days	Degrees
+122	-1.2°	+122	-1.2°	+112	-1.3°	+122	-1.2°	+122	-1.2°

If there are 122 days of improvement over the study period, then there will be 3.6 days in October where there is a temperature improvement. The improvement will be 1.2° Fahrenheit lower water temperature for 3.6 days. This is the increment of improvement. The improvement will be from the 7 DADM criteria. Figure 5-1 shows how a 1.2° F decrease in 7 DADM may be a model improvement, but will likely not result in a real world benefits.

There is no evidence, fact, or statement, in the record that a water temperature "improvement" as stated above provides any benefit or "reasonable" protection of the beneficial use, or any benefit to the fishery at all. This is because the model and model results, as explained above, can show no benefit. The modeling error +/- the breadth of the stream, its depth, etc., only can give relative results. The results the SWB is pointing to or relying on as the benefit are well within the margin of error of the model.

iii. <u>Districts' Analysis</u>

The Districts used the hydrology from Mr. Steiner's hydrology runs to perform a modeling run in HEC-5Q (water temperature) for the Stanislaus River. As with the SWB's model, this model uses monthly averages for inputs, even though the Project calls for releases based on a 7-day running average. The initial analysis here was performed in order to compare the Districts' results directly with the SWB's results. The results for the Water Temperature are set forth below:

Table 5-7. Districts' Water Temperature Results

Districts Results

Stanislaus Average 7DADM	Life Stage	Month/USEPA Criteria (°F)	Confluence (RM0)		1/4 River (RM13.3)		1/2 River (RM28.2)		3/4 River (RM 43.7)		Below Goodwin (RM 58.5)	
			Base (F)	40%UF (F)	Base (F)	40%UF (F)	Base (F)	40%UF (F)	Base (F)	40%UF (F)	Base (F)	40%UF (F)
Sep	AM	64.4	69.8	0.9	69.0	1.0	67.5	1.2	63.6	1.3	56.6	1.5
Oct	AM / R	64.4 / 55.4	62.1	1.0	61.6	1.1	60.5	1.2	58.8	1.4	56.5	1.6
Nov	R	55.4	56.7	0.6	56.6	0.7	56.3	0.8	55.9	1.0	55.2	1.4
Dec	R	55.4	50.9	0.2	51.1	0.3	51.2	0.3	51.7	0.5	52.3	0.6
Jan	R	55.4	49.8	0.0	49.9	0.1	49.7	0.1	49.5	0.1	48.9	0.1
Feb	R	55.4	52.5	-0.7	52.3	-0.7	51.7	-0.7	50.5	-0.5	48.7	0.0
Mar	R / CR	55.4 / 60.8	56.3	-1.2	55.9	-1.2	54.9	-1.3	53.1	-1.0	50.4	-0.4
Apr	CR / S	60.8 / 57.2	58.8	-1.1	58.2	-1.0	56.8	-1.0	54.6	-0.7	51.4	-0.2
May	CR / S	60.8 / 57.2	61.6	-1.5	60.8	-1.4	59.2	-1.3	56.5	-0.8	52.5	0.0
Jun	S / SR	57.2 / 64.4	67.2	-1.8	66.4	-1.8	64.4	-1.6	60.4	-0.9	53.7	0.4
Jul	SR	64.4	73.2	0.1	72.3	0.2	70.3	0.4	65.0	0.6	54.9	0.9
Aug	SR	64.4	73.2	0.7	72.3	0.7	70.3	0.9	65.1	1.1	55.9	1.3

AM = Adult Migration
R = Reproduction (Spawning, Egg Incubation, and Fry Emergence)
CR = Core Rearing
S = Smoltification
SR = Summer Rearing

This graph shows the USEPA criteria, with 40% as modeled by the Districts.

The Districts' analysis show rising water temperatures outside the February-June time period due to the loss of cold water pool in New Melones due to increased releases to meet the proposed objective. Unless carryover storage and refill are SWB objectives, then the water temperature benefits will not occur.

iv. Analysis & Conclusion

There are several fundamentals that do not change under the SWB or District analysis. From October to March, USEPA water temperature criteria are attained. Similarly, USEPA water temperatures are not obtained under the SWB or District analysis in June, July and August in the lower river. As with any water temperature analysis, the controlling factor is ambient air temperature. When it is cold in the winter, water temperature criteria will be met; when it is 100° in July, criteria will not be met.

In reality, there are only four months, October, March, April and May where flow of a sufficient quantity and temperature may change water temperatures downstream of Goodwin.

The March rearing 55.4° F is not met under the base case SWB or District analysis downstream. The reason is that ambient air temperatures are increasing. March 60.8° F, however is met in all times and under all runs. Likewise, April 60.8° F is met in almost all times and all conditions.

April has smoltification at 57.2° F. This objective is never obtained downstream. Same with May and June. It is achieved upstream, but not downstream because of ambient air conditions.

The confluence objective would be 55.4° F in March and 57.2° F in June when immediately downstream on the SJR the monthly temperatures average 59.1° F to 73.1° F. One has to question the benefit to the fish of trying to obtain a goal that cannot be obtained, only to swim 10 meters downstream and be in 10-20° warmer water.

The SWB analysis at 40%, also shifts water from the Spring to the Fall in all year types on the Stanislaus River. (SED, at Appx. F.1, Table F.1.2-26, p. F.1-45.) This amounts to 21,000 afa on the Stanislaus River. The water temperature "benefits" shown by the modeling would not occur without flow shifting. As stated above, flow shifting is not the project. This "benefit" is illusory.

Finally, the SWB draft documents touts the benefits of the proposed flow regime with SalSim maximum 40% flow shifting and the benefits from 40% UIF for water temperature and Floodplain Habitat (FPH). Unfortunately, for the SWB analysis, no such conclusion can be drawn because the SalSim model run and the water temperature/floodplain habitat model runs use different inputs that are actually in conflict with each other. The SalSim run at 40% maximum flow shifting moves 25% of all water February-June, in all year types to September-December.

In essence, the 40% maximum flow shifting is 30% UIF for water temperature and FPH. This SalSim run creates twice as many fish as 40%. If true, then 30% of UIF is only needed in Spring. Or, stated differently, the only "benefits" to FPH or water temperature that one should be looking at February-June is 30% UIF. There are no water temperature benefits in February – June at 30% UIF on the Stanislaus River. This begs the question then of the benefits to fish with FPH and water temperature, when DFW's own model shows February-June FPH and water temperature do not matter at 30%.

e. Floodplain Habitat (FPH)

i. SWB Analysis

This analysis will be similar to the Water Temperature analysis above. The FPH benefits are shown by the SWB Table 19-22. (SED, at 19-63.)

Once again, we stripped out the alternatives and looked solely at 40%. SED highlights were originally in green, however have been modified to yellow for clarification.

Table 5-8. Percentage of Years Under Baseline Conditions with Average Monthly Stanislaus River Flows at Goodwin Dam Under 40% UIF

Stanislaus River		February						March						April						May						June					
Flow (cfs)	Floodplain Acreage	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%
100	0	**100%**			0%			**100%**			0%			**100%**			0%			**100%**			0%			**100%**			0%		
200	0	**100%**			0%			**100%**			0%			**100%**			0%			**100%**			0%			**100%**			0%		
250	0	**49%**			23%			**61%**			28%			**100%**			0%			**100%**			0%			**85%**			9%		
500	0	**21%**			23%			**48%**			10%			**98%**			1%			**89%**			9%			**44%**			23%		
750	0	**12%**			15%			**37%**			0%			**84%**			7%			**73%**			17%			**41%**			11%		
1000	Initiates	**10%**			12%			**30%**			2%			**60%**			13%			**59%**			21%			**37%**			6%		
1250	19	**10%**			4%			**29%**			0%			**57%**			7%			**59%**			13%			**7%**			16%		
1500	46	**7%**			2%			**29%**			-4%			**43%**			-1%			**40%**			17%			**5%**			9%		
2000	161	**7%**			1%			**4%**			0%			**0%**			4%			**11%**			20%			**1%**			4%		
3000	326	**4%**			1%			**2%**			-1%			**0%**			0%			**0%**			7%			**1%**			0%		
4000	455	**1%**			0%			**1%**			0%			**0%**			0%			**0%**			1%			**1%**			0%		
5000	609	**0%**			0%			**1%**			0%			**0%**			0%			**0%**			0%			**0%**			0%		

Finally, we only took those times the SWB determined there would be significant improvement to FPH; greater than 10%. Again, SED highlights were originally in green, however have been modified to yellow for clarification.

Table 5-9. Percentage of Years with Significant Improvement to Floodplain Habitat

Stanislaus River		February						Marc h						April						Ma y						Jun e					
Flow (cfs)	Floodplain Acreage	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%	**Base**	20%	30%	40%	50%	60%
100	0	**100%**						**100%**						**100%**						**100%**						**100%**					
200	0	**100%**						**100%**						**100%**						**100%**						**100%**					
250	0	**49%**						**61%**						**100%**						**100%**						**85%**					
500	0	**21%**						**48%**						**98%**						**89%**						**44%**					
750	0	**12%**						**37%**						**84%**						**73%**						**41%**					
1000	Initiates	**10%**			12%			**30%**						**60%**			13%			**59%**			21% 13%			**37%**					
1250	19	**10%**						**29%**						**57%**						**59%**						**7%**			16%		
1500	46	**7%**						**29%**						**43%**						**40%**			17%			**5%**					
2000	161	**7%**						**4%**						**0%**						**11%**			20%			**1%**					
3000	326	**4%**						**2%**						**0%**						**0%**						**1%**					
4000	455	**1%**						**1%**						**0%**						**0%**						**1%**					
5000	609	**0%**						**1%**						**0%**						**0%**						**0%**					

Table 5-10. Monthly Breakdown of Floodplain Habitat Improvement Under 40% UIF

BREAKDOWN BY MONTH		
February	Improves 12% at 1,000 cfs	0-19 acres
March	Improves 2% at 1,000 cfs	0-19 acres
April	Improves 13% at 1,000 cfs	0-19 acres
May	Improves 20% to 31% at 2,000 cfs	161 acres
June	Improves 16% to 23% at 1,250 cfs	19 acres

For reference at 1,250 cfs the total wetted area from Goodwin to confluence is 805 acres.

ii. Districts' Analysis

FISHBIO conducted two field studies on the Stanislaus River at various flow stages to document water quality conditions in the inundated areas and to determine if fish were using the off-channel areas. The two reports are attached to this submittal. (Attachments 4-1 and 4-2.)

iii. Analysis and Conclusion

There is no floodplain habitat benefit. As explained by DFW in its comments on the SWB Delta Flow Criteria Report, floodplain habitat has many components. The SWB assumption that if it is wet, it is floodplain habitat is rejected by the scientific community. Indeed, at the November 29, 2016 Hearing, Dr. Jonathan Rosenfield said, "muddy ground is not where fish live", Dr. Rene Henery said, "habitat doesn't equal wetted acre days," Doug Obegi: stated, "the SED fails to demonstrate that the flow and non-flow measures are actually likely to achieve the salmon doubling objective." The SWB definition of FPH does not exist. The supposed "benefits" of FPH do not exist.

Table 5-11. Habitat Water Temperatures on the Stanislaus River compared to USEPA Water Temperature Criteria

USEPA		Confluence		¼ River		½ River	
		Average	Percent	Average	Percent	Average	Percent
CR	60.8	61.5	51%	60.8	61%	59.1	73%
S	57.2	61.5	5%	60.8	13%	60.8	31%

In May, there would be little or no benefit to juvenile salmon at the confluence because water temperatures greatly exceed USEPA criteria. These water temperatures are in the river and FPH conditions may be warmer, making for unsuitable temperatures according to the SWB. There is some matching up of water temperatures and FPH at ¼ mile and ½ mile. How much of the 161 acres is in these two reaches? This was not disclosed in the SED. So, it is unknown if habitat matches water temperature.

In June, the analysis is worse. First, it should be noted that steelhead do not use floodplain habitat, and even if they did, they are not migrating in June. In 20 years of monitoring at Oakdale from 1995-2015 (no monitoring in 1997) there have only been 3 smolts captured in June. Similarly, at least 97% of juvenile salmon have migrated out of the river by June 1.(Attachment 7.) Secondly, according to the SWB analysis, FPH inundation would be expected to increase from 7% to 16% of the time at 1,250 cfs activating 19 acres of wetted area. This is a tiny area, even if it were in one piece, but it should also be noted that the total area is comprised of even smaller fragments. Further, according to the criteria set forth by the SWB, the water temperatures would not be suitable, as they would greatly exceed 57.2F. So in summary, the fish are not there in June, and even if they were, the temperature conditions in the tiny fragments of inundated area created by the proposed flows would be inhospitable.

Table 5-12. Average Water Temperature Compared with State Objective for Water Temperature

Confluence			
		Average Water Temperature	**Percentage Time Achieved**
S	57.2	66.8	0%
¼ River			
S	57.2	66	3%
½ River			
S	57.2	64	5%

The Baseline is wrong. The No Project Alternative is wrong. The SWB never runs the Preferred Project Alternative, 40% UIF based on a minimum seven-day running average. Instead, the SWB runs a mitigation of its Preferred Alternative. A more accurate and complete report should have been presented after $70,000,000 and ten years of work. The SWB was told in 2012 by the SJTA that these analyses were wrong. The SED misinforms the public on how devastating the project will be to the environment. There will be no benefits derived from the project.

f. <u>October Pulse Flows</u>

The WQCP includes a requirement for a minimum flow of 1000 cfs at Vernalis during October and an additional 48 TAF pulse flow on top of the base flow. The October pulse flow requirement equates to 109,380 AF of run-off; in contrast the 83-year average October run-off at Vernalis is only 33,000 AF. Managed pulse flows have been used since the early 1990's to stimulate upstream migrations. SWB Staff claim the October pulse flow requirement on the Stanislaus, Tuolumne, and Merced Rivers would improve water temperatures for adult migrating Chinook salmon and CV steelhead populations, thus, aiding and triggering upstream migration. (SED, at 7-127.) However, empirical studies show factors other than temperature may be of greater importance in stimulating migration.

Recent studies have found managed pulse flows result in immediate increases in daily passage, but the responses are brief and represent a small portion of the total run. One of these studies was conducted on the Stanislaus River between 2003 – 2014, Environmental Factors Associated with the Upstream Migration of Fall-Run Chinook Salmon in a Regulated River. (Peterson, et. al (2017) North American Journal of Fisheries Management, 37:1, 78-93.) The study examined daily counts and proportions of Chinook salmon in relation to discharge patterns before, during, and after pulse flows conducted on the Stanislaus River. It found managed pulse flows only aided upstream migration numbers during two of the eleven years analyzed (2006 and 2012); however, the 2006 pulse flow was not provided as an attraction flow, but rather a flood control release. (Id. at 89.) Thus, the October pulse flow was an attraction in only one out of the eleven-year study.

Moreover, this study along with studies on the Klamath, Trinity, and Columbia Rivers noted substantial differences in migration rates in fall-run Chinook salmon between years with managed pulse flows and years without. On the Columbia River the run timing of multiple stocks was later when discharge during the migratory period was higher. (See Keefer et. al (2004) Stock-Specific Migration Timing of Adult Spring-Summer Chinook Salmon in the Columbia River Basin, North American Journal of Fisheries Management, 24, 1145-1162; and Strange (2012) Migration Strategies of Adult Chinook Salmon Runs in Response to Diverse Environmental Conditions in the Klamath River Basin, Transactions of the American Fisheries Society, 141, 1622-1636.) In fact, due to the lack of pronounced migratory response by Chinook salmon, Reclamation does not currently recommend pulse flows unless under emergency conditions on the Klamath and Trinity Rivers.

As there is ample evidence to indicate no beneficial use of October pulse flows to support adult Chinook salmon or CV steelhead upstream migrations, OID and SSJID ask that this requirement be eliminated from the WQCP.

6. <u>Water Rights</u>

a. <u>Pre-New Melones Project</u>

Prior to the construction of New Melones, Oakdale Irrigation District (OID)/South San Joaquin Irrigation District (SSJID) had the major storage facilities and diversions on the Stanislaus River. The Districts have a Pre-1914 adjudicated right to the first 1816.6 cfs of water in the Stanislaus River Basin (Stanislaus River Adjudication Decree (Nov. 14, 1929) Superior Court of San Joaquin County, Action No. 16873; *See also United Sates v. California* (E.D. Cal. 1981) 509 F. Supp. 867, 901 [“rights determined by Stanislaus River Adjudication Decree… Action No. 16873].) In addition to its Pre-1914 water right, the Districts have the right to store and re-direct 106,949 acre-feet from Old Melones (Division of Water Rights, Permit No. 2106, License No. 2013 (Apr. 22, 1940) [10,754 af.]; Division of Water Rights, Permit No. 2104, License No. 2012 (Apr. 22, 1940) [96,195 af.]) It also has rights for the Tri-Dam Project, Donnells (Division of Water Rights, Permit No. 009362, License No. 10166 (Aug. 31, 2001) [11,000 af.]), Beardsley (Division of Water Rights, Permit No. 9361, License No. 7857 (Oct. 22, 1959) [76,900 af.]) both above Old Melones and Tulloch (Division of Water Rights, Permit No. 9360, License No. 7856 (Oct. 23, 1959) [63,000 af.]) and below Old Melones. Downstream from Tulloch is Goodwin Reservoir where water is diverted into the South and North Mains for use in the District.

b. New Melones

In 1966, the U.S. Bureau of Reclamation commenced construction of New Melones Dam, immediately downstream of Old Melones Dam. The history of New Melones is set forth *United States vs. California* wherein the United States objected to the State Water Resources Control Board's proposed use of water from New Melones. There are two important documents that define the New Melones project; its authorizing legislation (Flood Control Act of 1962 (P.L. 87-874)) and the Secretary of Interior's Decision (New Melones Lake Area Master Plan of 1976). We have discussed these documents in detail under Project Purpose.

c. State Water Resources Control Board (SWB) Permits

In order to operate the New Melones Dam and Reservoir, Reclamation needed to obtain a permit from the SWB (*United States v. California, State Water Resource Control Bd.* (9th Cir., 1982) 694 F.2d 1171, 1177). The permitting process allows legal users of water that may be injured by a new water right permit to protest. The Districts protested, since a 2,450,000 acre-foot reservoir, dam, and powerhouse were being put right in the middle of its operations.

After lengthy hearings and negotiations, the Districts and Reclamation entered into an Operation Agreement. The original Operation Agreement was in 1978. The subsequent and current agreement is simply titled the 1988 Agreement and Stipulation (See Attachment 9). The original agreement was recognized by the SWB as a settlement of the Districts' protest of the New Melones water right permits. (*In the Matter of Application 14858, 14859, 19303 and 19304* (Apr. 4, 1973) State Water Resource Control Board, D-1422 at p. 4; S*ee also In the Matter of Application 24371 and 24372* (Apr. 20, 1978) State Water Resource Control Board, D-1481.) Since the original agreement to the present, the Districts and Reclamation have operated under the Agreement.

d. Current Requirements

Reclamation, as the Junior Water Rights holder on the Stanislaus, is currently required as a condition of its permits, the Endangered Species Act (ESA) and other rules and regulations to meet the following instream flow obligations:

- 1988 Agreement with California Department of Fish & Wildlife (DFW) for Instream Flow.
- Central Valley Project Improvement Act, § 3406(b)(2), commonly referred to as (b)(2) water
- NMFS Biological Opinion on the Long-Term Operation of the CVP and SWP, Appendix 2e flows
- D-1641 February-June flow objective at Vernalis
- D-1641 April-May pulse flow objective at Vernalis
- D-1641 Salinity Objective at Vernalis
- D-1422 Dissolved Oxygen Objective at Ripon
- OCAP-BO Water Temperature Objectives

OID and SSJID have no obligations for instream flows. These flows and obligations are due to CVP operations or New Melones specific impacts. Whether it be D-1422, D-1481, D-1641, ESA, or the CVPIA, it has been found that the New Melones project impacts are the impacts to be mitigated.

e. The Districts are not Central Valley Project Contractors (CVPC)

The SED improperly treats the Districts as if they were CVP contractors. In fact, the SED states, "SSJID, together with OID, holds contract rights with [USBR] to divert 600,000 acre-feet (TAF) of water from the Stanislaus River." (SED, at 20-28.) The Districts are not CVP contractors. CVP contractors receive CVP "project water." The Districts do not receive CVP "project water." Rather, USBR has entered into an agreement with the Districts in order to resolve the Districts' protest to USBR's application for water right permits and licenses to build New Melones Reservoir on the Stanislaus River. Pursuant to the most recent iteration of that Agreement ("1988 Agreement"), the Districts receive the first 600,000 acre-feet of water on the Stanislaus River in recognition of the senior water rights.

In *Consol. Salmonid Cases v. Locke*, Judge Oliver Wanger found the reasonable and prudent alternatives (RPAs) in the NMFS BO, including the required flows in Appendix 2e, were not applicable to OID or SSJID because they do not receive CVP project water. (*Consol. Salmonid Cases v. Locke, supra,* 791 F.Supp.2d at 938-941.) The Districts do not pay Reclamation for water, nor do the Districts follow the RPA. The Districts coordinate their operations with Reclamation to ensure that when the water year is complete the entities have received and used the water they are entitled to use under their respective water rights.[6]

This understanding of the 1988 Agreement between the District and USBR as an operations agreement, rather than a water supply contract, was reinforced in the OCAP-BO litigation cases. In its OCAP-BO lawsuit, the Districts sought to enjoin the use of their water to meet Appendix 2e Flows. The Federal District Court affirmed the Districts' position, holding that their water could not be used to meet the Appendix 2e Flows. It stated:

> "If . . . Reclamation's predictions prove incorrect and make the RPA's implementation infeasible, the burden cannot be imposed on senior water rights holders [such as OID and SSJID]. Rather, Reclamation must then re-initiate consultation [under Section 7 of the ESA]." (*Consol. Salmonid Cases v. Locke, supra,* 791 F.Supp.2d at 940.)

f. 40% Unimpaired Flow (UIF)

The SWB's proposal to require 40% UIF turns water rights, regulatory and statutory findings, and the SWB permit process upside down.

The SWB found in D-1422 and D-1485 that Reclamation was solely responsible for meeting instream flows below Goodwin. (*In the Matter of Permit 12720* (Aug. 16, 1978) State Water Resource Control Board, D-1485, at p. 6, 22). The SWB recognized the 1988 Agreement between DFW and Reclamation wherein 98,200 to 308,000 acre-feet would be released to meet instream flows. D-1422 and D-1481 also found Reclamation to be solely responsible to meet the Dissolved Oxygen level at Ripon by releasing sufficient flow in the summer (D-1422, *supra* at p. 31.). The SWB also found in

[6] It is almost impossible on a daily basis to match water rights and water operations through seven reservoirs, nine powerhouses and multiple diversion points.

D-1422 and D-1481 that Reclamation is responsible for providing sufficient flow below Goodwin to meet riparian demand in the lower Stanislaus River.

As stated above, the flows required by Appendix 2e and the water temperature objectives from the NMFS BO are the sole responsibility of Reclamation.

In D-1641, the SWB found Reclamation solely responsible for the Vernalis Salinity Objective, February – June flow objective, and April – May pulse flow.[7]

The first question with the 40% UIF is, "Whose water goes down the river first?" It is OID and SSJID's position that before any senior water right can be required to bypass any water to meet the 40% UIF requirement, all junior water right holders, such as USBR, must release or bypass water to meet their current legal obligations. Those obligations are based on the impacts to instream flows caused solely by the New Melones project. Compelling senior water right holders to bypass water first, thereby providing flows that would have otherwise been required from junior water right holders in order to mitigate for impacts caused by their project, will constitute a taking of senior water rights.

A simple example will make this clear. If the UIF at New Melones was 1,000 cfs on April 1, then under the proposed Project, 40% UIF, or approximately 400 cfs, would be released at Goodwin. If the Appendix 2e flows required from USBR by ESA meet or exceed[8] the 400 cfs, then the entire 40% UIF requirement will be satisfied using CVP releases. If Appendix 2e flows were only 200 cfs, then all water users on the river may need to bypass an additional 200 cfs to meet the 400 cfs. Since the proposed SWB project is "additive" to the existing baseline, Reclamation will need to release or bypass stored water first to meet the Appendix 2e flows.

The same analysis would need to be done for every requirement Reclamation has for the New Melones project. Otherwise, the senior water right holders will be assuming the junior water right holders' obligations and mitigating for Reclamation's project impacts.

g. Carryover Storage and Refill Requirements

The Water Supply Effect Model used by the SWB has two major assumptions; carryover storage and reservoir refill criteria. The WQCP/SED sets out as a carryover storage requirement of 700,000 af EMOSS for New Melones. (SED, at Appen. F.1-36.)

Depending on the year, water may be taken from OID and SSJID's storage from October-February and/or from the Districts' direct diversion rights from March 1st – November 1st to meet either the release requirement, the carryover storage requirement or both. Water may be taken from both because the equation described above is driven solely by meeting the End of Month Storage September. Where and when the water comes from is irrelevant to the equation to create carryover storage. This leads to an illegal taking and usurpation of the water right priority system.

An example will make this point.

In 1930, the Districts would have used at least 559,000 acre-feet water to meet the model's land use requirement.[9] (See Table 5-1: State Water Board Model Run of 40% UIF recreated by Daniel B.

[7] Reclamation may argue it is not solely responsible for the April-May pulse flow. What is clear is neither are OID/SSJID.
[8] The 1988 DFW Agreement flows are subsumed in Appendix 2e, because 2e flows are always higher.
[9] The model only focuses on land use, it has no analysis of "storage" as a "use", or "water transfers" as a "use."

Steiner, Attachment 1, p. 19.) In 1930, there was water available to the Districts under the 1988 Agreement because there was 671,000 acre-feet of inflow into New Melones, and/or under their water rights because there was 732,000 acre-feet of UIF in the Basin. The Districts' water supply is reduced from 600,000 acre-feet to 314,000 acre-feet solely to meet the carryover storage requirement in New Melones. This phenomenon occurs 21 times under the historical analysis. (Attachment 1.)

The carryover storage requirement results in District water being stored in New Melones, and then effectively used by Reclamation to meet its regulatory, statutory and contractual obligations. Each year Reclamation releases water for CVPIA (b)(2), Appendix 2e flows, salinity requirements at Vernalis, dissolved oxygen requirements at Ripon, and CVP project contractors (SEWD and CSJWCD), if available. When storage drops because of these CVP uses, and when inflow in the following water year is minimal, the Districts' diversions will be cut in that following year in order to ensure that the carryover storage requirement is met. The result is that the Districts are filling New Melones so that junior CVP project purposes can be met in the year prior. The same issue occurs with the SWB refill criteria six times. For 27 out of 80 years of record, the Districts' rights to directly divert and divert to storage are subjugated to the junior rights of Reclamation.

h. 40% UIF

In the analysis, there are an additional seven years where the Districts' right to divert is diminished in order to make water available for instream uses or fill storage in New Melones. In these seven years, the SWB provides a minimum diversion to the Districts. (See Attachment 1.)

In 1990, there was 491,000 acre-feet of inflow into New Melones. Under the 1988 Agreement, the Districts would have received 530,000 acre feet. The land use demand was 570,000 acre feet. The diversion to the Districts was 217,000 acre feet. The river received 262,000 acre feet, and carryover storage was 757,000 acre feet. In this example, it's impossible to say if the water was going to meet the 40% UIF or the carryover storage.

In 34 out of 80 years, the Districts' water rights would be severely impaired to meet 40% UIF, carryover storage or refill criteria, or some combination of them. In these 34 years, the senior water rights of the Districts, which rights are not disputed, would be subjugated to the rights of the most junior water right holder in the Basin, namely, Reclamation.

7. Impacts to Agriculture

- OID & SSJID incorporate the comments of the SJTA -

8. Groundwater

- OID & SSJID incorporate the comments of the SJTA -

9. District Revenue

Beginning in 2007 after the implementation of VAMP, OID actively engaged in the sale and transfer of surplus water when such sources were available. Over the last ten-years these activities generated over $58 million ($5.8 million per year) in revenue for OID. Pursuant to OID policy, eighty percent of that revenue is committed to capital improvement projects ("CIP programs"). This revenue, in turn, was invested in CIP programs to advance water conservation within the District. A realized benefit of these actions can be seen in OID's annual water use, which has dropped ten percent over the last ten-years.

OID's water transfers and CIP programs benefit fisheries in the Stanislaus River and move water to other public agencies in the State who are in need of additional supplies and who can put the water to reasonable and beneficial uses. Moreover, the economic stimulus and rollup benefits of injecting between $5-6 million a year on CIP program implementation into the local economy is significant.

Under the proposed WQCP the State will be taking all of OID's salable water supplies leaving OID with no revenue stream for continuation of CIP programs and further conservation improvements. Without outside water sales these water projects are not economically viable locally. Thus, the State's actions will end OID's ability to rebuild and modernized its water delivery system resulting in an end to the advancement of water conservation implementation at OID.

Additionally, the loss of all water sales revenue will mean that twenty percent of operational expenses previously funded by water sales, roughly $1.2 million annually, will be passed onto OID constituents. This will increase the annual cost of water by forty-three percent in the Districts' service area. Fifty percent of the Districts' irrigated crops are low value feed and field crops that are not conducive to higher water rates as the return on investment is low. The fallowing or conversion of low value crops coupled with the loss of $5-6 million in local economic stimulus will result in a host of impacts locally. Furthermore, OID's constituents can ill afford to absorb the remaining $4.6 million to continue the CIP programs for conservation on water that is not economically viable to conserve.

As none of these direct, indirect, or induced impacts were evaluated in Section 18: *Summary of Impacts*, nor in Appendix G: *Agricultural Economic Effects* of the SED, OID requests the State Water Board address these impacts in its economic analysis prior to adopting the WQCP.

10. Urban Water Demand in Stanislaus

The cities of Escalon, Lathrop, Manteca and Tracy in joint planning efforts with South San Joaquin Irrigation District (SSJID) created the South County Water Supply Project (Project) in 1995 to enhance water quality and supply to the nearly 200,000 residents and thousands of businesses that depend on these services for urban water supplies. At a cost of over $127,000,000, from the cities of one of the most economically challenged areas of California, this project was an extraordinary undertaking for its people.

Able to supply up to 42 million gallons per day (mgd) from its central plant, the Project draws from SSJID water rights on the Stanislaus River. The treated water is used in residential, commercial, industrial, manufacturing and agricultural processing in the region. The treated surface water supplements, and in some cases largely replaces, local ground water supplies. In addition, the Project was designed to be modular in that it could expand to meet the demand expected from future urban growth. Even with the recent economic downturn and its especially harsh impact on this region, population growth surged ahead in the South San Joaquin Region increasing 30% between 2000 and 2014 according to the Housing Element of the San Joaquin County General Plan, with growth projected to continue and accelerate in the region as more of the Bay Area population seeks affordable, but commutable housing and as commerce increases to serve that population.

Though SSJID owns and operates the treatment plant and much of the distribution system it does so in financial partnership with its retail cities. The Stanislaus River water supply to these cities has become critically necessary for human health and safety for several reasons:

a. Water Supply: Much of the urban service area is located over a groundwater basin designated as critically overdrafted , suggesting that water supply (quantity) could become a growth and economic drag on the local economy. Continuing to chase ever more limited supplies of groundwater in the region is just not sustainable. Currently the SSJID facilities can supply up to 42 mgd and provides between 50-70 percent of the annual water supply to the partner cities an indispensable resource for current and future urban water supply and fully necessary to the health and safety of its population.

b. Water Quality: Over the years the primary water demand in the region has been and continues to be for agriculture. That industry and its related manufacturing activities as well as other local urban operations, as in other parts of California, has reduced the availability of good quality groundwater contributing cost and challenges in specific areas to meeting rigid drinking water standards for supply and quality. In addition virtually the entire region overlies or directly borders the south delta such that much of the region suffers from high salinity and intrusion in the ground water supply. The Project treated water is critical to the delivery of safe treated water to the residents and businesses of the region by delivering extraordinarily high quality water that can be used much of the time to meet demand and, when mixed with ground water supplies, to increase its quality at other times.

c. Reliability: Currently SSJID supplied water is highly reliable as a local water supply because of the nature of the Stanislaus River hydrology and its associated water right priorities. With an average runoff in excess of 1 million acre feet annually and access to storage and direct diversions that are both pre-1914 adjudicated rights, SSJID water supplies have historically been impacted by extended drought only occasionally.

The delivery of water by the Project is governed by the Water Supply Development and Operating Agreement which provides that in the event of water shortage, deliveries by SSJID to cities is curtailed by approximately the same percentage as deliveries to agriculture. For instance, this requirement led to urban water supply reduction in 2015 of 20% and in 2016 of 16%. Within the context of local conservation during extended droughts, these reductions are currently manageable by local authorities.

The Water Quality Control Plan as analyzed by the Substitute Environmental Document (SED) will radically alter that sustainable condition.

The analysis set forth in the State Water Resources Control Board's SED is fatally flawed in multiple ways, but one of its more shocking errors is its analysis of water supply impacts. Indeed, as referenced elsewhere in these comments (Stanislaus parties) there are a few years, based on historical analysis, that result in water supply curtailment to SSJID in excess of 60%. This arises not just from diversion restrictions necessary to meet the unimpaired flow requirements but also from the reservoir carry over targets set for the cold water pool at New Melones, in the plan of implementation. While discussed in detail elsewhere as a discussion of service water supply impacts generally, in the context of urban water supply such a loss of supply is more than catastrophic. Recall that percentage reductions in supply to SSJID are shared in approximately the same percentages between agriculture and urban deliveries. Fifty to sixty percent reductions or more to agriculture is not survivable for extended periods but accommodations in the short term can be orchestrated for economic survival (though certainly not at the levels set out in the SED.

However, we are unaware of any city in California that has achieved anything approaching a 50% or 60% conservation rate for any single year let alone for an extended drought period. There are no other sources of water currently available to the SSJID service area other than its Stanislaus River rights and groundwater.

As previously indicated the very genesis of the Project began over 25 years ago with the recognition that continuing reliance on groundwater as an exclusive source for urban water supply was not sustainable. No amount of regulatory manipulation can change that basic fact. Increased pressure on the area without alternate or surface supply was and is continuing to impair the sustainability of groundwater as a source of urban supply. Additionally, the generally high salinity of groundwater in areas of the region further limits any increased reliance on groundwater for urban supply. Indeed accelerated use of groundwater in and around the local groundwater basin from users without alternative supplies has simply confirmed the wisdom of SSJID and its partner cities to initiate the diversification of local water supply implemented by the Project.

With respect to supply, California's adoption of the Sustainable Groundwater Management Act (SGMA) confirms as a matter of law what the Project parties concluded 25 years ago; continuing reliance on groundwater for sustained urban supply and growth was not possible long term, even in a conjunctive use program. SGMA will require further adaptation by the Project parties in resource management. Indeed, because of its critical overdraft status management plans for the basin are due shortly and implementation required by 2022. Consequently SSJID and its partner cities find themselves in a catch-22 with respect to supplies.

On the one hand, the SED recognizes a significant water supply impact from the implementation of the revised Water Quality Control Plan (WQCP) even though SSJID and its partners realize this impact is vastly understated in the SED. Nevertheless the SED plan finds such an impact to be unavoidable and suggests, without any justification about available supply and with full knowledge of the status of the groundwater basin and the impending impacts of SGMA, that much of the impact will simply be made up by the use of groundwater. This conclusion, without supported analysis is a gross violation of the California Environmental Quality Act (CEQA).

On the other hand the catch 22 turns even more vicious. SGMA requires groundwater management plans that achieve a sustainable management of the basin. Tools to achieve sustainability include conservation extending to extraction limitations. The theory is that surface water can be imported and stored in the basin as a tool to achieve sustainability. So, one part of state government is dictating groundwater sustainability by suggesting (if not regulating) limiting groundwater extraction and importing surface water, while at the same time another arm of the state is taking that imported surface water and suggesting it will be mitigated by more use of groundwater. No reasonable management is sustainable in such a legal / regulatory environment. The citizens of South San Joaquin County will pay at both pumps. The notion that the WQCP, (SED) and SGMA can both successfully be implemented in this region is pure fantasy. Nowhere in the SED is this sufficiently analyzed.

Finally, no economic theory we are aware of ever suggests that any economy is sustainable with permanent zero growth. No new housing, no new schools or businesses, no ability to absorb indigenous population growth let alone demands placed on the region by those with more financial resources seeking to relocate in the area. Nevertheless, this bleak scenario is a real and probable outcome if both the SED and SGMA are implemented without modifications.

The California Water Code deals with Urban Water Management Planning (§§ 10611-10656). Specifically, each urban water supplier, including SSJID and its partner cities are required to submit an urban water management plan that includes provisions for conservation methods and targets, shortage contingencies, alternate supplies of water, and reliability.

Section 10635 (CWC) requires that water supply reliability be assessed for supply availability during "normal, dry, and multiple dry water years". This projected supply is compared to projected demand over 20 years, taking into account growth projections from local entities. These projections are set forth for San Joaquin County as a whole in its General Plan. Table 7-1 of the Housing Element catalogues historical growth of the County population. From 2000-2010 the county population grew at 2% average annual growth rate (AAGR), twice the state average of 1%. Even after 2010 during the implosion of the local housing market the AAGR was, and remains, 1%.

The loss of groundwater supply from the implementation of SGMA and increased agriculture demands from WQCP implementation and water quality issues, the loss of direct surface water supply, also from the WQCP (SED), particularly exacting in dry and sequentially dry or critical years, and the current unavailability of alternate supplies, will have the likely effect of turning currently safe reliable urban water supplies on their head.

Section 10631(c)(2) (CWC) requires that plans analyze either alternate sources or demand management controls for sources of water not consistently available for use based on legal, environmental, quality or climatic conditions. When the shortage, including temporary supplies, in any given year exceed reasonably obtainable conservation measures urban water supplies are faced with extraordinary choices. Many communities have responded by simply halting any new water connections.

SSJID and its partner cities are all urban water suppliers. It is unknown how the collision of the SED with SGMA and regional growth induced demand will impact decisions of the partner cities but continuing the issuance of building permits and water connections in the face of unreliable water supplies seems unlikely, bringing economic progress in an impoverished section of California to a halt while allowing it to potentially flourish in other areas of the state unaffected by the SED.

The implementations of the WQCP as envisioned by the SED would truly be catastrophic for the region as a whole including its urban population.

11. <u>The Federal Endanger Species Act (ESA)</u>

The State Water Board's adoption of the WQCP will require USBR to modify its long-term operation of the Central Valley Project and State Water Project (hereafter CVP/SWP), thus, triggering the requirement for re-initiation of the formal consultation process pursuant to §7 of the Endangered Species Act (ESA). (16 U.S.C. § 1531 *et. seq.*) The ESA requires interagency cooperation in carrying out the objective of protecting endangered and threatened species. Under section 7, subdivision (a)(2) it states: "[e]ach Federal agency shall, in consultation with and with the assistance of the Secretary, *insure that any action* authorized, funded, or *carried out by such agency* is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species…" (16 U.S.C. § 1536(a)(2).)

The USBR and the California Department of Water Resources (DWR) jointly operate the CVP/SWP. The coordinated operation agreement between the two is the Federal nexus (i.e., agency action) requiring ESA section 7 consultation on operation of the CVP/SWP.

The first formal consultation and subsequent biological opinion (BO) issued on the long-term CVP/SWP operations was completed in 2004. Then in 2006, USBR requested re-initiation of consultation on CVP/SWP operations based on the new species listings and critical habitat designations, this led to the 2009 NMFS BO. The law requires USBR to reinitiate formal consultation with NMFS whenever (1) the amount or extent of the taking specified in the incidental take statement is exceeded; (2) new information reveals that listed species or critical habitat may be affected in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 C.F.R. § 402.16).

The adoption of the WQCP will modify the manner USBR operates the New Melones Dam, this may affect the threatened Central Valley (CV) steelhead population and their designated critical habitat in a manner not considered by the 2009 NFMS BO.

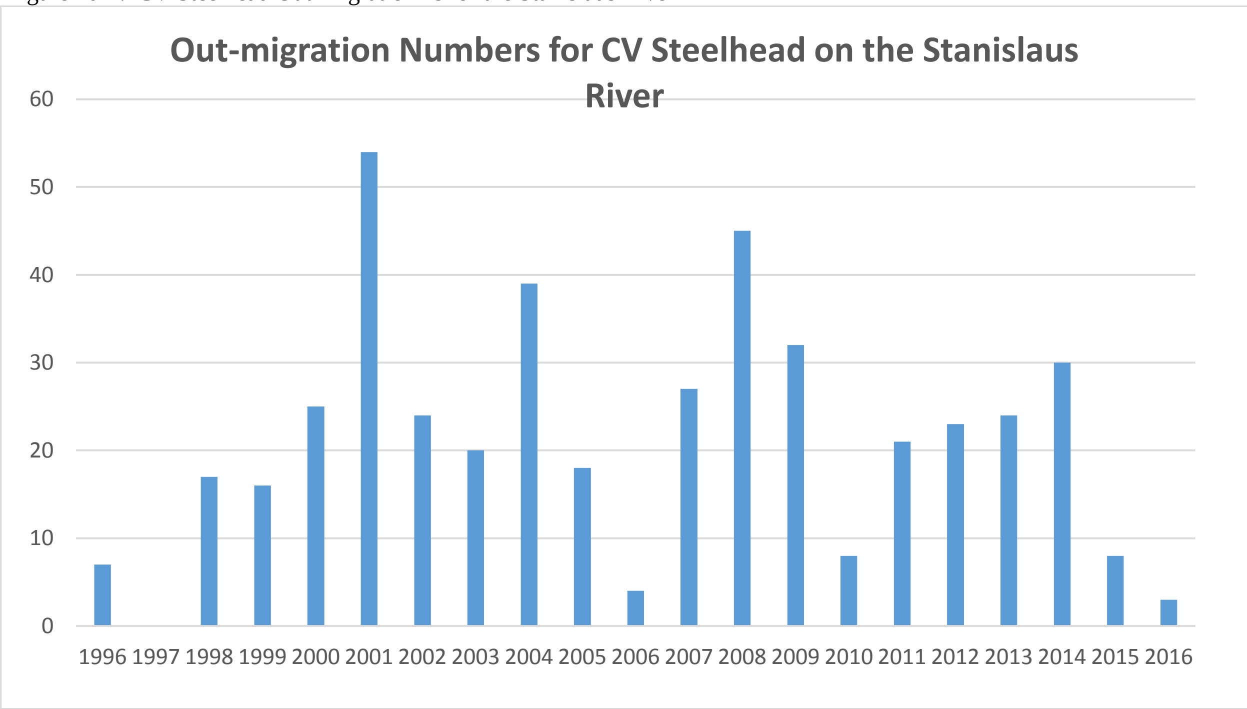
CV steelhead are on the Stanislaus River (2009 NFMS BO, at p. 106-108.) and CV steelhead critical habitat was designated on the Stanislaus River from Goodwin Dam to the confluence with the San Joaquin River. (70 F.R. 52488) The factors affecting the current status of CV steelhead and their critical habitat are related to operations of the East Side Division of the CVP. Temperature control and flow variations on the Stanislaus River affect both the CV steelhead and their critical habitat.

The new regulations proposed by the WQCP affecting the operations of New Melones will impact CV steelhead on the Stanislaus River. The 2009 NFMS BO reasonable and prudent alternatives for the New Melones Project are only for CV steelhead. They are not for CVFRCS or Spring-run. There is no other federally listed species in the Stanislaus River. CV steelhead distinct population segment (DPS) is comprised of two elements. The first is steelhead or *O'mykiss*. These are fish that smoltify and leave the Stanislaus River, go to the ocean, return to spawn (unlike the CVFRCS they do not die after spawning) and continue to cycle until their demise. The second element of CV steelhead DPS are Resident Rainbow Trout (RRT), hatchery or native, below an impassible dam. RRT were included in the listing and critical habitat designation because it is unknown where RRT will exhibit the smoltification trait/behavior.

The 2009 NMFS BO RPA Appendix 2e has not stabilized or recovered either the *O'mykiss* or RRT in the Stanislaus River. Rather than helping these listed species the 2009 NFMS BO Appendix 2e flows have devastated RRT. Attached to these comments are the field notes from Fish-bio RRT/*O'mykiss* survey. Since the inception of 2009 and Appendix 2e flows, the RRT has gone from just over 20,000 fish to approximately 5,000 fish in 2016. The reason, Appendix 2e flows.

The drawdown in storage in New Melones is set forth below for 2009-2016. This drawdown in storage is caused by the releases required under Appendix 2e as described above in project purpose. The large releases in the spring are supposedly to help *O'mykiss* migrate out from the Stanislaus River to the ocean.

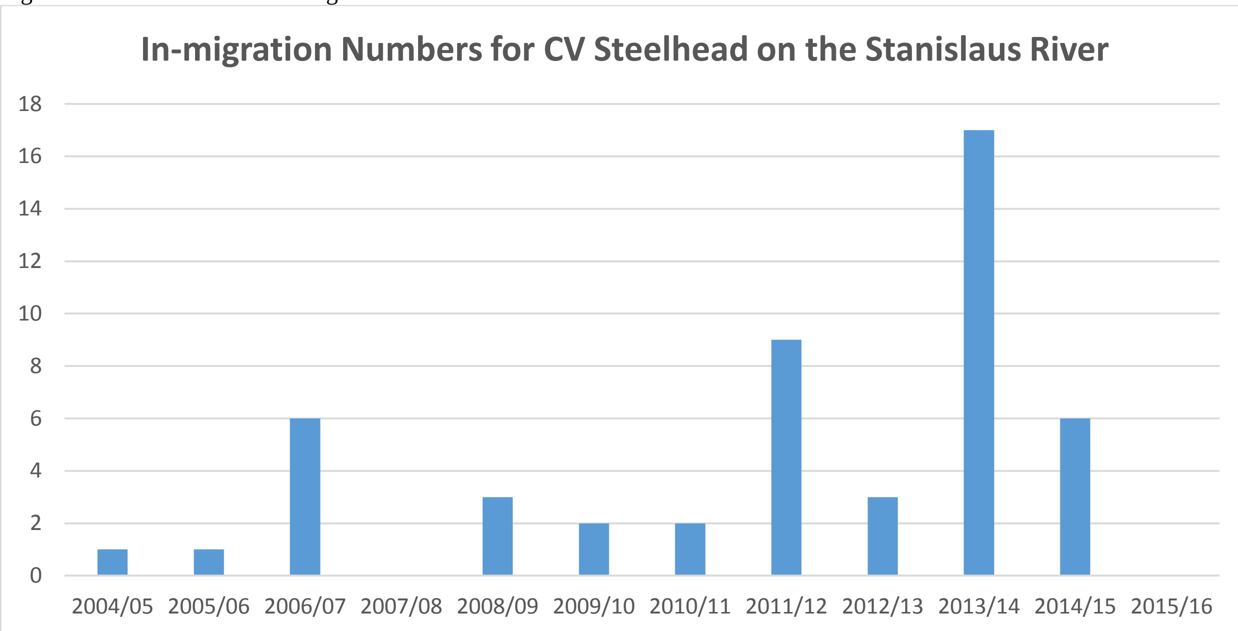
Figure 10-1. CV Steelhead Out-Migration #s for the Stanislaus River



FISHBIO, Upstream migrating numbers at weir counts of adults >16in. (2004-2015) Unpublished Data

As shown in this graph, there has been no increase, in out-migrating *O'mykiss* under Appendix 2e flows, but rather a decline. Similar results appear when looking at in-migrating steelhead. (See Figure 10-2, below)

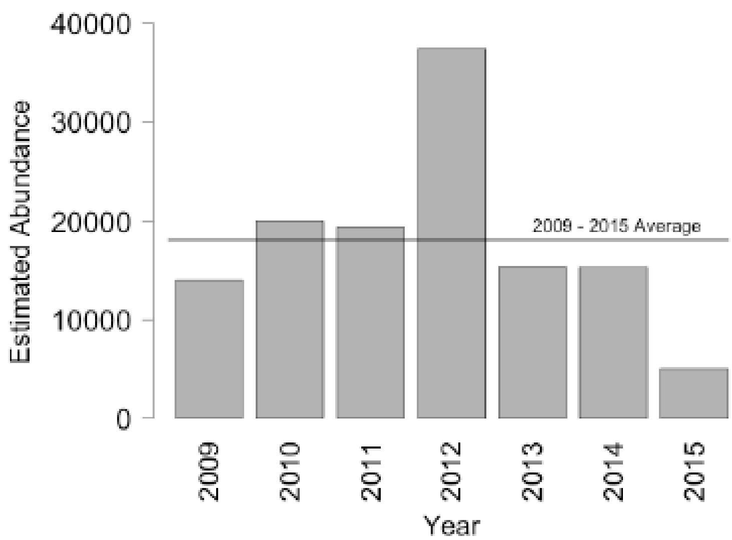
Figure 10-2. CV Steelhead In-Migration #s for the Stanislaus River



FISHBIO, Out-migrating *O. mykiss* captured in Oakdale rotary screw traps numbers (1996-2016) Unpublished Data

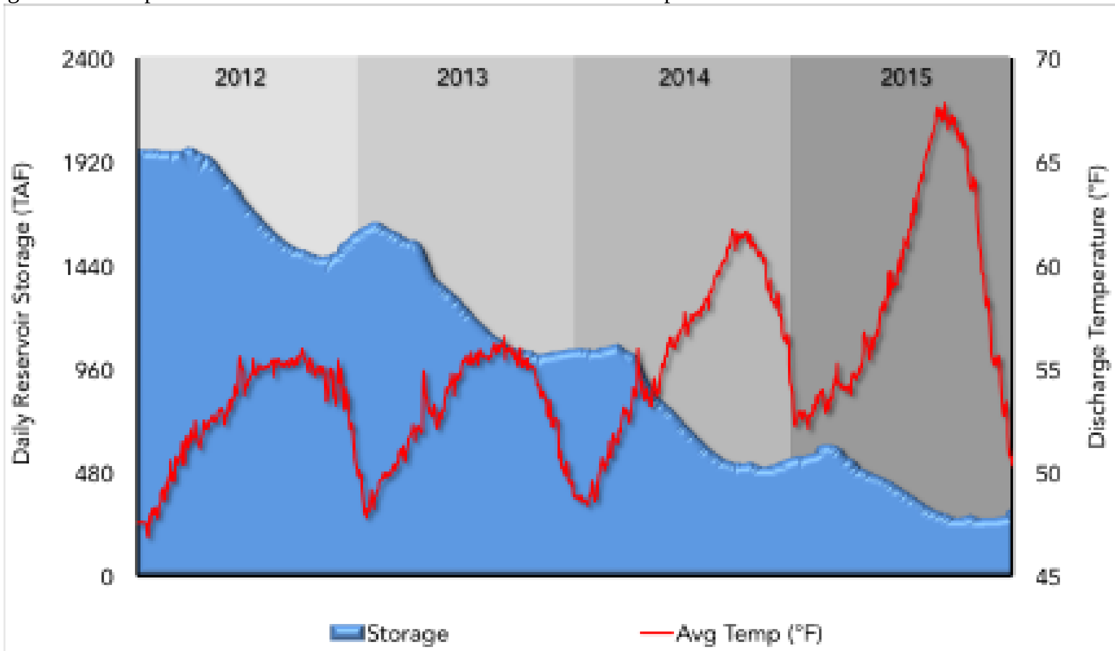
Finally, and most revealing is the precipitous decline of RRT. (Attachment 5, p. 4.)

Figure 10-3. # of Resident Rainbow Trout on the Stanislaus River



Why are RRT below an impassible dam so devastated by the 2009 NFMS BO Appendix 2e flows? The reason can be explained by the water temperature graph below. (Attachment 5, p. 10.)

Figure 10-4. Impact of New Melones Reservoir Levels on Water Temperature Below Goodwin Dam



As New Melones Reservoir declined the temperature of the water released from the outlet of the dam began and continued to increase. Water released at New Melones Dam makes its way through Tulloch Reservoir and then immediately downstream of Tulloch Reservoir flows over Goodwin Dam to the Stanislaus River. The majority of RRT in the Stanislaus are from Goodwin Dam to Knights Ferry. When water temperatures in the summer start to exceed 18° degrees Celsius (64° degrees Fahrenheit) at Goodwin Dam the RRT become stressed. Every summer of every year water temperatures increased and RRT populations declined.

As explained above, the SWB 40% UIF objective will only exacerbate this problem. In addition, while New Melones Reservoir never went broke in the recent drought, in any future drought it would. Thus, there would be no cold-water pool at all in New Melones.

If the USBR does not reinitiate formal consultation for the long-term operation of the CVP/SWP based on the proposed regulations of the WQCP it will "take" CV steelhead in violation of section 9 of the ESA. Section 9 states, "…with respect to any endangered (or threatened) species of fish or wildlife… it is unlawful for any person (including federal, state, and local governments) subject to the jurisdiction of the United States to… take any such species." (16 U.S.C. § 1538(a)(1)(B).) The operational requirements imposed on New Melones by the WQCP would create the potential for taking of CV steelhead without the issuance of an incidental take permit.

The Secretary of the Interior recently instructed the USBR and other state and federal agencies to complete the "recently reinitiated consultation" of long-term effects of the operations of the CVP/SWP. (Secretarial Order, January 3, 2017.) Are the objectives of the WQCP analyzed in the recent reinitiated consultation as project impacts? Moreover, how does the State intended to implement the WQCP against USBR's operation of the CVP? If not, will the USBR and DWR be required to ask for re-initiation of the consultation process to comply with 50 C.F.R. § 402.16 when the WQCP modifies current operations of New Melones that may affect CV steelhead and critical habitat? Does the SWB have to issue a water right order against USBR in order to meet the WQCP's objectives? If so and USBR finds that the WQCP "takes" CV steelhead without an incidental take permit, can USBR then refuse to comply with WQCP regulations?

12. Project Purpose

The Project Purpose of New Melones will be destroyed by the SWB Flow requirement.

As proposed, the State Water Board's WQCP will frustrate the public purpose of the New Melones Dam as authorized by Congress. The Reclamation Act of 1902, set forth the controlling law, whether State or Federal, pertaining to the operation of reclamation projects. It states, "[n]othing in this Act shall be construed as affecting or intending to affect or to in any way interfere with the laws of any State or Territory relating to control, appropriation, use, or distribution of water used in irrigation." (43 U.S.C. § 383.)

From the legislative history of the Act it is clear that state law was expected to control in two important respects. First, the Secretary of the Department of the Interior would have to appropriate, purchase, or condemn necessary water rights in strict conformity with state law. Second, once the waters are released from projects, their distribution to individual landowners would be controlled by state law. (35 Cong. Rec. (1902) 6678.)

Past cases analyzed the effect of congressional directives in relation to the language and legislative history of section 383 of U.S.C., granting authority to state law. Overwhelmingly the courts have held "a state limitation or condition on the federal management or control of a federally financed water project is valid unless it clashes with express or clearly implied congressional intent or works at cross-purposes with an important federal interest served by the congressional scheme." (*United States v. California, State Water Resource Control Bd.* (9th Cir., 1982) 694 F.2d 1171, 1177; *See also Ivanhoe Irrigation District v. McCracken* (1958) 357 U.S. 275, 291-292 [holding that section 383 of U.S.C. did not override the congressional directives in the Reclamation Act of 1902.]; *City of Fresno v. California* (1963) 372 U.S. 627, 630-631[holding that section 383 of U.S.C. did not require the Secretary of the Interior to ignore explicit congressional provisions preferring irrigation use over domestic and municipal use.]; *and California v. United States* (1978) 438 U.S. 645, 676 [holding a state may impose any condition on a federal reclamation project not inconsistent with congressional directives.].

As such, all conditions imposed on the operation of New Melones Dam by California are invalid if inconsistent with congressional directives. There is an array of congressional directives in federal reclamation law relevant to implementation of the WQCP/SED. "[F]ederal reclamation law is contained in the Reclamation Act of 1902, which, together with Acts amendatory and supplementary thereto, forms a complete legislative pattern in the field." (Solicitor Harper Opinion (May 31, 1945) M-33902 at p. 2.) Implementation of the regulations proposed in the WQCP are inconsistent with congressional directives in section 9, subdivision (c) of the Reclamation Act of 1939 and with section 203 of the Flood Control Act of 1962 authorizing construction of New Melones Dam.

The WQCP regulations will impact the operation of the New Melones Dam by letting the lake go dry. This is inconsistent with the express congressional directives of the Reclamation Act of 1939. Section 9, subdivision (c) of the Act provides, "[n]o contract relating to municipal water supply *or miscellaneous purposes*… shall be made unless, in the judgment of the Secretary [of the Interior], it will not impair the efficiency of the project for irrigation purposes." (Reclamation Act of 1939, § 9, subd. (c) [emphasis supplied].)

As set forth above New Melones does not have a viable plan of operation under current conditions. The current contractual and regulatory obligations on New Melones have the reservoir going to zero in the 1928-1934, 1987-1992, and 2011-2016 droughts. The current releases for the 2009 NFMS BO, Appendix 2e flows are too great. Set forth below are the releases that occurred in the recent drought. It shows the percentage of releases February – June and for the entire year. (Attachment 1, p. 19.)

Figure 11-1. Stanislaus River Runoff and River Release

Stanislaus River Runoff and River Release

WY	OCT–JAN	FEB–JUN	JUL–SEP	Total
2011 Release	95	430	339	863
Runoff	417	1,537	278	2,231
		Release as % of Feb-Jun Runoff 28%		39%
2012 Release	241	277	59	577
Runoff	100	495	29	624
		Release as % of Feb-Jun Runoff 56%		92%
2013 Release	100	289	42	431
Runoff	194	409	24	627
		Release as % of Feb-Jun Runoff 71%		69%
2014 Release	81	225	43	349
Runoff	26	289	20	336
		Release as % of Feb-Jun Runoff 78%		104%
2015 Release	76	94	28	198
Runoff	63	253	10	326
		Release as % of Feb-Jun Runoff 37%		61%
2016 Release	73	212	40	326
Runoff	159	885	38	1,081
		Release as % of Feb-Jun Runoff 24%		30%

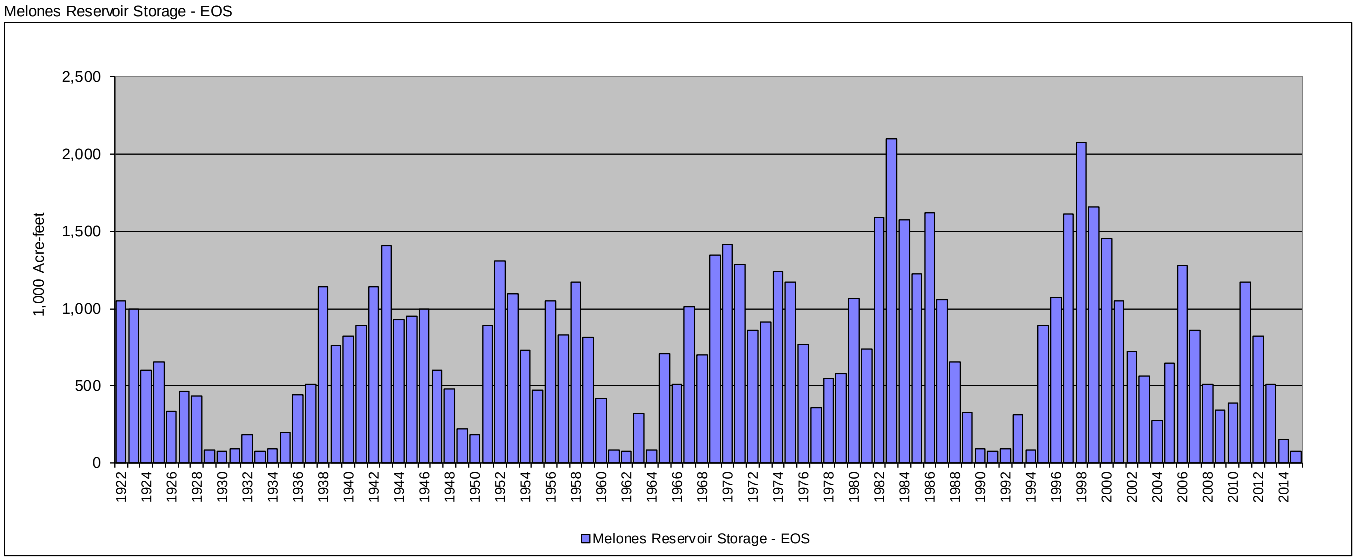
All values 1,000 acre-feet unless otherwise noted (UF and release at Goodwin Dam)

This is not sustainable.

The Districts' modeling shows the impacts from the combination of the 2009 NMFS BO, Appendix 2e flows and 40% UIF bypass for February – June. It is important to remember the SWB flow objective is additive to the 2009 NFMS, Appendix 2e flows. Thus, whatever flow prescription is higher will be released or bypassed[10]. The Districts' analysis results in the following storage for New Melones.

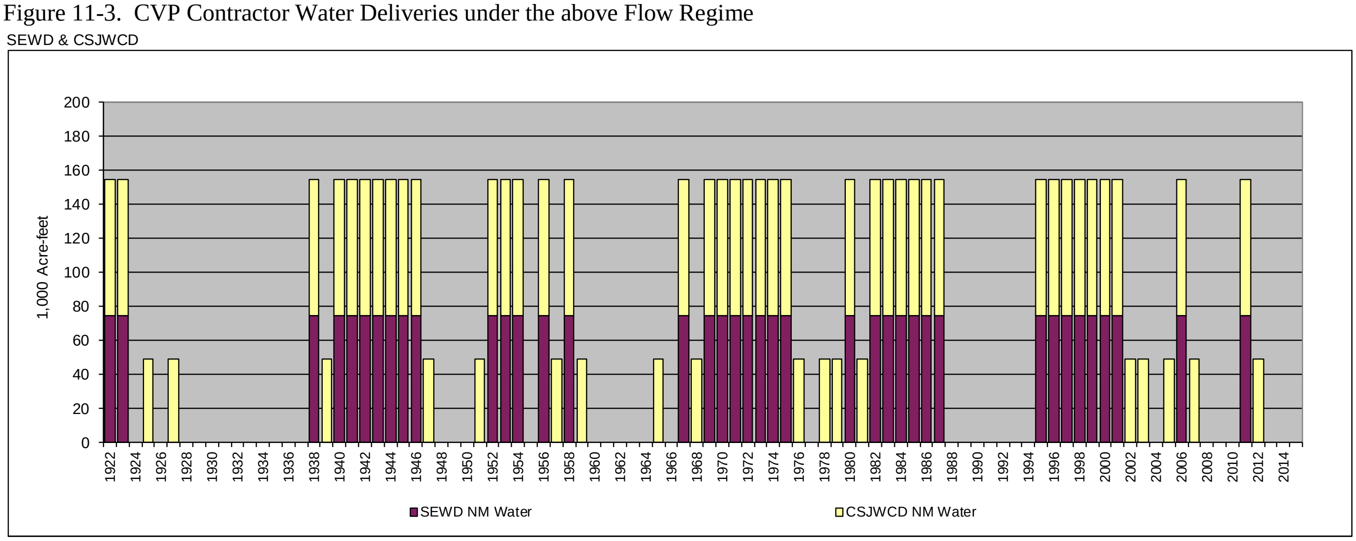
[10] The distinction between release and bypass is important. 40% UIF is a bypass of the inflow. 2009 NFMS BO, Appendix 2e can be a release of stored project water.

Figure 11-2. New Melones Storage Under 2009 NMFS BO and Appendix 2e Flows with 40% UIF Bypass



New Melones Reservoir now goes to zero water in approximately 10 years out of 95 years. This means water is not delivered to CVP customers for irrigation in the many years and more due to the physical reality of no water or the rules that guide CVP customer allocations. The deliveries to CVP contractors are set forth below.

Figure 11-3. CVP Contractor Water Deliveries under the above Flow Regime



The project as designed, authorized, funded, and built was to deliver 55,000 afa of firm water to CSJWCD, in the Stanislaus Basin. There can be no dispute that the WQCP will not deliver a firm supply of 55,000 afa to CSJWCD.

Additionally, the State's WQCP regulations will impact New Melones' ability to generate hydropower as congressionally mandated by the Flood Control Act of 1962. The plan for a reservoir on the Stanislaus River was first introduced in Congress in the Flood Control Act of 1944. When first introduced, appropriations for the dam did not include a hydropower facility. In House Document 367, 81st Congress, 1st session, the Chief of Engineers of the U.S. Army recommended that power generating facilities be constructed concurrently with and as part of New Melones Dam to more fully develop the water resources of the Stanislaus River. New Melones Dam with a power generation component was subsequently approved in the Flood Control Act of 1962. While there is no express congressional directive that New Melones be used as a power generation facility for the CVP, it is clear from the legislative history that power generation is an implied directive from Congress.

OID and SSJID concur with the Western Area Power Administration's (WAPA) general comment that the SED does not adequately identify or address the impacts the proposed 40% UIF would have on CVP power generation. WAPA evaluated the potential impacts on the regional hydropower system associated with alternative unimpaired flow standards. It concluded if a 40% UIF regime standard were imposed upon the CVP for both Sacramento and San Joaquin River systems, the total hydropower generation output of the project would be reduced by approximately thirty percent.

A hydropower generation reduction of this magnitude would have **major impacts** on CVP operations. Yet, the SED concludes the WQCP 40% UIF regime results in less than significant impacts on hydropower production. The proposed standards would require increased releases from reservoirs during spring runoff months, which translates to less hydropower generation during peak summer months. This results in (1) loss of financial value, (2) potential need to purchase power on the market during peak summer months, and (3) increased reliance on out-of-state power. These are significant impacts that need to be addressed and highlight the importance of the congressional directive to include hydropower production in CVP facilities.

In addition to the project purpose of irrigation and hydropower, Congress directed public recreation and preservation and propagation of fish and wildlife. The recent drought is illustrative of how public recreation was devastated at New Melones. Visitor days trickled down to almost nothing as the reservoir dropped. Local communities, like Sonora, that rely on selling gas, food, fishing supplies, etc. were especially hard hit. In the last two years of the drought the New Melones Reservoir was a ghost town. With the regulatory drought of the SWB 40% objective, public recreation will cease to exist in 90% of the years.

We will briefly address fish and wildlife here in regards to the fishery in the reservoir. The reservoir fishery was devastated in the recent drought. The SWB WQCP will continually suppress the reservoir fishery, which will suppress public recreation because there are no fish to catch. We will further address fish and wildlife impacts downstream of Goodwin Dam in the ESA section.

If the State's WQCP is challenged in court, it is likely its proposed regulations and provisions would be found inconsistent with the congressional directives relating to New Melones. In *United States v. California, State Water Resource Control Bd.*, the USBR challenged the conditions placed on its water right permit for management of New Melones. (*SWRCB.*, 694 F.2d 1171.) However, USBR refused to present evidence of the impracticality or harmful consequences of the SWRCB's conditions on the congressional directives for New Melones. It took the position that "since it built the dam it need not justify its operational plans so long as those plans are consistent with the scope of the project as envisioned by Congress." (*Id.* at 1174.) As a result, the court held "[w]e find nothing in California's conditions that cannot be in harmony with the letter and spirit of the 1962 statute **given the failure of the United States (USBR) to introduce evidence to show the existence of facts that might dictate a contrary result**." (*Ibid.* [emphasis supplied].)

The present issue is distinguishable from *U.S. v. SWRCB*, in that there is a plethora of facts highlighting WQCP's inconsistencies with Congress' directives from the Reclamation Act of 1939 and Flood Control Act of 1962. It can be shown under the WQCP New Melones water use and releases will be significantly affected. For example, diversions to CVP contractors will be reduced by the states action. Under the WQCP's baseline CVP contractors receive 107 (TAF) annually, however, under a 40% UIF regime CVP contractors will receive 74 (TAF) annually. (Attachment 1, p. 2, 8.) This action alone stands as an obstacle to the accomplishment of an important federal interests served by New Melones Dam.

Moreover, the Supremacy Clause of the Constitution will be implicated if the WQCP is adopted, and federal reclamation law will preempt critical portions of the of the regulations relating to New Melones, leaving the WQCP un-implementable. The Constitution's Supremacy Clause states, "[t]his Constitution, and the laws of the United States which shall be made in pursuance thereof… shall be the supreme law of the land; …anything in the constitution or laws of any state to the contrary notwithstanding." (U.S. Const., art. VI.) The Supreme Court ruled that, in order for federal preemption to apply "Congress' command must be explicitly stated in the statute's language or implicitly contained in its structure and purpose." (*Jones v. Rath Packing Co.* (1977) 430 U.S. 519, 525.) Therefore, a state statute or regulation is preempted by a federal rule when it conflicts with a federal statute, or where it stands as an obstacle to the accomplishment and execution of a full purpose and objective of Congress. (*See Maryland v. Louisiana* (1981) 451 U.S. 725, 747; *Perez v. Campbell* (1971) 402 U.S. 637, 649.)

The regulations placed on New Melones pursuant to the State's amended WQCP are inconsistent with the express and clearly implied congressional directives dictating the public and project purposes served by New Melones Dam. The SWB much fully implement its water quality control plan. (Water Code § 13247.) However, as written it will be impossible to implement the WQCP because it stands as an obstacle to Congress' intent behind constructing the New Melones Dam. Both the Reclamation Act of 1939 and the Flood Control Act of 1962 preempt the WQCP and may stop its implementation.

a. HydroPower Impacts

The SED's analysis of the WQCP's impacts on hydropower production fails to disclose the real impacts of implementing the LSJR Alternatives on hydropower facilities located on the Stanislaus River. SWB staff include refill in their analysis of reservoir levels, which keeps storage levels artificially high. The SED's figures depict approximately 700,000 acre-feet of storage in New Melones Dam in many dry years. This is an artificial condition incorporated into the model and serves to mask the impacts of sequential dry years. The SWB staff used these figures to estimate the effects of the WQCP on hydropower generation, but only on the "rim dams". (SED, at J-15.) The SED's focus on the impacts to the New Melones Dam ignores the cumulative impacts a 40% UIF regime will have on upstream and/or downstream reservoirs.

Tulloch Dam and New Melones Dam on the Stanislaus River illustrate how the SED's averages (including refill) do not reveal the true impacts and why upstream and downstream facilities should be analyzed in the SED. The average reduction in hydropower at Tulloch Dam under a 40% UIF is 2,871 megawatt hour (MWh) annually. At the current price of $69 per MWh this equates to an annual loss in revenue of $198,144. However, if a 40% UIF had been implemented on Tulloch Dam in 1931, it would have resulted in a loss of 47,951 MWh, equating in a **revenue loss of $3,308,619**. A sequential dry year cycle sheds further light on the hidden impacts behind the SWB's misleading averages. Looking at Tulloch Dam figures between 1987-1992 shows a net loss of 57,276 MWh, resulting in a loss of $3,952,044 in revenue. (Attachment 10.)

The impacts on New Melones Dam during a critically dry year and sequential dry years further highlight the significant impacts a 40% UIF regime will have on hydropower. If a 40% UIF had been implemented on the Stanislaus River in 2015, it would have resulted in a net loss of 195,510 (MWh) at New Melones, equating to a **revenue loss of $6,096,017**. When you look at two different sets of sequential dry years (1987-1992 and 2011-2016) the impacts of a 40% UIF exceed those on Tulloch Dam. Between 1987-1992, New Melones would suffer a net loss of 288,846 MWh and $19,930,374 in revenue. Looking at more recent sequential dry years 2011-2016, New Melones would suffer a net loss of 670,882 MWh and $46,290,858 in revenue. (Attachment 11)

Moreover, these losses in hydropower generation would need to be offset, most likely by use of gas turbines or coal fired power plants, thus increasing greenhouse gas emissions (GHG) within the state. Table 14-14 and Table 14-15 (SED, at 14-36 – 14-37) illustrate the increase in GHG emissions due to the loss of hydropower generation and the resulting reliance on alternative energy sources. Just within the Turlock Irrigation District Service Area offsetting the loss of hydropower is anticipated to increase emissions of Carbon Dioxide by 139.69 pounds per megawatt hour (lb/MWh). Total GHG emission increases within the plan area to compensate for the loss of hydropower and for increased groundwater pumping is 16,948 metric tons of Carbon Dioxide per year.

Once again, the SWB's numbers hide the true impact the loss of hydropower will have on GHG emissions. In 2014, for the California region, the total annual emissions output for GHG was 619.6 pounds of Carbon Dioxide generated per megawatt hour (lb/MWh). (USEPA eGRID2014.) Based on the figures above, **the GHG emissions increase to offset the loss of hydropower production from only Tulloch Dam in a critically dry year amounts to 13,483 metric tons of Carbon Dioxide**. To put this number into context, in 2015 the Almond Power Plant in Modesto reported emitting 104,448 metric tons of Carbon Dioxide. (USEPA, Facility Level Information on GreenHouse gases Tool.) Thus, the lost output from Tulloch Dam alone results in a 10% increase in a single power plant's Carbon Dioxide emissions.

The increase in greenhouse gases to offset the loss of hydropower at New Melones Dam is even greater. **In sequential dry years (2011-2016) the Carbon Dioxide emissions output to offset the loss of hydropower is 188,640 metric tons or an average of 31,440 metric tons per year.** We have not run the figures on facilities located on the Merced and Tuolumne Rivers, however, it is foreseeable a similar result would occur. As such, when you take into account the lost output of other regional hydropower facilities, Carbon Dioxide emissions at a single power plant may increase by more than 50% in dry years if a 40% UIF regime is implemented.

The SED also assumes in its analysis that in-stream facilities located downstream of the rim dams have constant reservoir elevations equal to the maximum head of the reservoir, as these facilities are generally run-of-the-river. (SED, at J-4.) This assumption, however, masks the impacts of sequentially dry years. If water needs to be bypassed upstream to meet the 40% UIF this results in lower reservoir elevations, lower reservoir head, less efficient release through turbines, and less energy production. While SWB's assumption that downstream dams have constant reservoir levels is correct during many years, it is incorrect during critically dry years and sequential dry years as demonstrated by the Tulloch Dam and New Melones Dam figures (Attachments 10, 11.)

Similarly, upstream hydropower facility impacts are ignored. For example, if 1,000 cfs is required at New Melones in order to obtain a 40% UIF and upstream reservoirs are storing water, will the SWB require upstream reservoirs to bypass inflow to meet the 40% UIF and downstream senior water rights holder demand? If so, this result is the same dilemma downstream facilities will face: lower reservoir elevations, lower reservoir head, less efficient release through turbines, and less energy production. As the impacts to hydropower generation, revenue, and GHG emissions are significant on ALL hydropower facilities, CEQA mandates the SWB analyze and disclose these impacts, not just those of the "rim dams".

13. Technical Comments

Chapter 2: Water Resources

Section 2.5.1, first paragraph, second sentence, should read, "The Stanislaus River originates in the high elevations of the Sierra Nevada and flows into the LSJR at Vernalis, located approximately 11 miles southwest of the City of Ripon ~~approximately 3 miles upstream of Vernalis at Ripon~~. (SED, at 2-25.)

Section 2.5.1, second paragraph, first sentence, should read, "The New Melones Dam, the only ~~major~~ CVP dam on the Stanislaus River, is located just downstream of the confluence of the river's three forks. (SED, at 2-25.)

Section 2.5.1, second paragraph, third sentence, should read, OID and SSJID "divert water from the Stanislaus River both upstream and downstream of New Melones for the purpose of generating ~~and generate~~ hydropower, which they sell to the City of Santa Clara ~~California Independent System Operator (CalISO)~~. (SED, at 2-25.)

Section 2.5.1., second paragraph, should reflect that there are other small diverters on the Stanislaus River in addition to the ones noted. (SED, at 2-25.)

Section 2.5.1, third paragraph, first sentence, should read, "The Stanislaus River has 28 dams under DSOD jurisdiction storing an approximate 2.8 MAF of water; these include the New Melones, Tulloch, and Goodwin Dams and several small dams ~~both~~ upstream ~~and downstream~~ of New Melones." Other than Goodwin and Tulloch, there are no dams on the Stanislaus downstream of New Melones.

Section 2.5.1, fifth paragraph, the following sentence should be deleted because it is an incorrect statement: "~~Goodwin Dam also creates a reregulating reservoir for peaking power releases from Tulloch power plant.~~" (SED, at 2-26.)

Section 2.5.2, second paragraph under heading of Oakdale Irrigation District heading, first sentence, should read, "Surface water is nominally supplemented by groundwater pumping from 22 groundwater wells located throughout the district on both sides of the Stanislaus River~~, especially during dry periods when water supplies are limited~~. The average annual pumping rate is 8,000 AF/y from these wells. ~~Approximately 8,000 AF/y is pumped from these wells in dry years~~. (SED, at 2-27.)

Section 2.5.2, second paragraph under heading of Oakdale Irrigation District, should also include the following sentence, "OID installed a few wells in the 1950's for the purpose of controlling shallow water tables in localized areas but does not use them today for that purpose." (SED, at 2-27.)

Section 2.5.2, second paragraph under heading of Oakdale Irrigation District, last sentence, states, "Over the last 10 years, these domestic wells have produced approximately 1,000 AF/y." It is not clear what domestic wells are being referenced in this statement. (SED, at 2-27.)

Section 2.5.2, second paragraph under heading Stockton East Water District, last sentence, should read, "This agreement ended in 2009, ~~but~~ was extended ~~beyond~~ into 2010 and then termed out at the end of 2010. The original agreement ended and there is no provision to extend the contract without establishing a new contract and new terms ~~may be renewed pending further studies~~." (SED, at 2-28.)

Section 2.5.2, first paragraph under heading Central San Joaquin Water Conservation District, last sentence, should read, "On occasion, SSJID ~~and OID have also~~ has made water available to CSJWCD for irrigation." (SED, at 2-29.)

Section 2.5.2, first paragraph under heading Tri-Dams Project, second sentence should read, "Together they funded, developed, operate, and maintain the Beardsley, Donnells, and Tulloch projects (collectively the Tri-Dam Project), and also the Sand Bar Project, including the dams, tunnels, penstocks, power houses, communications systems, and general offices." (SED, at 2-29.)

Chapter 5: Surface Hydrology and Water Quality

Section 5.2.5, second paragraph under heading Unimpaired and Historical Flow, the second and third sentences should be replaced as follows: "~~SSJID and OID jointly hold right with USBR to divert 600 TAF when the projected annual inflow to New Melones is greater than 600 TAF. OID and SSJID have an agreement to equally divide the available water, each receiving 300 TAF.~~ Prior to construction of the New Melones Dam and Reservoir by the USBR, and as part of the condemnation of (Old) Melones Reservoir, OID and SSJID entered into a 1972 Stipulation and Agreement with USBR. Pursuant to the 1972 Stipulation and Agreement, USBR agreed to operate New Melones Reservoir by ensuring that a total of 654,000 acre-feet per year was available to OID and SSJID in recognition of their senior, jointly-held water rights of 1,816.6 cfs (adjudicated in 1926). In 1988, OID and SSJID renegotiated the 1972 Stipulation and Agreement with the USBR. Under the 1988 Agreement, USBR agreed to operate New

Melones Reservoir by ensuring that a maximum of 600,000 acre-feet per year was available to OID and SSJID in recognition of their adjudicated water rights of 1,816.6 cfs. Based on an even split of the available supply, 300,000 acre-feet of water is available to both OID and SSJID each year. Under the terms of the 1988 Agreement, OID and SSJID agreed to forego 54,000 acre-feet per year of water in exchange for an obligation from the USBR to make up 33 percent of any deficiency below 600,000 acre-feet per year. In years when the inflow into New Melones Reservoir is less than 600,000 acre feet, the Districts' entitlement is set forth as follows: Annual Entitlement = Inflow + [600,000 acre-feet – Inflow] / 3." (SED, at 5-26.)

Section 5.2.5, second paragraph under heading Unimpaired and Historical Flow, should reflect – in accordance with Section 2.5.2 (pp. 2-28 to 2-29) – that SEWD has a contract with USBR for 75,000 acre-feet per year, and that CSJWCD has a contract with USBR for 80,000 acre-feet per year, with 49,000 as a firm supply and 31,000 as an interim supply. (SED, at 5-26.)

Section 5.2.5, second paragraph under heading Unimpaired and Historical Flow, states, "The maximum diversion from the Stanislaus River is therefore 755 TAF/y. This represents approximately 67 percent of the average unimpaired Stanislaus River runoff of 1,120 TAF/y." (SED, at 5-26.) Dividing the *maximum* allowable diversion by the *average* inflow for the Stanislaus River is improper and incorrectly reflects the percentage of water diverted by the Districts. Maximum values should not be mixed with averages when performing these computations.

Section 5.2.5, third paragraph under heading Unimpaired and Historical Flow, states, "The inflow to New Melones is seasonally shifted from the unimpaired flow by the upstream hydropower operations. The annual inflow to New Melones is about the same as the unimpaired runoff because, although there are several upstream storage reservoirs for hydroelectric generation, there are no major upstream diversions for consumptive uses." (SED, at 5-26.) Please provide a citation for these statements.

Section 5.2.5, fourth paragraph under heading Unimpaired and Historical Flow; please identify where the unimpaired flow measurement is determined on the Stanislaus River for the years 1922 to 2003. It could be added to the Heading for Table 5-10a as was done in Table 5-10b which identifies Ripon as the measurement point.

Section 5.2.5, fourth paragraph under heading Unimpaired and Historical Flow, to the extent that median values are compared to average (or mean) values, such comparison is improper.

Section 5.2.5, fifth paragraph under heading Unimpaired and Historical Flow, compares a series of events that occurred between 1922 and 2003 to a series of events that occurred between 1985 and 2009. Since conclusions are going to be drawn from these comparisons, the time periods should be the same.

Chapter 9: Groundwater Resources

This chapter describes groundwater conditions in the region and cites many conflicting studies. While acknowledging DWR designations of high priority and critically over drafted basins, the chapter contains many incomplete statements that seem to imply that the groundwater condition is not as serious as the DWR designations would imply. Some examples and comments related to these statements are provided below:

9-24, middle of third paragraph: "As of 2010, there was a fairly large cone of depression centered east of Stockton below SEWD and CSJWCD service areas (Figure 9-3). However, this cone of depression is not as severe as it once was; between 2005 and 2010, groundwater elevations within some portions of this area showed some signs of improvement (Figure 9-4)." Careful examination of Figure 9-4 also shows a portion of this area (directly east of Stockton on the eastern boundary) where groundwater elevations have dropped by 10 and 20 feet.

9-26 middle of first complete paragraph: "SEWD has continued a conjunctive use management approach; between 2011 and 2014, SEWD pumped no groundwater." What were the SEWD surface water supplies during these years? Even though SEWD did not pump groundwater, the growers inside SEWD likely pumped sufficient groundwater to meet the needs of their agricultural analysis (See DE NDVI analysis for confirmation of this).

Chapter 9, p. 9-15, Figure 9-2—Conceptual figure is missing a flow path. There should be a line from irrigated crops to the river representing tailwater.

Discussion of irrigated lands with respect to groundwater impacts and irrigation districts implies similar surface water supplies and reliability with respect to irrigated crop demands. This downplays the groundwater impacts of the reduced surface water. Specifically, the analysis as described in Appendix G on page G-14 states: "The SEWD and CSJWCD analysis focused only on the portion of the CVP contract delivery that could come from the Stanislaus River. The other water used by these districts would not be affected by the LSJR Alternatives. If no Stanislaus River water is available to these districts, then it is assumed there would be enough groundwater pumping capacity to fully replace any lost surface water supply, …" This essentially means there is no impact to SEWD and CSJWCD, is this a reasonable assumption when the subbasin is designated as a critically over drafted basin?

Nearly all of the shortcomings noted above tend to under-estimate agricultural water supply shortages, suggesting a desire to minimize, or understate, unavoidable negative impacts to water supplies and agricultural production that would be caused by the LSJR alternatives (or a pre-existing belief that impacts to irrigated agricultural will be small). Furthermore, and likely far more important, is the State Board assume that large quantities of groundwater, in aggregate far exceeding those used historically, will be available to offset the reductions in surface water supplies that will unavoidably result from the LSJR alternatives. In fact, when the Sustainable Groundwater Management Act takes effect, allowable quantities of pumping are likely to be less than those pumped historically, not more. Consequently, the State Board's failure to incorporate the effects of SGMA into baseline conditions likely results in a gross understatement of the unavoidable, negative effects of the LSJR alternatives. Until the impacts of the alternatives are correctly assessed, it is impossible to have a fair, rational public policy discussion.

Effects of Not Incorporating the Sustainable Groundwater Management Act (SGMA) into Baseline Conditions

In Chapter 9 – Groundwater Resources, Section 9.2, the SED describes groundwater conditions in the seven subbasins in the plan area, with a primary focus on the four subbasins in the study area. The four subbasins are the East San Joaquin, Modesto, Turlock and Merced, all four of which are designated by DWR as high-priority subbasins, with the East San Joaquin and Merced subbasins designated as basins with critical conditions of overdraft. However, Table 9-4 (SED, at 9-17) and the supporting text describes declining groundwater conditions in all four subbasins, and provides estimates of rates of overdraft for each. In each subbasin, overdraft tends to be more severe in the areas outside of the irrigation districts than within; however, groundwater levels in all four irrigation districts have declined over recent years.

Chapter 9 also describes the existing regulatory environment within which groundwater is managed, acknowledging that the Sustainable Groundwater Management Act (SGMA) is part of existing regulations. In general, SGMA requires that subbasins be managed sustainably, meaning that overdraft conditions will not be permitted to continue. Chapter 9 also describes the general authorities granted to local agencies that elect to become Groundwater Sustainability Agencies (GSA), including the authority to "control groundwater extractions by regulating, limiting, or suspending extractions from wells." (SED, at 9-2, last paragraph). From this, it is evident that the SWRCB foresees future limitations on groundwater production relative to historical conditions as a means of achieving sustainable management in the four groundwater subbasins, and in the irrigation districts.

After acknowledging the likely effects of SGMA, the SED states: "However, since the groundwater protections that will be afforded by SGMA cannot be determined at this time with precision, this chapter evaluates the potential impacts on groundwater levels from LSJR alternatives ***without*** including SGMA as an ameliorating factor, which means that estimates of impacts are likely more conservative (i.e., worse) than would occur in the groundwater basins over time (emphasis added)." The fact that the SWRCB elected to leave SGMA out of the baseline is incredible on its own; however, the statement that doing so results in conservative (worse) estimates of impacts is contrary to the Board's own assessment. It would appear from this statement that the SWRCB rationalizes that the "groundwater protections that will be afforded by SGMA", rather than limiting future groundwater extractions, will somehow enable the vast increases in pumping it assumes to be possible to offset the reductions in surface water supplies due to the LSJR alternatives. Because SGMA will reduce the volumes of groundwater that can be extracted in the future, not increase them, the SWRCB has adopted an unrealistic, seriously flawed baseline condition, resulting in the effects of the proposed LSJR alternatives being vastly understated, not overstated.

Chapter 11: Agricultural Resources

Table 11-2 (California Department of Conservation's Land Use Classification Acreages in the LSJR Area of Potential Effects): OID's service lands receiving irrigation water have expanded by 10,000 acres since the DOC 2012. Thus, Table 11-2 is incorrect based on those changes. Since most of the additional land is foothill soil, it will likely fall in the Farmland of Local Importance category. (SED, at 11-11.)

Table 11-5 (Crop Production in the LSJR Area of Potential Effects by DAU) and Table 11-6 (Crop Production in the LSJR Area of Potential Effects by DAU (Percent)): The crop production values for OID are significantly in error. Further explanation is provided in the comments to Appendix G. (SED, at 11-17 to 11-18.)

Table 11-12 (Average Annual SWAP Baseline Acreage and Percent by Crop Category for Each Irrigation District): The crop acreages for OID are incorrect. Further explanation is provided in the comments to Appendix G. (SED, at 11-42.)

Appendix F

Table F.1.2-11 (Calculation of Deep Percolation Factors and Distribution Loss Factors):

The Operational Spills/Returns (OS) value for OID is incorrect. The number should be 16,826 acre feet, instead of 48,884 acre feet. The former number is the operational spill from the canal delivery system and the latter number is total surface water drainage leaving OID. The 48,884 acre-feet goes to other irrigation districts for reuse; a nominal amount goes down the river. (SED, at F.1-21.)

OID's Sphere of Influence Deliveries (SOI) should be 40,000 acre-feet to reflect water sold to State and Federal water contractors on the west side of the San Joaquin River. The sold water is used to irrigate crops, and should be treated the same as sales by Merced ID, whose SOI is listed as 74,712. (SED, at F.1-21.)

The changes to OS and SOI will result in changes to the Distribution Loss Factor. (SED, at F.1-22.)

Appendix G

There are several issues with the crop distribution computations in G.4.2. First, the number of irrigated acres were taken from the various AWMPs of the irrigation and water districts. Although the AWMPs contain crop distribution data from recent years, that data was not used. Instead, "the crop distribution and applied water rates [were] based on DWR DAU data" for all irrigation districts except SEWD and CSJWCD. Table G.4-2 indicates that DWR has not surveyed some of the land for DAU purposes since 1996. (SED, at G-45.) The most recent DWR survey was 2004. (Table G.4-2.) This data was then used to compute estimated 2010 crop distribution within the Districts. (SED, at G-46; Table G.4-3.) This older data is of little value for determining current crop distribution. California agriculture is moving toward higher value crops, and has been for several years, due to rising operating costs. Some crops grown in 1996 are no longer profitable in today's market. Utilizing this older crop distribution data underestimates the impacts of the project. The recent crop distribution data from the AWMPs should have been used in order to more accurately assess the impact of the project on agriculture. The differences can be significant. (SED, at Appx. G, Attachment 1, Tables 3 &4, pp. 3-5.)

Modeling Comments

Appendix G describes the methods used to estimate changes (reductions) in applied water associated with the LSJR alternatives. Estimated reductions in applied water are then used as a basis for estimating economic impacts in terms of reduction in irrigated area, changes in cropping patterns and reduction of crop production. This review focuses on the methods for estimating applied water requirements presented in Appendix G. Those methods do not follow generally accepted technical approaches and terminology, such as those described in the first edition and the recently released second edition of Manual 70 Evaporation, Evapotranspiration and Irrigation Water Requirements of the American Society of Civil Engineers (ASCE) series of Manuals and Reports on Engineering Practice (ASCE 2016) and peer reviewed literature on modeling of irrigation distribution and on-farm systems. Additionally, in spite of using basic information reported by the various irrigation districts that divert from the Stanislaus, Tuolumne and Merced Rivers in their respective Agricultural Water Management Plans (AWMPs), the methodology does not utilize accepted performance indicators, such as the Crop Consumptive Use Fraction (CCUF) and Delivery Fraction (DF), cited in many of those AWMPs. These performance indicators are described in the California Department of Water Resources' (DWR's) 2012 report to the Legislature titled "A Proposed Methodology for Quantifying the Efficiency of Agricultural Water Use."

A primary shortcoming of the methodology described in Appendix G is not including on-farm losses to tailwater (Appendix G, pg. G-10 and in Appendix F, pg. F.1-21 in Table F.1.2-11). Not including these losses in the determination of water demands means that the actual water supply shortages (and, therefore economic impacts) caused by the LSJR alternatives would be greater than those reported in Appendix G. Additional problems and shortcomings of the methodology used to estimate water demands include:

1. The methodology assumes (SED, at Appx.G-10, section G.2.1.4 Crop Surface Water Demand, equation at bottom of page uses Deep Percolation Factor that does not include tailwater) that all groundwater pumping is applied directly to irrigated lands. In fact, the groundwater pumping volumes used in the analysis include district groundwater pumping, most of which is discharged to the district distribution system. Deep percolation is the only loss from groundwater pumping that is accounted for in the analysis. Tailwater losses from groundwater pumping applied directly to irrigated lands and evaporation and seepage losses from groundwater pumping discharged to district distribution systems should also be accounted for.

2. Appendix G states (SED, at Appx.G-7, first sentence Spills/Returns section) that "estimates of spills and returns come from CALSIM II." But the methodology uses operational spills reported in the AWMP (SED, at Appx. F F.1-21; Table F.1.2-11).

3. For the portion of the Oakdale Irrigation District (OID) north of the Stanislaus the distribution loss factors are assumed to be the same as those used for South San Joaquin Irrigation District

(SSJID). No justification is provided in the text, but in the spreadsheet “GW and SW use analysis 09142016.xlsx”, tab “Input Parameters”, cell F9, the comment states: Nelson, Timothy@Waterboards: Used the same loss factor as SSJID as OID north shares much of the same distribution system.” This statement is incorrect. OID north does NOT share much of the same distribution system as SSJID. In fact, the OID north distribution is completely independent of the SSJID distribution system except for a few miles of main canal immediately downstream of the reservoir. Additionally, the OID north distribution system is operated completely independent from the SSJID distribution system. The OID south distribution factor should be used for OID north. Using the SSJID distribution system, under estimates distribution system losses in OID, thus, impacts are underestimated.

4. Appendix G states (SED, at Appx. G-10, section G.2.1.4 Crop Surface Water Demand) that "…the total consumptive use demand for each irrigation district, C_{dem}, …is based on CALSIM II data." Additional description of how the CALSIM II data is developed should be provided. Upon inspection of the WSE model from which the C_{dem} data is obtained, one finds that the "total consumptive use demand" is the consumptive use of applied water (CUAW) and, furthermore, this value is "adjusted" before it is used in the methodology. Additional explanation of why the adjustment is needed and how it was done should be provided.

5. The variability in the adjusted CUAW is less than that reported in district AWMPs. For example, although, through the adjustment process, the average adjusted CUAW is reasonably close to the average ETaw reported in district plans, the ETaw reported in dry years is greater than the adjusted CUAW. Conversely, the ETaw reported in wet years is less than the adjusted CUAW. This results in an under estimation of water supply shortages, and therefore economic impacts, in dry years.

6. Calculation of Monthly Surface Water Demand: Appendix F states that "CUAW was calculated by USBR for various regions through the plan area using the DWR consumptive use model (USBR 2005) and is an input to CALSIM II." (SED, Appx. F1, p. F.1-19.) In reviewing the CALSIM II documentation referenced, i.e., USBR 2005, it appears that DWR's CU program is used to calculate the CUAW for CALSIM II. The document states, "The CU model does not currently consider temperature or other meteorological data in its determination of CUAW. The ET data in the current CU model is based on 1976 evaporation values." (USBR 2005, p. 25.) This raises the question, if CUAW uses the same single year of evaporation values for every year of the analysis, then what drives the annual variability in total CUAW. Another question is whether CUAW is based only on precipitation. A better approach to calculating CUAW would be to use the historical climate data. A historic time series of reference ET could be developed, and CUAW calculated for each month a year based on both climatic demand and precipitation in that year.

7. For SSJID, the comment in WSE_model09132016, tab "CUAW-CalSim", cell N4 says "Tim: Degroot WTP demand was not included in SWRCB CalSim. This was added based on information in the SSJID 2012 AWMP." The SSJID AWMP avg 2005-2009 value of 15,700 is distributed equally across 12 months in column N. This value is used in tab "% CUAW met" as the "off the top" M&I demand on the Stanislaus River. This number is too small as the Degroot Demand is projected to increase to 43,000 acre-feet. Thus, by using 15,700 acre-feet for this M&I demand, the M&I Demand "off the top" is underestimated and the impacts on groundwater pumping are also under estimated.

8. Appendix F, p. F.1-20, Figure F.1.2-2—Conceptual figure is missing a flow path. There should be a line from irrigated crops within irrigation districts to the river representing tailwater.

9. Naming and labeling across Appendices F and G and spreadsheets GW and SW use analysis 09142016.xls and WSE_Model 09132016.xls are inconsistent. Some examples of such inconsistencies include:

    a. GW and SW use analysis 09142016.xls, tab "Input Parameters", cells B8, B9 and B10

        i. In cell B8, Crop Deep Percolation factor appears to be the Deep Percolation Factor described in Appendix G, pg G-10 and in Appendix F, pg. F.1-21 in Table F.1.2-11.
        ii. In cell B9, Distribution Total loss factor appears to be the Distribution Loss Factor described in Appendix G, pg G-9 and in Appendix F, pg. F.1-21 and F.1-22 in Table F.1.2-11.

        iii. In cell B10, Distribution Seepage factor is not described anywhere in the 3638 pages of SED documentation.

    b. GW and SW use analysis 09142016.xls, tab "AW Demand", Row 2, columns C-I, Seepage Factor is not described in the SED documentation. (Also, used on tab "Applied SW" and "Total AW" and "Deep Percolation from Crops" tabs)

10. The analysis is difficult to follow in the spreadsheets, data from one spreadsheet is input to the next and many cells have complicated equations that reference multiple tabs. Also, many constants are repeated on many tabs in the spreadsheets.

***

ATTACHMENT 1

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

Memorandum

Subject: **Stanislaus River Analysis – Baseline and 40% Unimpaired Requirement**

From: **Daniel B. Steiner**

Date: **November 16, 2016**

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1. Introduction

The State Water Resources Control Board has issued a draft Substitute Environmental Document (SED) in support of potential changes to the water quality control plan for the Bay-Delta, San Joaquin River Flows and Southern Delta Water Quality. The potential changes to the water quality control plan include implementing flow requirements in the Stanislaus, Tuolumne and Merced River tributaries.

The results described in this memorandum pertain to an investigation of the Oakdale Irrigation District and South San Joaquin Irrigation District (collectively, the "Districts") modeling of a current "Baseline" and their version of SWRCB "40% Unimpaired February-June" condition for the Stanislaus River. The Districts' worksheet model of the Stanislaus River and the New Melones Project was used for this investigation. Summary assumptions and results follow.

2. Baseline Stanislaus River (Existing)

<u>Summary of Assumptions</u>

- 2005/2020 (same) LOD New Melones Inflow, Calsim derived, extended with actual hydrology
- 2009 BO RPA 5 Schedules (Table 2e)
- DO, modeled by a flow surrogate
- D1641 Salinity (at Vernalis)
- D1641 Vernalis Flow Requirement, WSE D1641 Base Flow, Actual 602020
- SJR Maze flow and quality, DWR 2015 Reliability Report (2020 LOD), w/o SJRRP
- OID/SSJID Land Use based demand (Calsim derived), limited by formula
- CVP Contractors <1,400<1,800> 0/49/155
- Minimum New Melones storage 80,000 acre-feet, OID/SSJID curtailment to maintain

Summary of Results

Table 1. Stanislaus Baseline

1922-2015	New Melones		Goodwin																
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release (Base 1641)	Districts Formula Water	Unused Districts Formula Water	Land Use & Commit w/ Formula	Land Use & Commit Div Reqd	District Shortage other than Formula
Avg:	1,068	1,182	505	48	59	334	11	7	25	439	62		0	0	581	77	510	522	5
	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	WY	WY	WY	WY	WY
1922	1,391	1,343	506	75	80	347	3	0	0	350	0	2,227	0	0	600	94	506	506	0
1923	1,109	1,384	507	75	80	347	3	0	29	379	0	2,332	0	0	600	93	507	507	0
1924	385	940	457	0	49	185	18	44	0	251	4	1,619	0	0	457	0	457	630	0
1925	1,092	1,167	444	75	80	234	15	0	13	263	0	1,940	0	0	600	156	444	444	0
1926	619	848	559	0	49	185	27	5	45	266	3	1,623	0	0	600	41	559	559	0
1927	1,256	1,063	515	75	80	235	15	0	114	364	0	1,996	0	0	600	85	515	515	0
1928	952	1,066	509	75	80	234	15	0	3	252	0	1,905	0	0	600	91	509	509	0
1929	506	722	530	0	49	185	27	6	0	219	0	1,432	0	0	537	8	530	530	0
1930	671	574	559	0	0	185	25	11	0	221	0	1,247	0	0	600	41	559	559	0
1931	438	213	492	0	0	186	18	70	0	275	1	924	0	0	492	0	492	549	0
1932	1,160	508	531	0	0	185	27	0	114	327	0	1,280	0	0	600	69	531	531	0
1933	586	244	574	0	0	185	26	11	28	250	0	957	0	0	591	17	574	574	0
1934	498	92	380	0	0	185	23	47	63	318	0	652	0	0	532	152	532	564	152
1935	1,082	369	436	0	0	186	27	0	96	339	30	1,040	0	0	600	164	464	464	28
1936	1,291	897	480	0	49	185	27	0	15	235	7	1,570	0	0	600	120	480	480	0
1937	1,080	1,073	498	75	80	234	15	0	0	268	19	1,854	0	0	600	102	498	498	0
1938	2,032	1,897	495	75	80	589	0	0	0	589	0	2,973	0	0	600	105	495	495	0
1939	562	1,333	529	75	80	347	3	0	0	350	0	2,274	0	0	575	46	529	529	0
1940	1,327	1,486	514	75	80	484	0	0	0	484	0	2,509	0	0	600	86	514	514	0
1941	1,290	1,625	486	75	80	484	0	0	0	484	0	2,622	0	0	600	114	486	486	0
1942	1,450	1,877	454	75	80	589	0	0	0	758	169	2,937	0	0	600	146	454	454	0
1943	1,538	1,884	484	75	80	590	0	0	0	708	117	3,090	0	0	600	116	484	484	0
1944	649	1,398	547	75	80	347	3	0	0	350	0	2,338	0	0	600	53	547	547	0
1945	1,228	1,482	474	75	80	484	0	0	0	484	0	2,514	0	0	600	126	474	474	0
1946	1,175	1,495	481	75	80	484	0	0	0	484	0	2,543	0	0	600	119	481	481	0
1947	634	1,006	600	75	80	235	15	10	48	308	0	1,979	0	0	600	0	600	637	0
1948	853	953	489	0	49	234	15	2	74	325	0	1,726	0	0	600	111	489	489	0
1949	732	760	583	0	49	185	27	7	35	255	0	1,532	0	0	600	17	583	583	0
1950	1,027	899	549	0	49	185	27	2	51	269	4	1,650	0	0	600	51	549	549	0
1951	1,656	1,406	505	75	80	484	0	0	25	515	6	2,494	0	0	600	95	505	505	0
1952	1,844	2,032	496	75	80	589	0	0	0	711	122	3,140	0	0	600	104	496	496	0
1953	965	1,608	546	75	80	484	0	0	15	498	0	2,695	0	0	600	54	546	546	0
1954	882	1,318	590	75	80	347	3	0	12	362	0	2,294	0	0	600	10	590	590	0
1955	656	1,003	516	75	80	235	15	3	1	274	20	1,831	0	0	600	84	516	516	0
1956	1,825	1,655	527	75	80	484	0	0	0	484	0	2,720	0	0	600	73	527	527	0
1957	878	1,417	557	75	80	347	3	0	0	350	0	2,365	0	0	600	43	557	557	0
1958	1,599	1,888	419	75	80	589	0	0	0	589	0	2,890	0	0	600	181	419	419	0
1959	624	1,362	556	75	80	347	3	0	0	350	0	2,311	0	0	600	44	556	556	0
1960	574	983	583	0	49	234	15	5	0	254	0	1,780	0	0	583	0	583	608	0
1961	446	642	497	0	0	185	18	25	0	232	4	1,323	0	0	497	0	497	549	0
1962	863	703	540	0	0	185	27	0	42	255	0	1,396	0	0	600	60	540	540	0
1963	1,227	988	481	0	49	235	15	0	144	394	0	1,799	0	0	600	119	481	481	0
1964	632	724	578	0	49	185	27	8	7	237	10	1,501	0	0	600	22	578	578	0
1965	1,666	1,328	500	75	80	347	3	0	69	419	0	2,315	0	0	600	100	500	500	0
1966	733	1,023	552	75	80	234	15	0	72	321	0	1,917	0	0	600	48	552	552	0
1967	1,831	1,697	486	75	80	484	0	0	0	484	0	2,685	0	0	600	114	486	486	0
1968	670	1,271	534	75	80	347	3	0	0	375	25	2,202	0	0	600	66	534	534	0
1969	2,118	2,100	502	75	80	589	0	0	0	1,203	613	3,287	0	0	600	98	502	502	0
1970	1,321	1,616	528	75	80	484	0	0	24	508	0	2,720	0	0	600	72	528	528	0
1971	1,066	1,477	528	75	80	484	0	0	6	490	0	2,551	0	0	600	72	528	528	0
1972	764	1,082	600	75	80	234	15	2	88	343	4	2,090	0	0	600	0	600	625	0
1973	1,237	1,277	490	75	80	347	3	0	46	396	0	2,222	0	0	600	110	490	490	0
1974	1,500	1,677	439	75	80	484	0	0	0	484	0	2,686	0	0	600	161	439	439	0
1975	1,210	1,699	492	75	80	484	0	0	20	504	0	2,744	0	0	600	108	492	492	0
1976	467	1,172	511	75	80	234	15	10	0	260	0	2,012	0	0	511	0	511	608	0
1977	271	743	381	0	0	185	14	39	1	239	1	1,295	0	0	381	0	381	608	0
1978	1,311	1,213	454	75	80	234	15	0	0	249	0	1,960	0	0	600	146	454	454	0
1979	1,139	1,219	529	75	80	347	3	0	86	439	3	2,226	0	0	600	71	529	529	0
1980	1,721	1,724	481	75	80	589	0	0	0	589	0	2,839	0	0	600	119	481	481	0
1981	634	1,305	540	75	80	234	15	0	11	298	37	2,152	0	0	600	60	540	540	0
1982	2,229	2,100	429	75	80	589	0	0	0	1,814	1,225	3,419	0	0	600	171	429	429	0
1983	2,900	2,100	413	75	80	590	0	0	0	2,255	1,665	3,965	0	0	600	187	413	413	0

Table 1. Stanislaus Baseline (continued)

	New Melones		Goodwin																
1922-2015	New Melones Inflow	New Melones Storage	OID & SSJID Canals	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release (Base 1641)	Districts Formula Water	Unused Districts Formula Water	Land Use & Commit w/ Formula	Land Use & Commit Div Reqd	District Shortage other than Formula
Avg:	1,068	1,182	505	48	59	334	11	7	25	439	62		0	0	581	77	510	522	5
	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	WY	WY	WY	WY	WY
1984	1,621	1,587	549	75	80	589	0	0	0	589	0	2,765	0	0	600	51	549	549	0
1985	744	1,234	510	75	80	347	3	0	0	374	24	2,179	0	0	600	90	510	510	0
1986	1,869	1,835	475	75	80	589	0	0	0	642	52	2,984	0	0	600	125	475	475	0
1987	497	1,293	531	75	80	235	15	7	0	257	0	2,139	0	0	531	0	531	531	0
1988	390	865	460	0	49	185	18	39	0	242	0	1,548	0	0	460	0	460	543	0
1989	648	677	548	0	0	185	27	22	2	237	0	1,365	0	0	600	52	548	548	0
1990	491	370	527	0	0	185	21	37	0	243	0	1,058	0	0	527	0	527	570	0
1991	502	94	526	0	0	186	16	25	2	228	0	734	0	0	535	8	526	526	0
1992	459	91	210	0	0	185	15	29	14	250	7	466	0	0	506	296	506	508	296
1993	1,275	540	447	0	0	185	27	16	154	383	0	1,310	0	0	600	153	477	477	30
1994	501	239	529	0	0	185	13	46	0	258	14	931	0	0	534	5	529	529	0
1995	2,160	1,478	452	75	80	347	3	0	0	359	9	2,306	0	0	600	148	452	452	0
1996	1,512	1,731	517	75	80	589	0	0	0	1,376	787	2,838	0	0	600	83	517	517	0
1997	1,902	1,624	556	75	80	484	0	0	0	505	21	2,749	0	0	600	44	556	556	0
1998	1,876	2,100	444	75	80	589	0	0	0	1,246	657	3,373	0	0	600	156	444	444	0
1999	1,326	1,712	508	75	80	590	0	0	0	590	0	2,860	0	0	600	92	508	508	0
2000	1,062	1,588	488	75	80	484	0	0	2	488	2	2,593	0	0	600	112	488	488	0
2001	588	1,258	469	75	80	234	15	0	34	284	0	2,070	0	0	592	124	469	469	0
2002	710	844	548	75	80	234	15	4	131	384	0	1,801	0	0	600	52	548	548	0
2003	896	712	530	0	49	186	26	10	179	400	0	1,570	0	0	600	70	530	530	0
2004	670	538	600	0	0	185	25	14	0	237	12	1,248	0	0	600	0	600	647	0
2005	1,576	1,205	524	75	80	234	15	0	59	309	0	2,047	0	0	600	76	524	524	0
2006	2,061	2,005	496	75	80	589	0	0	0	706	117	3,060	0	0	600	104	496	496	0
2007	581	1,273	587	75	80	347	3	0	25	375	0	2,289	0	0	587	0	587	589	0
2008	579	946	550	0	49	185	21	45	43	295	0	1,714	0	0	586	36	550	550	0
2009	866	779	555	0	49	185	27	6	147	366	0	1,640	0	0	600	45	555	555	0
2010	1,011	1,023	478	0	49	185	27	0	0	217	5	1,672	0	0	600	122	478	478	0
2011	2,093	1,971	466	75	80	590	0	0	0	652	61	3,030	0	0	600	134	466	466	0
2012	607	1,379	525	75	80	347	3	4	15	369	0	2,351	0	0	600	75	525	525	0
2013	559	1,024	544	0	49	234	15	0	9	259	0	1,792	0	0	573	28	544	544	0
2014	339	635	426	0	0	185	27	5	28	246	0	1,245	0	0	426	0	426	575	0
2015	333	263	422	0	0	186	27	0	119	332	0	892	0	0	422	0	422	533	0
2016	1,003	196	575	0	0	101	27	8	212	349	0	1,085	0	0	600	25	575	575	0

All units in 1,000 acre-feet unless otherwise noted.

Figure 1. OID/SSJID Water Use and Commitments – Baseline (Chronological)

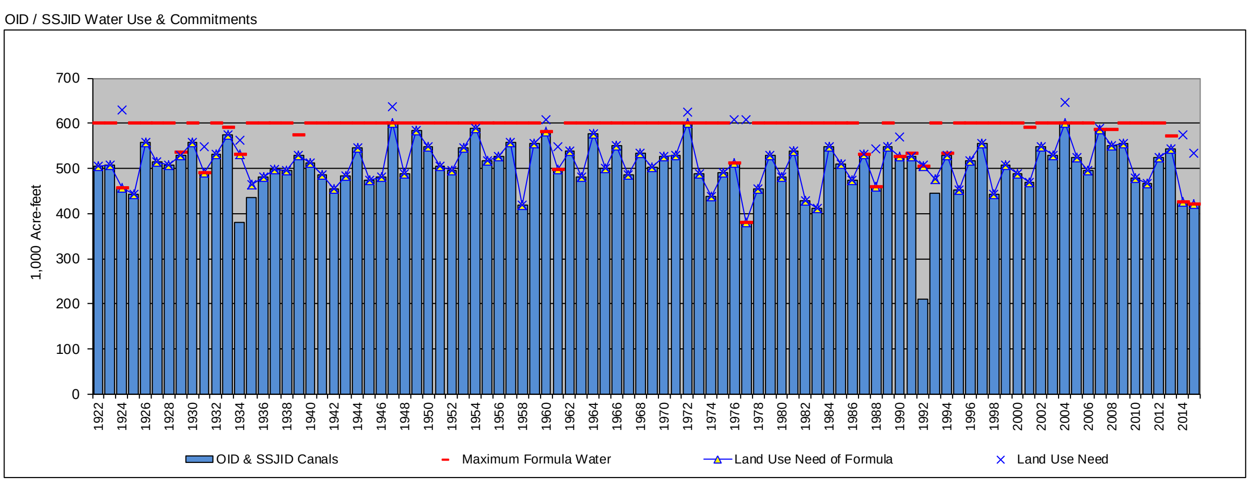


Figure 2. New Melones Reservoir Storage, End of September – Baseline (Chronological)

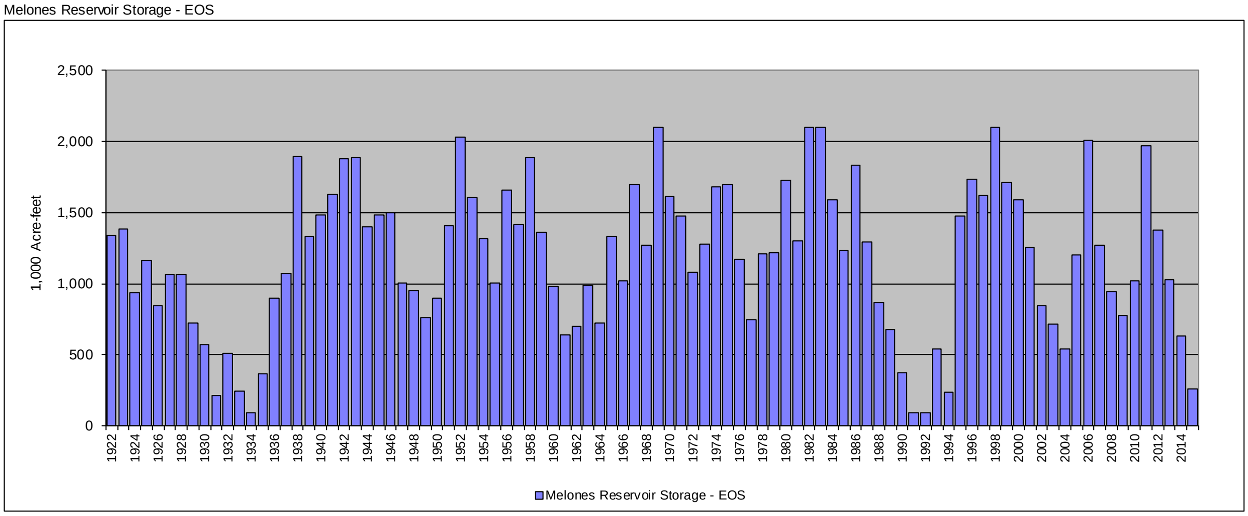


Figure 3. Stanislaus River Release – Baseline (Chronological)

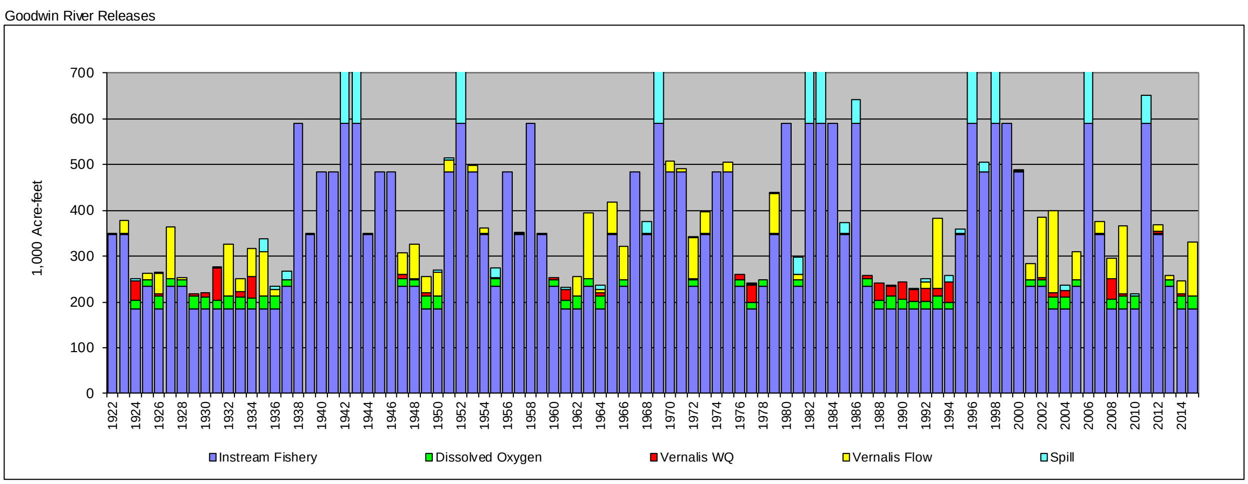


Figure 4. CVP Contractors – Baseline (Chronological)

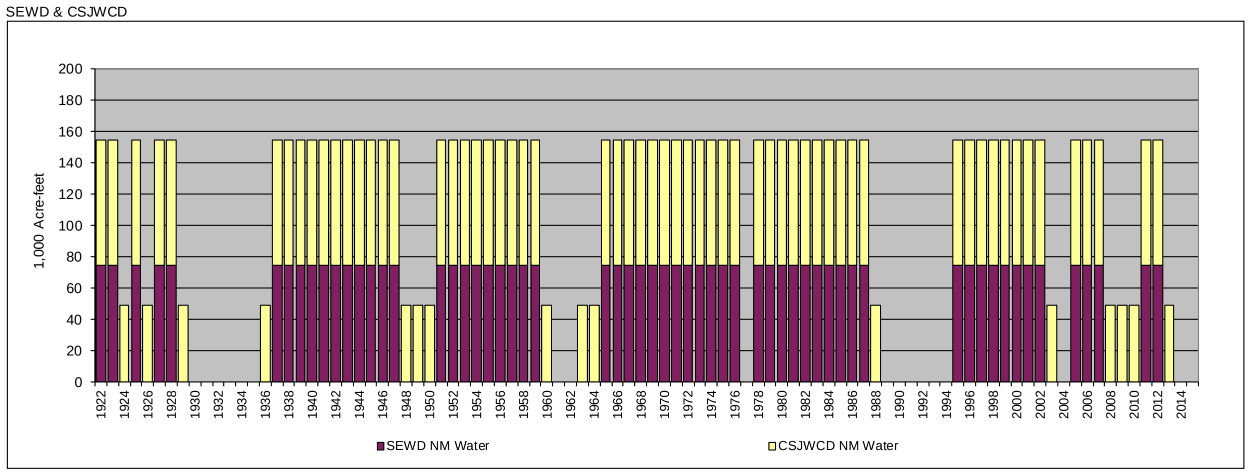


Figure 5. New Melones Reservoir Storage, End of September Ranked by NMI – Baseline

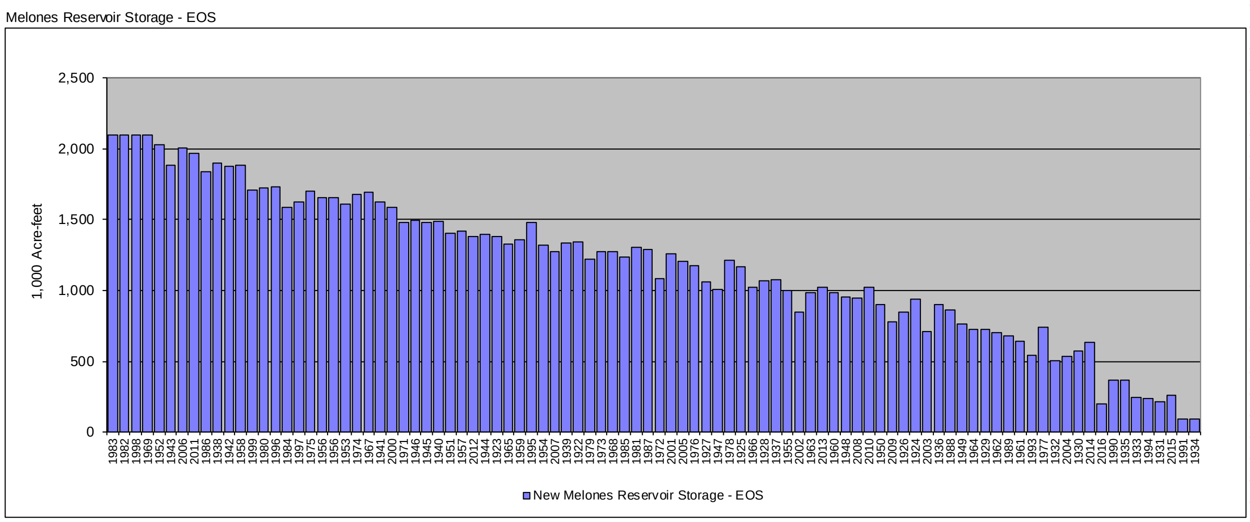


Figure 6. Stanislaus River Release, Ranked by NMI – Baseline

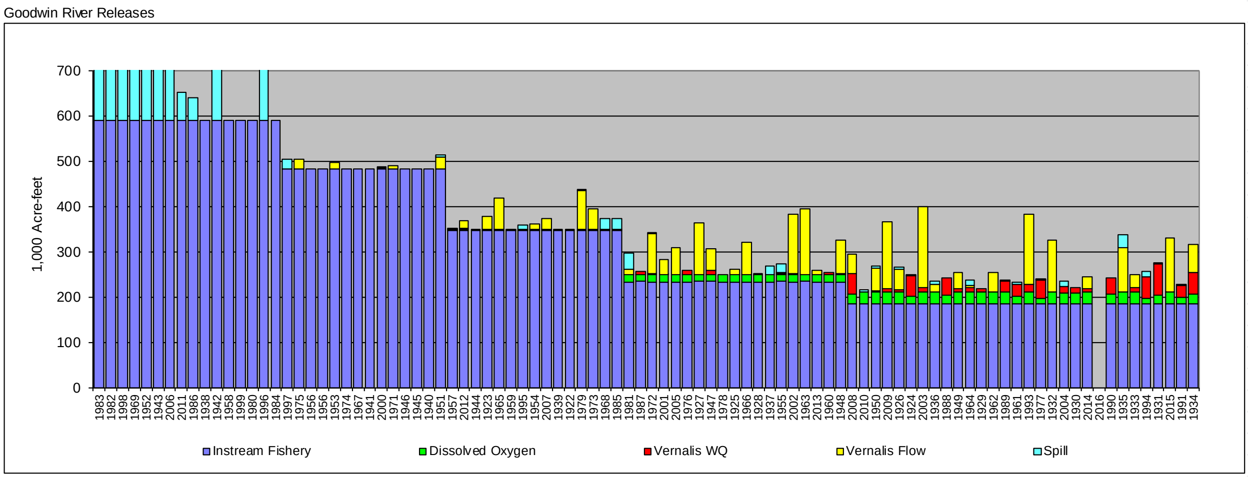
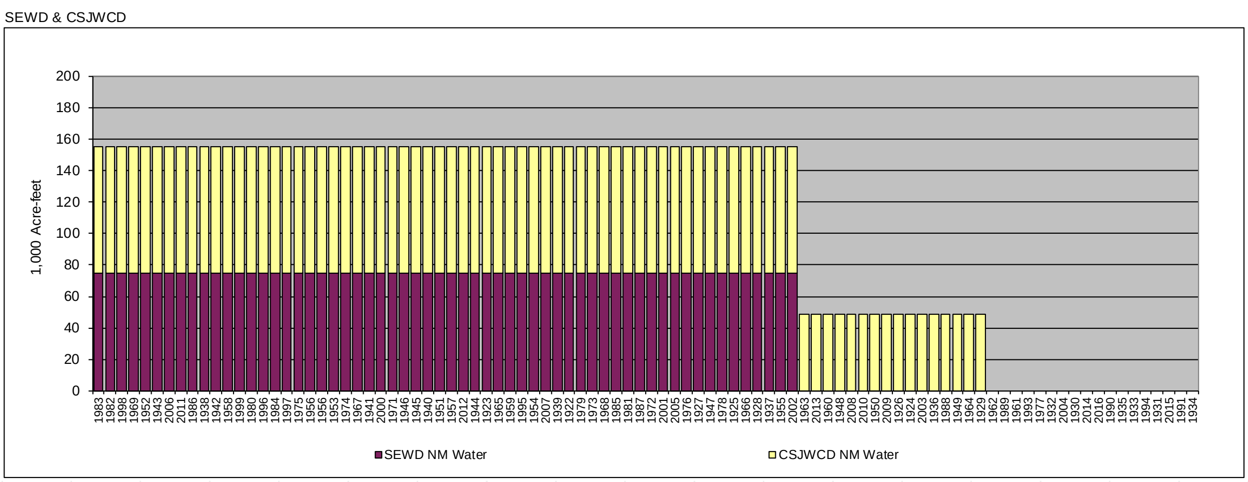


Figure 7. CVP Contractors, Ranked by NMI – Baseline



3. 40% Unimpaired February-June (Potential Change)

Summary of Assumptions

- 2005/2020 (same) LOD New Melones Inflow, Calsim derived, extended with actual hydrology
- The greater of RPA (Table 2e) Schedules (at Goodwin), or 40% UF applied at Ripon, burdened by reach depletions, no credit for accretions
- DO, modeled by a flow surrogate
- D1641 Salinity, at Vernalis
- No Vernalis Flow Requirement (replaced by individual tributary contributions), minimum Vernalis 800-1,200 cfs minimum not yet evaluated
- SJR Maze flow and quality, DWR 2015 Reliability Report (2020 LOD), w/o SJRRP
- OID/SSJID Land Use based demand (Calsim derived), limited by formula
- CVP Contractors <1,400<1,800> 0/49/155
- Minimum New Melones storage 80,000 acre-feet, OID/SSJID curtailment to maintain

This analysis will differ from the SWRCB modeling of the alternative as portrayed in the implementation analysis due to the Districts' modeling not incorporating carryover storage targets and protocols, refill curtailments, and flow shifting.

The SWRCB flow requirement assumes that the compliance location of the X% requirement is at a downstream location near the mouth of the Stanislaus River. For modeling purposes the SED assumes a computation at Ripon, which corresponds with CalSim Node 528. In effect, the SED analysis "translates" the X% requirement upstream to Goodwin for comparison to the BO RPA requirement at Goodwin. In the translation the X% requirement (an absolute value) may be decreased or increased when made comparable to the RPA requirement at Goodwin, as the Ripon flow would be affected by accretions/depletions between Goodwin and Ripon. The SED analysis adjusts the Ripon-translated X% flow requirement at Goodwin either up to account for depletions, or down to account for accretions. For the Districts' analysis only depletions will adjust the X% requirement placed at Goodwin. The reasoning is although there has historically been an overall accretion occurring between Goodwin and Ripon due to groundwater accretion, return flows and surface runoff countering stream depletions (pumping), return flows and groundwater accretion are anticipated to decrease due to the proposed flow requirements as water users are expected to deplete the adjacent basins and also increase water management efficiency. Also, in practical operation water project operators will not be able to rely on the certainty of flashy surface runoff to partially offset the downstream-located flow requirement; therefore, the full requirement will typically be required to be released at Goodwin to assure compliance.

Summary of Results

Table 2. Stanislaus 40% UF

1922-2015	New Melones		Goodwin																
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release (Base 1641)	Districts Formula Water	Unused Districts Formula Water	Land Use & Commit w/ Formula	Land Use & Commit Div Reqd	District Shortage other than Formula
Avg:	1,068	748	480	31	43	471	14	2	0	511	24		0	7	581	101	510	522	
	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	WY	WY	WY	WY	WY
1922	1,391	1,046	506	75	80	634	3	0	0	637	0	2,204	0	0	600	94	506	506	0
1923	1,109	998	507	75	80	446	12	0	0	458	0	2,028	0	0	600	93	507	507	0
1924	385	602	457	0	0	260	18	28	0	305	0	1,244	0	0	457	0	457	630	0
1925	1,092	656	444	0	49	493	21	0	0	514	0	1,570	0	0	600	156	444	444	0
1926	619	337	559	0	0	355	21	0	0	376	0	1,122	0	18	600	41	559	559	0
1927	1,256	464	515	0	49	511	21	0	0	532	0	1,451	0	0	600	85	515	515	0
1928	952	434	509	0	0	422	21	0	0	443	0	1,315	0	0	600	91	509	509	0
1929	506	82	530	0	0	295	21	0	0	316	0	826	0	0	537	8	530	530	0
1930	671	80	290	0	0	349	20	2	0	371	0	667	0	0	600	310	559	559	269
1931	438	90	115	0	0	297	18	20	0	335	0	438	0	0	492	377	492	549	377
1932	1,160	182	496	0	0	514	21	0	0	535	0	1,154	0	18	600	104	531	531	35
1933	586	80	328	0	0	329	20	1	0	351	0	633	0	24	591	262	574	574	246
1934	498	92	171	0	0	285	17	4	0	306	0	501	0	56	532	361	532	564	361
1935	1,082	199	436	0	0	588	21	0	0	609	0	1,096	0	19	600	164	464	464	28
1936	1,291	445	480	0	0	531	21	0	0	552	0	1,361	0	0	600	120	480	480	0
1937	1,080	513	498	0	0	528	21	0	0	549	0	1,390	0	0	600	102	498	498	0
1938	2,032	1,143	495	75	80	755	0	0	0	755	0	2,400	0	0	600	105	495	495	0
1939	562	763	529	0	49	332	21	0	0	353	0	1,552	0	2	575	46	529	529	0
1940	1,327	822	514	75	80	565	12	0	0	577	0	1,906	0	0	600	86	514	514	0
1941	1,290	890	486	75	80	559	12	0	0	571	0	1,942	0	0	600	114	486	486	0
1942	1,450	1,140	454	75	80	591	3	0	0	594	0	2,187	0	0	600	146	454	454	0
1943	1,538	1,404	484	75	80	599	0	0	0	599	0	2,521	0	0	600	116	484	484	0
1944	649	931	547	75	80	417	12	0	0	429	0	1,889	0	0	600	53	547	547	0
1945	1,228	954	474	75	80	489	12	0	0	501	0	1,997	0	0	600	126	474	474	0
1946	1,175	996	481	75	80	453	12	0	0	465	0	2,021	0	0	600	119	481	481	0
1947	634	604	600	0	49	302	19	3	0	325	0	1,488	0	16	600	0	600	637	0
1948	853	481	489	0	0	431	21	0	0	452	0	1,337	0	42	600	111	489	489	0
1949	732	221	583	0	0	388	21	0	0	409	0	1,078	0	0	600	17	583	583	0
1950	1,027	182	549	0	0	510	21	0	0	539	7	1,109	0	0	600	51	549	549	0
1951	1,656	888	505	0	49	408	12	0	0	428	8	1,756	0	20	600	95	505	505	0
1952	1,844	1,307	496	75	80	770	0	0	0	770	0	2,609	0	0	600	104	496	496	0
1953	965	1,093	546	75	80	416	12	0	0	428	0	2,121	0	10	600	54	546	546	0
1954	882	731	590	75	80	450	12	0	0	462	0	1,802	0	0	600	10	590	590	0
1955	656	475	516	0	0	357	19	2	0	405	27	1,254	0	0	600	84	516	516	0
1956	1,825	1,053	527	75	80	566	3	0	0	569	0	2,182	0	0	600	73	527	527	0
1957	878	831	557	0	49	452	12	0	0	464	0	1,756	0	0	600	43	557	557	0
1958	1,599	1,172	419	75	80	697	3	0	0	699	0	2,289	0	0	600	181	419	419	0
1959	624	814	556	0	49	292	21	0	0	313	0	1,616	0	7	600	44	556	556	0
1960	574	418	583	0	0	308	20	1	0	330	0	1,244	0	0	583	0	583	608	0
1961	446	86	486	0	0	271	13	8	0	292	0	777	0	0	497	11	497	549	11
1962	863	80	393	0	0	508	21	0	0	529	0	859	0	0	600	207	540	540	147
1963	1,227	318	441	0	0	457	21	0	0	478	0	1,163	0	48	600	159	481	481	40
1964	632	84	533	0	0	326	21	0	0	361	14	867	0	0	600	67	578	578	45
1965	1,666	711	489	0	49	471	21	0	0	492	0	1,669	0	0	600	111	500	500	11
1966	733	508	552	0	0	338	21	0	0	359	0	1,320	0	29	600	48	552	552	0
1967	1,831	1,014	486	75	80	735	3	0	0	738	0	2,221	0	0	600	114	486	486	0
1968	670	699	534	0	49	359	21	0	0	399	19	1,500	0	0	600	66	534	534	0
1969	2,118	1,347	502	75	80	815	0	0	0	818	3	2,684	0	0	600	98	502	502	0
1970	1,321	1,414	528	75	80	526	0	0	0	526	0	2,517	0	10	600	72	528	528	0
1971	1,066	1,285	528	75	80	461	3	0	0	464	0	2,334	0	2	600	72	528	528	0
1972	764	862	600	75	80	404	12	0	0	416	0	1,903	0	5	600	0	600	625	0
1973	1,237	910	490	75	80	508	12	0	0	520	0	1,968	0	1	600	110	490	490	0
1974	1,500	1,240	439	75	80	573	3	0	0	576	0	2,317	0	0	600	161	439	439	0
1975	1,210	1,171	492	75	80	585	3	0	0	588	0	2,293	0	0	600	108	492	492	0
1976	467	765	511	0	49	214	25	9	0	248	0	1,489	0	0	511	0	511	608	0
1977	271	360	381	0	0	227	11	31	0	270	1	901	0	1	381	0	381	608	0
1978	1,311	546	454	0	49	624	21	0	0	645	0	1,548	0	0	600	146	454	454	0
1979	1,139	575	529	0	49	567	21	0	0	592	4	1,543	0	50	600	71	529	529	0
1980	1,721	1,066	481	75	80	500	12	0	0	512	0	2,128	0	0	600	119	481	481	0
1981	634	736	540	0	49	419	21	0	0	446	6	1,534	0	0	600	60	540	540	0
1982	2,229	1,586	429	75	80	834	0	0	0	1,184	350	2,776	0	0	600	171	429	429	0
1983	2,900	2,100	413	75	80	956	0	0	0	2,256	1,299	3,965	0	0	600	187	413	413	0

Table 2. Stanislaus 40% UF (continued)

	New Melones		Goodwin																
1922-2015	New Melones Inflow	New Melones Storage	OID & SSJID Canals	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release (Base 1641)	Districts Formula Water	Unused Districts Formula Water	Land Use & Commit w/ Formula	Land Use & Commit Div Reqd	District Shortage other than Formula
Avg:	1,068	748	480	31	43	471	14	2	0	511	24		0	7	581	101	510	522	
	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	WY	WY	WY	WY	WY
1984	1,621	1,576	549	75	80	600	0	0	0	600	0	2,765	0	0	600	51	549	549	0
1985	744	1,223	510	75	80	530	12	0	0	542	0	2,168	0	0	600	90	510	510	0
1986	1,869	1,619	475	75	80	683	0	0	0	683	0	2,806	0	0	600	125	475	475	0
1987	497	1,057	531	75	80	263	15	5	0	283	0	1,924	0	0	531	0	531	531	0
1988	390	658	460	0	0	229	14	13	0	257	0	1,313	0	0	460	0	460	543	0
1989	648	326	548	0	0	380	21	1	0	403	0	1,171	0	0	600	52	548	548	0
1990	491	89	428	0	0	257	18	10	0	285	0	718	0	0	527	100	527	570	100
1991	502	80	174	0	0	317	13	9	0	338	0	503	0	0	535	360	526	526	352
1992	459	91	150	0	0	278	15	12	0	312	7	450	0	7	506	356	506	508	356
1993	1,275	310	447	0	0	565	21	0	0	586	0	1,278	0	16	600	153	477	477	30
1994	501	82	416	0	0	294	10	16	0	333	14	703	0	0	534	118	529	529	112
1995	2,160	890	425	75	80	881	12	0	0	893	0	2,149	0	0	600	175	452	452	27
1996	1,512	1,070	517	75	80	558	12	0	0	715	145	2,161	0	0	600	83	517	517	0
1997	1,902	1,614	556	75	80	580	0	0	0	580	0	2,749	0	0	600	44	556	556	0
1998	1,876	2,080	444	75	80	826	0	0	0	1,174	348	3,298	0	0	600	156	444	444	0
1999	1,326	1,657	508	75	80	701	0	0	0	701	0	2,860	0	0	600	92	508	508	0
2000	1,062	1,450	488	75	80	516	0	0	0	519	3	2,484	0	0	600	112	488	488	0
2001	588	1,052	469	75	80	323	15	0	0	338	0	1,933	0	24	592	124	469	469	0
2002	710	721	548	0	49	374	19	2	0	395	0	1,615	0	29	600	52	548	548	0
2003	896	566	530	0	49	433	21	0	0	455	0	1,484	0	39	600	70	530	530	0
2004	670	277	600	0	0	366	21	0	0	399	12	1,111	0	0	600	0	600	647	0
2005	1,576	645	524	0	49	661	12	0	0	673	0	1,756	0	16	600	76	524	524	0
2006	2,061	1,280	496	75	80	781	0	0	0	781	0	2,525	0	0	600	104	496	496	0
2007	581	857	587	0	49	278	24	0	0	302	0	1,696	0	13	587	0	587	589	0
2008	579	511	550	0	0	321	21	7	0	349	0	1,312	0	26	586	36	550	550	0
2009	866	342	555	0	0	439	21	0	0	460	0	1,245	0	20	600	45	555	555	0
2010	1,011	391	478	0	0	478	21	0	0	505	7	1,246	0	0	600	122	478	478	0
2011	2,093	1,174	466	75	80	720	3	0	0	723	0	2,384	0	0	600	134	466	466	0
2012	607	822	525	0	49	304	21	0	0	326	0	1,652	0	20	600	75	525	525	0
2013	559	512	544	0	0	261	22	0	0	283	0	1,257	0	2	573	28	544	544	0
2014	339	155	426	0	0	241	27	0	0	269	0	750	0	15	426	0	426	575	0
2015	333	80	156	0	0	224	25	0	0	249	0	390	0	85	422	266	422	533	266
2016	1,003	80	540	0	0	345	21	0	0	366	0	981	0	57	600	60	575	575	35

All units in 1,000 acre-feet unless otherwise noted.

Figure 8. OID/SSJID Water Use and Commitments – 40% UF (Chronological)

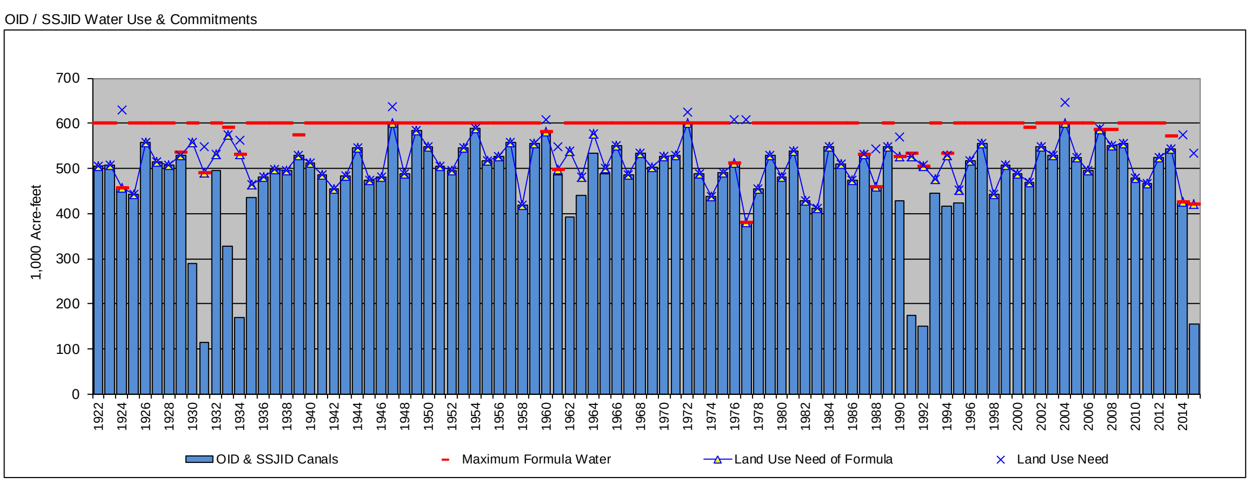


Figure 9. New Melones Reservoir Storage, End of September – 40% UF (Chronological)

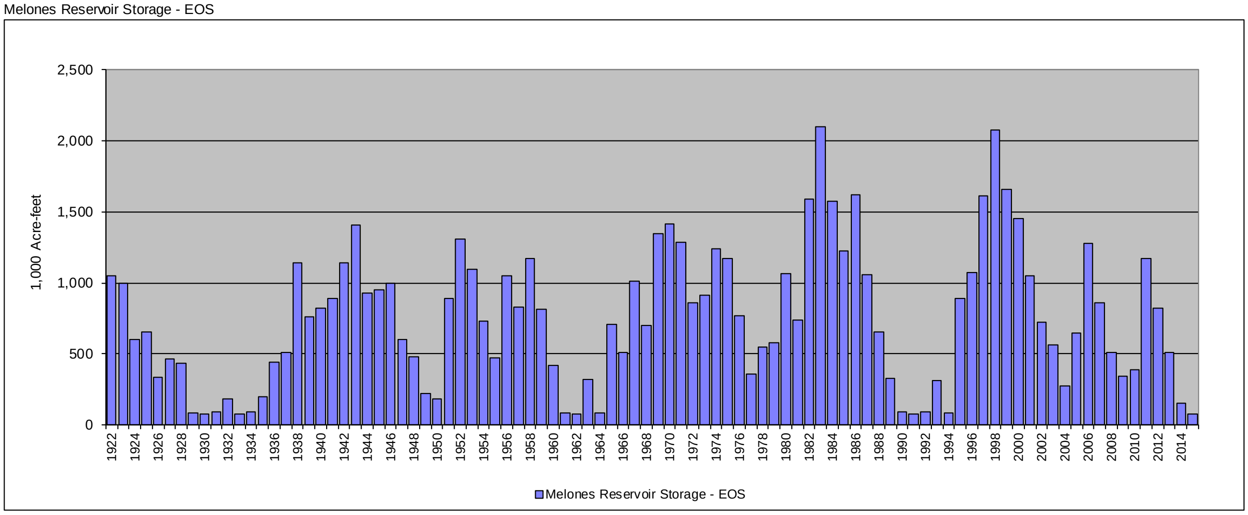


Figure 10. Stanislaus River Release – 40% UF (Chronological)

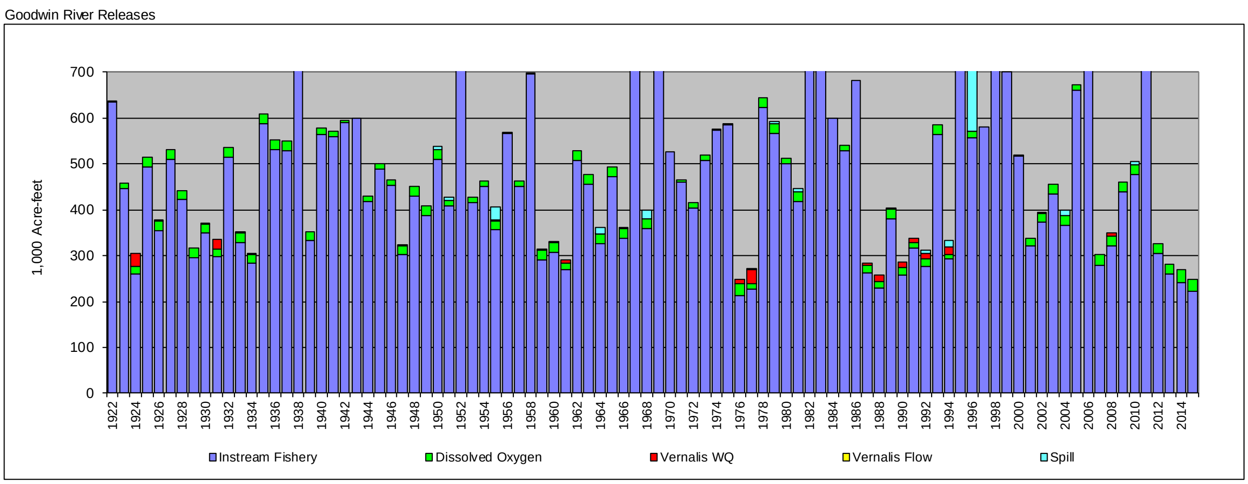


Figure 11. CVP Contractors – 40% UF (Chronological)

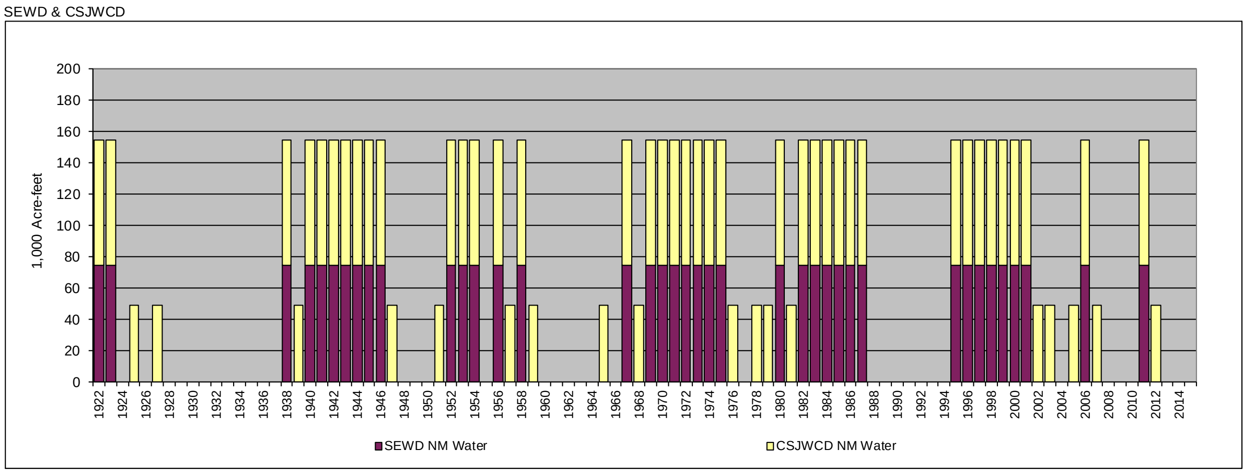


Figure 12. New Melones Reservoir Storage, End of September Ranked by NMI – 40% UF

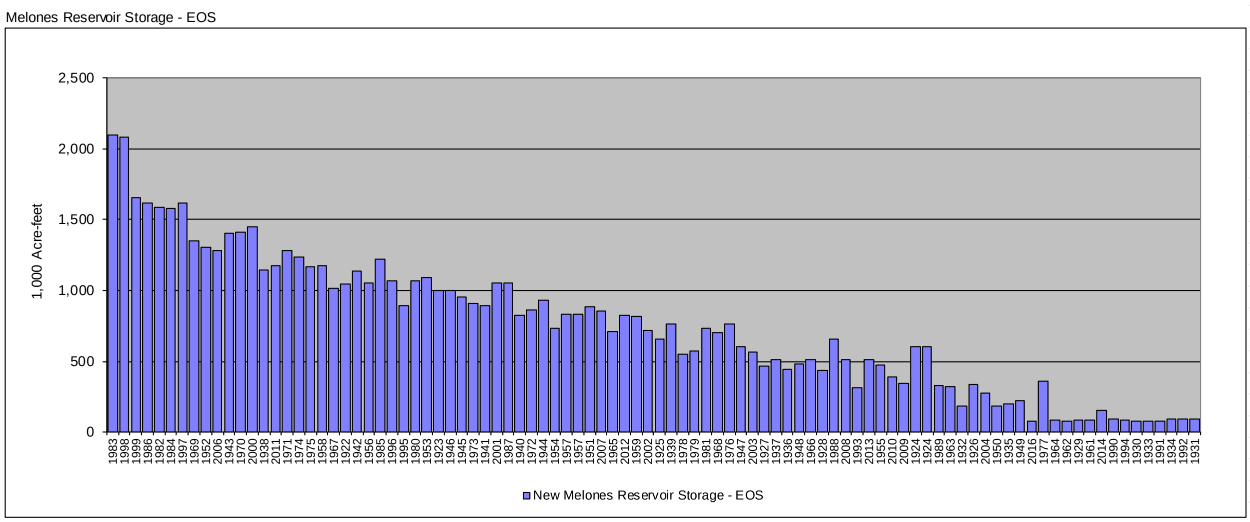


Figure 13. Stanislaus River Release, Ranked by NMI – 40% UF

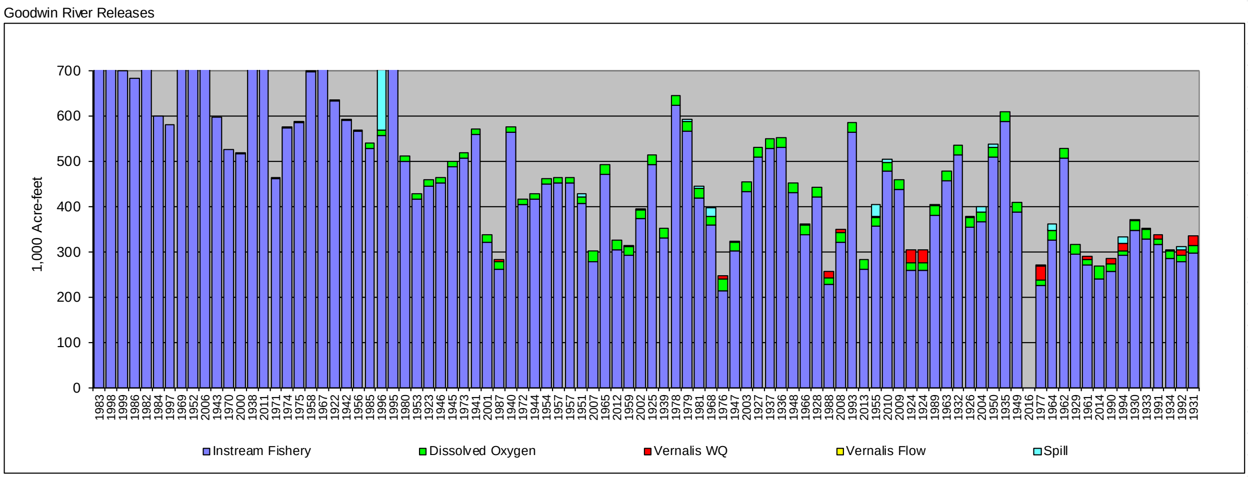


Figure 14. CVP Contractors, Ranked by NMI – 40% UF

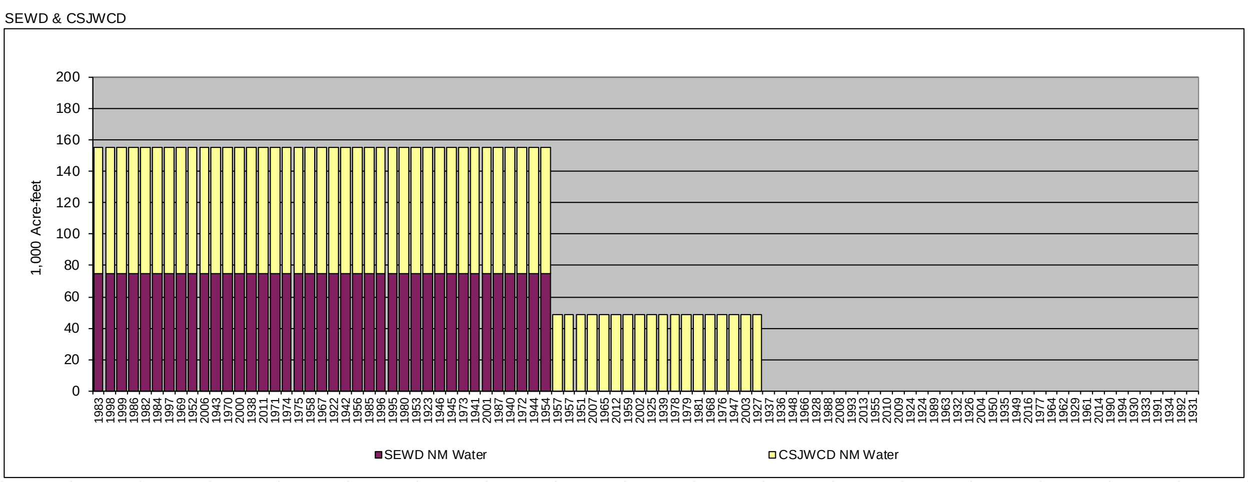


Table 3. Comparison of Studies

Base

1922-2015	New Melones		Goodwin																
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release (Base 1641)	Districts Formula Water	Unused Districts Formula Water	Land Use & Commit w/ Formula	Land Use & Commit Div Reqd	District Shortage other than Formula
Avg:	1,068	1,182	505	48	59	334	11	7	25	439	62		0	0	581	77	510	522	5
	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	WY	WY	WY	WY	WY

40% UF

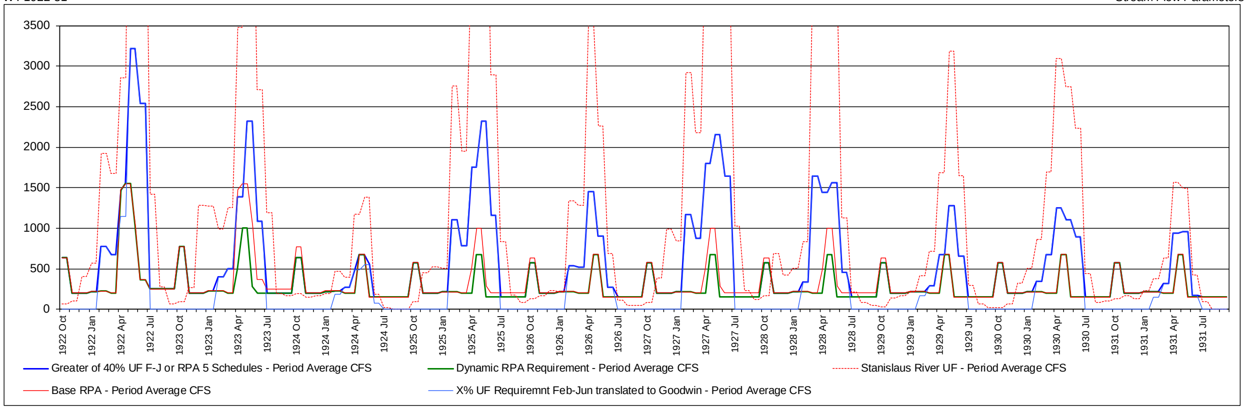
1922-2015	New Melones		Goodwin																
	New Melones Inflow	New Melones Storage	OID & SSJID Canals	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index	Missed Vernalis WQ Release	Missed Vernalis Flow Release (Base 1641)	Districts Formula Water	Unused Districts Formula Water	Land Use & Commit w/ Formula	Land Use & Commit Div Reqd	District Shortage other than Formula
Avg:	1,068	748	480	31	43	471	14	2	0	511	24		0	7	581	101	510	522	
	WY	EOS	WY	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F	M-F	WY	WY	WY	WY	WY

Figure 15. Comparison of Flows

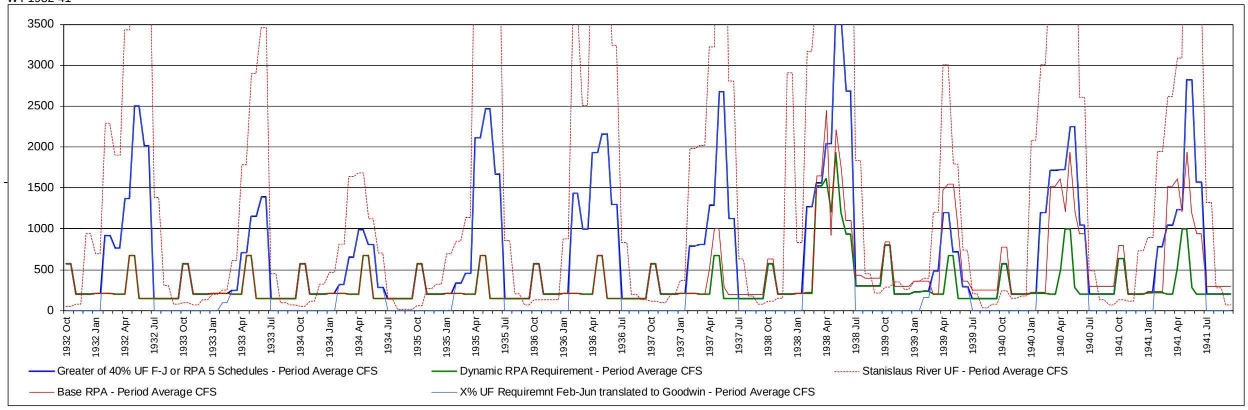
The following graphs illustrate a comparison between required instream flow (blue line, representing the greater of the study's dynamic RPA requirement or 40% UF (SNS) translated to Goodwin), total UF at Goodwin (SNS, dashed red line), 40% UF February-June (SNS) translated to Goodwin (thin blue line), the dynamic RPA requirement of this study (green line), and the RPA requirement of the Base study (thin red line). All values are in expressed in period-cfs.

WY 1922-31

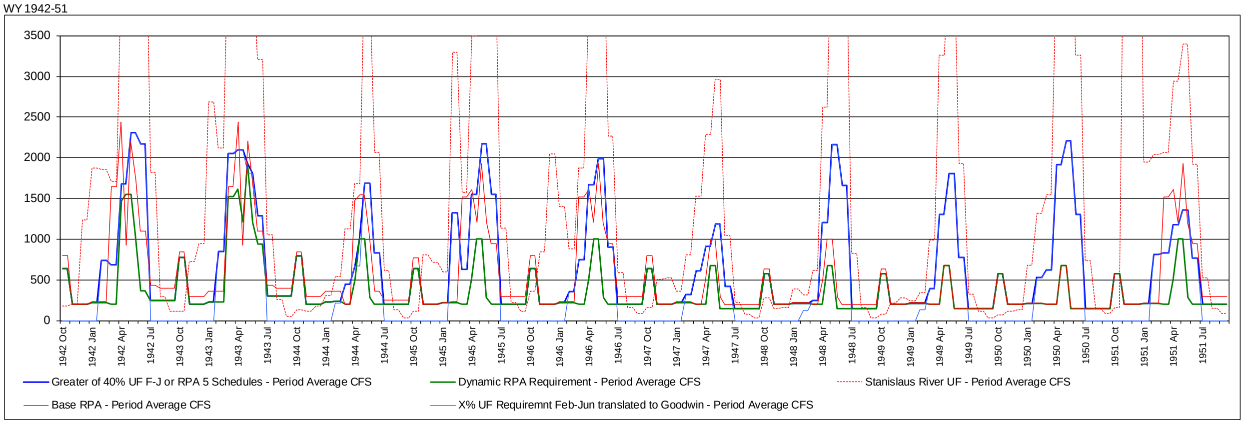
Stream Flow Parameters



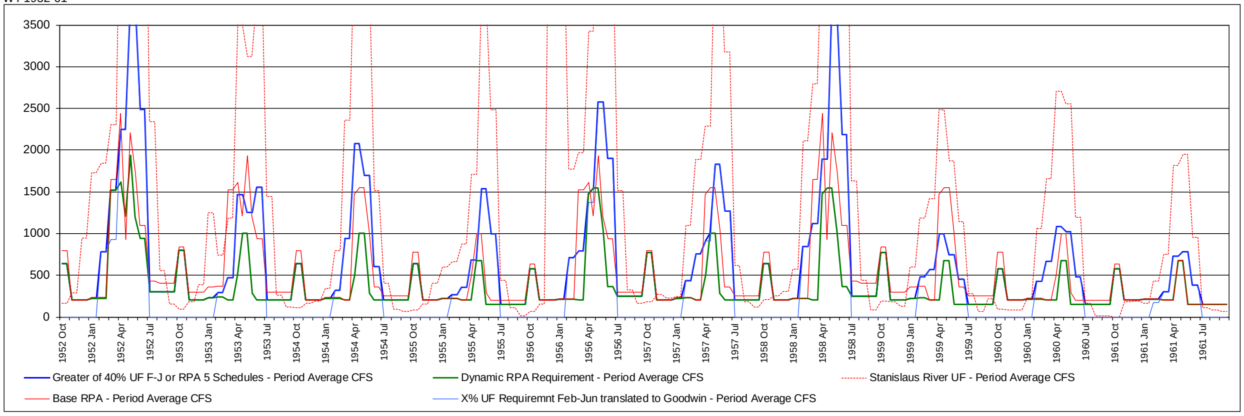
WY 1932-41



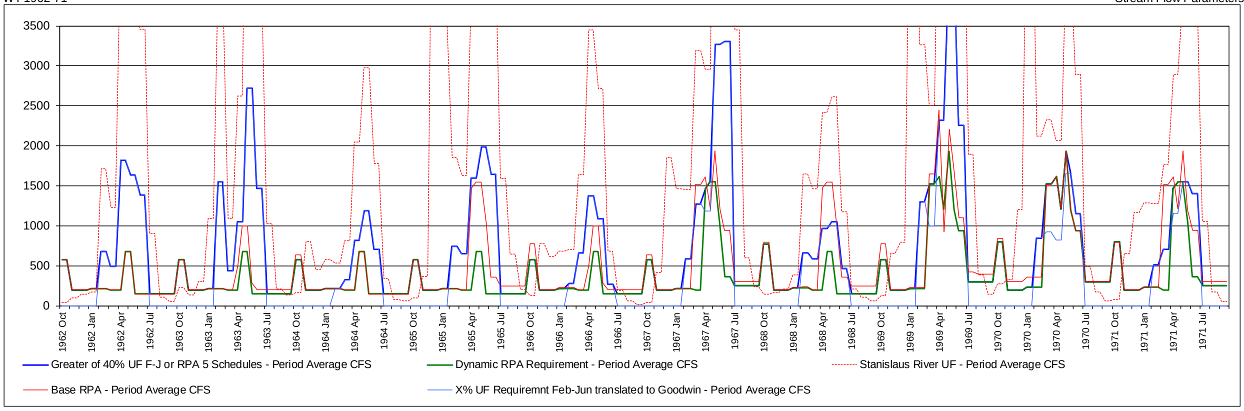
WY 1942-51



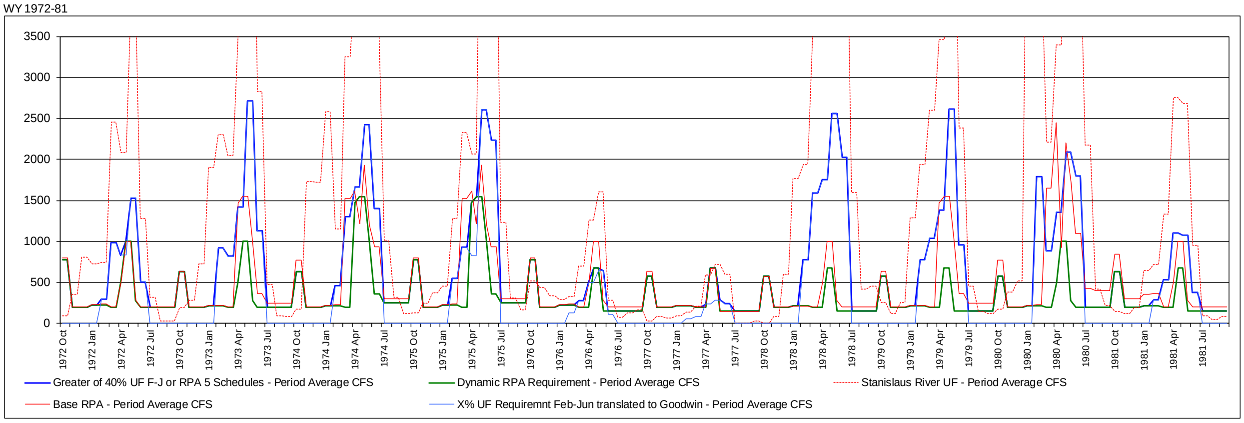
WY 1952-61



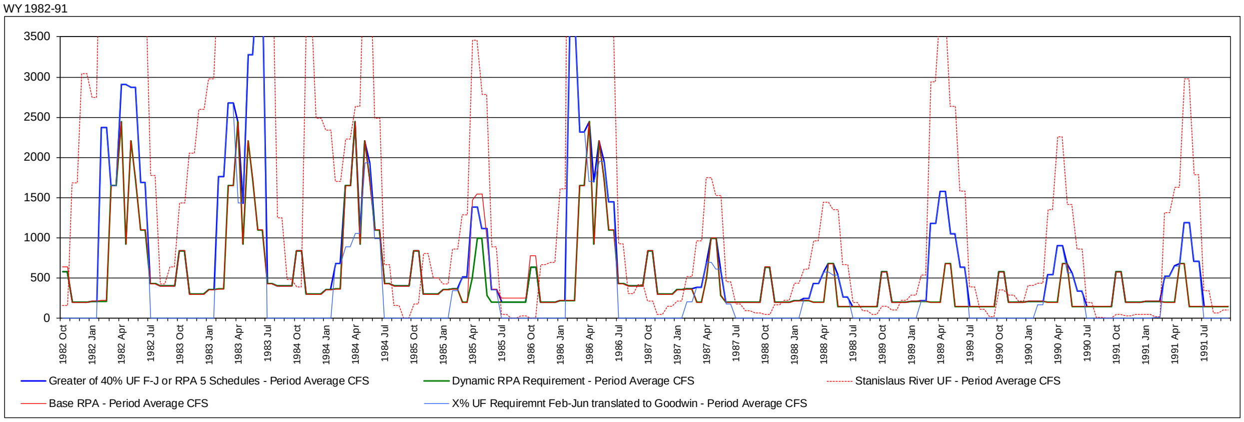
WY 1962-71



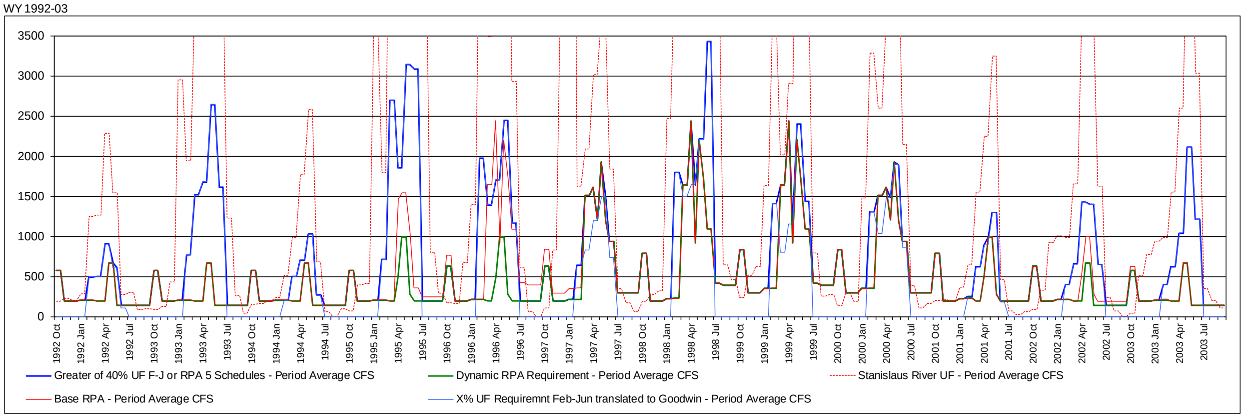
WY 1972-81

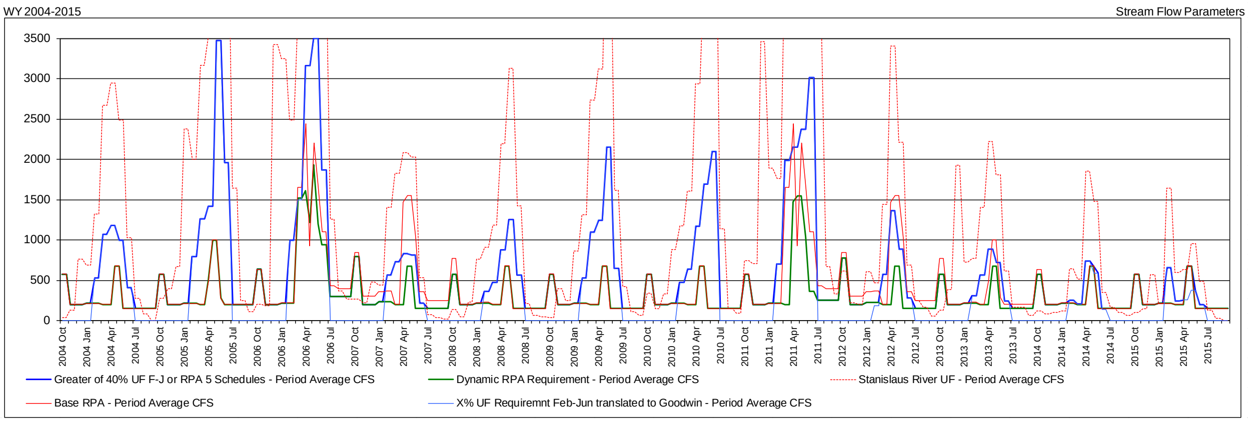


WY 1982-91



WY 1992-03





4. Additional Information

The SWRCB Staff analysis of the 40% scenario using its WSE model results in an end-of-September New Melones Reservoir storage as shown in Figure 16. The difference in New Melones Reservoir storage between the SWRCB modeling results and the Districts' modeling of the 40% conditions is illustrated in Figure 17. The differences are primarily the result of the assumed carryover storage target.

Figure 16. New Melones Reservoir Storage, End of September – SWRCB 40% WSE Modeling

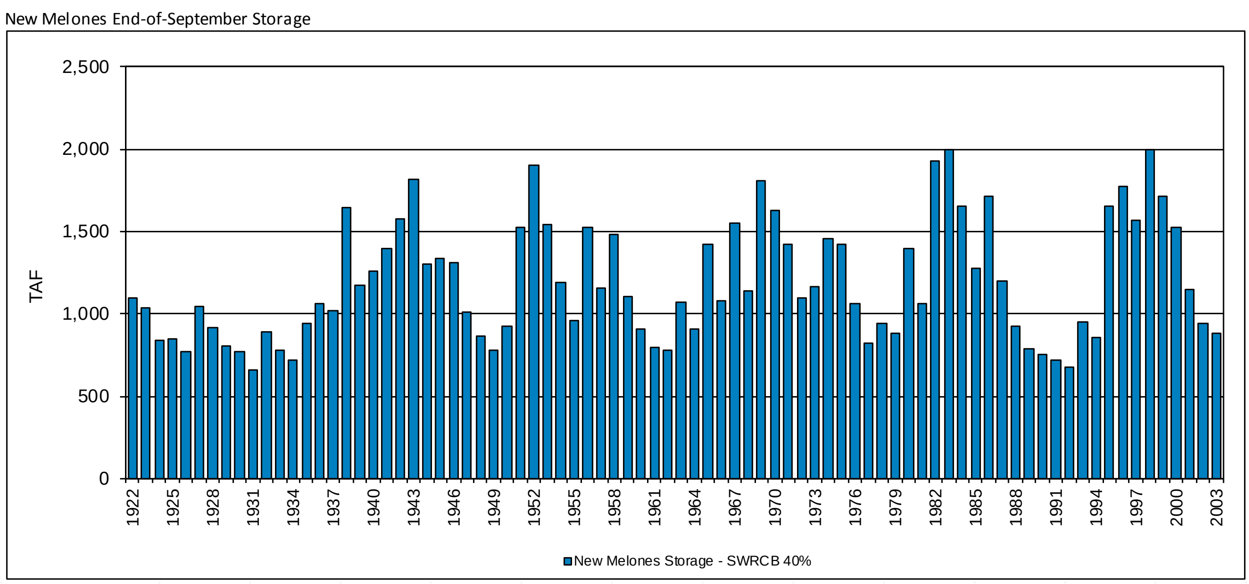
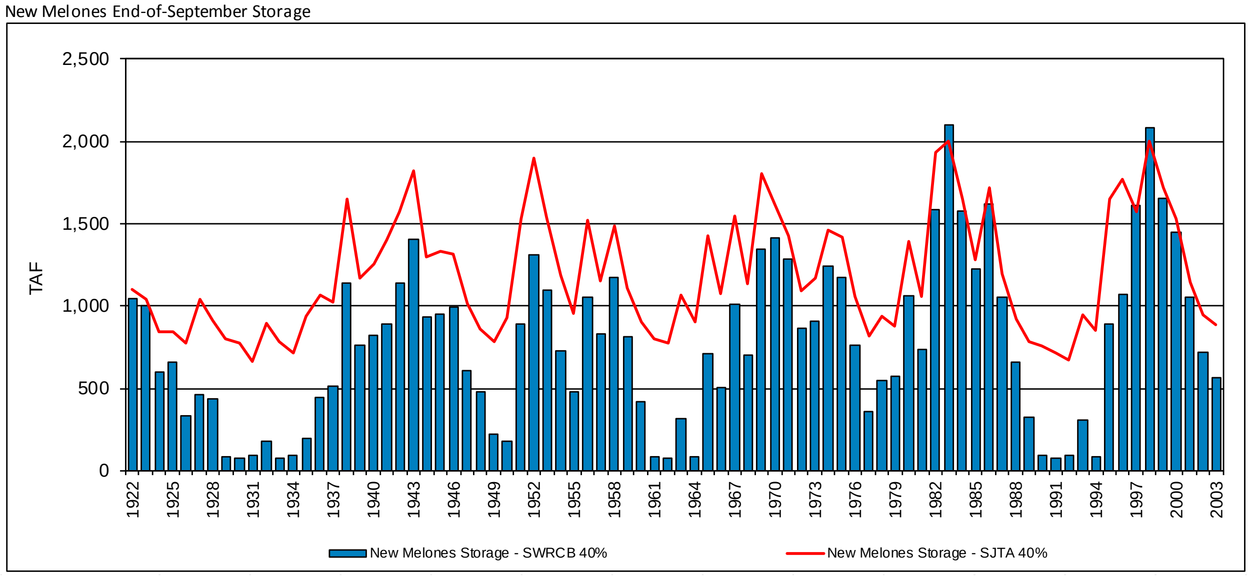


Figure 17. New Melones Reservoir Storage Difference, End of September – 40% Condition



The SWRCB WSE modeling results for its Baseline and 40% conditions were reviewed and Table 4 illustrates annual results concerning hydrology and the WSE operation simulation results.

Table 4. SWRCB WSE Modeling Results – Baseline and 40% Conditions

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
All values expressed in 1,000 acre-feet				NM Storage		OID/SSJID				CVP		
Water Year	SJR Basin WYT	Stanislaus UF	New Melones Reservoir Inflow	**WSE NM EOS Storage SWRCB 40%**	***WSE NM EOS Storage SWRCB Baseline***	Districts' Model Land Use	Districts' Formula Water	**WSE OID/SSJID Diversion SWRCB 40%**	***WSE OID/SSJID Diversion SWRCB Baseline***	**WSE CVP Contractor Allotment SWRCB 40%**	***WSE CVP Contractor Allotment SWRCB Baseline***	**WSE Total Goodwin Release SWRCB 40%**
	602020	TAF	TAF	**TAF**	***TAF***	TAF	TAF	**TAF**	***TAF***	**TAF**	***TAF***	**TAF**
								Land Use				
Does not change among scenarios				SWRCB	*SWRCB*	*Districts' -*		CO Stor	*SWRCB*	SWRCB	*SWRCB*	SWRCB
Districts' and SWRCB Use Same Values				40%	*Baseline*	*SWRCB Differs*		Refill	*Baseline*	40%	*Baseline*	40%
				Alt				Min Diver		Alt		Alt
1922-2003								Formula				
Average		1,118		**1,188**	***1,125***	520	583	**446**	***510***	**91**	***106***	**524**
1922	W	1,431	1,389	**1,097**	***1,340***	506	600	**507**	***507***	**155**	***155***	**606**
1923	AN	1,130	1,109	**1,038**	***1,340***	507	600	**512**	***512***	**155**	***155***	**480**
1924	C	261	385	**842**	***822***	630	457	**252**	***489***	**31**	***78***	**251**
1925	BN	1,225	1,092	**844**	***1,039***	444	600	**451**	***461***	**124**	***136***	**493**
1926	D	607	619	**771**	***677***	559	600	**305**	***553***	**31**	***78***	**320**
1927	AN	1,365	1,256	**1,041**	***899***	515	600	**358**	***521***	**87**	***136***	**522**
1928	BN	951	952	**913**	***935***	509	600	**522**	***529***	**102**	***78***	**427**
1929	C	517	506	**802**	***639***	530	537	**261**	***529***	**20**	***24***	**298**
1930	C	732	671	**773**	***495***	559	600	**314**	***554***	**0**	***16***	**354**
1931	C	316	438	**662**	***169***	549	492	**217**	***457***	**0**	***3***	**289**
1932	AN	1,355	1,160	**894**	***483***	531	600	**363**	***529***	**4**	***12***	**541**
1933	D	610	586	**782**	***216***	574	591	**319**	***570***	**1**	***16***	**338**
1934	C	427	498	**717**	***119***	564	532	**221**	***338***	**0**	***3***	**306**
1935	AN	1,213	1,082	**939**	***334***	464	600	**326**	***467***	**47**	***12***	**470**
1936	AN	1,322	1,291	**1,063**	***752***	480	600	**483**	***491***	**136**	***50***	**547**
1937	W	1,107	1,080	**1,021**	***974***	498	600	**504**	***504***	**155**	***59***	**450**
1938	W	2,076	2,032	**1,647**	***1,870***	495	600	**498**	***498***	**155**	***136***	**764**
1939	D	526	562	**1,171**	***1,299***	529	575	**536**	***536***	**44**	***155***	**401**
1940	AN	1,400	1,327	**1,257**	***1,543***	514	600	**522**	***522***	**128**	***155***	**572**
1941	W	1,336	1,290	**1,399**	***1,658***	486	600	**493**	***493***	**155**	***155***	**478**
1942	W	1,485	1,450	**1,577**	***1,944***	454	600	**476**	***477***	**155**	***155***	**617**
1943	W	1,553	1,538	**1,821**	***1,866***	484	600	**503**	***503***	**155**	***155***	**620**
1944	BN	675	649	**1,301**	***1,328***	547	600	**547**	***547***	**155**	***155***	**418**
1945	AN	1,278	1,228	**1,335**	***1,491***	474	600	**500**	***500***	**155**	***155***	**508**
1946	AN	1,178	1,175	**1,312**	***1,444***	481	600	**510**	***510***	**155**	***155***	**494**
1947	D	634	632	**1,014**	***945***	637	600	**526**	***613***	**31**	***155***	**327**
1948	BN	898	853	**862**	***866***	489	600	**491**	***495***	**43**	***78***	**438**
1949	BN	745	732	**781**	***669***	583	600	**400**	***575***	**10**	***59***	**371**
1950	BN	1,076	1,027	**928**	***779***	549	600	**381**	***547***	**13**	***59***	**463**
1951	AN	1,692	1,654	**1,528**	***1,330***	505	600	**512**	***518***	**128**	***136***	**407**
1952	W	1,920	1,844	**1,902**	***1,931***	496	600	**504**	***504***	**155**	***155***	**808**
1953	BN	976	965	**1,542**	***1,563***	546	600	**548**	***548***	**155**	***155***	**570**
1954	BN	889	882	**1,187**	***1,277***	590	600	**577**	***577***	**155**	***155***	**458**
1955	D	681	656	**955**	***1,036***	516	600	**473**	***521***	**31**	***78***	**351**
1956	W	1,881	1,825	**1,524**	***1,671***	527	600	**521**	***524***	**124**	***136***	**608**
1957	BN	895	878	**1,156**	***1,372***	557	600	**552**	***552***	**155**	***155***	**491**
1958	W	1,678	1,599	**1,485**	***1,878***	419	600	**441**	***441***	**155**	***155***	**683**
1959	D	586	624	**1,106**	***1,341***	556	600	**551**	***551***	**103**	***155***	**298**
1960	C	594	574	**904**	***934***	608	583	**389**	***584***	**18**	***78***	**324**
1961	C	404	446	**799**	***583***	549	497	**256**	***502***	**0**	***24***	**249**
1962	BN	994	863	**778**	***584***	540	600	**421**	***542***	**0**	***16***	**437**
1963	AN	1,267	1,227	**1,067**	***824***	481	600	**349**	***493***	**87**	***50***	**484**
1964	D	644	632	**907**	***599***	578	600	**415**	***575***	**21**	***24***	**316**
1965	W	1,750	1,666	**1,425**	***1,163***	500	600	**506**	***512***	**124**	***128***	**512**
1966	BN	704	733	**1,075**	***917***	552	600	**558**	***558***	**122**	***78***	**355**
1967	W	1,932	1,831	**1,548**	***1,578***	486	600	**492**	***492***	**147**	***136***	**723**
1968	D	640	670	**1,137**	***1,126***	534	600	**545**	***545***	**72**	***155***	**413**
1969	W	2,212	2,118	**1,807**	***1,983***	502	600	**510**	***510***	**135**	***155***	**810**
1970	AN	1,322	1,321	**1,628**	***1,562***	528	600	**543**	***543***	**155**	***155***	**774**

Table 4. SWRCB WSE Modeling Results – Baseline and 40% Conditions (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
All values expressed in 1,000 acre-feet				NM Storage		OID/SSJID				CVP		
Water Year	SJR Basin WYT	Stanislaus UF	New Melones Reservoir Inflow	**WSE NM EOS Storage SWRCB 40%**	***WSE NM EOS Storage SWRCB Baseline***	Districts' Model Land Use	Districts' Formula Water	**WSE OID/SSJID Diversion SWRCB 40%**	***WSE OID/SSJID Diversion SWRCB Baseline***	**WSE CVP Contractor Allotment SWRCB 40%**	***WSE CVP Contractor Allotment SWRCB Baseline***	**WSE Total Goodwin Release SWRCB 40%**
	602020	TAF	TAF	**TAF**	***TAF***	TAF	TAF	**TAF**	***TAF***	**TAF**	***TAF***	**TAF**
								Land Use				
Does not change among scenarios				SWRCB	*SWRCB*	*Districts' -*		CO Stor	*SWRCB*	SWRCB	*SWRCB*	SWRCB
Districts' and SWRCB Use Same Values				40%	*Baseline*	*SWRCB Differs*		Refill	*Baseline*	40%	*Baseline*	40%
				Alt				Min Diver		Alt		Alt
1922-2003								Formula				
Average		1,118		1,188	1,125	520	583	446	510	91	106	524
1971	BN	1,074	1,064	1,425	1,462	528	600	538	538	155	155	535
1972	D	775	764	1,095	1,015	625	600	600	600	39	155	409
1973	AN	1,281	1,237	1,169	1,144	490	600	508	508	126	155	518
1974	W	1,560	1,500	1,460	1,477	439	600	478	479	155	155	555
1975	W	1,249	1,210	1,422	1,461	492	600	506	507	155	155	553
1976	C	373	467	1,059	1,012	608	511	445	512	31	78	298
1977	C	155	271	820	587	608	381	229	394	0	24	231
1978	W	1,589	1,311	938	1,064	454	600	446	457	124	128	620
1979	AN	1,163	1,139	879	1,032	529	600	536	535	137	155	510
1980	W	1,806	1,721	1,393	1,571	481	600	502	502	150	155	538
1981	D	590	633	1,061	1,074	540	600	551	551	60	155	307
1982	W	2,346	2,229	1,932	2,000	429	600	447	447	132	155	799
1983	W	2,950	2,900	2,000	2,000	413	600	436	436	155	155	2,288
1984	AN	1,434	1,621	1,651	1,651	549	600	560	560	155	155	1,227
1985	D	678	744	1,279	1,289	510	600	529	529	155	155	379
1986	W	1,936	1,869	1,718	1,817	475	600	495	495	155	155	774
1987	C	372	497	1,197	1,160	531	531	537	539	31	155	392
1988	C	378	389	922	758	543	460	337	456	0	43	278
1989	C	780	648	785	598	548	600	354	536	0	16	391
1990	C	469	491	757	297	570	527	217	524	0	16	262
1991	C	510	502	717	116	526	535	209	444	0	3	298
1992	C	486	459	673	100	508	506	210	248	0	0	266
1993	W	1,558	1,275	950	549	477	600	335	474	71	12	581
1994	C	454	501	852	248	529	534	222	526	17	16	315
1995	W	2,349	2,160	1,652	1,433	452	600	447	463	124	128	800
1996	W	1,489	1,512	1,772	1,744	517	600	510	510	155	155	690
1997	W	1,758	1,902	1,572	1,589	556	600	563	563	155	155	1,375
1998	W	2,092	1,876	2,000	2,000	444	600	454	454	155	155	848
1999	AN	1,347	1,326	1,716	1,713	508	600	526	526	155	155	893
2000	AN	1,162	1,062	1,529	1,581	488	600	477	477	155	155	583
2001	D	566	588	1,145	1,122	469	592	493	493	120	155	332
2002	D	849	710	944	774	548	600	452	558	22	78	392
2003	BN	994	896	885	627	530	600	454	536	0	59	466

The record of historical hydrology was reviewed for a comparison of unimpaired runoff from the Stanislaus River Basin to the releases to the Stanislaus River at Goodwin Dam. Table 5 illustrates the monthly values of each parameter for the 2011 through 2016 period. Table 6 provides a comparison of the monthly volumes as summed for different periods of the year.

Table 5. Stanislaus Unimpaired Runoff and River Releases at Goodwin Dam

Stanislaus Unimpaired at Goodwin - TAF (DWR)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Feb-Jun
2011	46	42	213	116	98	305	321	364	449	217	41	20	2,231	1,537
2012	38	13	12	37	27	89	202	136	41	15	10	3	624	495
2013	8	23	119	45	43	86	132	111	36	10	10	4	627	409
2014	7	5	6	7	36	32	110	91	21	10	6	4	336	289
2015	6	9	35	13	91	37	38	59	29	8	2	0	326	253
2016	8	14	50	87	90	250	221	205	119	23	8	6	1,081	885

Stanislaus River @ Goodwin - Converted to TAF (USGS/DWR)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Feb-Jun
2011	39	12	28	15	17	36	139	120	118	133	113	92	863	430
2012	139	34	31	37	26	19	92	84	55	27	17	15	577	277
2013	46	17	18	20	76	29	79	87	18	17	13	12	431	289
2014	35	15	13	18	14	25	92	77	16	19	14	9	349	225
2015	26	21	13	16	17	29	29	9	10	10	9	9	198	94
2016	27	21	13	13	12	13	72	90	26	18	14	9	326	212

Table 6. Comparison of Stanislaus River Runoff and Release

Stanislaus River Runoff and River Release

<table>
<tr><th>WY</th><th>OCT</th><th>NOV</th><th>DEC</th><th>JAN</th><th>FEB</th><th>MAR</th><th>APR</th><th>MAY</th><th>JUN</th><th>JUL</th><th>AUG</th><th>SEP</th><th>Total</th></tr>
<tr><td>2011 Release</td><td colspan="4">95</td><td colspan="5">430</td><td colspan="3">339</td><td>863</td></tr>
<tr><td>Runoff</td><td colspan="4">417</td><td colspan="5">1,537</td><td colspan="3">278</td><td>2,231</td></tr>
<tr><td></td><td colspan="4"></td><td colspan="5">Release as % of Feb-Jun Runoff 28%</td><td colspan="3"></td><td>39%</td></tr>
<tr><td>2012 Release</td><td colspan="4">241</td><td colspan="5">277</td><td colspan="3">59</td><td>577</td></tr>
<tr><td>Runoff</td><td colspan="4">100</td><td colspan="5">495</td><td colspan="3">29</td><td>624</td></tr>
<tr><td></td><td colspan="4"></td><td colspan="5">Release as % of Feb-Jun Runoff 56%</td><td colspan="3"></td><td>92%</td></tr>
<tr><td>2013 Release</td><td colspan="4">100</td><td colspan="5">289</td><td colspan="3">42</td><td>431</td></tr>
<tr><td>Runoff</td><td colspan="4">194</td><td colspan="5">409</td><td colspan="3">24</td><td>627</td></tr>
<tr><td></td><td colspan="4"></td><td colspan="5">Release as % of Feb-Jun Runoff 71%</td><td colspan="3"></td><td>69%</td></tr>
<tr><td>2014 Release</td><td colspan="4">81</td><td colspan="5">225</td><td colspan="3">43</td><td>349</td></tr>
<tr><td>Runoff</td><td colspan="4">26</td><td colspan="5">289</td><td colspan="3">20</td><td>336</td></tr>
<tr><td></td><td colspan="4"></td><td colspan="5">Release as % of Feb-Jun Runoff 78%</td><td colspan="3"></td><td>104%</td></tr>
<tr><td>2015 Release</td><td colspan="4">76</td><td colspan="5">94</td><td colspan="3">28</td><td>198</td></tr>
<tr><td>Runoff</td><td colspan="4">63</td><td colspan="5">253</td><td colspan="3">10</td><td>326</td></tr>
<tr><td></td><td colspan="4"></td><td colspan="5">Release as % of Feb-Jun Runoff 37%</td><td colspan="3"></td><td>61%</td></tr>
<tr><td>2016 Release</td><td colspan="4">73</td><td colspan="5">212</td><td colspan="3">40</td><td>326</td></tr>
<tr><td>Runoff</td><td colspan="4">159</td><td colspan="5">885</td><td colspan="3">38</td><td>1,081</td></tr>
<tr><td></td><td colspan="4"></td><td colspan="5">Release as % of Feb-Jun Runoff 24%</td><td colspan="3"></td><td>30%</td></tr>
</table>

All values 1,000 acre-feet unless otherwise noted (UF and release at Goodwin Dam)

ATTACHMENT 2

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

Stanislaus Temperature Modeling
2016 Proposed Operations
Water Allocation Schedule – March 20, 2016

General:

The objective of this work is to assess, using the HEC-5Q Model, the expected temperature conditions at discrete points along the Stanislaus River, given the most recent projections of inflow to New Melones Reservoir, proposed instream flow requirements and various alternatives for OID/SSJID/SEWD diversions from March 20, 2016 through December 31, 2016.

Tasks:

1. Set up the model to run a year with observed and synthesized data similar to the 2015 analysis:
    a. Extend the meteorological inputs (April 2015 thru present). Use last year's (2015) conditions going forward.
    b. Extend the hydrologic inputs through present based on available data.
    c. Consider two alternatives for New Melones Unimpaired Flow (UF) conditions in the water year 2016:
        - Based on the 90% forecast (New Melones inflow ~ 926 TAF)
        - Based on the 75% forecast (New Melones inflow ~ 996 TAF).
    d. Disaggregate the estimated monthly New Melones inflow to daily using inflow records for similar monthly inflows (monthly data provided in Figure 1 & 2 below).
    e. Disaggregate the estimated monthly diversion and Goodwin flows incorporating pulse flow when appropriate (monthly data provided in Figure 1 & 2 below).
    f. Prime the model by setting New Melones and Tulloch to the November 2015 temperature profiles and to the most recent profiles taken in March 2016 (see Task 2).
2. Conduct field measurements for New Melones and Tulloch temperature profiles on March 9, 2016.
3. Incorporate representation of Tulloch's third unit in the model (based on specifications provided by Tri-Dam).
4. Perform model validation by running the model from Jan 1, 2015 to March 8, 2016 and comparing computed temperatures with observed.
5. Perform model simulation, assuming no hydro bypass at New Melones, for the two alternatives by running the model from March 8 to December 31, 2016. Compute the thermal regime downriver.
6. Analyze the results in terms of the expected temperatures (7DADM) at the specified locations along the Stanislaus River from day 1 of the simulation to end-of-year 2016.
7. Prepare a short summary report containing: methodology, assumptions, model verification and results.

Modeling, Analysis and Findings

1. Model Validation

Model validation was conducted by simulating the operation of the Stanislaus River System with actual hydrological and meteorological data from January 1, 2015 through March 8, 2016 and then comparing computed temperature downriver with observed. It should be emphasized that the HEC-5Q was not recalibrated for the purpose of this study but rather validated. In other words, none of the parameters used in the computation process as currently exist in the model have been modified.

The first measure of validation is how well the model replicates the thermal structure in New Melones and Tulloch in comparison with the most recent temperature profiles taken for these reservoirs.

Temperature profiles for Tulloch and New Melones were taken in May, June and October of 2015. However, in order to ensure that the model starts with the most recent and most accurate thermal structure in the reservoirs when projecting temperatures forward in time, additional profiles were taken on March 9, 2016.

A comparison between the computed and observed temperature profiles in New Melones and Tulloch is shown in Figure 3 and Figure 4 below.

The figures show a good match between computed and observed temperatures, thus concluding that the model performed to par as well as was primed properly for this study.

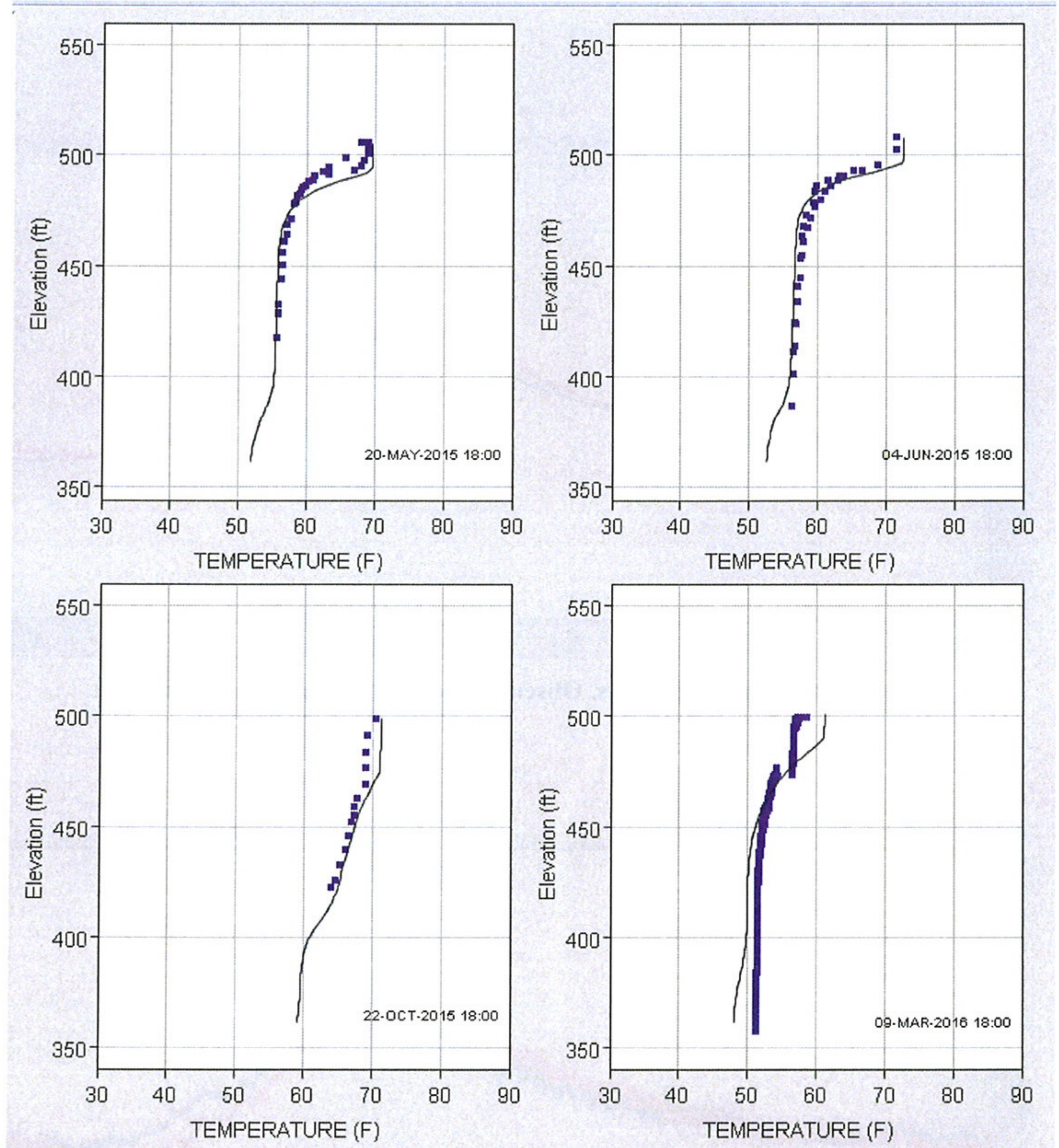


Figure 4: Temperature Profile in Tulloch. Computed (line) vs. Observed (squares).

The second measure of validation is how well the model was able to compute temperature condition downriver for the same time period (i.e., January 1, 2015 to March 8, 2016).

The results are shown in the following three plots, for three locations:

- Goodwin Pool below Tulloch Power Plant
- Below Goodwin Dam
- Below Hwy 120 Bridge (Oakdale)

Here again, the results demonstrate a good match between computed and observed.

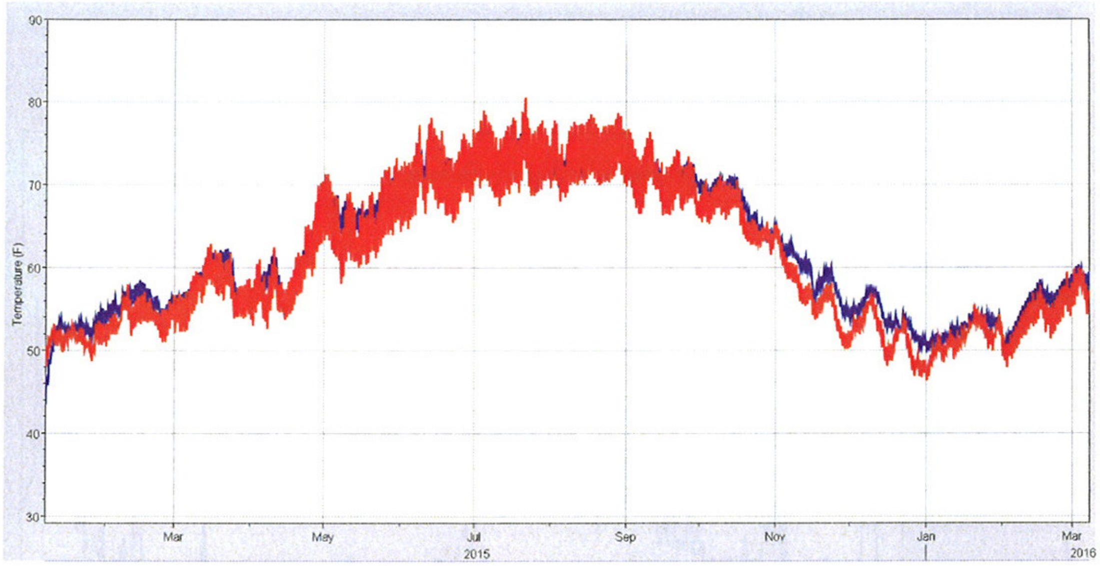


Figure 7: Computed (blue) vs. Observed (red) below Hwy 120 Bridge (Oakdale)

2. Hydrological and Meteorological Data used for Simulation

The pattern of inflow to New Melones for the remainder of this year was based on the pattern of inflow that was observed in 2010. The justification for that is the fact that the level of snowpack that was present in January and February of 2010 and the resulting inflow to New Melones, appear to be similar to the current conditions, as shown in Figure 9 and Figure 9 below. The volume of the inflow in a daily basis was then scaled down to match the monthly estimates for 2016, as specified in Figure 1 and Figure 2 above.

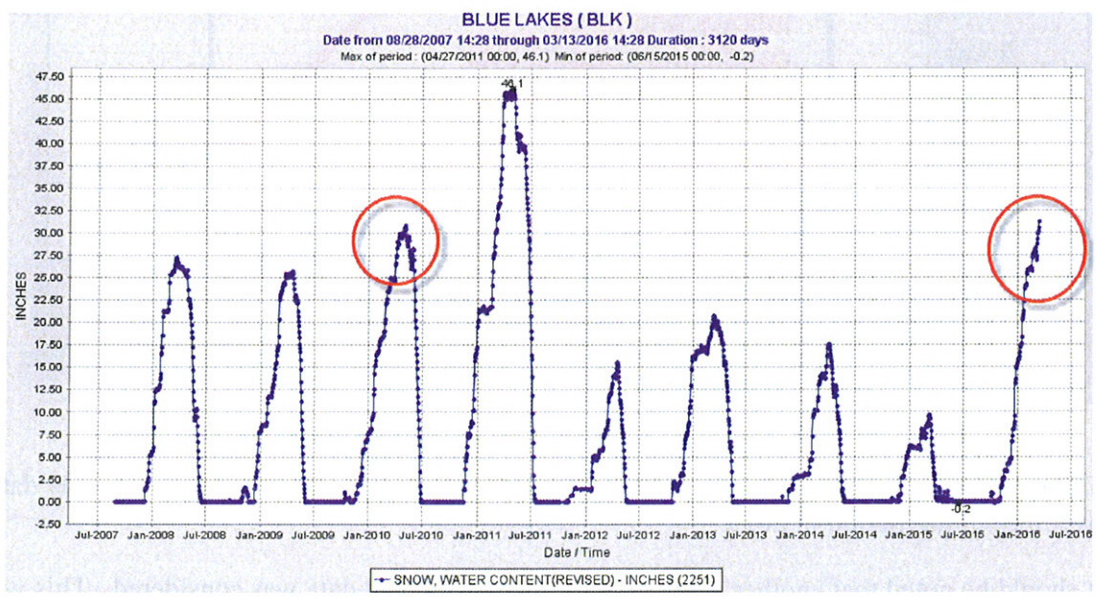


Figure 8: Snowpack in 2016 Similar to 2010

two meteorological conditions on downriver temperatures was minimal, the 2015 meteorology was selected for this study.

3. Projected New Melones Storage

The projected New Melones end-of-month (EOM) storage as simulated with the model for the 90% UF and 75% UF is shown in the table and figure below.

	90% UF	75% UF
EOM	TAF	TAF
Feb-16	459	459
Mar-16	617	617
Apr-16	586	590
May-16	588	623
Jun-16	574	637
Jul-16	499	565
Aug-16	439	506
Sep-16	404	472
Oct-16	393	461
Nov-16	399	468
Dec-16	407	475

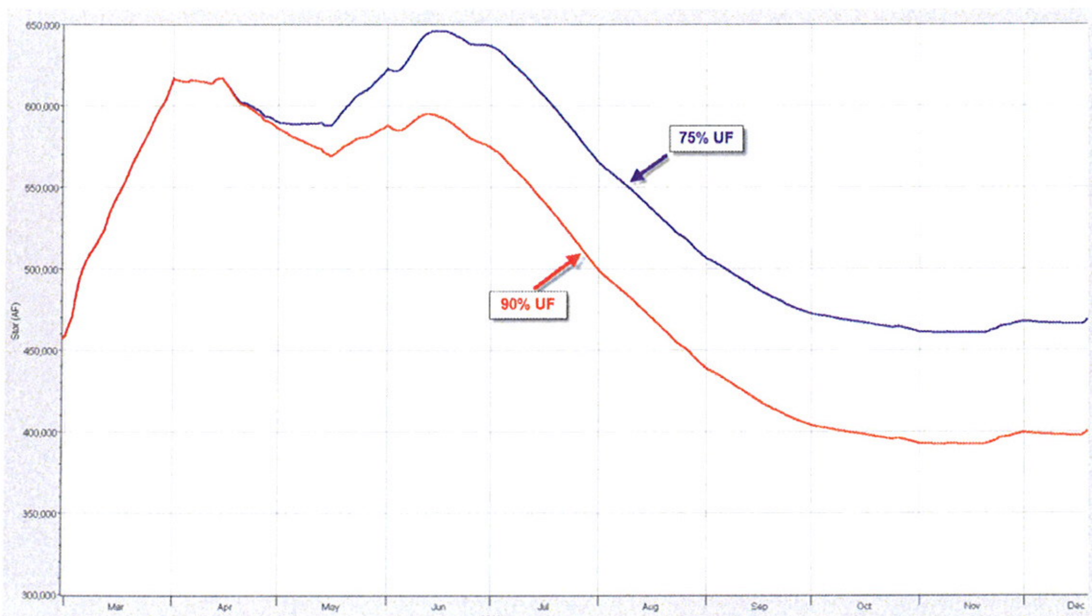


Figure 10 – New Melones Projected Storage

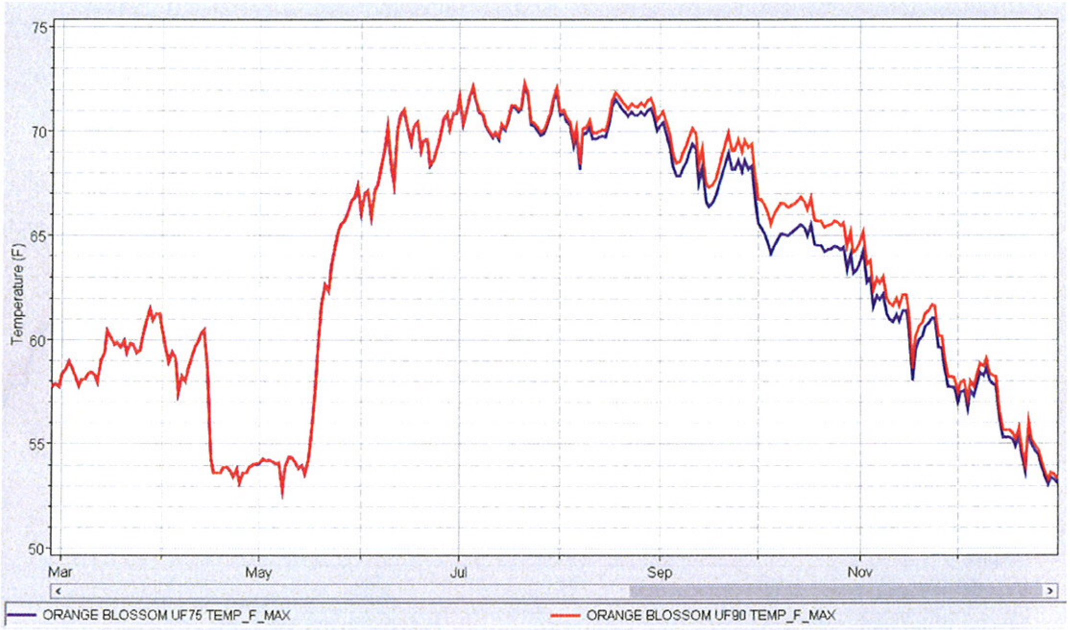


Figure 13 : Maximum Daily Temperatures at Orange Blossom Bridge

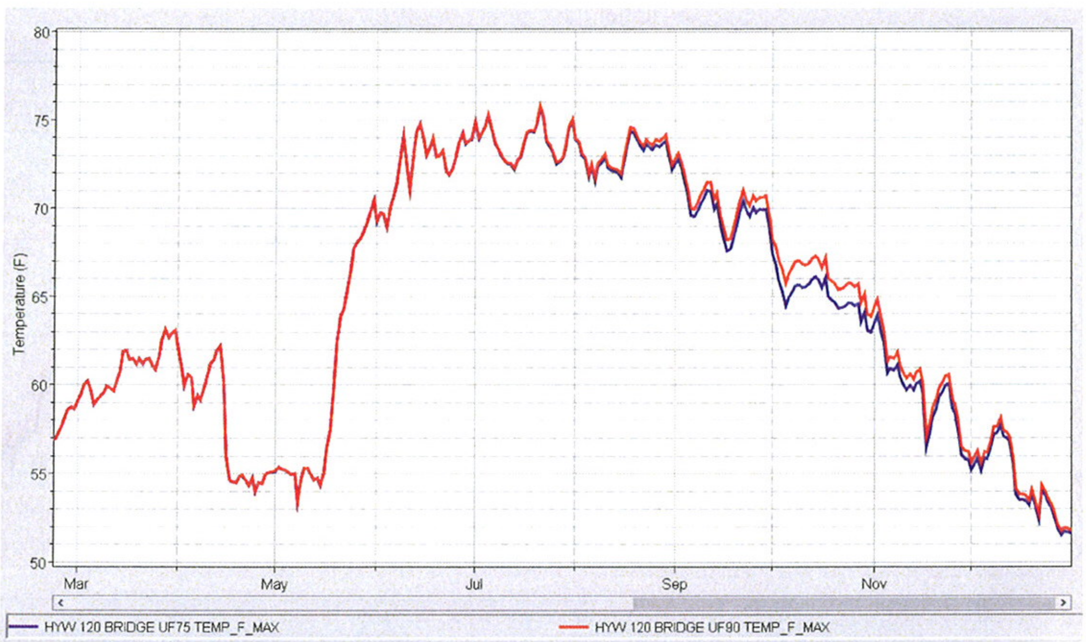


Figure 14 : Maximum Daily Temperatures below Highway 120 Bridge (Oakdale)

5. Relationship between New Melones Storage and Below Goodwin Temperatures

The recent drought and the precipitous decline in New Melones storage provide us with a unique opportunity to gain insight of the relationship between New Melones storage and the temperature below Goodwin Dam.

It should be noted that this is just a crude assessment as the temperature is greatly influenced by the thermal structure of the reservoir which depends on depletion of cold/warm water from the reservoir resulting from preceding operation strategies.

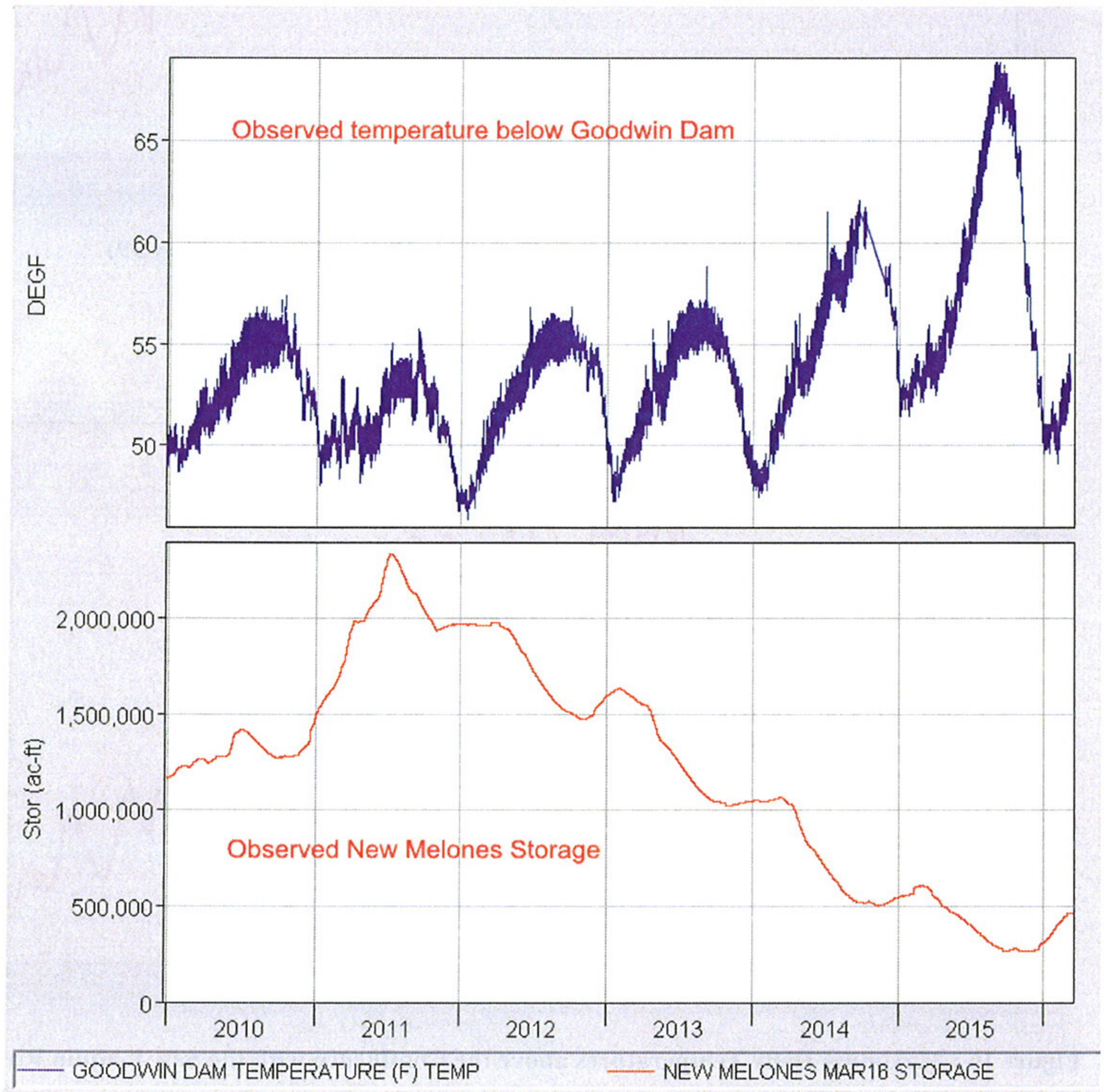


Figure 17 : Goodwin Observed Temperatures vs. New Melones Storage

ATTACHMENT 3

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

Water Temperature Modeling Principles

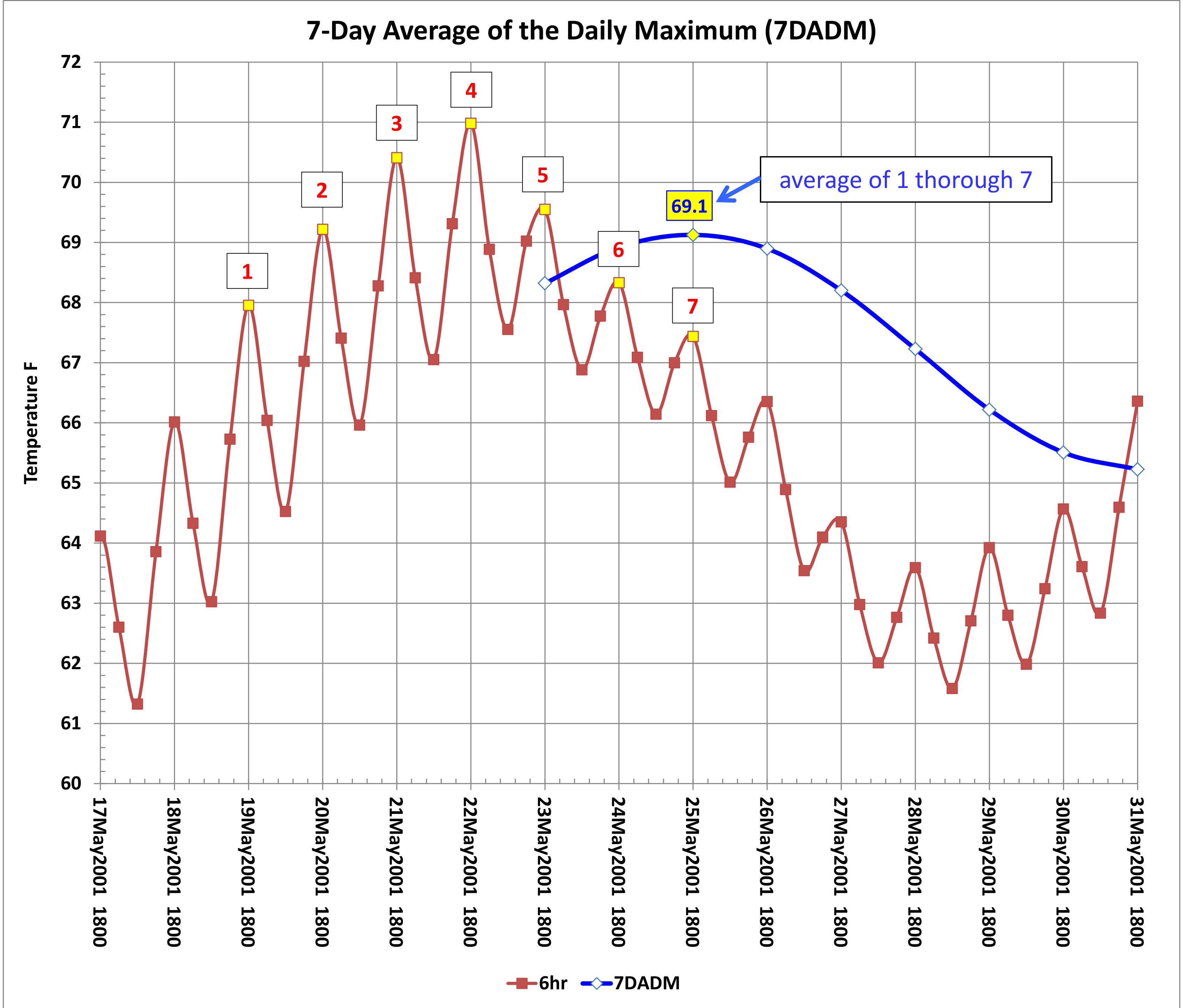
The purpose of this presentation is to explain several principles in modeling the water temperature in the San Joaquin River and its tributaries, using the San Joaquin River Basin-wide Water Temperature Model (aka HEC-5Q).

Understanding those principles would hopefully assist in the evaluation and interpretation of modeling results produced in connection with the San Joaquin River/Southern Delta Water Quality Control Plan, 2017.

7-Day Average of Daily Maximum (7DADM)

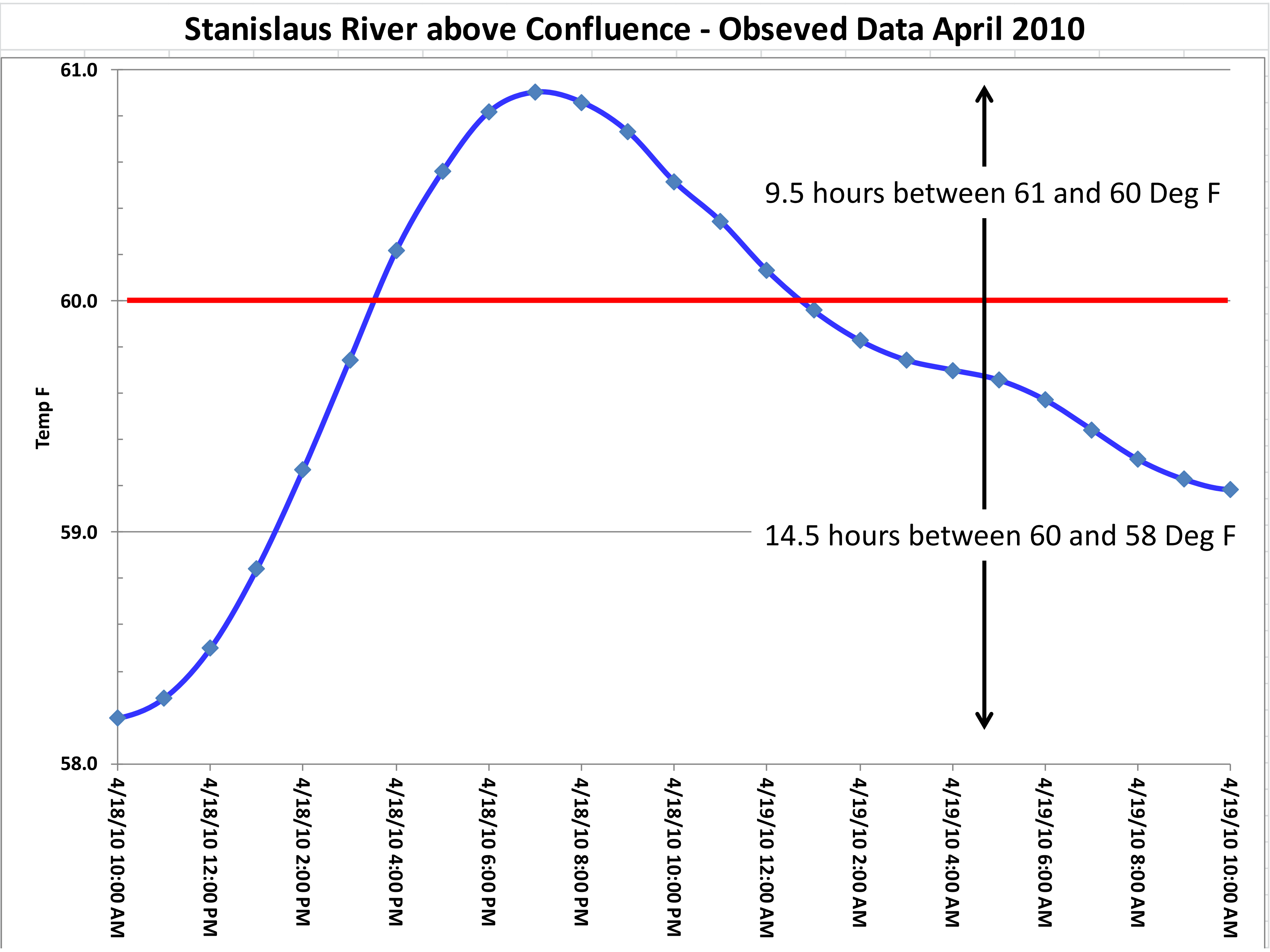
The HEC-5Q model utilizes a sub-daily time step (6-hour intervals) in order represent daily maximum and minimum temperatures. The assumption is that minimum temperature occurs at 0600 hour (6 AM) and maximum temperature occurs at 1800 hour (6 PM).

The 7DADM is the arithmetic average of seven consecutive measures of daily maximum temperatures. Usually, the 7DADM for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date. Occasionally, to simplify the computation process, the 7DADM is also computed as the moving running average, i.e., by averaging that day's daily maximum temperature with the daily maximum temperatures of the prior six consecutive days, as shown in the following chart. Regardless how the 7DADM is calculated, it is important to note that the 7DADM does not reflect the entire range of temperature conditions in the river throughout the 7-day period, but rather the most acute conditions. These acute conditions are short in duration, as will be shown in the charts to follow.

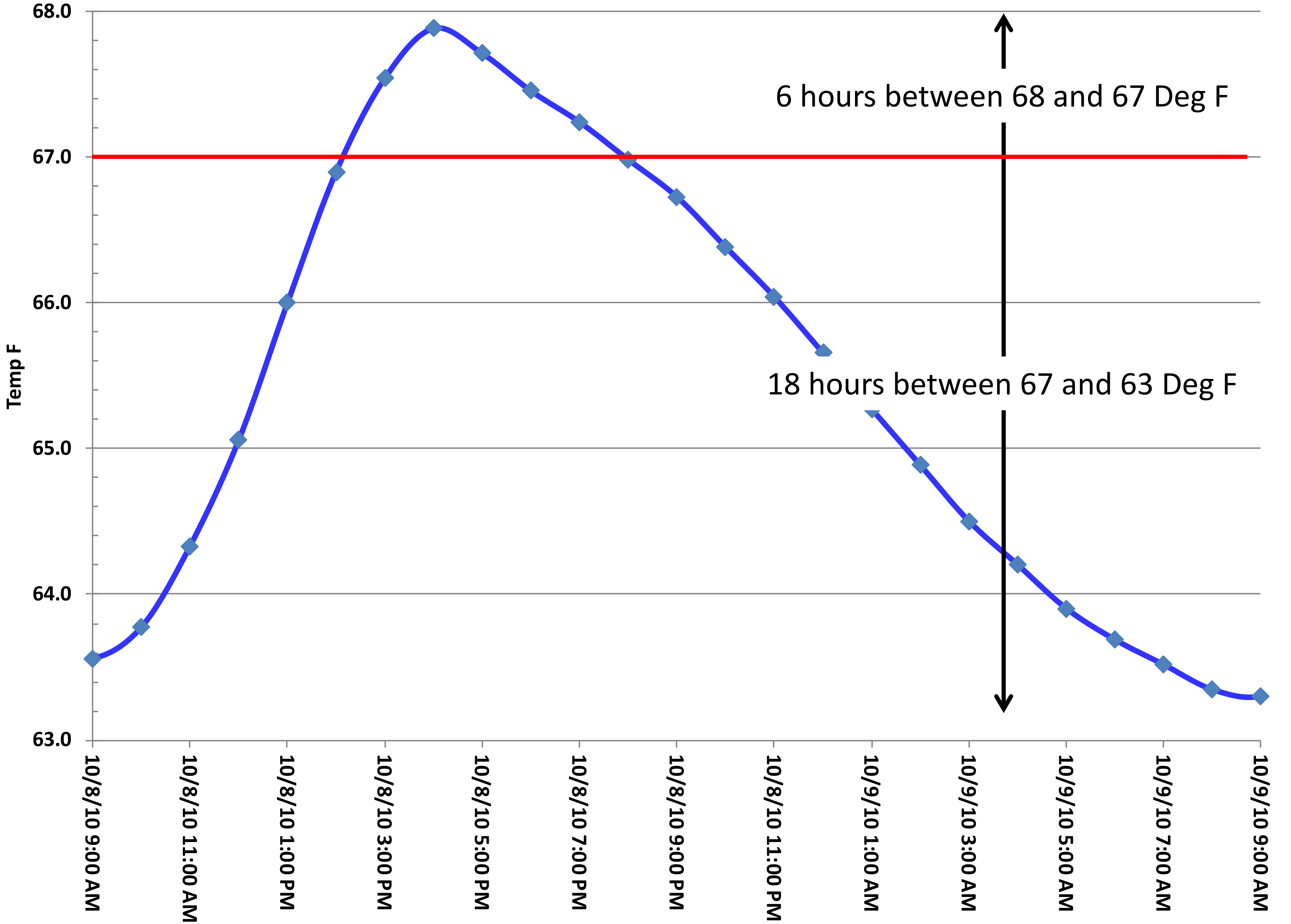

7-Day Average of the Daily Maximum (7DADM)
Temperature F
72
71
70
69
68
67
66
65
64
63
62
61
60
1
2
3
4
5
6
7
69.1
average of 1 thorough 7
17May2001 1800
18May2001 1800
19May2001 1800
20May2001 1800
21May2001 1800
22May2001 1800
23May2001 1800
24May2001 1800
25May2001 1800
26May2001 1800
27May2001 1800
28May2001 1800
29May2001 1800
30May2001 1800
31May2001 1800
6hr
7DADM

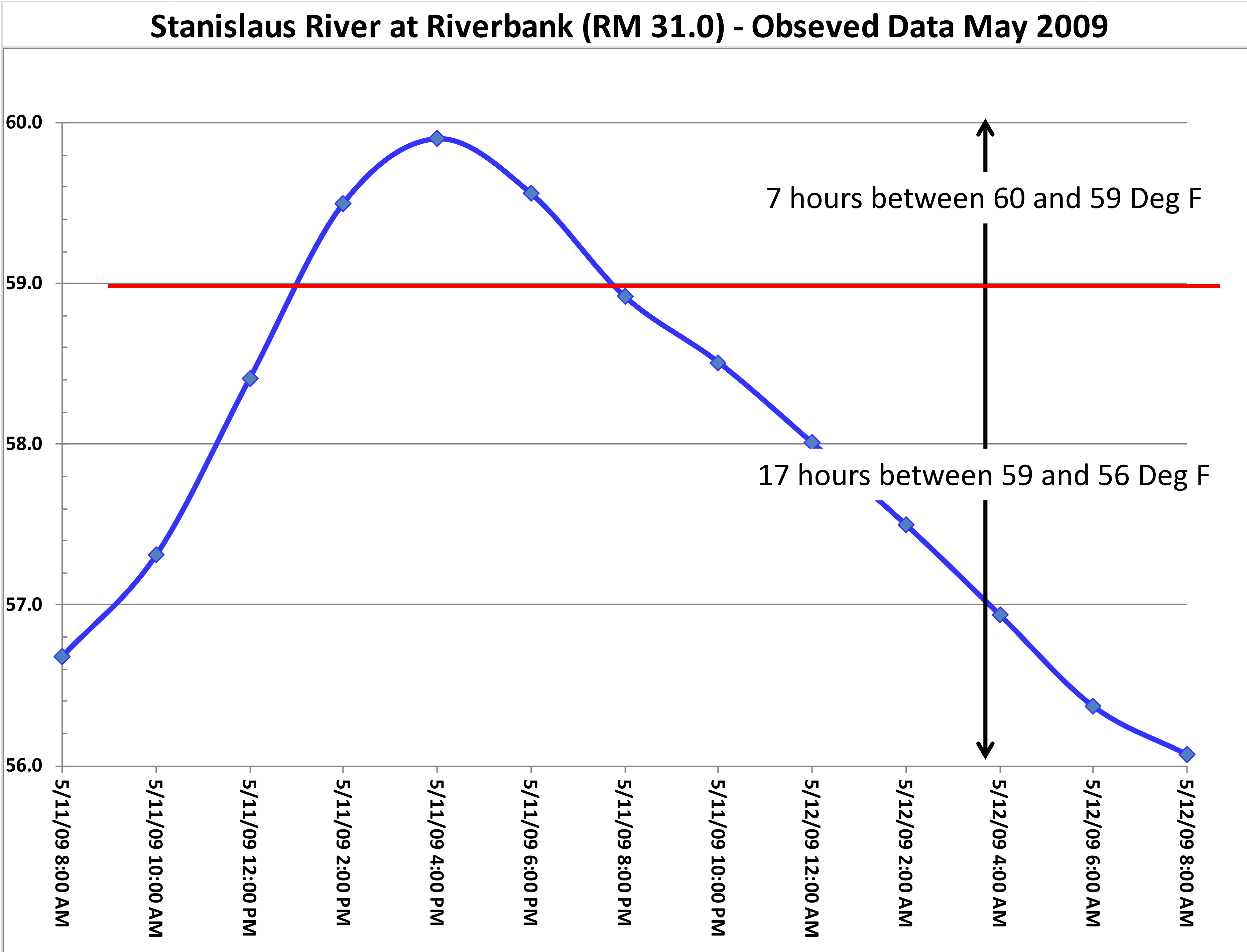
Diurnal Temperature Variation

Diurnal temperature variation is the variation between a high temperature and a low temperature that occurs during the same day. The following charts show the diurnal temperature variations at three locations and times in the Stanislaus River. The charts show that acute conditions (e.g., the temperatures within 1 Deg. F of the maximum temperature) are short in duration relative to the rest of the time in the day and that most of the time the temperatures are lower by more than 1 Deg. F of the maximum temperature (sometime as much as 5 Deg. F, as observed at the confluence in October 2010).


Stanislaus River above Confluence - Obseved Data April 2010
61.0
60.0
59.0
58.0
Temp F
9.5 hours between 61 and 60 Deg F
14.5 hours between 60 and 58 Deg F
4/18/10 10:00 AM
4/18/10 12:00 PM
4/18/10 2:00 PM
4/18/10 4:00 PM
4/18/10 6:00 PM
4/18/10 8:00 PM
4/18/10 10:00 PM
4/19/10 12:00 AM
4/19/10 2:00 AM
4/19/10 4:00 AM
4/19/10 6:00 AM
4/19/10 8:00 AM
4/19/10 10:00 AM

Stanislaus River above Confluence - Obseved Data October 2010




Stanislaus River at Riverbank (RM 31.0) - Obseved Data May 2009
60.0
59.0
58.0
57.0
56.0
7 hours between 60 and 59 Deg F
17 hours between 59 and 56 Deg F
5/11/09 8:00 AM
5/11/09 10:00 AM
5/11/09 12:00 PM
5/11/09 2:00 PM
5/11/09 4:00 PM
5/11/09 6:00 PM
5/11/09 8:00 PM
5/11/09 10:00 PM
5/12/09 12:00 AM
5/12/09 2:00 AM
5/12/09 4:00 AM
5/12/09 6:00 AM
5/12/09 8:00 AM

Temperature Duration Curve

A common way to present the duration and magnitude of hydrological conditions in rivers, is by using duration curves. Normally, the duration curve is a plot that shows the percentage of time flow in a stream is likely to equal or exceed (or be lower) some specified value of interest.

The duration curve is computed by sorting all the values in the data set from largest to the smallest and then assigning for each value its probability (exceedance) based on its ranking within the data set.

In the context of water temperature, one should exercise caution in using 7DADM duration curve as it might be misleading. 7DADM does not provide the full insight to the thermal conditions in river as it does not include diurnal temperature variation, only daily maximums.

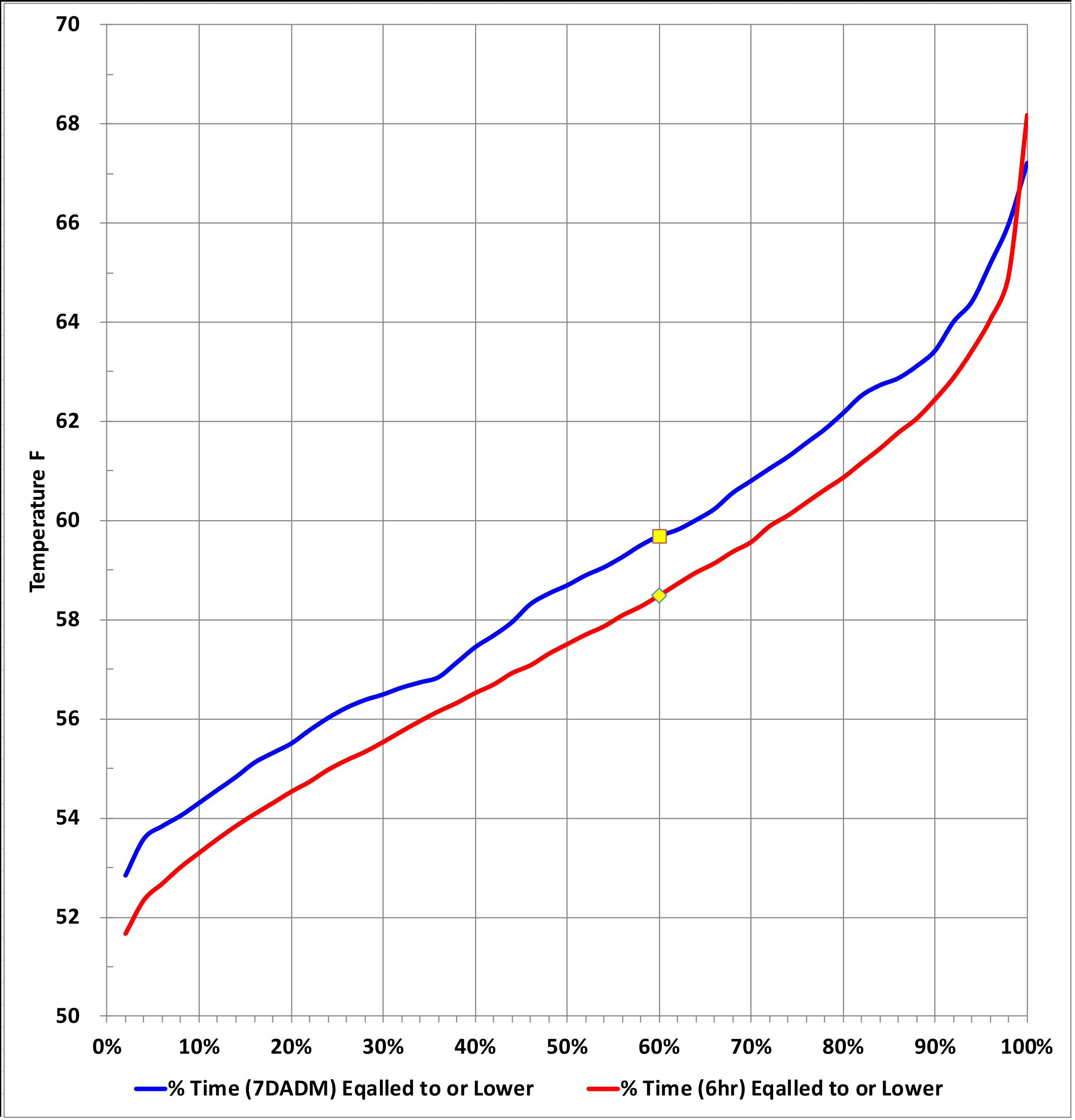
The following chart illustrates that in a way of example:

Two durations curves were developed, one based on 7DADM and one based on temperatures computed at 6-hour time step.

The chart shows that at 60% exceedance level, the water temperature is 58.5 F based on 6-hour time step while it is 59.7 F based on 7DADM. In other words, the 6-hour time step shows cooler temperature than the 7DADM which is more indicative of the actual temperature conditions, statistically speaking.

% Time Eqalled to or Lower	Temp at 6Hr	7DADM	Diff.
2%	51.7	52.8	-1.2
4%	52.3	53.6	-1.2
6%	52.7	53.8	-1.2
8%	53.0	54.0	-1.0
10%	53.3	54.3	-1.0
12%	53.6	54.6	-1.0
14%	53.8	54.8	-1.0
16%	54.1	55.1	-1.0
18%	54.3	55.3	-1.0
20%	54.5	55.5	-1.0
22%	54.7	55.8	-1.0
24%	55.0	56.0	-1.0
26%	55.2	56.2	-1.1
28%	55.3	56.4	-1.0
30%	55.5	56.5	-1.0
32%	55.7	56.6	-0.9
34%	56.0	56.7	-0.8
36%	56.1	56.8	-0.7
38%	56.3	57.1	-0.8
40%	56.5	57.4	-0.9
42%	56.7	57.7	-1.0
44%	56.9	57.9	-1.0
46%	57.1	58.3	-1.2
48%	57.3	58.5	-1.2
50%	57.5	58.7	-1.2
52%	57.7	58.9	-1.2
54%	57.9	59.1	-1.2
56%	58.1	59.3	-1.2
58%	58.3	59.5	-1.2
60%	58.5	59.7	-1.2
62%	58.7	59.8	-1.1
64%	58.9	60.0	-1.1
66%	59.1	60.2	-1.1
68%	59.4	60.6	-1.2
70%	59.6	60.8	-1.2
72%	59.9	61.0	-1.2
74%	60.1	61.3	-1.2
76%	60.4	61.6	-1.2
78%	60.6	61.8	-1.2
80%	60.9	62.2	-1.3
82%	61.2	62.5	-1.4
84%	61.5	62.7	-1.3
86%	61.8	62.9	-1.1
88%	62.1	63.1	-1.1
90%	62.4	63.4	-1.0
92%	62.9	64.0	-1.1
94%	63.4	64.4	-1.0
96%	64.1	65.2	-1.1
98%	65.0	66.0	-1.0
100%	68.2	67.2	1.0

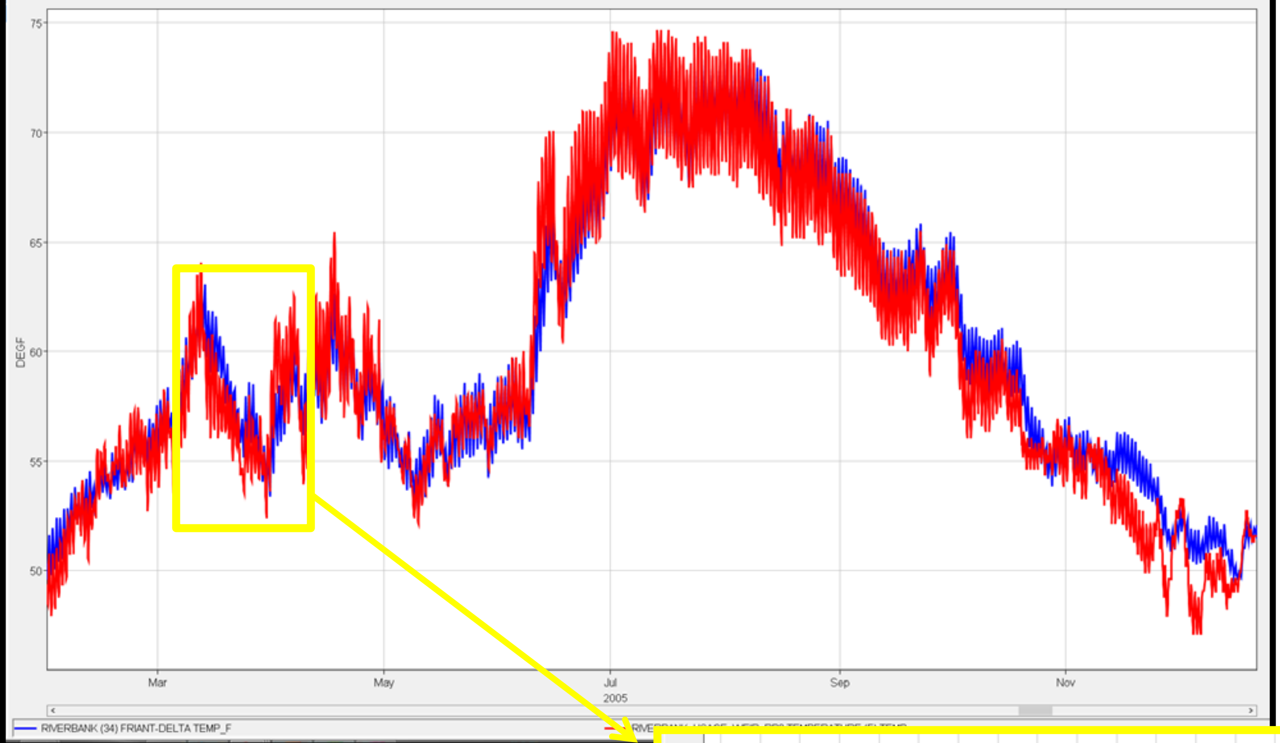
Water Temperature in the Stanislaus River in Apr at RM 0.000



Model Calibration

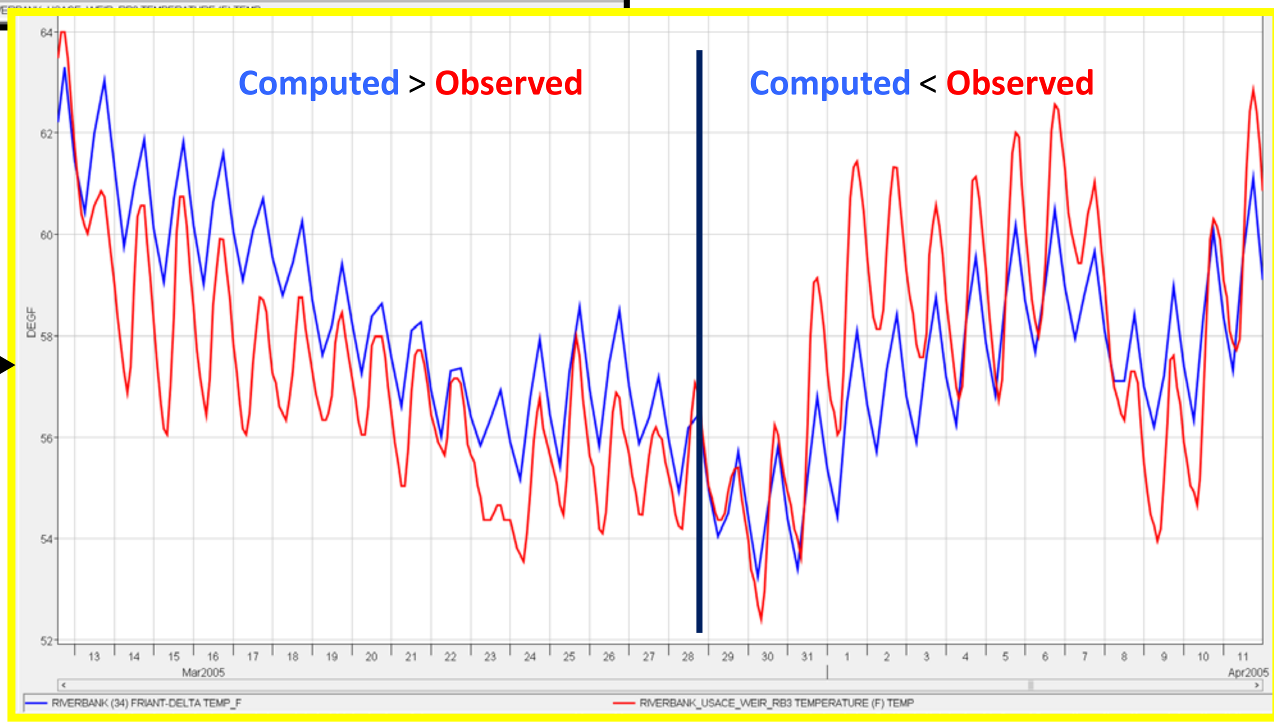
Calibration of the stream reaches in the model was done by comparing computed and observed time series temperatures both graphically and statistically.
The model generally does an excellent job of reproducing the thermal regime in streams. However, this does not mean that there is a perfect match between computed and observed, as shown in the following example:

Example: Water Temperature at Riverbank, May 2009



Model calibration shows a good fit between computed and observed, thus capturing well the temperature trend at this location for this time frame

However, a closer look reviles discrepancies between computed and observed, some in the order of 1-3 Deg. F. These discrepancies could be positive (computed > observed) or negative (computed < observed)



Model Calibration - Margin of Error

The measures by which we determine how well the model is calibrated, are:

- **Coefficient of Determination (R^2)**

  R^2 is a standardized measure of degree of predictedness or fit. R^2 = 1 means a perfect match between computed and observed. The closer R^2 to 1, the more fitted the data is. Usually, R^2 greater than 0.9 means a very good match.

- **Root-Mean-Square Error (RMSE)**

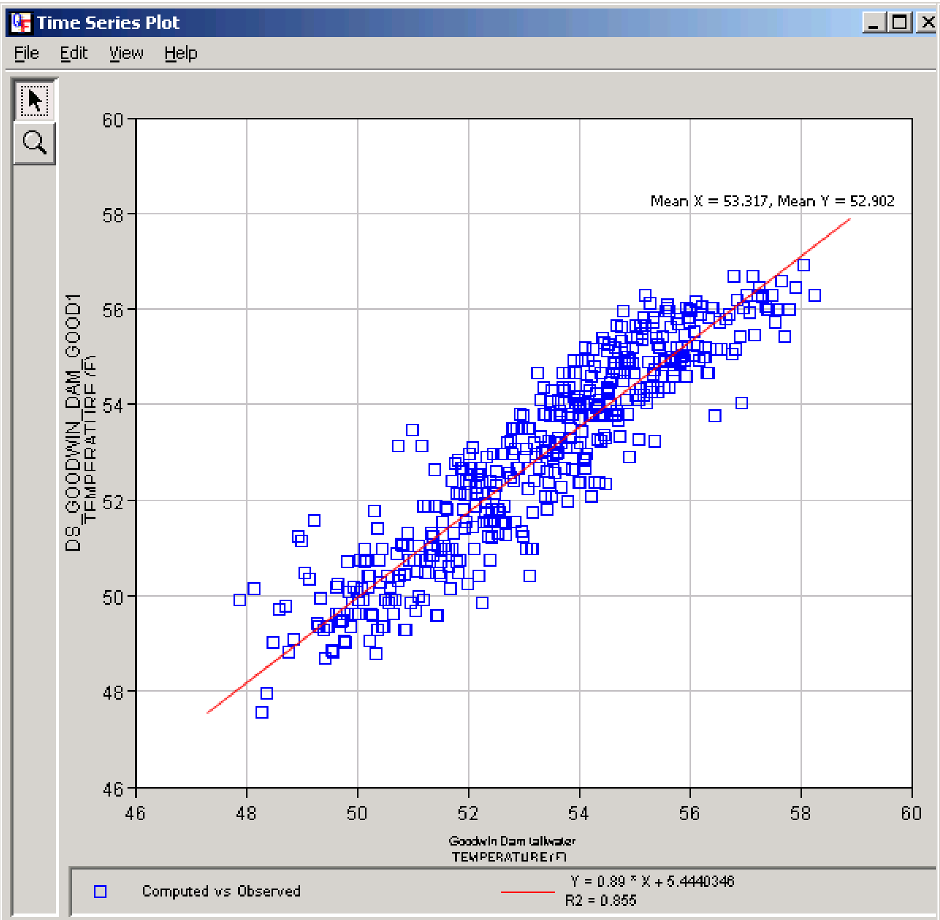
  RMSE tells us how concentrated the data is around the line of best fit. The larger the RMSE the more scatter the data is with respect to the line of best fit. RMSE is a term that is embedded in R^2.

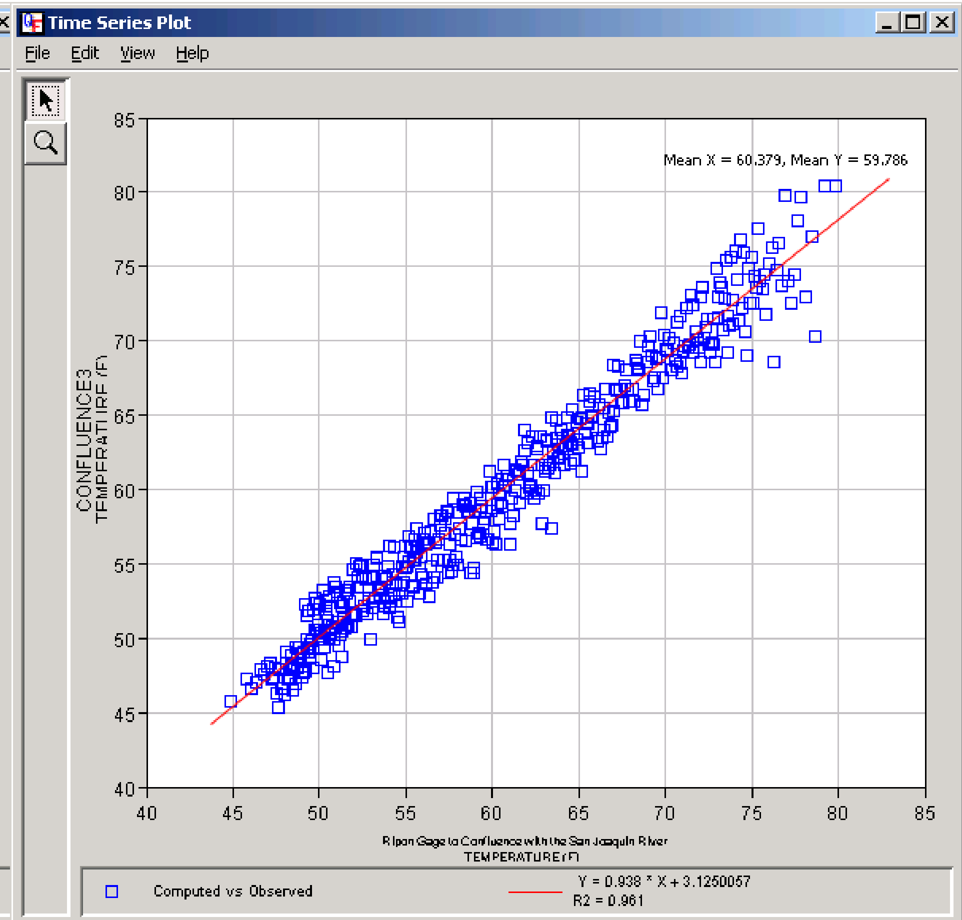
- **Model Bias**

  Model bias defined as the difference between the average computed and observed temperatures. The higher the bias in absolute terms the more skewed the model is. Positive Bias designates that computed tends to show higher temperatures than the observed and negative Bias is the opposite.

The following charts show the calibration results for two locations: Below Goodwin Dam and the Confluence.

Model Calibration - Computed vs. Observed





Below Goodwin Dam

Average computed =	53.32
Average observed =	52.90
Bias =	0.41
RMSE =	0.94
R^2 =	0.855

Confluence

Average computed =	60.38
Average observed =	59.79
Bias =	0.59
RMSE =	1.85
R^2 =	0.961

Model Calibration - Computed vs. Observed

Other locations in the Stanislaus River*

Location	River Mile	Water Temperature (degrees F)		
		Avg. Observed	Avg. Computed	Coefficient of Determination (R^2)
Below Goodwin	58	52.90	53.32	0.855
Knights Ferry	54	53.33	53.72	0.907
Orange Blossom	46	55.29	55.28	0.936
Oakdale Rec.	40	55.88	55.96	0.948
Riverbank	31	57.64	58.07	0.955
Ripon	15	60.49	60.40	0.961
Confluence	0	59.79	60.38	0.961

* Source: San Joaquin River Basin Water Temperature Modeling and Analysis, AD Consultants et al 2009.pdf

Model Implementation

The model generally does an excellent job of reproducing the thermal regime in streams. Results show Coefficient of Determination (R^2) to be around 0.93 for the Stanislaus, 0.91 for the Tuolumne, 0.93 for the Merced, and 0.98 for the Main-stem SJR at most locations. The model bias defined as the difference between the average computed and observed temperatures was 0.26, 0.67, 0.32 and 0.31 degrees Fahrenheit for the four rivers, respectively. This means that the model is a little bit biased towards higher temperatures.

In conclusion, it should be noted that inaccuracies in model prediction are carried into all the alternatives studied with the model. Therefore, the power of this modeling tool should not be viewed in terms of its capability to perfectly predict the temperatures but rather for comparing alternatives.

ATTACHMENT 4

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

TO: Tim O'Laughlin
FROM: FISHBIO
DATE: July, 2013
SUBJECT: **Stanislaus River Off-Channel Habitat Assessment**

From April 22 to May 11, 2013, Goodwin Dam releases were increased to 3,000 cfs as a result of a water sale by the Oakdale Irrigation District. During this period, FISHBIO conducted three surveys (one per week) to evaluate the amount and characteristics of off-channel habitat that could potentially support juvenile salmonid rearing under these flow conditions and timeframe.

The goals of this study were: (1) to identify the number and distribution of off-channel habitat areas within the Stanislaus River that become inundated under Goodwin flow releases of 3,000 cfs, (2) determine whether physical and water quality characteristics in representative off-channel areas are suitable to juvenile salmonid rearing, (3) determine the presence of juvenile salmon and other fish species in representative off-channel areas downstream of Oakdale, and (4) determine temporal changes in salmonid habitat usage of these representative off-channel areas downstream of Oakdale.

Key points

- At flows of 3,000 cfs, shallow off-channel habitats are very limited along the lower Stanislaus River.
- No Chinook salmon were documented in any of the off-channel habitats sampled, despite large numbers of juvenile salmon in the system. This finding is consistent with findings by Moyle et al. (2007), who reported prevalence of non-native species on floodplains and very limited habitat use by Chinook salmon after April.
- Juvenile Sacramento sucker and pikeminnow use off-channel habitat during this period, with large numbers of larval fish (presumably belonging to these species) observed in most sampled units.
- Adult splittail were observed at two sites downstream of Hwy 99, which are likely able to provide suitable spawning habitat when inundated, as splittail eggs develop rapidly and embryos hatch after 3-5 days (at ~65 degrees Fahrenheit; Moyle et al. 2004).
- Water temperatures were generally about 1°F warmer (range: -0.3 to 7°F) in off-channel habitats than in the adjacent mainstem river.
- Poor connectivity, in combination with large amounts of decaying organic matter, resulted in dissolved oxygen depletion in parts of some inundated areas, making them unsuitable for salmonid rearing.

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ATTACHMENT 1
STANISLAUS RIVER OFF-CHANNEL HABITAT ASSESSMENT

From April 22 to May 11, 2013, Goodwin Dam releases were increased to approximately 3,000 cfs (i.e., 3,009-3,045 cfs) to fulfill the terms of a water sale by the Oakdale Irrigation District. During this period, FISHBIO conducted three surveys (one each week) to ascertain the potential amount of off-channel habitat and potential salmonid rearing that occurs in these areas under these flow conditions and timeframe.

The goals of this study were: (1) to identify the number and distribution of off-channel habitat areas within the Stanislaus River that become inundated under Goodwin flow releases of 3,000 cfs, (2) determine whether physical and water quality characteristics in representative off-channel areas can support juvenile salmonid rearing, (3) determine the presence of juvenile salmon and other fish species in representative off-channel areas downstream of Oakdale, and (4) determine temporal salmonid habitat usage of these representative off-channel areas downstream of Oakdale.

Methods

Reconnaissance Mapping

Reconnaissance mapping surveys were conducted in the lower Stanislaus River on April 24 and May 7-8, 2013 to identify the number and distribution of off-channel habitat in the lower Stanislaus River under Goodwin Dam releases of 3,000 cfs, and to establish a framework for selecting a representative sub-sample of sites in order to evaluate habitat use by salmonids and other fish species during subsequent fish sampling events.

On April 24, mapping was conducted between Oakdale (RM 40) and the confluence with the San Joaquin River (RM 0) at a mean daily flow of 3,009 cfs at Goodwin and 2,458 cfs at Ripon (CDEC: GDW and RIP gages). On May 7-8, mapping was conducted between Knights Ferry (RM 54) and Oakdale (RM 40) at a mean daily flow of 3,008 cfs at Goodwin and 2,879 cfs at Ripon (CDEC: GDW and RIP gages, Figure 1).

Surveys consisted of travelling each reach by boat and identifying recently inundated, shallow off-channel habitats. At each site, we recorded coordinates (using a Trimble GPS with sub-meter accuracy), side of river (north bank/ south bank), and photo-documentation of site characteristics (e.g., inundation levels and cover types). Relative size was also recorded for a majority of sites based on whether the site was wadeable (perimeter measurements using GPS) or was too deep for wading (length and width measurements using a rangefinder); a few sites were not measurable due to heavy vegetation.

Physical Habitat and Water Quality Measurements

Based on reconnaissance mapping, representative sites were selected to collect physical habitat and water quality data (depth, water velocity, substrate, cover, dissolved oxygen, and water temperature) to ascertain whether physical conditions could support juvenile salmonid rearing in off-channel habitats (Figures 2 and 3). Physical habitat measurements were collected at 12 sites upstream of Oakdale. Downstream of Oakdale, environmental data was collected at 18 sites, and fish sampling occurred at eleven of these locations.

At each representative site, physical parameters were measured at five evenly spaced points along each of three transects oriented parallel to the river channel. Due to the variation in size and shape of off-channel habitats, standard distances between transects and between points were not established; instead, length of transects, distances between transects, and distances between points along transects were adjusted according to the size and shape of the inundated habitat. For each site, transects were spaced evenly between the wetted margin and the point where water depths approach four feet to adequately capture variation in physical parameters that may be influenced by the distance between sampling points and the main channel (e.g., DO, current velocity, and temperature). A schematic of each measured site, indicating transect and sampling point locations, was drawn during the first sampling event to ensure consistency and comparability of point-samples during subsequent events. Physical parameter measurements were then averaged for each site to obtain mean values for each event and each site (Tables 1, 2 and 3).

Fish Sampling Downstream of Oakdale

Based on the list of sites identified during reconnaissance mapping, representative sites between Oakdale (RM 40) and the confluence (RM 0) were randomly selected for conducting fish sampling using backpack electrofishing to document salmonid and other fish species presence and usage of inundated off-channel habitats. Sampling was limited to the reach downstream of Oakdale due to conditions of our National Marine Fisheries Service (NMFS) 4(d) sampling permit, which does not allow electrofishing upstream of Oakdale.

Backpack electrofishing was chosen as the most effective sampling method to document juvenile salmonids and other fish species in shallow water areas, often covered with dense vegetation. Care was taken to minimize disturbance of each site prior to and during electrofishing activities. Water depth was the most limiting factor to backpack electrofishing, and restricted sampling to areas less than about 3.5 feet deep. As assessing fish presence and habitat use (rather than determining fish abundance) were objectives for this investigation, electrofishing was limited to single passes along each of the three pre-established transect lines at each site. Captured fish were temporarily held in buckets until electrofishing at the respective site was completed, then identified to species, counted, measured, allowed to recover, and subsequently released. Additional fish observed—but not captured—in a sampling unit were noted and identified to species/lifestage whenever possible.

RESULTS

Reconnaissance Mapping

Under flows of 3,000 cfs, there were a total of 62 off-channel habitat areas identified between Knights Ferry and the confluence (Figures 2 and 3). Ten of these areas were too deep (>6 ft) under these flow conditions to function as shallow water juvenile salmonid rearing habitat. Sizes of inundated areas were generally small (mean=3,552 m^2/ 0.88 acres, min= 130 m^2/ 0.03 acres, max=22000 m^2/ 5.44 acres).

Physical Habitat and Water Quality Measurements

Backpack electroshockers could only be operated safely and effectively in depths that did not exceed 4 feet. As a result, corresponding habitat measurements are limited to areas shallower than 4 feet.

Mean current velocities were generally less than 0.3 fps, and could thus provide refuge from higher current velocities found in the main channel. Stagnant water (current velocity of 0 fps) was occasionally observed in habitats that were only minimally connected to the river or isolated from the channel by dense stands of vegetation. Such areas, though present on virtually all sampled off- channel habitats, were generally restricted to the immediate vicinity of the wetted margin.

Substrate in off-channel areas consisted of silt or soil, and cover in off-channel areas was predominantly made up of non-woody plants, such as grasses, nettles, etc. (Table 2). However, some sites were dominated by woody vegetation, such as trees and shrubs (e.g., site 182), while others were largely devoid of any cover (e.g., site 196).

During each sampling event, average water temperatures in off-channel areas were between 0.5 and 0.9 degrees warmer compared to surface water mid-channel (in the sun) (Table 1). In some instances, water temperatures in off-channel areas were cooler compared to mid-channel; these measurements were generally recorded in shaded areas. Temperature differences of greater than 7°F between the main channel and some inundated areas were recorded, but these high temperatures were associated with backwater areas having slow or no current.

Dissolved oxygen concentrations of inundated areas varied greatly (between 0.1 mg/L and 10.4 mg/L), but were generally suitable for fishes whenever there was water exchange between an inundated area and the main river channel. Dissolved oxygen concentrations were low in the backwater areas where water temperatures were occasionally over 7°F higher than in the main channel.

Table 1. Summary of mean off-channel habitat parameters on the Stanislaus River, sampled during flows of 3,000 cfs discharge in late April/ early May 2013. Temperature differences refer to the difference between mean floodplain temperature (generally based on 15 measurement points) and mid-channel surface temperature. Depths and velocities were not measured during the third sampling event.

	Depth (ft)			Temperature (°F)			Temperature difference (°F)			Velocity (fps)		
Event	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
1	0.70	2.58	1.96	55.0	65.7	57.8	-0.6	7.0	0.8	0	0.9	0.3
2	1.54	6.00	2.72	53.5	60.9	56.6	-0.5	3.7	0.5	0	0.4	0.2
3	NA	NA	NA	53.7	61.9	56.7	-0.3	4.1	0.9	NA	NA	NA

Table 2. Summary of off-channel habitat cover composition on the Stanislaus River, sampled during flows of 3,000 cfs discharge in late April/ early May 2013.

	% Coverage											
	Non-wood			Wood			Dead Wood			Bare Substrate		
Event	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
1	15	95	60	5	45	21	0	25	5	0	65	15
2	0	85	46	5	90	29	0	15	5	0	85	20
3	20	90	61	5	80	26	0	15	6	0	30	7

Fish Sampling Downstream of Oakdale

Fish sampling was conducted at 11, 9, and 10 sites on April 25-26, May 2-3, and May 9 respectively. As became apparent during the second sampling event, water level had not reached equilibrium by our first field sampling event, so that some of the areas could not be sampled repeatedly due to excessive water depth. Total electrofishing effort (time that electrofishing unit was active) was 14,272 seconds, for an average of 476 seconds per site.

No salmonids were captured or observed at any site. Since no salmonids were observed in any of the surveyed off-channel habitats, no statistical evaluation of habitat use or -preference was possible.

A small number of other fish species were captured or observed (Figure 4). The most numerous lifestages and species (with greater than 40 individuals of each species) included larval and juvenile Sacramento pikeminnow, Sacramento suckers, and splittail. Ten unidentified fish were recorded, which were likely one of these more abundant species. Six juvenile bass were observed. Adult splittail were observed in two locations downstream of HWY 99; one individual was captured at RM12.6R, while 4 individuals were captured at RM4.8R, in addition to observations of approximately 20 (adult) individuals at the latter site.

Discussion

Floodplains that have been found to support juvenile salmon rearing in other areas (e.g., Yolo Bypass, Cosumnes River Preserve); compared to these areas where hundreds or thousands of acres can be seasonally available to juvenile salmonid rearing, large areas of inundated, shallow off-channel habitat are conspicuously absent in the lower Stanislaus River under Goodwin Dam releases of 3,000 cfs. The 52 locations where shallow off-channel areas were identified in the Stanislaus River hardly fit the definition of a floodplain. For instance, eight of these areas were classified as side channels, while others are more aptly described as off-channel ponds/beaver ponds, flooded orchards, backyards, or campgrounds. Among the remaining sites, narrow bands of flooded margin habitat were relatively common, though riparian encroachment (resulting in very dense vegetation) was prohibitive of fish sampling at these locations. Few sites were larger than one (1) acre, but 40 sites (mean=3,926 m^2/ 0.97 acres, min= 130 m^2/ 0.03 acres, max=22000 m^2/ 5.44 acres) were identified as having the potential to function as juvenile salmonid rearing habitat based on a combination of physical and water quality conditions (i.e., water depth, connectivity to main channel, water temperature and DO).

Thermal benefits (i.e., warmer water temperatures) are frequently associated with floodplain rearing of juvenile salmonids, and are thought to provide increased food productivity and, subsequently, improved growth conditions compared to the main channel. Average water temperatures were generally about 1°F warmer in off-channel habitats compared to surface waters of the main channel, though some areas with limited water circulation warmed to greater than 7°F above in-river temperature. As expected, off-channel areas provided low-velocity habitat with mean current velocities of less than 0.3 fps, and some areas with no current were observed as well. Water was often warmer in areas with low current velocities (i.e. sites that were not classified as side-channels), particularly when shade was sparse. Incidents of low DO (nearly anoxic conditions) were occasionally observed in these areas, in particular at sampling points located farthest from the main river channel. Such adverse conditions were likely exacerbated by large amounts of decaying organic matter in these areas (expected to increase the biological oxygen demand).

Sampling gear (backpack electroshocker) efficiency was demonstrated by captures of various fish species present in inundated areas. Despite extensive sampling effort and collection of non-salmonid species, no juvenile Chinook salmon were documented. It is worth noting that the lack of Chinook captures cannot be attributed to absence of fish in the system, as large numbers of juveniles were documented at the Oakdale rotary screw trap (between April 25th and May 10th, 719 juvenile Chinook were captured, with an estimated passage of over 145,000 individuals). Also, a single juvenile Chinook was observed feeding downstream of a fast side channel site near Oakdale, but outside of the sampled area. Of the 11 different species we captured or observed at the sampled sites, larval/juvenile Sacramento suckers, larval/juvenile pikeminnow and juvenile/adult splittail (only downstream of Highway 99) were the most common (Figure 4). Most areas were also heavily utilized by non-salmonid larval fish (unknown species, but likely suckers or pikeminnow), which were too small to be sampled. Due to the overall low abundance, we are unable to determine quantitative changes in fish usage during the sampling period (e.g., little change in relative abundances).

Though the reasons for presumed lack of off-channel habitat use by juvenile salmonids are speculative, timing of the inundation event is likely an important variable. Given that the majority of juvenile salmon that remain in the system after April are smolts, and considering evidence that larger migrating juveniles typically use mid-channel, higher velocity areas for migration (Kemp et al. 2005; Svendsen et al. 2007), it is likely that these salmon do not utilize the floodplain habitat for extended rearing, but instead migrate rapidly through the lower reaches of the Stanislaus.

It is possible that inundation of these areas earlier in the year (e.g., January and February), under similar flow conditions, could provide suitable rearing habitat for the (often large) number of fry migrating past Oakdale. It is possible that fry, rather than juveniles emigrating from the river and (presumably) searching for rearing habitat near and in the Delta, would use these areas, as expected thermal benefits of off-channel habitat would be more pronounced during this time. In addition, migration speed of fry is likely much slower than that of parr and smolt lifestages, which exhibit active migration behavior and are ocean-bound by late spring, rather than searching for and remaining in freshwater rearing habitat. To further evaluate these potential explanations for the observed absence of juvenile salmonids in what appeared to be suitable rearing habitat, we suggest that a similar survey be conducted early in 2014 (January and/or February), even if flows during that time do not approach the magnitude of discharge observed during this year's sampling events.

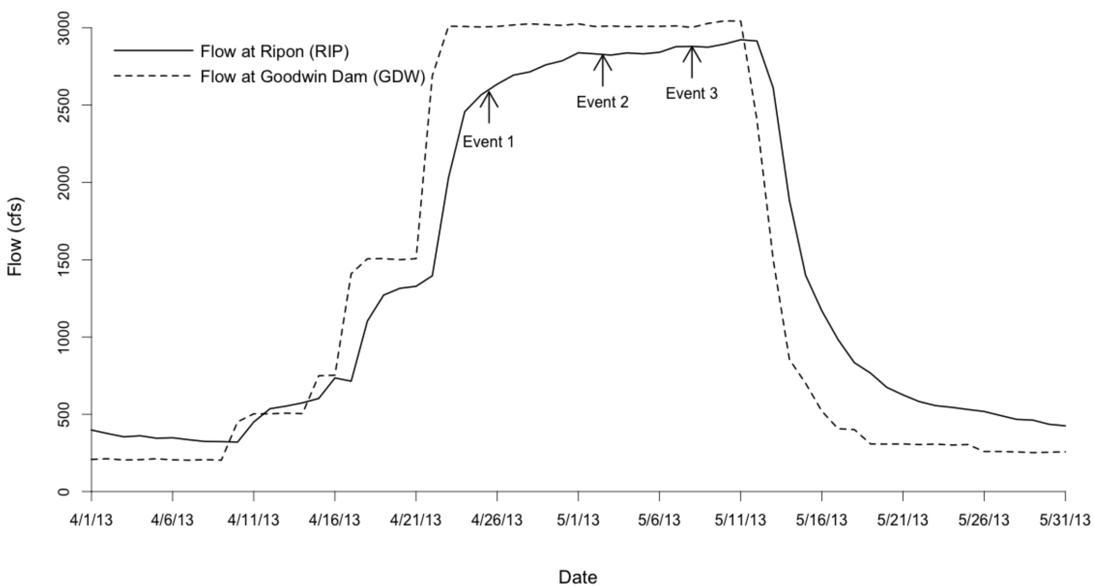

Figure 1. Mean daily flow (in cfs, as measured at Goodwin Dam and at Ripon) and timing of off-channel habitat surveys on the Stanislaus River.

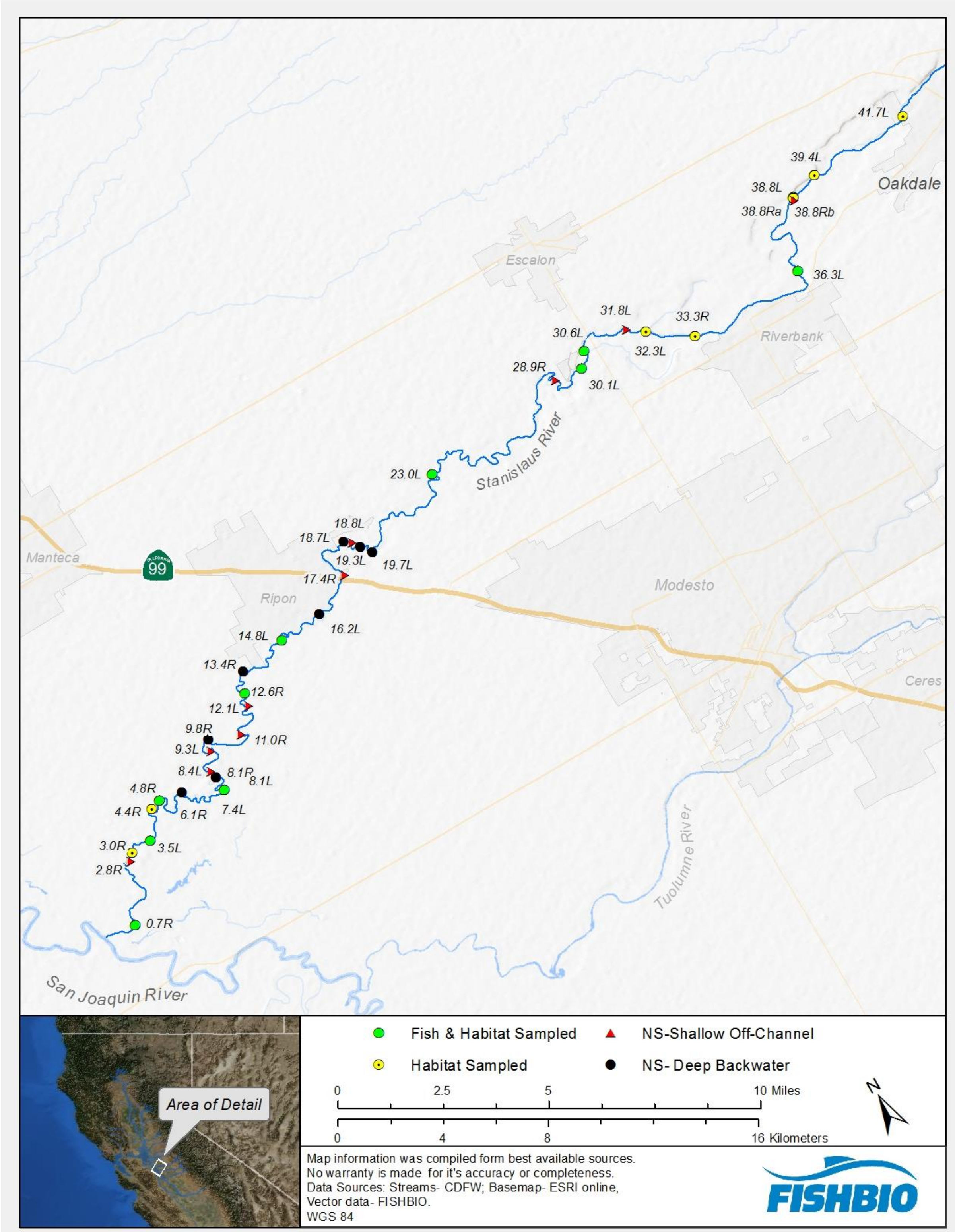

Figure 2. Location of off-channel habitats along the Stanislaus River downstream of Oakdale, identified at flows of 3,000 cfs.

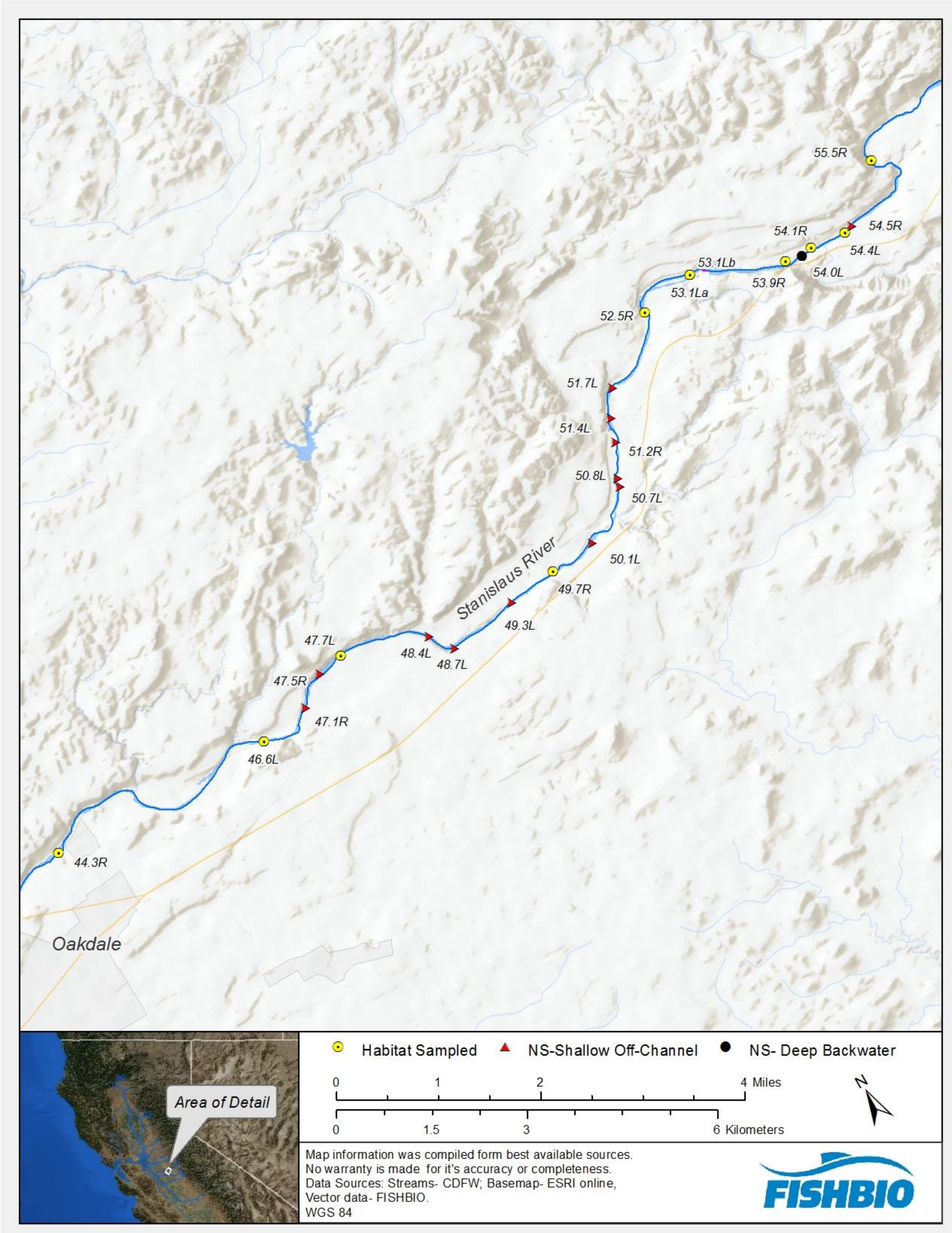

Figure 3. Location of off-channel habitats along the Stanislaus River upstream of Oakdale, identified at flows of 3,000 cfs.

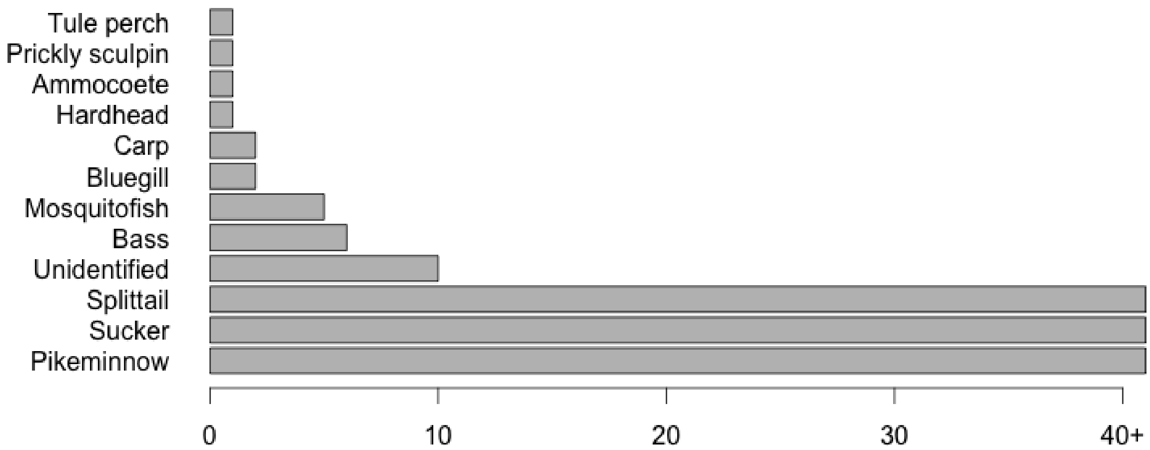

Figure 4. Composition of fish species observed on off-channel habitat on the Stanislaus River during sustained flows of 3,000 cfs. Observational counts of Sacramento splittail, sucker and pikeminnow far exceeded 40 individuals due to the large number of larval fish seen in most sampled units.

Table 3. Summary of sampled shallow-water areas on the lower Stanislaus River at flow of 3,000 cfs.

Unit ID	RM	Date sampled	Area (m^2) [a]	Classification	Sampling effort (seconds) [b]	Species observed (number)[c]	Comments
180	0.7R	4/26/2013	2047 (rf)	Backwater	467	MQK (<10)	Observed, not captured
		5/3/2013			1049	BAS (1), SASQ ([d]), TP (1), BGS (1), SASU (1)	BAS (FL = 122), other spp. observations only
		5/9/2013			563	SASQ ([d])	Juvenile SASQ observed, not captured
182	3.5L	4/26/2013	366 (rf)	Margin/Backwater	295	No fish observed	
		5/3/2013			273	No fish observed	
		5/9/2013			356	No fish observed	
184	4.8R	4/26/2013	1337 (t)	Floodplain	620	SPLT (20+), C (1)	Observed >20 adult SPLT, measured 3 (FL 340, 310, 234)
		5/3/2013			539	No fish observed	No fish captured, potential SPLT back in heavy cover
		5/9/2013			936	SASU (1), C (1)	Adult fish, observation only
204	7.4L	4/26/2013	252 (rf)	Floodplain	253	PRS (1), SASQ (2), MQK (2)	All fish smaller than 100mm
		5/9/2013			242	SF (1), UNID (1)	Unidentified sunfish and other unid. fish (<100 mm)
203	12.6R	4/26/2013	189 (rf)	Floodplain	499	SPLT (1)	Adult SPLT (325 mm TL)
		5/2/2013			213	No fish observed	
		5/9/2013			259	SASU (1), UNID (1)	All fish smaller than 100mm
190	14.8L	4/25/2013	275 (rf)	Backwater	503	BAS (1)	Observed, not captured; size less than 100mm
		5/2/2013			258	No fish observed	
		5/9/2013			379	No fish observed	
194[e]	23.0L	4/25/2013	130 (rf)	Side Channel	500	SASU ([d])	size about 50mm
		5/2/2013			66	SASU (1)	Adult SASU observed, too deep to electrofish[c]
196	30.1L	4/25/2013	1155 (t)	Backyard	939	SASU ([d])	size about 50mm
		5/2/2013			584	SASQ (2)	All fish smaller than 100mm
		5/9/2013			676	MQK (1), SASU (2), UNID (2)	All fish smaller than 100mm
202	30.6L	4/25/2013	285 (t)	Side Channel	618	SASU ([d])	Fish size about 50 mm
		5/2/2013			551	SASU ([d]), SASQ (1), MQK (1)	All fish smaller than 100mm
		5/9/2013			535	SASU ([d]), SASQ (2), HH (1), UNID (4)	All fish smaller than 100mm
198	36.3L	4/25/2013	181 (t)	Floodplain	280	SASU ([d]), SASQ ([d]), BAS (3),	SASQ size about 50mm
		5/2/2013			273	No fish observed	
		5/9/2013			214	SASU ([d]), LAM (1)	
200	38.8R	4/25/2013	876 (rf)	Walnut orchard	807	MQK (1), SASU([d])	Larval fish present, presumably SASU
201	39.4L	5/9/2013	376 (t)	Side Channel	528	SASU ([d]), SASQ ([d]), BAS (1), UNID (2)	All fish smaller than 100mm

[a] Method of area estimation is indicated by rf (rangefinder) or t (Trimble)

[b] Sampling effort refers to the cumulative time the electrofishing unit was activated at each site/date

[c] Species codes are as follows: BAS (largemouth and smallmouth bass), BGS (bluegill sunfish), C (carp), HH (hardhead), LAM (lamprey ammocoete), MSQ (mosquitofish), SASQ (Sacramento pikeminnow), SASU (Sacramento sucker), SPLT (Sacramento splittail), UNID (unidentified non-salmonid), TP (tule perch)

[d] When larval fish (<50mm) were present, no attempt was made to estimate the number of individuals, as they were too numerous to count accurately. Generally, schools of larval fishes contained more than 20 individuals.

[e] This unit was first sampled on 4/25/2013, when water level hadn't reached equilibrium. By 5/2/2013 the area was deemed too deep to sample efficiently.

Table 4. Off-channel habitat summary for areas inundated in late April/early May, 2013, at a discharge of 3,000 cfs. Areas identified in this table represent potentially suitable rearing habitat for native species at flows of 3,000cfs.

Unit ID	RM	Sampled (Y/N)	Area (m2)	Depth (ft)	Velocity (ft/sec)	Classification	Latitude	Longitude
180	0.7R	Y	2047.5	1.8	0	Backwater	N37°39.7894'	W121°13.8161'
236	2.8R	N		<1		Flooded Margin	N37°41.0047'	W121°13.2536'
181	3R	N	1520	2.8		Floodplain	N37°41.1113'	W121°13.1332'
182	3.5L	Y	366	2.6	0.02	Inundated margin/ backwater	N37°41.1382'	W121°12.6793'
183	4.4R	N	1200	4.1		Floodplain	N37°41.6878'	W121°12.3277'
184	4.8R	Y	2760	2.4	0.01	Floodplain	N37°41.7547'	W121°12.1055'
185	6.1R	N		6+		Backwater (too deep)	N37°41.6779'	W121°11.6231'
204	7.4L	Y	251.75	1.8	0.08	Floodplain	N37°41.2793'	W121°10.8346'
186	8.1L	N				Inundated year-round	N37°41.5999'	W121°10.8477'
186	8.1R	N				Side Channel (too deep)	N37°41.5999'	W121°10.8477'
237	8.4L	N				Backwater	N37°41.7884'	W121°10.9155'
238	9.3L	N	600			Backwater	N37°42.1487'	W121°10.6955'
187	9.8R	N		6+		Inundated year-round	N37°42.3385'	W121°10.6027'
188	11R	N	1270	6+		Backwater (too deep)	N37°42.1429'	W121°09.9904'
239	12.1L	N				Backwater	N37°42.5703'	W121°09.5677'
203	12.6R	Y	189	2.4	0.05	Floodplain	N37°42.7983'	W121°09.4783'
189	13.4R	N		>10		Backwater (too deep)	N37°43.2044'	W121°09.2792'
190	14.8L	Y	275	2	0	Backwater	N37°43.3524'	W121°08.2792'
230	16.2L	N		6+		Backwater (too deep)	N37°43.4394'	W121°07.3354'
231	17.4R	N		1.5		Floodplain	N37°43.9096'	W121°06.5084'
191	18.7L	N				Inundated year-round	N37°44.4766'	W121°06.1563'
232	18.8L	N	1500			Side Channel	N37°44.4161'	W121°06.0344'
192	19.3L	N				Inundated year-round	N37°44.2165'	W121°05.9148'
193	19.7L	N				Side Channel (too deep)	N37°43.9969'	W121°05.7565'
194	23.0L	Y	130	2.8	0.56	Side Channel	N37°44.7703'	W121°03.9022'
195	28.9R	N	2250			Floodplain	N37°45.2296'	W121°00.7382'
196	30.1L	Y	1155	2.2	0.18	Backyard	N37°45.1289'	W121°00.1311'
202	30.6L	Y	285	2.3	0.28	Side Channel	N37°45.4069'	W120°59.9162'
234	31.8L	N	9161	5		Flooded Margin	N37°45.4006'	W120°58.9501'
235	32.3L	N	15285	1.7		Floodplain	N37°45.1346'	W120°58.6175'
197	33.3R	N	1680	1.54		Floodplain	N37°44.5412'	W120°57.7787'
198	36.3L	Y	181	2.7	0.62	Flooded Margin	N37°44.6375'	W120°55.2902'
199	38.8R	N	664	1.9	0.4	Floodplain	N37°46.0023'	W120°54.6143'
200	38.8R	Y	875.5	0.7	0.56	Walnut Orchard	N37°46.0052'	W120°54.6020'
229	38.8L	N	2160	4.5		Flooded Margin	N37°45.9839'	W120°54.6440'
201	39.4L	N	376			Side Channel	N37°46.1815'	W120°54.0028'

Unit ID	RM	Sampled (Y/N)	Area (m2)	Depth (ft)	Velocity (ft/sec)	Classification	Latitude	Longitude
252	41.7L	N	10614	1.1	0.58	Backyard	N37°46.3233'	W120°51.8173'
251	44.3R	N	1701	2.54	1.88	Flooded Margin	N37°47.2612'	W120°49.4130'
250	46.6L	N	2367	2 to 4		Flooded Margin/Side Channel	N37°47.2100'	W120°47.4253'
249	47.1R	N	4466	3		Flooded Margin	N37°47.2914'	W120°46.9834'
248	47.5R	N	9490	5		Floodplain/ Side Channel	N37°47.4845'	W120°46.7359'
247	47.7L	N	153	2.25	0	Backwater	N37°47.5135'	W120°46.4957'
205	48.4L	N	900	2		Flooded Margin	N37°47.2931'	W120°45.7739'
206	48.7L	N	2000	4		Floodplain	N37°47.0986'	W120°45.6309'
207	49.3L	N				Side Channel (Restored)	N37°47.1890'	W120°45.0167'
245	49.7R	N	1357	1.7	0.82	Side Channel	N37°47.2327'	W120°44.5715'
209	50.1L	N	6400	4.5		Floodplain	N37°47.2873'	W120°44.1700'
211	50.7L	N		6 to 8		Backwater	N37°47.5864'	W120°43.7253'
212	50.8L	N	1600	1.5		Floodplain	N37°47.6600'	W120°43.7084'
179	51.2R	N	9700			Floodplain (Restored)		
220	51.4L	N	22000	<2'		Floodplain	N37°48.1297'	W120°43.4990'
221	51.7L	N	3282			Floodplain	N37°48.3488'	W120°43.3576'
222	52.5R	N	1054	1.5	0	Floodplain	N37°48.7560'	W120°42.7913'
244	53.1L	N	3508	1.5	1.38	Floodplain	N37°48.8375'	W120°42.3017'
178	53.1L	N	3365	2	0	Off-channel pond	N37°48.8375'	W120°42.3017'
223	53.9R	N	14969	2.4	2.08	Floodplain/ Side Channel (restored)	N37°48.5322'	W120°41.5405'
243	54.0L	N	1500	6+		Off-channel pond	N37°48.4997'	W120°41.3915'
242	54.1R	N	4741	2	0	Off-channel pond	N37°48.5258'	W120°41.2910'
241	54.4L	N	720	2.2	0.02	Floodplain	N37°48.4898'	W120°40.9789'
227	54.4R	N	7768	3	0.38	Floodplain	N37°48.5251'	W120°40.9075'
224	55.5R	N	3560	1.9	2.53	Side Channel	N37°48.9093'	W120°40.4756'

TO: Tim O'Laughlin

FROM: FISHBIO

DATE: July 2014

SUBJECT: **2014 Stanislaus River Off-Channel Habitat Assessment**

From April 14 to May 15, 2014, Goodwin Dam releases were increased to between 2,400 and 2,700 cubic feet per second (cfs). During this period, FISHBIO conducted surveys to evaluate the amount and characteristics of off-channel habitat that could potentially support juvenile salmonid rearing under these flow conditions and timeframe and to document the use of these off channel habitats by juvenile Chinook salmon. This survey is meant to accompany the 2013 Stanislaus River Off-Channel Habitat Assessment study which found that 40 of 52 off-channel areas had the potential to function as juvenile salmonid rearing habitat, however, no juvenile chinook salmon were observed at any of the sampled off-channel areas in 2013.

The goals of this study were to: (1) identify and photo-document the number and distribution of off-channel habitat areas within the Stanislaus River that become inundated under Goodwin flow releases of 2,400 - 2,700 cfs, (2) determine the presence or absence of juvenile salmon and other fish species in representative off-channel areas downstream of Knights Ferry Bridge, (3) determine whether physical and water quality characteristics in representative off-channel areas were suitable for juvenile salmonid rearing, and (4) evaluate the precision of the NewFields 3,000 cfs model layer and collect point-specific depth data that could potentially be used to calibrate the model output.

This memo is accompanied by a storybook containing photos and site descriptions of all identified off-channel areas along the Stanislaus River, from the confluence to Knights Ferry Bridge at river mile (RM) 56.0.

Key points

- At flows between 2,400 and 2,700 cfs, shallow off-channel habitats are very limited in quality and size along the Stanislaus River.
- Water temperatures were generally about 0.5°F warmer (range: -1 to 3°F) in off-channel habitats than in the adjacent mainstem river. Overall water temperatures were generally low (53.7 - 60.2°F) and did not show any spatial or temporal patterns.
- No Chinook salmon were documented in any of the off-channel habitats sampled below Oakdale (river mile 42.4), despite large numbers of juvenile salmon in the system. This finding is consistent with findings by Moyle et al. (2007), who reported prevalence of non-native species on floodplains and very limited habitat use by Chinook salmon after April.
- Overall, side-channels (located in upper reaches above Oakdale) appeared to have the greatest usage by salmonids. Recent restoration areas including Honolulu Bar, the

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Russian Rapids side-channel complex, and Lancaster Road restoration area provided habitat for the vast majority of observed juvenile Chinook salmon (199 of 265).

- Juvenile Sacramento sucker, juvenile pikeminnow, threespine stickleback and western mosquitofish use off-channel habitat during this period, with large numbers of larval fish (presumably belonging to these species) observed in most sampled units.
- No adult or juvenile splittail were observed during sampling.
- Given that the majority of juvenile salmon that remain in the system after April are smolts, and considering evidence that larger migrating juveniles typically use mid-channel, higher velocity areas for migration (Kemp et al. 2005; Svendsen et al. 2007), it is likely that these salmon do not utilize the floodplain habitat for extended rearing, but instead migrate rapidly through the lower reaches of the Stanislaus

Introduction

Background

From April 14 to May 15, 2014, Goodwin Dam releases were increased to between 2,400 and 2,700 cubic feet per second (cfs) (Figure 1). During this period, FISHBIO conducted surveys to evaluate the amount and characteristics of off-channel habitat that could potentially support juvenile salmonid rearing under these flow conditions and timeframe. This was the second consecutive year of floodplain sampling however study methods in 2014 were slightly different than those during the 2013 study. The primary difference was an increase in identified floodplain areas as a result of using the 3,000 cfs model layer from NewFields report (2013), which showed many potential floodplain areas that were missed during the 2013 reconnaissance mapping of inundated areas. Additionally, fish sampling methods were modified in 2014. Both snorkel surveys and seining were used to document fish presence/absence in the reach above Oakdale in 2014 which was not sampled for fish in 2013.

Pulse flows on the Stanislaus River are implemented for a number of reasons. One motive for the increased flows is the creation of salmonid rearing habitat on temporary off-channel floodplains. Historically, the Stanislaus River flooded annually in the lower reaches of the stream below Oakdale. Heavy mining and dredging operations, along with levee construction and bank stabilization for agricultural purposes have left very little usable floodplain habitat currently available during regulated flows from Goodwin Dam. Shallow, warm-water floodplains, once a defining characteristic of the Central Valley, provide refuge from high flows, high biotic diversity and abundant food sources, which have been shown to be ideal conditions for growth of juvenile salmonids (Jeffres 2008, Katz et al. 2013, Sommer et al. 2001). Sommer et al. (2001) found that fish which entered the Yolo Bypass floodplain had growth rates up to 35% greater than the growth rates of fish that stayed in the main channel of the Sacramento River. Size of fish at ocean entry has been shown in numerous studies to increase survival upon ocean entry (Unwin 1997). Access to off-channel areas may also serve as refugia from predatory fish.

Methods

Unit Identification - Desktop

Sampling units were identified using ArcGIS v. 10.1. Inundated areas were identified by plotting the 500 cfs Stanislaus River layer and the 3,000 cfs model layer from NewFields (2013). Relatively large inundated areas were marked for later examination in the field. A total of 161 potential locations were identified during the desktop assessment from the confluence to RM 56.0 at Knights Ferry Bridge (Figure 7-9). River miles were calculated (to tenths of a mile scale) using ArcGIS software and the 500 cfs Stanislaus River layer (note: river miles in this report are calculated using our own methods and do not necessarily correspond to USGS river miles).

Unit Identification and Verification – Field

Marked sampling units were located in the field using both the marked point and the inundation layers provided by NewFields. Additional areas were occasionally added when the areas were judged to have potential for salmonid usage or were able to be sampled effectively. Eleven units were examined that were not identified during the desktop assessment; four of these units were identified in the reconnaissance surveys from 2013 and seven units were added that were judged to have potential based upon observations made in the field.

The precision of the 3,000 cfs model layer was assessed by visiting all the identified sites and determining whether the site was connected to the main channel and whether features (e.g., depressions, islands) on the layer were consistent in the field. Because discharge during 2014 did not reach 3,000 cfs, we could not assess the accuracy of the predicted inundation of the 3,000 cfs layer quantitatively (Figure 1). However, we expected that the differences between predicted water levels of the 3,000 cfs model layer and observed water levels at 2,400 – 2,700 cfs during 2014 would be minor. Therefore, the evaluation of the model layer should be considered as a qualitative assessment instead of quantitative due to the differences in flows between years.

Physical Habitat, Water Quality, Site Descriptions

Based on the NewFields 3,000 cfs model layer and observations made in the field, representative sites were selected to collect physical habitat and water quality data (depth, water velocity, substrate, cover, dissolved oxygen, and water temperature) to ascertain whether physical conditions could support juvenile salmonid rearing in off-channel habitats. Representative sites were selected based upon accessibility and qualitative judgments of habitat suitability. Physical habitat measurements were collected at 15 sites upstream of Oakdale (44% of all upstream off-channel areas), and fish sampling occurred at 11 of these locations. Downstream of Oakdale, (RM 42.4) environmental data was collected at 27 sites (19.6% of all downstream off-channel areas), and fish sampling occurred at 13 of these locations. Fish sampling was not possible at all locations due to dense vegetation, access issues and/or safety concerns, but was conducted when possible and when off-channel areas were deemed to have potential for juvenile salmonid rearing.

All of the predicted off-channel habitats were classified as one of seven general habitat types. Due to unit complexity, habitat types were sometimes used in combination. Descriptions of each habitat type are detailed below.

- Backwater – Backwater habitats were generally deep, often had good connectivity to the main channel, and occasionally had large sunlit areas. Oxbows were grouped into backwater habitats. Many were deep enough to be present during periods of lower flows. Typically, no current was observed in backwater areas and only one connection was observed.
- Flooded margins – Margin habitats were generally narrow bands of thick vegetation, had good connectivity to the main channel, but had little open water or exposure to sunlight. Due to the proximity to the main channel, margin habitats typically had low to moderate water velocities throughout.
- Side channel – Side channel habitats were often well connected to the main channel, with moderate to high water velocities. In the upper Stanislaus River, several side channels were restored to function at a variety of flows (e.g. Honolulu Bar and Lancaster Road Restoration Area). Side channels often had well defined and identifiable upstream and downstream connections to the main channel.
- Flooded point bar – Flooded point bars had similar characteristics to flooded margin habitats (well connected, dense vegetation, etc.) but were differentiated from margins due to their location. They were located on the inside bend of the river where a point bar forms due to depositional processes.
- Meander cutoff – Meander cutoffs were similar to flooded point bars, but were differentiated based on the location. The flooded point bar was defined as occurring at the immediate point of an inside bend of the river, while meander cutoffs occurred further from that point. As a result they were often much larger in size than either flooded margins or point bars.
- Anthropogenic – These particular units were heavily influenced or manipulated by land use practices. Particular examples included a series of backyards near Oakdale (RM 41.8), the Horseshoe Bend campground (RM 52.5), or small areas where vegetation was controlled to allow access to the river (various locations).
- Dry – Some areas were classified as dry, likely due to low discharge.

At each accessible site, physical parameters were measured at selected intervals based upon observations made in the field. Due to the variation in size and shape of off-channel habitats, standard distances between points were not established; instead, distances between points were adjusted according to the size and shape of the accessible inundated habitat. For each site, between 2 and 15 sample points were spaced evenly throughout the floodplain to adequately capture variation in physical parameters that may be influenced by the distance between sampling points and the main channel (e.g., dissolved oxygen [DO], current velocity [feet per second; fps], and temperature). Physical parameter measurements were then averaged for each site to obtain mean values for each event and each site. After the first day methods were slightly altered due to the time constraints of examining all sites.

Fish Sampling

A combination of methods was used depending on site location and site characteristics. Backpack electrofishing was chosen as the most effective sampling method to document juvenile salmonid presence and usage of inundated off-channel habitats. Electrofishing was used at each sampled off-channel area downstream of RM 42.4 (Highway 120 Bridge in Oakdale) due to conditions of our National Marine Fisheries Service (NMFS) 4(d) sampling permit. Since electrofishing was not permitted above RM 42.4, snorkel surveys were used to document fish presence. Where possible, seining was conducted in addition to snorkeling, but only two sites had favorable habitat characteristics that allowed seines to be used.

Electrofishing (13 sites)

Backpack electrofishing was chosen as the most effective sampling method to document juvenile salmonids and other fish species in shallow water areas, often covered with dense vegetation. Care was taken to minimize disturbance of each site prior to and during electrofishing activities. Water depth was the most limiting factor to backpack electrofishing, and restricted sampling to areas less than about 3.5 feet deep. As assessing fish presence and habitat use (rather than determining fish abundance) were objectives for this study, electrofishing was conducted in likely fish holding areas and was limited to a single pass at each site. Captured fish were temporarily held in buckets until electrofishing of the site was completed, then identified to species, counted, measured, allowed to recover, and subsequently released. Additional fish observed—but not captured—in a sampling unit were noted and identified to species/life stage whenever possible.

Snorkeling (11 sites)

Snorkel surveys were conducted in units above Oakdale (RM 42.4) that were too dense or complex to seine effectively. The inundated unit was snorkeled and when possible, the main channel margin was snorkeled as well to document Chinook salmon presence near the site. One to two divers entered the water and surveyed all accessible areas of the unit. Fish were identified to species and life stage when possible. General habitat characteristics at the observation point were also made.

Seining (2 sites)

Seining was conducted when conditions allowed (i.e., little to no vegetation or complex habitats). However, due to the complexity and dense vegetation at most of the sites above RM 40, only two sites were sampled using the seine. The beach seine that was used for the survey was 30 feet long and five feet deep. All fish captured in the seine were identified to species and measured (fork length and total length).

Results

There were a total of 172 off-channel habitat areas (including dry units) identified on the lower Stanislaus River, downstream of Knights Ferry, under Goodwin Dam releases of between 2,400 and 2.700 cfs (Figure 7-9). A total of 161 off-channel habitat areas were identified using the Newfields 3,000 cfs model layer. Additionally, there were four sites that were not identified using the NewFields model but were identified during reconnaissance mapping in 2013, and seven sites that were added based upon observations made in the field during 2014. Sizes of inundated areas measured in GIS were generally small (mean = 8,146 m^2 [2.0 acres], median = 5,491 m^2 [1.4 acres], min = 511 m^2 [0.1 acres], max = 820,522 m^2 [20.3 acres]; Table 1). Physical habitat measurements were collected at 42 sites and fish sampling was conducted at 24 of those sites.

Summary of Physical Habitat and Water Quality

The 172 locations where shallow off-channel areas were identified in the Stanislaus River were generally heavily vegetated and were well connected to the main channel. Just over half (88 of 172) of these areas were comprised of narrow bands of flooded margin habitat where riparian encroachment, resulting in very dense vegetation, was common. Another 32 locations were classified as backwaters and 21 locations were classified as side-channels. Other habitats that were identified, while infrequent, were described as flooded point bars, meander cutoffs or anthropogenic (Table 1). Despite the relatively small size of the identified off-channel habitats, 36 of the 42 sites (approximately 86%) where physical habitat data was collected were identified as having the potential to function as juvenile salmonid rearing habitat based on a combination of physical and water quality conditions (i.e., water depth, connectivity to main channel, water temperature and DO). Despite probable habitat suitability, salmonids were only seen at 7 of 24 sampled locations, with 3 of those locations being recent restoration sites.

Substrate and vegetation type were only qualitatively assessed and in general were similar to the 2013 Stanislaus floodplain study. Substrate in off-channel areas consisted of silt or soil, and cover in off-channel areas was predominantly made up of non-woody plants, such as grasses and nettles. However, some sites were dominated by woody vegetation, such as trees and shrubs, while others were largely devoid of any cover.

During sampling, average water temperatures in off-channel areas were generally warmer compared to surface water mid-channel (in the sun) (Table 2, Figure 6). In some instances, water temperatures in off-channel areas were cooler compared to mid-channel; these measurements were generally recorded in shaded areas or areas with good connectivity and high flow. Temperature differences of greater than 3°F between the main channel and some inundated areas were recorded, but these high temperatures were associated with backwater areas having slow or no current. There was no correlation between temperature differences in off-channel areas and river mile or sampling day. There was a marked difference in average temperatures of each habitat type. In sampled backwaters the average temperature difference between off-channel areas and the adjacent main channel was 1.09°F, while the average temperature differences at sampled margins and side channels was 0.26° F and 0.18° F, respectively. For this study, temperature differences provided more useful information than instantaneous temperatures (due to influence of sampling time) but overall, water temperatures were generally low (53.7 - 60.2°F; Figure 3) due to ambient air temperatures and releases from Goodwin Dam. Temperatures in this range do not promote optimal growth rates in juvenile salmonids but they are within tolerable limits for rearing. The minimal differences in temperature between most off-channel areas and the corresponding mid-channel were indicative of the lack of suitable floodplain at 2,400 to 2,700 cfs.

Dissolved oxygen concentrations of inundated areas varied greatly (between 0.6 mg/L and 11.4 mg/L), but were generally suitable for fish whenever there was water exchange between an inundated area and the main river channel (Table 2, Figure 2). Dissolved oxygen concentrations were low in the backwater areas with minimal connectivity where water temperatures were occasionally over 3°F higher than in the main channel. The average DO concentration in all sampled backwaters was 7.7 mg/L. The average DO concentration in both side channels and margin habitat (9.2 mg/L) was similar to the mid-channel average of 10.3 mg/L. All sites with an observed average DO greater than 7.0 mg/L were considered suitable for salmonid rearing based on cold water habitat designations in the Water Quality Control Plan (CVRWQCB 1998). The six sites that had an average DO less than 7.0 mg/L were generally shallow with little or no connectivity to the main channel and were likely a result of groundwater seepage. The sum of the areas of these six sites was 15.1 acres (mean = 2.52 acres) or 16.8% of the overall size of all sampled areas (Table 2).

Mean current velocities were generally less than 1.0 fps (Table 2; Figure 4). Higher current velocities were found in side channel habitat types with good connectivity. Nearly half of the mean current velocities were below 0.1 fps, and could thus provide refuge from higher current velocities found in the main channel. As expected, velocities varied by habitat type with the highest average velocity being observed in side channels (0.85 fps), followed by margins (0.18 fps) and backwaters (0.05 fps). Stagnant water (no current velocity) was occasionally observed in habitats that were only minimally connected to the river or isolated from the channel by dense stands of vegetation. Such areas, though present on virtually all sampled off-channel habitats, were generally restricted to the immediate vicinity of the wetted margin. The highest average flow was observed in a side channel (2.79 fps). Flow conditions were tolerable for salmonid rearing at all sampled locations.

Site depth varied greatly both within and between sampling locations (Table 2; Figure 5). Average site depth overall was 1.9 ft; with a minimum average floodplain depth of 0.5 ft and a maximum of 3.5 ft. The highest average depths were observed in margin habitat (2.1 ft), followed by side channels (1.9 ft) and backwaters (1.7 ft). While these average depths are greater than other notable floodplains in the Sacramento-San Joaquin basin, they are still within the tolerable limits for juvenile salmonid rearing. It should again be noted that measured average depths of each habitat type might not be indicative of the river overall as sampling was not conducted in locations with depths greater than 3.5 ft.

Evaluation of NewFields model

Evaluation of the NewFields 3,000 cfs model layer was conducted qualitatively due to flows of less than 3,000 cfs being released out of Goodwin Dam. However, despite diminished flows it was possible to verify the accuracy of the model layer based on morphological features and floodplain characteristics. In general, the Newfields model appeared to be very precise, with connectivity to the main channel at 154 of the 161 identified sites despite reduced flows. Floodplain characteristics, such as depressions or islands, highlighted on the model were easily recognizable in the field. At sites with little or no connectivity it was still possible to predict the precision of the model with increased flows.

Fish Sampling

No salmonids were captured or observed at any of the 31 sites sampled downstream of RM 48.6 (Table 3). Upstream of RM 48.6 a total of 265 Chinook salmon and 10 rainbow trout were observed or captured. The majority of these fish (count = 180) were observed at the Honolulu Bar restoration area with an additional 19 Chinook being observed at the Russian Rapids side-channel complex, and Lancaster Road restoration area. Another 58 juvenile Chinook were observed in the main channel of the river directly adjacent to the floodplains (at the boundary between the temporary off-channel habitats and the main stem of the river). While these fish were not seen directly in the floodplain, observations still provide proof of their existence near identified off-channel habitats.

A small number of non-salmonids were captured or observed throughout the river, with larval and juvenile Sacramento pikeminnow, Sacramento sucker, threespine stickleback, and mosquitofish being the most abundant. Most areas were also heavily utilized by non-salmonid larval fish (unknown species, but likely suckers or pikeminnow), which were too small to be sampled. Total electrofishing effort (time that electrofishing unit was active) was 3,549 seconds, for an average of 273 seconds per site.

Discussion

Floodplains are increasingly being found to support juvenile salmon rearing in other areas of the Central Valley; namely the Yolo Bypass on the Sacramento River and the Cosumnes River Preserve on the Cosumnes River. A number of studies have been conducted in recent years that have demonstrated the benefits provided by these habitat areas to juvenile salmonids. Floodplains located on the Yolo Bypass and Cosumnes River Preserve are large (Yolo – 240,000,000 m^2 or 59,305 acres; Cosumnes – 186,150,000 m^2 or 45,999 acres), shallow (generally < 1 m depth) and warm (generally > 68°F and often up to 77°F) (Jeffres et al. 2008, Moyle et al. 2007, Sommer et al. 2001, Sommer et al. 2005). All of these habitat characteristics are conducive to prolific primary and secondary production, in the form of phytoplankton, zooplankton and benthic macroinvertebrates (Jeffres et al. 2008, Sommer et al. 2001). Studies have shown that this increased food supply results in floodplain-reared salmon that are significantly larger than those that stayed in the main channel of the river (Jeffres et al. 2008, Katz et al. 2012 Sommer et al. 2001). Since it has been shown that size at ocean entry can increase likelihood of survival upon ocean entry, these floodplains provide an important and necessary component to one of the most genetically and phenotypically diverse populations of Chinook salmon on the Pacific Coast (Unwin 1997, Yoshiyama et al. 2000).

Although it is clear that fragments of off-channel habitat, some of which may be considered floodplain, are created by increasing discharge out of Goodwin Dam, the quality and usefulness of this habitat is questionable. Environmental conditions of inundated areas varied greatly (i.e., relative quality or potential of habitats). While most sampled locations were determined to have conditions that were within thresholds for juvenile salmonid rearing, most lacked the warmer temperatures, shallow depths, and open sunlit areas more typical of the larger floodplain areas in the Sacramento – San Joaquin basin. Thermal benefits (i.e., warmer water temperatures) are frequently associated with floodplain rearing of juvenile salmonids, and are thought to provide increased food productivity and, subsequently, improved growth conditions compared to the main channel (Sommer et al. 2001). On the Stanislaus River, temperatures remained low throughout the duration of the sampling period. Water temperatures on average were only about 0.5°F warmer in off-channel habitats compared to surface waters of the adjacent main channel, though some areas with limited water circulation warmed to greater than 3°F above in-river temperatures. As expected, off-channel areas provided low-velocity habitat with mean current velocities of less than 0.4 fps, and many areas with no current were observed as well. Water was often warmer in areas with low current velocities (i.e. sites that were not classified as side-channels), particularly when shade was sparse. Incidents of low dissolved oxygen (nearly anoxic conditions) were occasionally observed in these areas, in particular at sampling points located farthest from the main river channel. Such adverse conditions were likely exacerbated by large amounts of decaying organic matter in these areas, which would be expected to increase the biological oxygen demand.

Increased sampling coverage (spatially – more units) and additional methods (snorkel, seine) provided more information than in 2013 about salmonid presence/absence in off-channel habitats. Due to changes in study design, all sites were only sampled once resulting in an absence of temporal data. It should be noted that even though sampling was conducted three separate times during the pulse flow in 2013, no substantial differences in either environmental conditions or fish habitat usage were noted during sampling events. Therefore, we expect that the one sampling event this year still adequately characterized both environmental conditions and fish habitat usage during the pulse flow in 2014. Sampling gear (backpack electroshocker, seine, and snorkel) efficiency was demonstrated by captures of various fish species, including Chinook salmon, present in inundated areas. Despite extensive sampling effort and collection of non-salmonid species, no juvenile Chinook salmon were documented below RM 48.6. Overall, side-channels (located in upper reaches above Oakdale) appeared to have the greatest usage by salmonids. Honolulu Bar, the Russian Rapids side-channel complex, and Lancaster Road restoration area provided habitat for the vast majority of observed juvenile Chinook salmon. Numerous areas were identified during sampling that have restoration potential, which, similar to existing restoration projects would provide increased side-channel areas at multiple flows.

It is worth noting that relatively small number of Chinook captures cannot be attributed to absence of fish in the system, as large numbers of juveniles were documented at the Oakdale rotary screw trap. Between April 21 and 30, 228 juvenile Chinook (mean fork length = 69.4 mm, min = 50 mm, max = 88 mm) and one rainbow trout (fork length = 48 mm) were captured. Using known catch efficiency rates of the Oakdale rotary screw trap,an estimated 38,000 juvenile Chinook salmon passed the trap during this time period. Though the reasons for presumed lack of off-channel habitat use by juvenile salmonids are speculative, timing of the inundation event is likely an important variable. Given that the majority of juvenile salmon that remain in the system after April are smolts, and considering evidence that larger migrating juveniles typically use mid-channel, higher velocity areas for migration (Kemp et al. 2005; Svendsen et al. 2007), it is likely that these salmon do not utilize the floodplain habitat for extended rearing, but instead migrate rapidly through the lower reaches of the Stanislaus.

It is possible that inundation of these areas earlier in the year (e.g., January and February), under similar flow conditions, could provide suitable rearing habitat for the (often large) number of fry migrating past Oakdale. It is possible that fry, rather than juveniles emigrating from the river and (presumably) searching for rearing habitat near and in the Delta, would use these areas, as expected thermal benefits of off-channel habitat would be more pronounced during this time. In addition, migration speed of fry is likely much slower than that of parr and smolt lifestages, which exhibit active migration behavior and are ocean-bound by late spring, rather than searching for and remaining in freshwater rearing habitat.

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Table 1. Summary of unit size by habitat type on the Stanislaus River, sampled during flows between 2,400 and 2,700 cfs in late April 2014.

Habitat Type	Count	Average Size (m^2)	Average Size (acres)	Total Size (m^2)	Total Size (acres)	% of Total Area
Margin	78	6,051.8	1.5	472,040.4	116.6	33.7
Backwater	32	11,147.9	2.8	356,733.9	88.2	25.5
Side Channel	14	7,820.7	1.9	109,489.8	27.1	7.8
Meander Cutoff	7	11,274.8	2.8	78,923.3	19.5	5.6
Oxbow	6	11,755.8	2.9	70,534.7	17.4	5.0
Flooded Point Bar	8	6,400.2	1.6	51,201.3	12.7	3.7
Anthropogenic	3	9,591.6	2.4	28,774.8	7.1	2.1
Dry	5	4,983.8	1.2	24,919.1	6.2	1.8
Flooded Island	1	8,791.6	2.2	8,791.6	2.2	0.6
Complex[1]	18	11,103.4	2.7	199,861.9	49.4	14.3
Total	172	8,146.90	2.0	1,401,270.70	346.3	100.0

[1] Complex units were made up of two or more of the primary habitat types

Table 2. Summary of sampled off-channel areas on the lower Stanislaus River at flows between 2,400 and 2,700 cfs.

Site	River Mile	Size (acres)	Habitat Type	Average Temperature (°F)	Average DO (mg/L)	Average Depth (feet)	Average Velocity (fps)
2R	0.7	0.4	Backwater	59.89	4.54	1.08	0.00
4R	2.1	0.2	Margin	58.22	9.69	1.74	0.34
5R	2.8	0.6	Margin	58.42	9.58	2.58	0.08
6R	3.0	0.2	Margin	60.32	8.09	1.66	0.02
8L	3.6	0.7	Margin/Backwater	58.60	9.27	2.40	-0.02
9R	4.5	0.6	Margin	59.39	8.51	2.68	0.01
10R	4.9	2.1	Margin	59.35	9.24	1.45	0.05
69L	17.4	6.2	Side Channel/Backwater	56.12	9.82	2.40	0.22
73L	18.7	1.2	Margin	56.80	9.85	3.00	NA
74L	19.0	1.9	Meander Cutoff	57.13	8.83	0.75	0.08
81R	19.5	5.1	Meander Cutoff	56.90	9.30	3.40	0.79
84R	20.2	1.2	Margin	56.67	7.77	1.17	0.01
94L	23.0	2.3	Meander Cutoff	56.80	9.90	1.85	0.58
95R	23.1	5.7	Meander Cutoff	59.20	3.66	1.22	0.00
97R	23.8	4.8	Margin	57.18	8.49	2.60	0.00
100R	24.6	2.8	Margin	58.25	2.05	2.15	0.00
101L	25.5	1.6	Margin	56.75	9.55	3.50	0.00
107L	27.4	5.5	Side Channel	56.67	10.18	1.90	0.46
119R	31.1	1.2	Side Channel	57.90	0.65	1.00	0.65
120L	31.3	1.1	Margin/Side Channel	57.70	7.58	1.50	0.00
122L	32.3	3.6	Side Channel	58.80	6.30	1.90	0.00
124R	33.4	2.4	Backwater	58.34	10.62	1.46	0.01
126L	36.3	1.1	Meander Cutoff	53.72	10.00	1.72	0.15
130L	38.7	2.9	Margin	54.00	10.22	1.28	0.32
164R	38.8	0.9	Margin	54.80	10.75	1.36	0.52
131R	39.6	2.3	Backwater	NA	NA	0.50	NA
132R	39.7	1.1	Backwater	58.20	9.20	1.90	NA
139R	42.7	1.6	Margin	54.60	10.75	2.25	0.06
141R	44.3	0.6	Side Channel/Flooded Island	55.10	11.05	2.30	0.94
143R	47.5	2	Side Channel/Margin	56.10	10.03	1.00	0.05
168L	48.3	0.7	Margin	NA	NA	1.70	0.28
169L	48.6	0.6	Side Channel	55.33	11.35	2.27	0.07
144L	49.3	1.6	Side Channel	55.76	11.38	2.40	2.00
146L	50.1	1.9	Margin	55.20	11.24	2.30	0.68
149R	51.1	7.5	Side Channel/Flooded Island	54.85	NA	2.36	1.09
171L	52.5	0.9	Anthropogenic	55.95	11.18	0.95	0.03
152R	52.7	0.9	Margin/Side Channel	54.63	11.40	2.63	1.03
156R	53.9	3.5	Side Channel/Margin	54.60	11.29	1.27	0.45
158R	54.1	1.4	Backwater	57.58	4.34	1.33	0.02
159R	54.4	1.3	Margin	53.87	11.08	1.43	0.19
160L	55.6	3.6	Side Channel	54.99	NA	2.07	2.09
161L	56.0	1.9	Side Channel	54.84	NA	3.02	2.79

Table 3. Summary of fish catch data from sampled off-channel areas on the lower Stanislaus River at flows between 2,400 and 2,700 cfs.

Site	River Mile	Date Sampled	Habitat Type	Species (number)[a]	Method	Effort (seconds)	Comment
2R	0.7	4/21/2014	Backwater	MQK (20), LARV (3)	Efish	444	No fish captured during E-fishing, all fish observed visually in the field
4R	2.1	4/21/2014	Margin	LARV (NA)	Efish	394	Larval fish observed, not enumerated
5R	2.8	4/21/2014	Margin	NONE	Efish	175	
6R	3.0	4/21/2014	Margin	LARV (NA)	Efish	277	Larval fish observed, not enumerated
8L	3.6	4/21/2014	Margin/ Backwater	LARV (NA)	Visual	NA	Larval fish not enumerated
9R	4.5	4/21/2014	Margin	NONE	Efish	287	
10R	4.9	4/21/2014	Margin	LARV (NA)	Efish	382	Larval fish observed, not enumerated
68R	17.4	4/22/2014	Anthropogenic	LARV (NA)	Visual	NA	Larval fish not enumerated
69L	17.4	4/22/2014	Side Channel/ Backwater	LARV (NA)	Visual	NA	Larval fish not enumerated
73L	18.7	4/22/2014	Margin	LARV (NA)	Visual	NA	Larval fish not enumerated
74L	19.0	4/22/2014	Meander Cutoff	NONE	Efish	119	
94L	23.0	4/22/2014	Meander Cutoff	NONE	Efish	283	
95R	23.1	4/22/2014	Meander Cutoff	LARV (NA)	Visual	NA	Larval fish only noted at inlet, not enumerated
97R	23.8	4/22/2014	Margin	LARV (NA)	Efish	279	Larval fish observed, not enumerated
107L	27.4	4/22/2014	Side Channel	LARV (NA)	Visual	NA	Larval fish not enumerated
120L	31.3	4/22/2014	Margin/ Side Channel	LARV (NA)	Visual	NA	Larval fish not enumerated

Table 3 (cont'd). Summary of fish catch data from sampled off-channel areas on the lower Stanislaus River at flows between 2,400 and 2,700 cfs.

124R	33.4	4/22/2014	Backwater	UNID SNF, LARV	Efish	285	No fish captured during E-fishing, all fish observed visually in the field
126L	36.3	4/23/2014	Meander Cutoff	SASQ (3)	Efish	180	One fish captured during E-fishing (56 mm), Two fish observed visually in the field
130L	38.7	4/23/2014	Margin	SASQ (2), MQK (1), LARV (NA)	Efish	192	Both SASQ smaller than 62mm; larval fish observed, not enumerated
164R	38.8	4/23/2014	NA	SASU (1), SASQ (1), LARV	Efish	252	All fish smaller than 63 mm; larval fish observed, not enumerated
139R	42.7	4/23/2014	Margin	SASU (2), TSS (5), PRS (1), LARV	Seine/ Snorkel	NA	All fish smaller than 54 mm; larval fish observed, not enumerated
168L	48.3	4/23/2014	Margin	TSS (1)	Visual	NA	Fish observed in field, no size measurement obtained
169L	48.6	4/23/2014	Side Channel	CHN (6), SASQ (2), TSS (4)	Seine/ Snorkel	NA	All SASQ smaller than 52 mm, no CHN or TSS measurements obtained
144L	49.3	4/23/2014	Side Channel	CHN (10), SASU (1)	Snorkel	NA	Majority of fish observed in main side channel, no size measurements obtained
149R	51.1	4/30/2014	Side Channel/ Flooded Island	CHN (180), SASU (202), SASQ (1)	Snorkel	NA	No size measurements obtained
171L	52.5	4/24/2014	Anthropogenic	SASU (NA), MQK (1)	Visual	NA	No size measurement obtained, no count of juvenile SASU
152R	52.7	4/24/2014	Margin/ Side Channel	TSS (2), UNID (1)	Snorkel	NA	Adult UNID, possible BAS, swam away quickly when diver scared it
156R	53.9	4/24/2014	Margin/ Side Channel	CHN (1), TSS (3), SASU (1)	Snorkel	NA	No size measurements obtained
158R	54.1	4/24/2014	Backwater	SASU (1), UNID (3)	Snorkel	NA	No size measurements obtained, 3 unidentified cyprinids (juveniles)
159R	54.4	4/24/2014	Margin	CHN (20), RBT (1)	Snorkel	NA	No CHN size measurements obtained; RBT fry ~ 40 mm
160L	55.6	4/30/2014	Side Channel	CHN (9), RBT (8)	Snorkel	NA	No size measurement obtained; 5 adult RBT & 3 juvenile RBT observed
161L	56.0	4/30/2014	Side Channel	CHN (39), RBT (1), TSS (40)	Snorkel	NA	No size measurements obtained; Juvenile RBT observed

[a] Species codes are as follows: LARV (unidentified larval fish), MQK (mosquitofish), PRS (prickly sculpin), RBT (Rainbow trout), SASQ (Sacramento pikeminnow), SASU (Sacramento sucker), SNF (sunfish), TSS (threespine stickleback), UNID (unidentified)

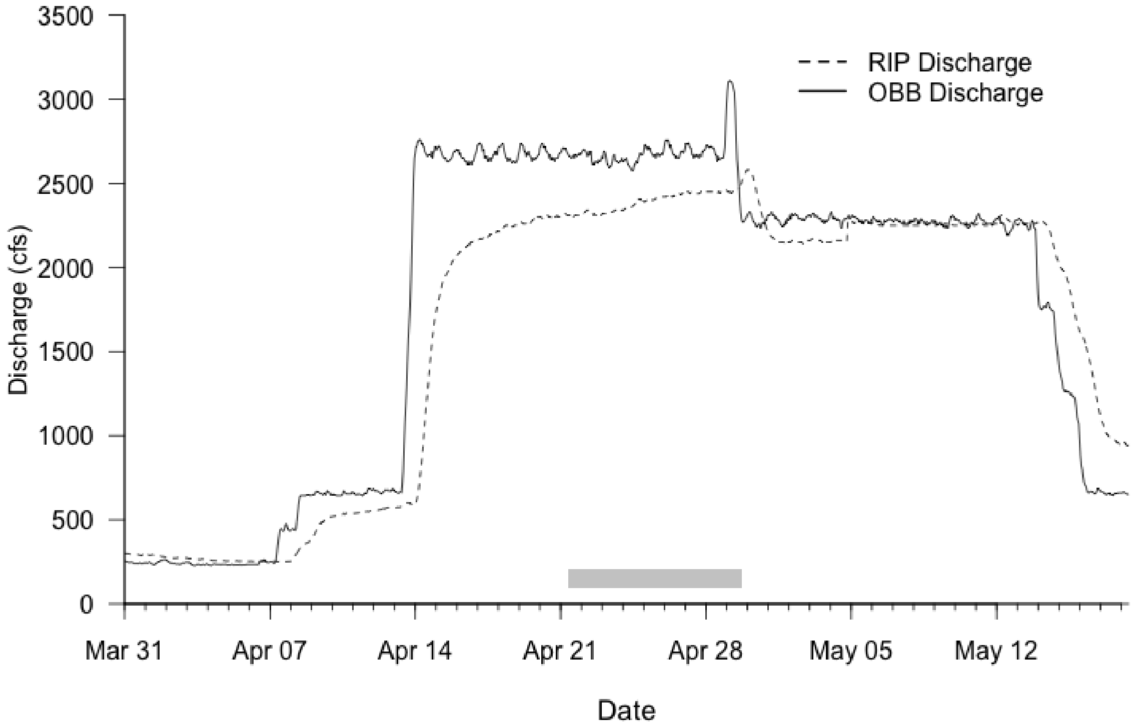

Figure 1. Discharge plots (hourly) from April 1 to May 14, 2014 on the Stanislaus River at Ripon (RIP; RM 17.1) and at Orange Blossom Bridge (OBB; RM 48.4). Shaded rectangle represents sampling period.

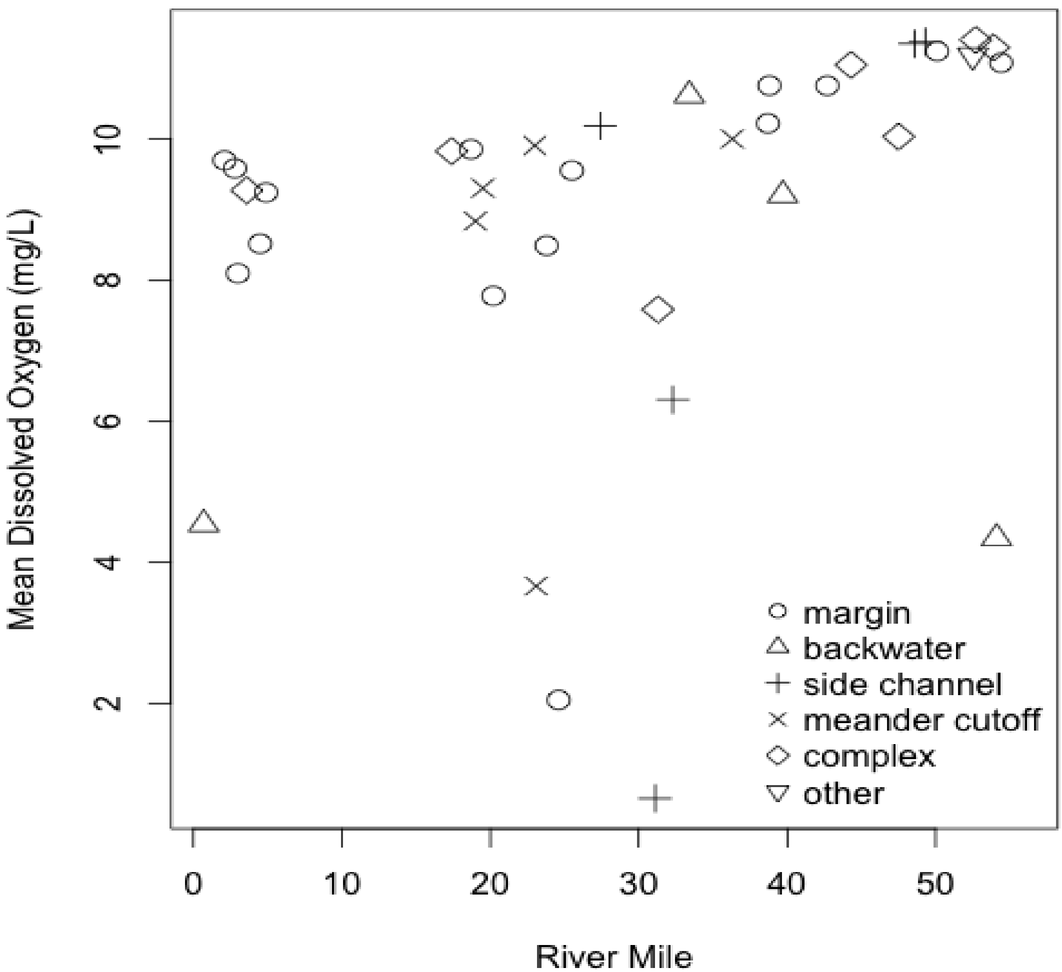

Figure 2. Physical habitat measurements by river mile on the Stanislaus River, sampled during flows between 2,400 and 2,700 cfs in late April 2014.

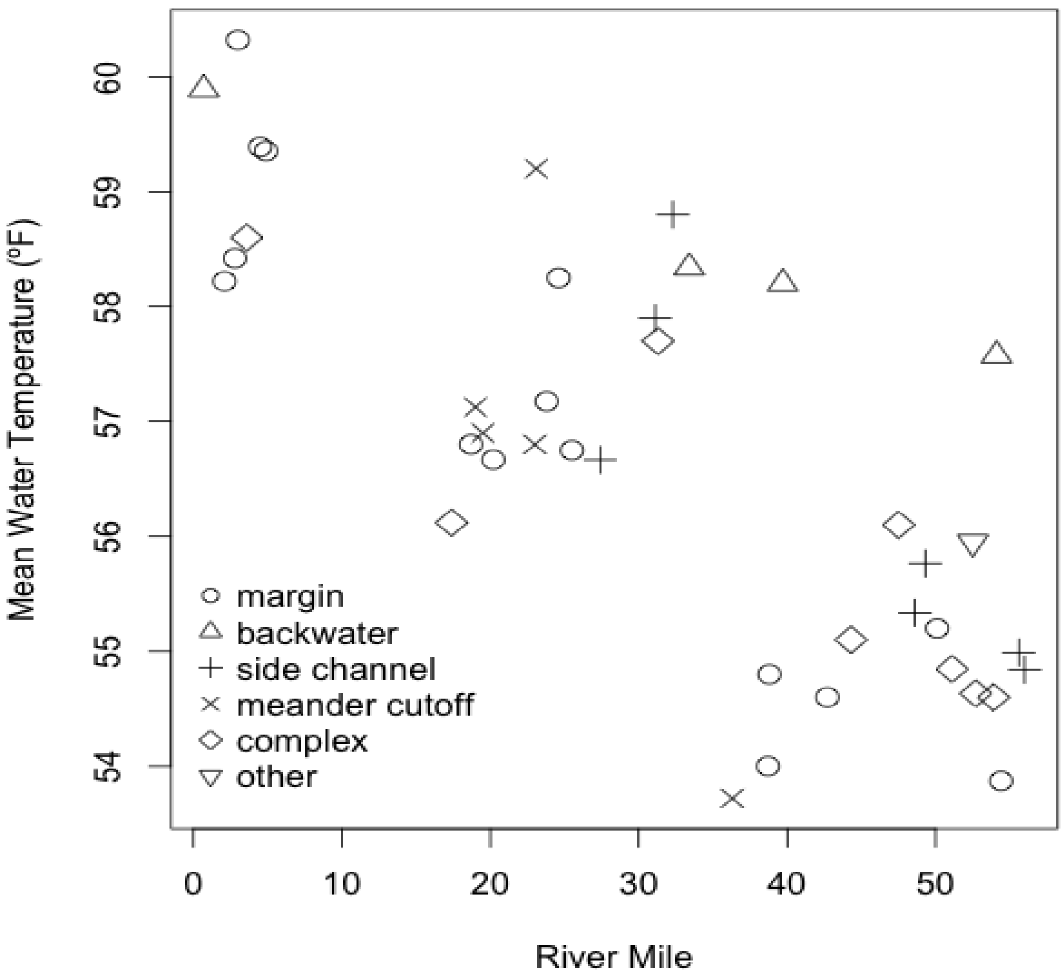

Figure 3. Physical habitat measurements by river mile on the Stanislaus River, sampled during flows between 2,400 and 2,700 cfs in late April 2014.

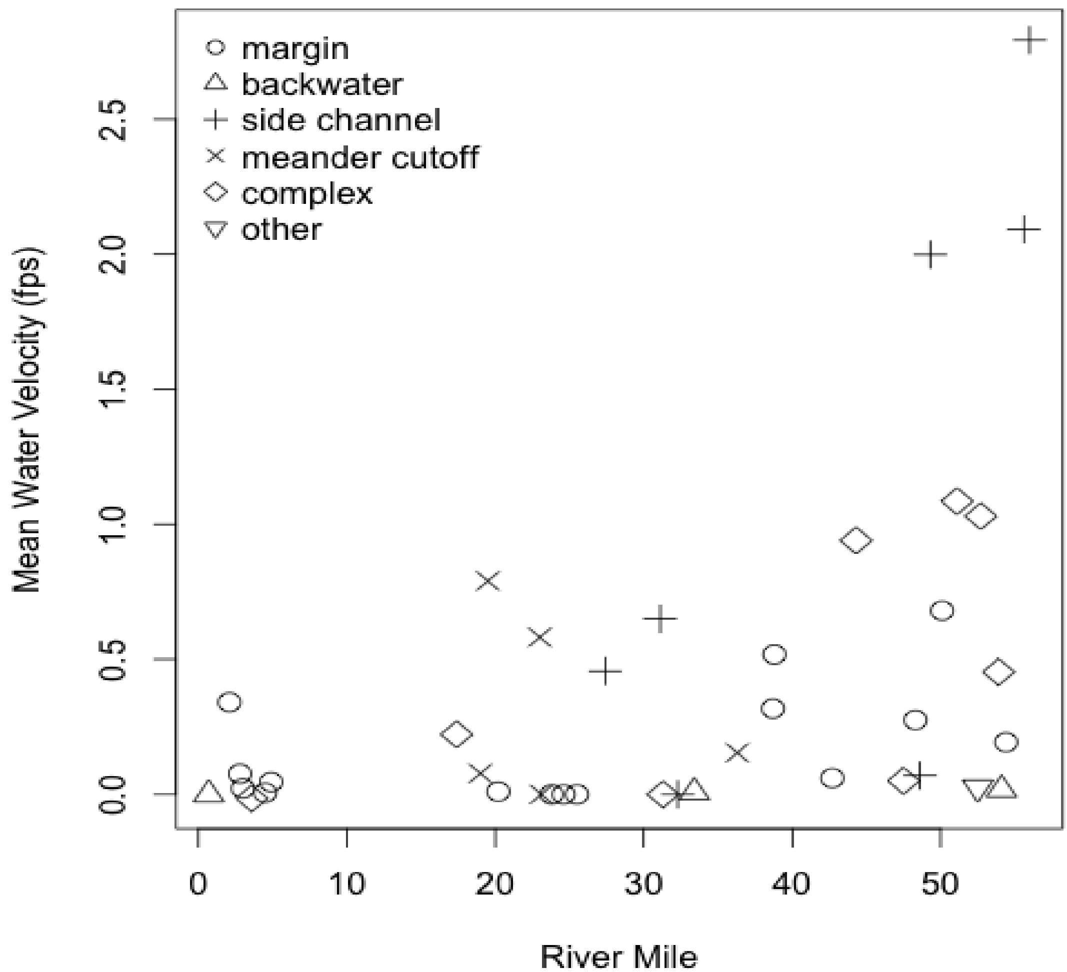

Figure 4. Physical habitat measurements by river mile on the Stanislaus River, sampled during flows between 2,400 and 2,700 cfs in late April 2014.

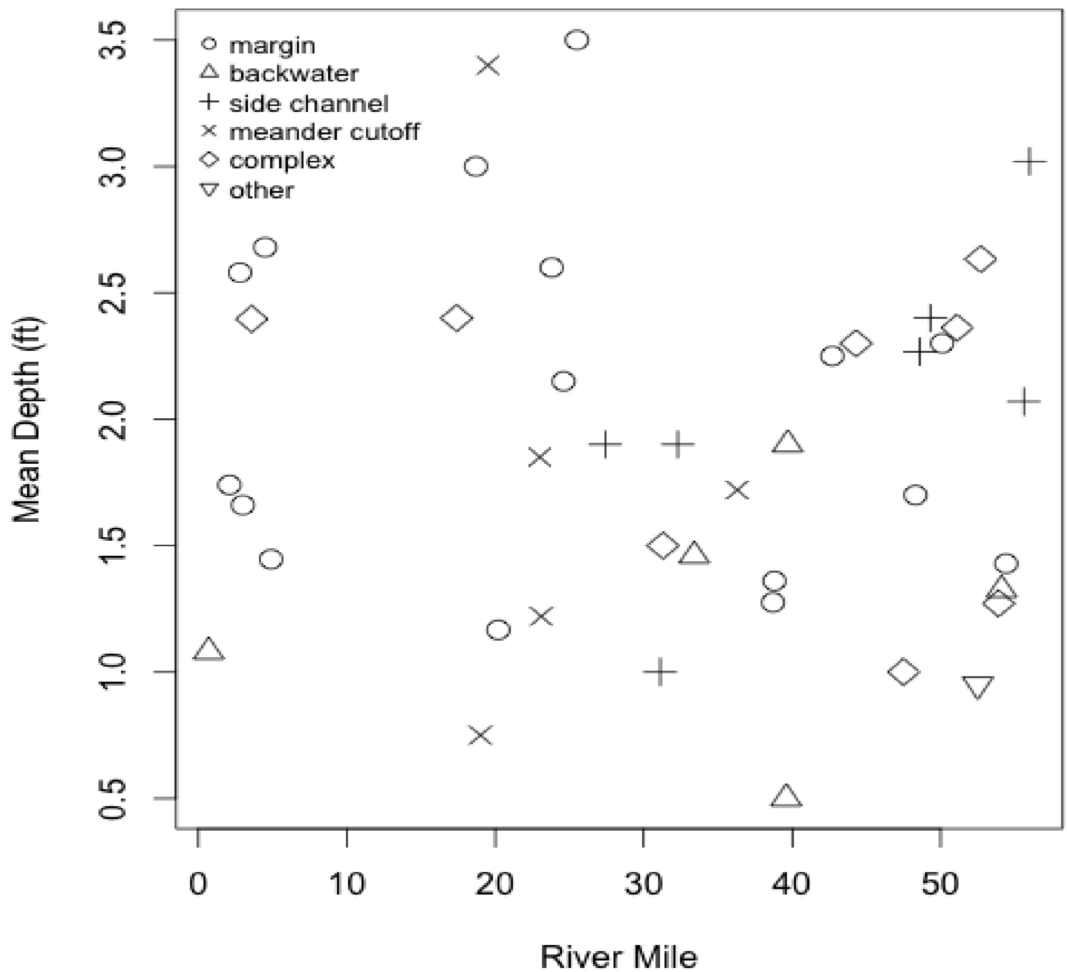

Figure 5. Physical habitat measurements by river mile on the Stanislaus River, sampled during flows between 2,400 and 2,700 cfs in late April 2014.

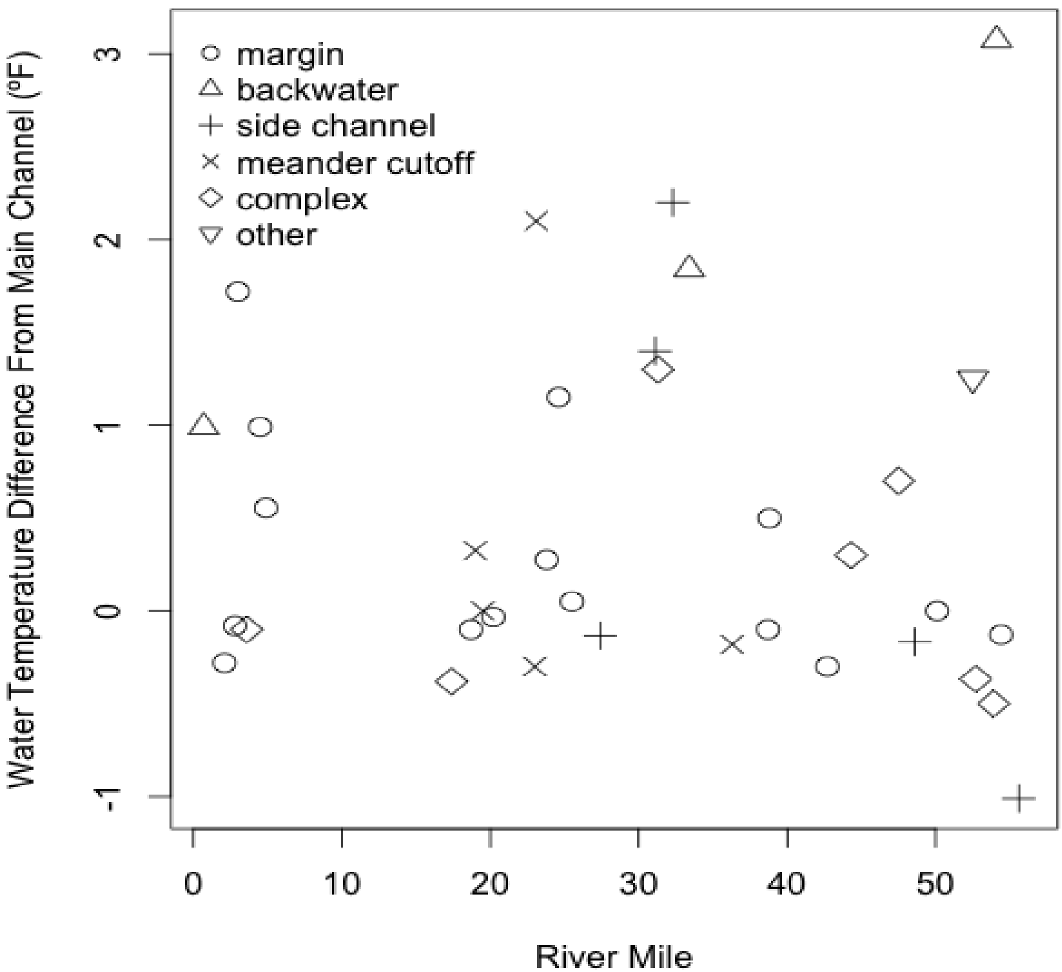

Figure 6. Physical habitat measurements by river mile on the Stanislaus River, sampled during flows between 2,400 and 2,700 cfs in late April 2014.

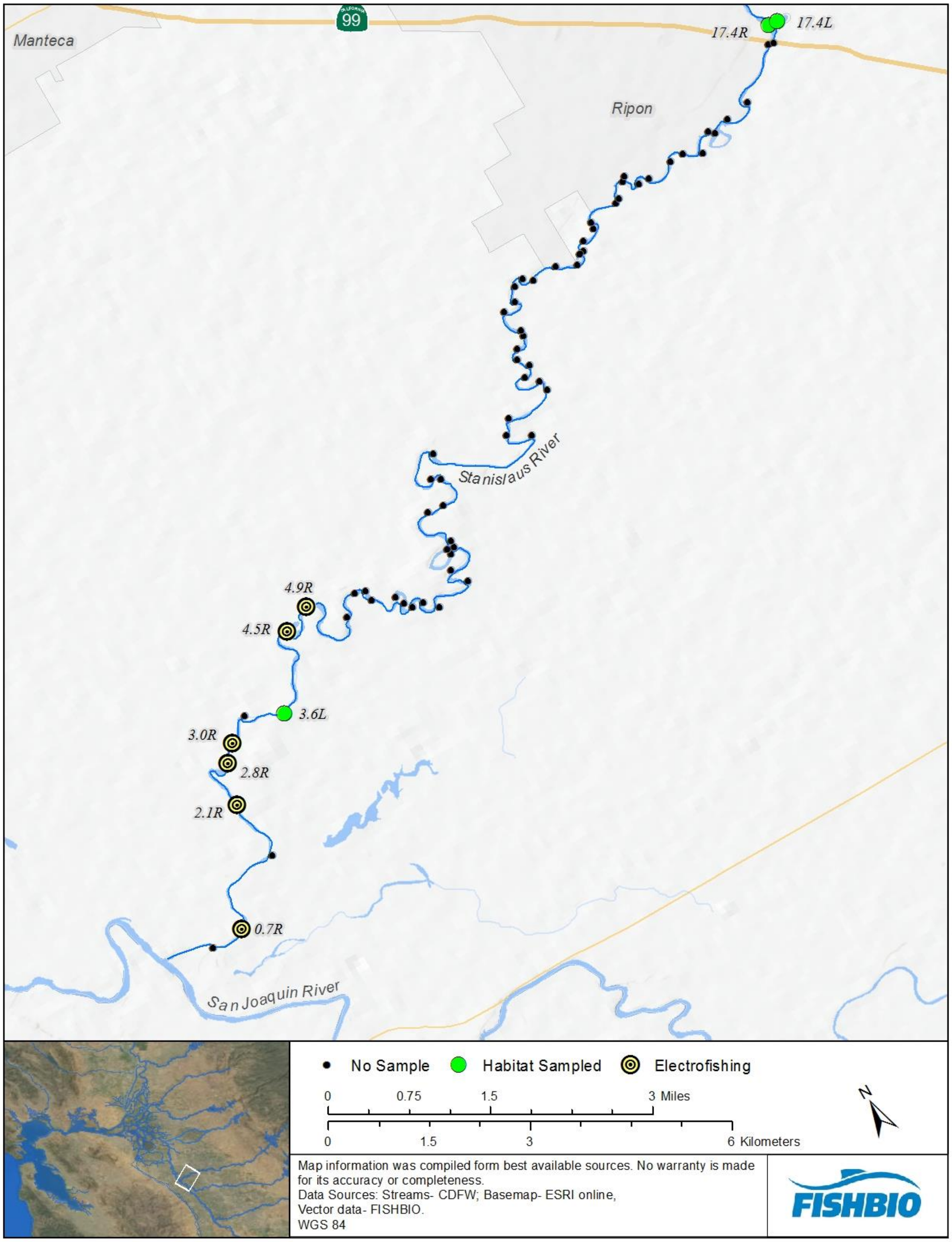

Figure 7. Location of off-channel habitats along the Stanislaus River downstream of Ripon, identified at flows between 2,400 and 2,700 cfs.

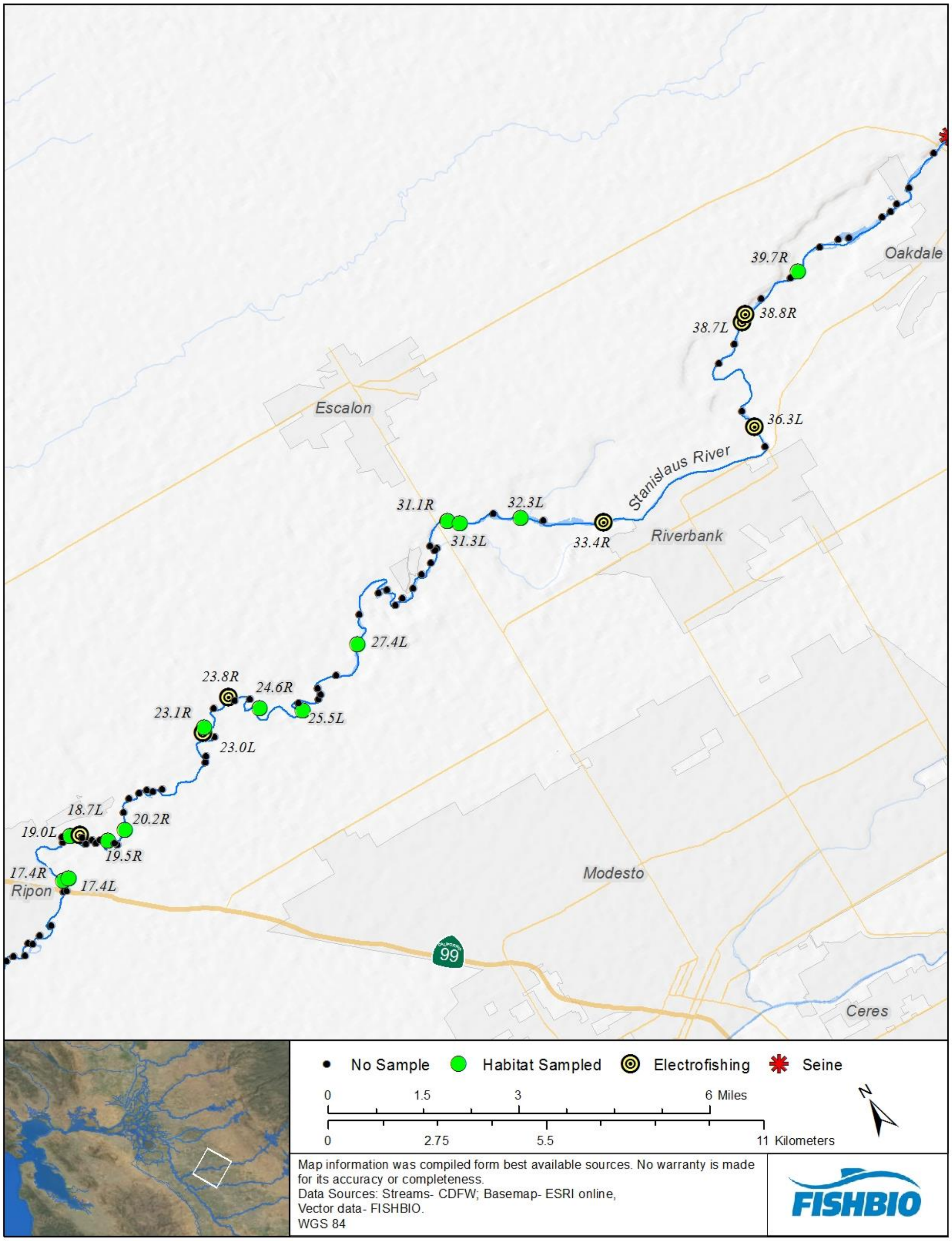

Figure 8. Location of off-channel habitats along the Stanislaus River downstream of Oakdale, identified at flows between 2,400 and 2,700 cfs.

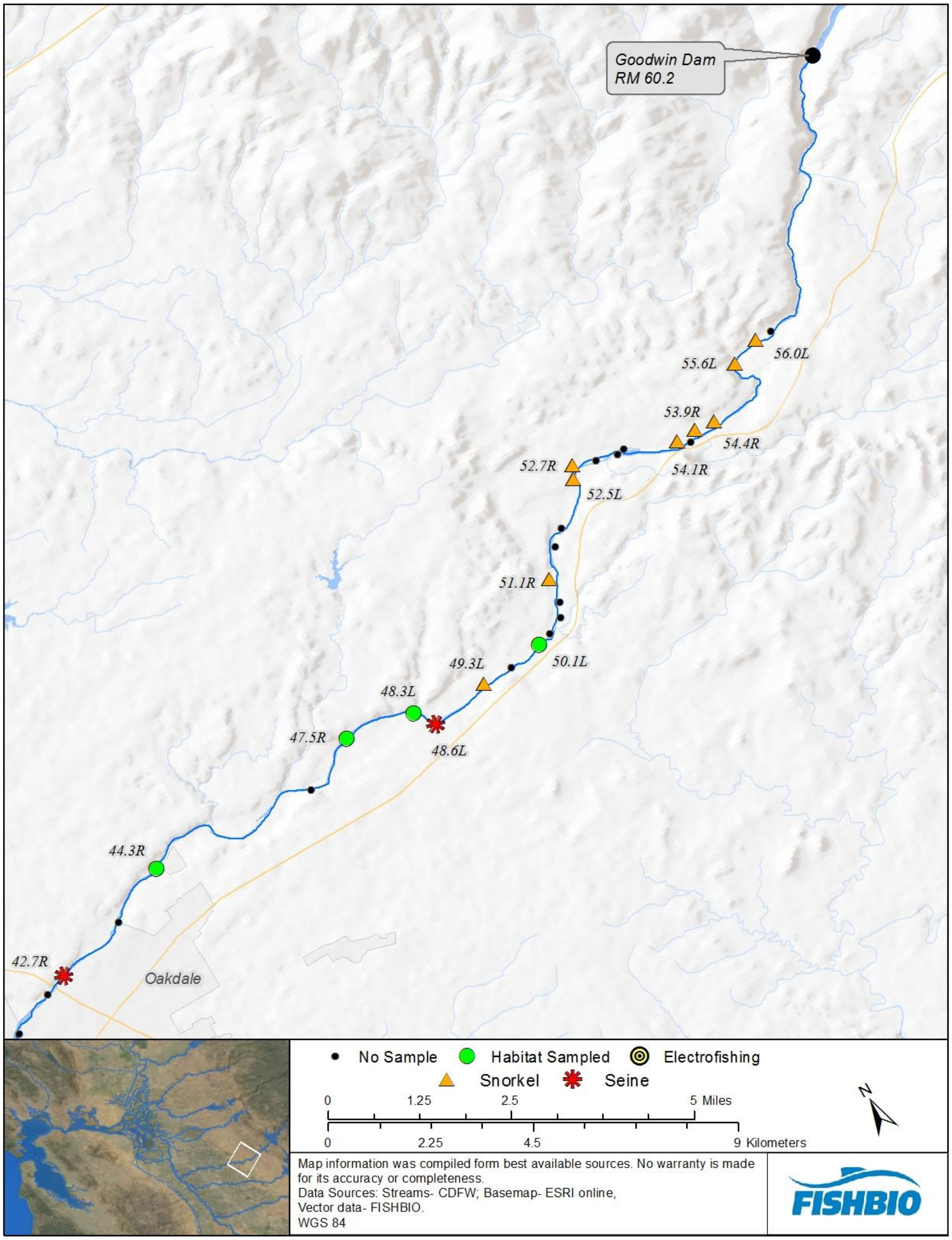

Figure 9. Location of off-channel habitats along the Stanislaus River downstream of Ripon, identified at flows between 2,400 and 2,700 cfs.

Appendices

Appendix 1 – Site Descriptions

Table A-1. Descriptions of habitat, water quality characteristics and summary of fish observations for each inundation site surveyed at flows between 2,400 and 2,700 cfs.

Backwater - Site 1L (RM 0.4) - Deep backwater, good connectivity, 5.2' deep near mouth. No fish or environmental sampling conducted at this site.
Backwater - Site 2R (RM 0.7) was sampled on 2014-04-21. Backwater, no flow through site, zero velocity at all points. Temperature in the main channel was 58.9°F and dissolved oxygen was 8.55 mg/L. Mean site depth was 1.08 feet (min = 0.5 feet; max = 1.6 feet). Mean site water velocity was 0 feet per second ([fps]; min = 0 fps; max = 0 fps). Mean water temperature was 59.89°F (min = 58.9°F; max = 61.2°F). Dissolved oxygen (mg/L) ranged from 1.75 to 8.17 (mean = 4.54 mg/L). E-fishing was conducted for 444 seconds, but yielded no fish. Unidentified larval fish and mosquitofish were observed.
Flooded point bar - Site 3R (RM 1.5) - Dense vegetation, no open water habitat. No fish or environmental sampling conducted at this site.
Margin - Site 4R (RM 2.1) was sampled on 2014-04-21 and was classified as narrow margin. Temperature in the main channel was 58.5°F and dissolved oxygen was 9.65 mg/L. Mean site depth was 1.74 feet (min = 0.7 feet; max = 2.8 feet). Mean site water velocity was 0.34 feet per second ([fps]; min = 0.04 fps; max = 1.08 fps). Mean water temperature was 58.22°F (min = 58°F; max = 58.6°F). Dissolved oxygen (mg/L) ranged from 9.6 to 9.75 (mean = 9.69 mg/L). E-fishing was conducted for 394 seconds but no fish were captured. Only unidentified larval fish were observed.
Margin - Site 5R (RM 2.8) was sampled on 2014-04-21. Margin habitat, fairly large and shallow, very thick vegetation, only accessible along narrow margin. Temperature in the main channel was 58.5°F and dissolved oxygen was 9.51 mg/L. Mean site depth was 2.58 feet (min = 1.5 feet; max = 3.2 feet). Mean site water velocity was 0.08 feet per second ([fps]; min = -0.18 fps; max = 0.37 fps). Mean water temperature was 58.42°F (min = 58.2°F; max = 58.8°F). Dissolved oxygen (mg/L) ranged from 9.33 to 9.75 (mean = 9.58 mg/L). E-fishing was conducted for 175 seconds but no fish were captured or observed.
Margin - Site 6R (RM 3.0) was sampled on 2014-04-21. Brushy margin habitat, no trees on sampled portion. Temperature in the main channel was 58.6°F and dissolved oxygen was 9.67 mg/L. Mean site depth was 1.66 feet (min = 0.8 feet; max = 2.7 feet). Mean site water velocity was 0.02 feet per second ([fps]; min = -0.02 fps; max = 0.09 fps). Mean water temperature was 60.32°F (min = 58.8°F; max = 62.3°F). Dissolved oxygen (mg/L) ranged from 3.34 to 9.6 (mean = 8.09 mg/L). E-fishing was conducted for 277 seconds but no fish were captured or observed.
Backwater - Site 7R (RM 3.2) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin / Backwater - Site 8L (RM 3.6) was sampled on 2014-04-21. Combination of inundated margin (downstream end) and backwater (upstream end). Temperature in the main channel was 58.7°F and dissolved oxygen was 9.68 mg/L. Mean site depth was 2.4 feet (min = 1.6 feet; max = 3.3 feet). Mean site water velocity was -0.02 feet per second ([fps]; min = -0.05 fps; max = 0.01 fps). Mean water temperature was 58.6°F (min = 58.2°F; max = 59.4°F). Dissolved oxygen (mg/L) ranged from 8.45 to 9.64 (mean = 9.27 mg/L). No electrofishing was conducted. Unidentified larval fish were observed.
Margin - Site 9R (RM 4.5) was sampled on 2014-04-21. Margin habitat just upstream of outside bend. Temperature in the main channel was 58.4°F and dissolved oxygen was 9.51 mg/L. Mean site depth was 2.68 feet (min = 2 feet; max = 3.6 feet). Mean site water velocity was 0.01 feet per second ([fps]; min = -0.06 fps; max = 0.05 fps). Mean water temperature was 59.39°F (min = 58.7°F; max = 59.8°F). Dissolved oxygen (mg/L) ranged from 3.03 to 9.65 (mean = 8.51 mg/L). E-fishing was conducted for 287 seconds, no fish captured or observed.
Margin - Site 10R (RM 4.9) was sampled on 2014-04-21. Margin habitat with broad connection to main channel. Temperature in the main channel was 58.8°F and dissolved oxygen was 9.71 mg/L. Mean site depth was 1.45 feet (min = 0.6 feet; max = 3.1 feet). Mean site water velocity was 0.05 feet per second ([fps]; min = 0 fps; max = 0.13 fps). Mean water temperature was 59.35°F (min = 58.7°F; max = 60.1°F). Dissolved oxygen (mg/L) ranged from 5.53 to 9.82 (mean = 9.24 mg/L). E-fishing was conducted for 382

seconds but no fish were captured. Unidentified larval fish were present.
Backwater - Site 11R (RM 5.7) - Backwater habitat - no description from field notes (typed from inundation layer). No fish or environmental sampling was conducted at this site.
Flooded point bar - Site 12L (RM 6) - Dense vegetation, no open water habitat. No fish or environmental sampling conducted at this site.
Margin - Site 13R (RM 6.1) - Downstream end covered with low brush, upstream end with willows. No fish or environmental sampling conducted at this site.
Margin - Site 14L (RM 6.2) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Backwater / Oxbow - Site 15R (RM 6.5) - Oxbow.
Backwater / Oxbow - Site 16R (RM 6.5) - Oxbow.
Backwater - Site 17L (RM 6.7) - Backwater habitat - no description from field notes (typed from inundation layer). No fish or environmental sampling conducted at this site.
Margin - Site 18R (RM 6.9) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Backwater - Site 19L (RM 7.1) - Small connection at current flows to very large and deep backwater pond. No fish or environmental sampling conducted at this site.
Backwater - Site 21L (RM 7.5) - flooded backwater covered in small woody debris. No fish or environmental sampling conducted at this site.
Margin - Site 20R (RM 7.7) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Backwater / Oxbow - Site 22R (RM 8.1) - Oxbow. No fish or environmental sampling conducted at this site.
Backwater / Oxbow - Site 23R (RM 8.1) - Part of 22R oxbow (upstream end). No fish or environmental sampling conducted at this site.
Margin - Site 25L (RM 8.1) - Margin habitat, would call side channel but no flow or current through the connection, good connections at downstream and upstream ends. No fish or environmental sampling conducted at this site.
Margin - Site 24L (RM 8.2) - flooded margin with woody debris habitat, too deep to sample, small.
Margin - Site 26R (RM 8.7) - Margin habitat, fairly narrow, brushy and covered in small woody debris, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 27L (RM 8.8) - Margin habitat, small, open water habitat, grasses present. No fish or environmental sampling conducted at this site.
Margin - Site 27R (RM 9.1) - Flooded margin, small brush and grassy, small. No fish or environmental sampling conducted at this site.
Backwater - Site 28L (RM 9.3) - Backwater, no connection, likely seepage due to higher groundwater levels, water covered in small woody debris, range (cows were present). No fish or environmental sampling conducted at this site.
Margin - Site 29R (RM 9.8) - Flooded margin with small willows and grasses. No fish or environmental sampling conducted at this site.
Margin - Site 30L (RM 10.8) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 31R (RM 11) - Flooded margin with dense vegetation at downstream end, more small brush and grasses at upstream end. No fish or environmental sampling conducted at this site.
Margin - Site 32R (RM 11.2) - Flooded margin with dense vegetation (willows and trees), little to no open water habitat. No fish or environmental sampling conducted at this site.
Margin - Site 33L (RM 11.6) - Flooded margin with small brush and medium debris floating on surface (no current), deep. No fish or environmental sampling conducted at this site.
Margin - Site 34L (RM 11.7) - Flooded margin with dense vegetation (willows and trees), little to no open water habitat. No fish or environmental sampling conducted at this site.
Margin - Site 35R (RM 12.0) - No connection observed at current flows, dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 36L (RM 12.1) - Dense vegetation, no open water habitat, difficult access. No sampling

conducted at this site.
Flooded point bar - Site 37L (RM 12.2) - Flooded point bar with younger willows, little to no open water habitat. No fish or environmental sampling conducted at this site.
Margin - Site 38R (RM 12.4) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 39R (RM 12.5) - Flooded margin with mostly open water habitat, well connected to main channel. No fish or environmental sampling conducted at this site.
Margin - Site 40L (RM 12.6) - Flooded margin with dense vegetation (willows and trees), little to no open water habitat.
Oxbow - Site 41R (RM 12.8) - Oxbow. No fish or environmental sampling conducted at this site.
Margin - Site 42L (RM 13.1) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 43L (RM 13.3) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Backwater - Site 44R (RM 13.4) - Deep. No fish or environmental sampling conducted at this site.
Margin - Site 45L (RM 13.5) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 46R (RM 13.7) - Dense vegetation, little to no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 47R (RM 13.9) - Dense vegetation, little to no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 48L (RM 14.1) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 49R (RM 14.1) - Small narrow strip of flooded margin, open water habitat. No fish or environmental sampling conducted at this site.
Backwater - Site 50R (RM 14.2) - Deep, dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Side Channel - Site 51R (RM 14.3) - Open side channel, good connection to main channel, shaded by mature trees, may be range area. No fish or environmental sampling conducted at this site.
Flooded point bar - Site 52L (RM 14.5) - Flooded point bar - no description from field notes (typed from inundation layer). No fish or environmental sampling conducted at this site.
Dry - Site 53R (RM 14.8) - No connection observed at current flows, did not evaluate habitat if flows were higher. No fish or environmental sampling conducted at this site.
Margin - Site 54L (RM 14.8) - Flooded margin with grasses. No fish or environmental sampling conducted at this site.
Dry - Site 55L (RM 15.0) - No connection observed at current flows, did not evaluate habitat if flows were higher.
Margin / Backwater - Site 56R (RM 15.0) - Dense vegetation, no open water habitat, difficult access, opens into large backwater habitat complex. No fish or environmental sampling conducted at this site.
Margin - Site 58L (RM 15.2) - Dense vegetation, no open water habitat, difficult access, some large woody debris present. No fish or environmental sampling conducted at this site.
Margin - Site 57R (RM 15.4) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 59L (RM 15.7) - Dense vegetation, no open water habitat, difficult access, could not locate connection due to dense vegetation, likely not connected at 2500 cfs. No fish or environmental sampling conducted at this site.
Dry - Site 60L (RM 15.8) - Open goat pasture, but not inundated at observed flows, shaded, grassy. No fish or environmental sampling conducted at this site.
Margin - Site 61L (RM 16.0) - Flooded margin with some open water, moderate willows, no current. No fish or environmental sampling conducted at this site.
Margin - Site 62R (RM 16.2) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Backwater - Site 63L (RM 16.2) - Moderate connection at current flow that opens into large backwater,

lower end is connected oxbow. No fish or environmental sampling conducted at this site.
Margin - Site 64R (RM 16.3) - flooded margin, deep, little open water, well connected. No fish or environmental sampling conducted at this site.
Margin - Site 65L (RM 16.6) - Dense vegetation, little to no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 66R (RM 17.2) - Shallow area under and adjacent to Hwy 99 Bridge, grassy. No fish or environmental sampling conducted at this site.
Margin / Backwater - Site 67L (RM 17.2) - Flooded margin and backwater just upstream of Hwy 99 Bridge, well shaded, moderate amount of open water.
Anthropogenic - Site 68R (RM 17.4) Flooded walking path, inundated area small, walking path turned "side channel", larval fish present. No electrofishing was conducted.
Side Channel / Backwater - Site 69L (RM 17.4) was sampled on 2014-04-22. Small side channel connection to large forested off-channel area, no live vegetation, only leaf litter. Temperature in the main channel was 56.5°F and dissolved oxygen was 9.96 mg/L. Mean site depth was 2.4 feet (min = 1.3 feet; max = 3.5 feet). Mean site water velocity was 0.22 feet per second ([fps]; min = 0.02 fps; max = 0.66 fps). Mean water temperature was 56.12°F (min = 55.7°F; max = 56.4°F). Dissolved oxygen (mg/L) ranged from 9.61 to 9.92 (mean = 9.82 mg/L). No electrofishing was conducted. Unidentified larval fish were observed at the site.
Backwater - Site 70L (RM 18.5) - Deep. No fish or environmental sampling conducted at this site.
Oxbow - Site 71R (RM 18.6) - Oxbow, very dense vegetation. No fish or environmental sampling conducted at this site.
Dry - Site 72R (RM 18.7) - Dry, no connection at observed flows, did not evaluate habitat if flows were higher. No fish or environmental sampling conducted at this site.
Margin - Site 73L (RM 18.7) was sampled on 2014-04-22. Deep margin habitat, grassy with some LWD, too deep to E-fish (3.0'). Temperature in the main channel was 56.9 °F and dissolved oxygen was 9.94 mg/L. Only one point was taken at this site. Depth was 3.0 feet, water velocity was not measured, and dissolved oxygen was 9.85 mg/L. No electrofishing was conducted. Unidentified larval fish were observed at the site.
Meander cutoff - Site 74L (RM 19.0) was sampled on 2014-04-22. Shallow, small meander cutoff, all shaded. Temperature in the main channel was 56.8 °F and dissolved oxygen was 9.87 mg/L. Mean site depth was 0.75 feet (min = 0.5 feet; max = 0.9 feet). Mean site water velocity was 0.08 feet per second ([fps]; min = 0 fps; max = 0.24 fps). Mean water temperature was 57.12°F (min = 57.0°F; max = 57.4 °F). Dissolved oxygen (mg/L) ranged from 8.22 to 9.39 (mean = 8.83 mg/L). E-fishing was conducted for 119 seconds and yielded no captures or observations of fish.
Backwater - Site 75R (RM 19.0) - Deep backwater, floating debris, no current. No fish or environmental sampling conducted at this site.
Backwater - Site 76L (RM 19.1) - Deep backwater, good connectivity. No fish or environmental sampling conducted at this site.
Margin - Site 77R (RM 19.3) - Moderate vegetation, moderate open water, good connectivity. No fish or environmental sampling conducted at this site.
Backwater - Site 78L (RM 19.3) - Deep backwater, good connectivity. No fish or environmental sampling conducted at this site.
Margin - Site 79R (RM 19.4) - Flooded margin, small brush, small size. No fish or environmental sampling conducted at this site.
Margin - Site 80L (RM 19.4) - flooded margin, small brush and grassy, small. No fish or environmental sampling conducted at this site.
Meander cutoff - Site 81R (RM 19.5) was sampled on 2014-04-22. Very large meander cutoff, deep with dense vegetation, flow noticeable on downstream end. Temperature in the main channel was 56.9°F and dissolved oxygen was 9.86 mg/L. Only one point taken at downstream end. Site depth was 3.4 feet, water velocity was 0.79 feet per second, water temperature was 56.9°F and dissolved oxygen (mg/L) was 9.3 mg/L. No fish sampling was conducted.
Backwater - Site 83L (RM 19.8) - Deep backwater, moderate amount of large woody debris, shaded. No fish or environmental sampling conducted at this site.
Flooded point bar - Site 82L (RM 19.9) - Small vegetation, moderate open water. No fish or

environmental sampling conducted at this site.
Margin - Site 84R (RM 20.2) was sampled on 2014-04-22. Shaded, shallow flooded off-channel habitat, very small connection to main channel, barely inundated at 2500 cfs. Temperature in the main channel was 56.7°F and dissolved oxygen was 9.96 mg/L. Mean site depth was 1.17 feet (min = 0.3 feet; max = 2.1 feet). Mean site water velocity was 0.01 feet per second ([fps]; min = 0 fps; max = 0.03 fps). Mean water temperature was 56.67 °F (min = 56°F; max = 57.6°F). Dissolved oxygen (mg/L) ranged from 6.42 to 9.67 (mean = 7.77 mg/L). No fish sampling was conducted.
Margin - Site 85R (RM 20.5) - Dense vegetation, little to no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Backwater - Site 86R (RM 20.7) - Large backwater, but very difficult to access due to dense vegetation. No fish or environmental sampling conducted at this site.
Margin - Site 87L (RM 20.9) - Too deep and dense to sample. No fish or environmental sampling conducted at this site.
Backwater - Site 88R (RM 21) - Very large backwater (based on inundation layer) with poor connectivity. No fish or environmental sampling conducted at this site.
Backwater - Site 89L (RM 21.2) - Deep. No fish or environmental sampling conducted at this site.
Margin - Site 90R (RM 21.3) - large but very dense vegetation. No fish or environmental sampling conducted at this site.
Meander cutoff - Site 91R (RM 22.2) - Dense vegetation. No fish or environmental sampling conducted at this site.
Backwater - Site 92L (RM 22.3) - Large and deep, very dense vegetation. No fish or environmental sampling conducted at this site.
Margin - Site 93L (RM 22.8) - Flooded margin, heavily shaded, moderate to little open water. No fish or environmental sampling conducted at this site.
Meander cutoff - Site 94L (RM 23.0) was sampled on 2014-04-22. Good flow and connectivity. Temperature in the main channel was 57.1°F and dissolved oxygen was 9.89 mg/L. Mean site depth was 1.85 feet (min = 1.2 feet; max = 3 feet). Mean site water velocity was 0.58 feet per second ([fps]; min = 0.16 fps; max = 0.92 fps). Mean water temperature was 56.8°F (min = 56.7°F; max = 57°F). Dissolved oxygen (mg/L) ranged from 9.77 to 9.96 (mean = 9.9 mg/L). E-fishing was conducted for 283 seconds but yielded no observed or captured fish.
Meander cutoff - Site 95R (RM 23.1) was sampled on 2014-04-22. Large low-lying, dense vegetation, wet areas but stagnant water (likely seepage from raised groundwater level), very small upstream connection, larval fish were observed at inlet. Temperature in the main channel was 57.1°F and dissolved oxygen was 9.89 mg/L. Mean site depth was 1.22 feet (min = 0.4 feet; max = 2.1 feet). The site had zero flow. Mean water temperature was 59.2°F (min = 57.7 °F; max = 60.4 °F). Dissolved oxygen (mg/L) ranged from 0.27 to 9.54 (mean = 3.66 mg/L). No electrofishing was conducted.
Margin / Backwater - Site 96R (RM 23.5) - Densely vegetated. No fish or environmental sampling conducted at this site.
Margin - Site 97R (RM 23.8) was sampled on 2014-04-22. Large, shallow densely vegetated area. Temperature in the main channel was 56.9°F and dissolved oxygen was 9.96 mg/L. Mean site depth was 2.6 feet (min = 2.3 feet; max = 3.1 feet). No flow was observed at site. Mean water temperature was 57.17°F (min = 56.9 °F; max = 57.6 °F). Dissolved oxygen (mg/L) ranged from 5.31 to 9.75 (mean = 8.48 mg/L). Electrofishing was conducted for 279 seconds but yielded no captured or observed fish. Unidentified larval fish were observed.
Margin - Site 98L (RM 23.9) - very large, very densely vegetated. No fish or environmental sampling conducted at this site.
Margin - Site 99R (RM 24.2) - Dense vegetation, little to no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 100R (RM 24.6) was sampled on 2014-04-22. Long margin habitat, presumably connected to large backwater via narrow channel, however backwater and margin not connected at current flows. Temperature in the main channel was 57.1°F and dissolved oxygen was 9.98 mg/L. Mean site depth was 2.15 feet (min = 1.7 feet; max = 2.6 feet). No flow was observed. Mean water temperature was 58.25°F (min = 56.9°F; max = 59.6°F). Dissolved oxygen (mg/L) ranged from 0.61 to 3.48 (mean = 2.04 mg/L). No electrofishing was conducted.

Margin - Site 101L (RM 25.5) was sampled on 2014-04-22. Inundated forest floor, seemingly only one small connection to main channel, too deep to sample. Temperature in the main channel was 56.7°F and dissolved oxygen was 10.12 mg/L. Mean site depth was 3.5 feet (min = 3.2 feet; max = 3.8 feet). No flow was observed. Mean water temperature was 56.75°F (min = 56.7°F; max = 56.8°F). Dissolved oxygen (mg/L) ranged from 9.47 to 9.63 (mean = 9.55 mg/L). No fish sampling was conducted.
Meander cutoff - Site 102L (RM 25.8) - large meander cutoff, unable to locate connection or verify connectivity at current flows (very unlikely connection). No fish or environmental sampling conducted at this site.
Margin - Site 103R (RM 26.1) - Dense willows. No fish or environmental sampling conducted at this site.
Margin - Site 104L (RM 26.2) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Possible margin - Site 105L (RM 26.3) - Notes: not sure how to classify, unaccessible due to dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 106R (RM 26.7) - Long, narrow inudnated margin, dense vegetation. No fish or environmental sampling conducted at this site.
Side Channel - Site 107L (RM 27.4) was sampled on 2014-04-22. Large, shallow side channel area with good flow at upstream end, connectivity obscured by dense vegetation. Temperature in the main channel was 56.8°F and dissolved oxygen was 10.27 mg/L. Mean site depth was 1.9 feet (min = 1.2 feet; max = 2.9 feet). Mean site water velocity was 0.46 feet per second ([fps]; min = 0.3 fps; max = 0.68 fps). Mean water temperature was 56.67°F (min = 56.6°F; max = 56.8°F). Dissolved oxygen (mg/L) ranged from 10.16 to 10.21 (mean = 10.18 mg/L). No electrofishing was conducted, but unidentified larval fish were observed.
Margin / Side Channel - Site 108R (RM 27.9) - Long inundated margin and side channel. No fish or environmental sampling conducted at this site.
Backwater - Site 109L (RM 28.9) - Off-channel pond. No fish or environmental sampling conducted at this site.
Margin - Site 111R (RM 29) - Notes: flooded beach (McHenry park), moderate amount of open water, deep. No fish or environmental sampling conducted at this site.
Margin / Oxbow - Site 110L (RM 29.4) - Densely vegetated margin, presumably connected to oxbow. No fish or environmental sampling conducted at this site.
Dry - Site 112R (RM 29.5) - Not connected at current flows. No fish or environmental sampling conducted at this site.
Margin - Site 113L (RM 29.8) - No description from field notes. No fish or environmental sampling conducted at this site.
Margin - Site 114R (RM 30.0) - No description from field notes. No fish or environmental sampling conducted at this site.
Side Channel - Site 115R (RM 30.3) - Flooded side channel, inlet open, decent flow. No fish or environmental sampling conducted at this site.
Margin - Site 116L (RM 30.5) - Dense vegetation, little to no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Margin - Site 117R (RM 30.5) - Flooded beach, small, no vegetation for cover. No fish or environmental sampling conducted at this site.
Side Channel - Site 116bL (RM 30.6) - barely connected at current flows, lots of larval fish. No fish or environmental sampling conducted at this site.
Flooded point bar - Site 118L (RM 31.0) - Dense vegetation, no open water habitat, difficult access. No fish or environmental sampling conducted at this site.
Side Channel - Site 119R (RM 31.1) was sampled on 2014-04-22. Shallow, side channel, only connected at lower end. Temperature in the main channel was 56.5°F and dissolved oxygen was 10.26 mg/L. Only one point was taken; site depth was 1 feet, water velocity was 0.0 feet per second, water temperature was 57.9°F and dissolved oxygen (mg/L) was 0.65 mg/L. No fish sampling was conducted.
Margin / Side Channel - Site 120L (RM 31.3) was sampled on 2014-04-22. Flooded margin / side channel. Temperature in the main channel was 56.4°F and dissolved oxygen was 10.33 mg/L. Only one point was taken at this site. Site depth was 1.5 feet, water velocity was 0 feet per second, water temperature was

57.7°F, and dissolved oxygen (mg/L) was 7.58 mg/L. No electrofishing was conducted but unidentified larval fish were observed at the site.
Flooded point bar - Site 121L (RM 31.8) - Dense vegetation. No fish or environmental sampling conducted at this site.
Side Channel - Site 122L (RM 32.3) was sampled on 2014-04-22. Shallow side channel with thick vegetation, very little flow. Temperature in the main channel was 56.6°F and dissolved oxygen was 10.46 mg/L. Only one point taken at this site; site depth was 1.9 feet, water velocity was 0 feet per second, water temperature was 58.8°F, and dissolved oxygen (mg/L) was 6.3 mg/L. No fish sampling was conducted.
Margin - Site 123R (RM 32.6) - Long flooded margin. No fish or environmental sampling conducted at this site.
Backwater - Site 124R (RM 33.4) was sampled on 2014-04-22. Well connected backwater (at downstream end), noticed juvenile sunfishes when pulling up. Temperature in the main channel was 56.5°F and dissolved oxygen was 10.59 mg/L. Mean site depth was 1.46 feet (min = 1 feet; max = 2 feet). Mean site water velocity was 0.01 feet per second ([fps]; min = 0 fps; max = 0.02 fps). Mean water temperature was 58.34°F (min = 56.9°F; max = 60.3°F). Dissolved oxygen (mg/L) ranged from 9.79 to 11.73 (mean = 10.62 mg/L). E-fishing was conducted for 285 seconds, but no fish were captured, however unidentified larval fish were observed.
Meander cutoff / Margin - Site 125R (RM 35.9) - Densely vegetated. No fish or environmental sampling conducted at this site.
Meander cutoff - Site 126L (RM 36.3) was sampled on 2014-04-23. Well connected upstream end, thick vegetation. Temperature in the main channel was 53.9°F and dissolved oxygen was 10.16 mg/L. Mean site depth was 1.72 feet (min = 1 feet; max = 2.9 feet). Mean site water velocity was 0.15 feet per second ([fps]; min = 0.09 fps; max = 0.21 fps). Mean water temperature was 53.72°F (min = 53.6°F; max = 53.8°F). Dissolved oxygen (mg/L) ranged from 9.75 to 10.15 (mean = 10.0 mg/L). E-fishing was conducted for 180 seconds and captured 1 juvenile pikeminnow and observed 2 others.
Flooded point bar - Site 127L (RM 36.6) - Larger grassy area only a couple inches above water would likely inundate at 3000 cfs. No fish or environmental sampling conducted at this site.
Margin - Site 128L (RM 38.0) - Long, narrow inundated margin, dense vegetation. No fish or environmental sampling conducted at this site.
Margin - Site 129R (RM 38.3) - Inundated margin, dense and inaccessible. No fish or environmental sampling conducted at this site.
Margin - Site 130L (RM 38.7) was sampled on 2014-04-23. Long inundated margin, rough boatramp or access road only accessible spot. Temperature in the main channel was 54.1°F and dissolved oxygen was 10.38 mg/L. Mean site depth was 1.27 feet (min = 0.7 feet; max = 1.7 feet). Mean site water velocity was 0.32 feet per second ([fps]; min = 0.01 fps; max = 1.03 fps). Mean water temperature was 54°F (min = 53.8°F; max = 54.3°F). Dissolved oxygen (mg/L) ranged from 10.03 to 10.42 (mean = 10.22 mg/L). E-fishing was conducted for 192 seconds and juvenile pikeminnow and mosquitofish were captured. Unidentified larval fish were present.
Margin - Site 199R (RM 38.8) was sampled on 2014-04-23. Shallow inundated area with moderate current, downstream of walnut orchard. Temperature in the main channel was 54.3°F and dissolved oxygen was 10.54 mg/L. Mean site depth was 1.36 feet (min = 0.5 feet; max = 1.9 feet). Mean site water velocity was 0.52 feet per second ([fps]; min = -0.02 fps; max = 1.94 fps). Mean water temperature was 54.8°F (min = 54.1°F; max = 56.4°F). Dissolved oxygen (mg/L) ranged from 10.59 to 11.18 (mean = 10.75 mg/L). E-fishing was conducted for 252 seconds and juvenile suckers, pikeminnow and unidentified larval fish were observed but not captured.
Backwater - Site 130cR (RM 39.1) - Pond behind residence part of deep backwater that stays inundated year-round. No fish or environmental sampling conducted at this site.
Backwater - Site 131R (RM 39.6) - Large backwater, not connected at current flows (a few inches more would connect). No fish or environmental sampling conducted at this site.
Backwater - Site 132R (RM 39.7) was sampled on 2014-04-23. Just barely connected at current flow, covered with duckweed. Only one point taken at this site, water temperature was 58.2°F and dissolved oxygen (mg/L) was 9.2 mg/L.
Margin - Site 133L (RM 40.2) - Deep (4.4' off bow of boat), very dense vegetation just downstream of "lake" at Oakdale Recreation Area. No fish or environmental sampling conducted at this site.

Backwater - Site 134R (RM 40.5) - Oakdale Recreation Area, always inundated, deep. No fish or environmental sampling conducted at this site.
Backwater - Site 135R (RM 40.6) - Other side of lake/pond at Oakdale Recreation Area. No fish or environmental sampling conducted at this site.
Backwater - Site 136R (RM 41.1) - Large deep backwater covered with aquatic vegetation. No fish or environmental sampling conducted at this site.
Flooded island - Site 137L (RM 41.3) - Large inundated island, too deep to sample (good flow through). No fish or environmental sampling conducted at this site.
Backwater - Site 137R (RM 41.4) - Pond immediately adjacent to Oakdale RST, barely connected at 2500 cfs. No fish or environmental sampling conducted at this site.
Anthropogenic - Site 138L (RM 41.8) - Flooded backyards on River Left - did not sample due to access issues, heavily modified.
Side Channel - Site 138bR (RM 42.4) - Narrow side channel covered in blackberries. No fish or environmental sampling conducted at this site.
Margin - Site 139R (RM 42.7) was sampled on 2014-04-23. Long narrow flooded margin, too deep to wade at downstream end, access point at middle of site (seined and snorkeled), maintained access road through vegetation, unpaved. Temperature in the main channel was 54.9°F and dissolved oxygen was 10.9 mg/L. Mean site depth was 2.25 feet (min = 2 feet; max = 2.6 feet). Mean site water velocity was 0.06 feet per second ([fps]; min = 0.03 fps; max = 0.09 fps). Mean water temperature was 54.6°F (min = 54.3°F; max = 55°F). Dissolved oxygen (mg/L) ranged from 10.62 to 10.85 (mean = 10.75 mg/L). No electrofishing was conducted. Seining was conducted in open area and captured prickly sculpin, juvenile suckers and threespine stickleback.
Side Channel / Backwater / Flooded island - Site 140L (RM 43.5) - too deep to seine or wade. No fish or environmental sampling conducted at this site.
Side Channel / Flooded island - Site 141R (RM 44.3) was sampled on 2014-04-23. Deep side channel (>5'), dense willows. Temperature in the main channel was 54.8°F and dissolved oxygen was 11.14 mg/L. Mean site depth was 2.3 feet (min = 1.3 feet; max = 3.4 feet). Mean site water velocity was 0.94 feet per second ([fps]; min = 0.07 fps; max = 2.29 fps). Mean water temperature was 55.1°F (min = 54.8°F; max = 55.6°F). Dissolved oxygen (mg/L) ranged from 10.86 to 11.14 (mean = 11.05 mg/L). No fish sampling was conducted.
Margin - Site 142L (RM 46.7) - Flooded margin, very dense vegetation, some open area further off-channel but inaccessible, more open towards top but too deep to wade. No fish or environmental sampling conducted at this site.
Side Channel / Margin / Island - Site 143R (RM 47.5) was sampled on 2014-04-23. Side channel/flooded margin, side channel too deep to sample, margin/island barely inundated. Temperature in the main channel was 55.4°F and dissolved oxygen was 11.26 mg/L. Mean site depth was 1 feet (min = 0.3 feet; max = 1.7 feet). Mean site water velocity was 0.05 feet per second ([fps]; min = 0.05 fps; max = 0.05 fps). Mean water temperature was 56.1°F (min = 55.5°F; max = 56.7°F). Dissolved oxygen (mg/L) ranged from 9.83 to 10.23 (mean = 10.03 mg/L). No fish sampling was conducted.
Margin - Site bonus2 (RM 48.3) was sampled on 2014-04-23. Just downstream of Orange Blossom Bridge on river left, inundated margin, noted 1 stickleback, well connected to main channel, did not take DO or temp (not on original list). No mid-channel temperature or dissolved oxygen readings were taken. Mean site depth was 1.7 feet (min = 1.5 feet; max = 1.9 feet). Mean site water velocity was 0.28 feet per second ([fps]; min = 0.15 fps; max = 0.4 fps).
Side Channel - Site bonus3 (RM 48.6) was sampled on 2014-04-23. Not on original list, side channel, connected through dense debris, seined (1 juvenile Chinook; FL = 52 mm) and snorkeled (observed 4 juvenile Chinook on margin adjacent to river). Temperature in the main channel was 55.5°F and dissolved oxygen was 10.91 mg/L. Mean site depth was 2.27 feet (min = 2.1 feet; max = 2.5 feet). Mean site water velocity was 0.07 feet per second ([fps]; min = 0.05 fps; max = 0.1 fps). Mean water temperature was 55.33°F (min = 55.3°F; max = 55.4°F). Dissolved oxygen (mg/L) ranged from 11.31 to 11.37 (mean = 11.35 mg/L). Juvenile pikeminnow and threespine stickleback were also observed at the site.
Side Channel - Site 144L (RM 49.3) was sampled on 2014-04-23. Lancaster Road restoration area, series of side channels, snorkeled with 2 divers, observed 10 juvenile Chinook and 1 adult sucker. No mid-channel temperature or dissolved oxygen readings were taken. Mean site depth was 2.4 feet (min = 1.7

feet; max = 3.2 feet). Mean site water velocity was 2.0 feet per second ([fps]; min = 1.0 fps; max = 3.19 fps). Mean water temperature was 55.76°F (min = 55.6°F; max = 56.2°F). Dissolved oxygen (mg/L) ranged from 11.28 to 11.42 (mean = 11.38 mg/L).
Side Channel - Site 145R (RM 49.7) - Flooded side channel, many points of connectivity, long island separates main channel. No fish or environmental sampling conducted at this site.
Margin - Site 146L (RM 50.1) was sampled on 2014-04-24. Flooded margin with total connectivity, many deep spots throughout, heavily wooded, good flow. Temperature in the main channel was 55.2°F and dissolved oxygen was 11.21 mg/L. Mean site depth was 2.3 feet (min = 1.5 feet; max = 3.1 feet). Mean site water velocity was 0.68 feet per second ([fps]; min = 0.56 fps; max = 0.8 fps). Mean water temperature was 55.2°F (min = 55.1°F; max = 55.3°F). Dissolved oxygen (mg/L) ranged from 11.14 to 11.34 (mean = 11.24 mg/L). No fish sampling was conducted.
Side Channel - Site 147R (RM 50.4) - Long side channel, connectivity at top and bottom. No fish or environmental sampling conducted at this site.
Side Channel - Site 147bL (RM 50.6) - Flooded side channel, inlet at top and bottom (well connected), may be part of 148 (very large). No fish or environmental sampling conducted at this site.
Margin - Site 148L (RM 50.8) - high flows through margin, total connectivity - may be better floodplain at slightly higher flows. No fish or environmental sampling conducted at this site.
Side Channel / Flooded island - Site 149R (RM 51.1) was sampled on 2014-04-30. Honolulu Bar restoration area; snorkeled and observed 180 juvenile Chinook (147 in side channel and 33 in flood margin), 200 juvenile suckers, 2 adult suckers, 1 adult pikeminnowNo mid-channel temperature or dissolved oxygen readings were taken. Mean site depth was 2.36 feet (min = 1.4 feet; max = 3.1 feet). Mean site water velocity was 1.09 feet per second ([fps]; min = 0 fps; max = 4.67 fps). Mean water temperature was 54.85°F (min = 54.5°F; max = 56.2°F).
Margin / Backwater - Site 150L (RM 51.6) - Little connectivity at top and bottom. No fish or environmental sampling conducted at this site.
Backwater - Site 151R (RM 51.8) - Connectivity year-round (Dominic Giudice - CDFW pers. comm.), deep backwater just downstream of take out at Horseshoe Bend. No fish or environmental sampling conducted at this site.
Anthropogenic - Site Bonus4 (RM 52.5) was sampled on 2014-04-24. Flooded access road at upstream end of Horseshoe Bend campground, water trickled down road into several isoloated ponds (no connection for fish; observed school of juvenile suckers, mosquitofish, and unidentified larval fish in connected portion). Temperature in the main channel was 54.7°F and dissolved oxygen was 11.31 mg/L. Mean site depth was 0.95 feet (min = 0.9 feet; max = 1 feet). Mean site water velocity was 0.02 feet per second ([fps]; min = 0 fps; max = 0.05 fps). Mean water temperature was 55.95°F (min = 54.8 °F; max = 57.1°F). Dissolved oxygen (mg/L) ranged from 11.04 to 11.32 (mean = 11.18 mg/L).
Margin / Side Channel - Site 152R (RM 52.7) was sampled on 2014-04-24. Margin and top of side channel (depth of side channel would suggest that likely remains wet year-round, but unverified), total connectivity, backyard / beach like area. Temperature in the main channel was 55°F and dissolved oxygen was 11.28 mg/L. Mean site depth was 2.63 feet (min = 1.6 feet; max = 3.4 feet). Mean site water velocity was 1.03 feet per second ([fps]; min = 0.09 fps; max = 1.51 fps). Mean water temperature was 54.63°F (min = 54.6°F; max = 54.7°F). Dissolved oxygen (mg/L) ranged from 11.35 to 11.44 (mean = 11.4 mg/L). Threespine stickleback and 1 adult unidentified fish was observed during snorkeling.
Side Channel / Backwater / Flooded island - Site 153L (RM 52.9) - Long side channel, huge complex of habitat, well connected, good flow even at lower discharges (Dominic Giudice, CDFW, personal communication). No fish or environmental sampling conducted at this site.
Margin - Site 154L (RM 53.2) - Difficult access, no points or samples. No fish or environmental sampling conducted at this site.
Margin / Islands - Site 155L (RM 53.2) - Edge of Wilm pond, good connectivity. No fish or environmental sampling conducted at this site.
Side Channel / Margin - Site 156R (RM 53.9) was sampled on 2014-04-24.Lover's Leap restoration area, multiple channels inundated, fish observed during snorkeling included threespine stickleback 1 adult sucker and 1 juvenile Chinook at outlet of main side channel. Temperature in the main channel was 55.1°F and dissolved oxygen was 11.27 mg/L. Mean site depth was 1.27 feet (min = 0.5 feet; max = 2.3 feet). Mean site water velocity was 0.45 feet per second ([fps]; min = 0 fps; max = 1.09 fps). Mean water

temperature was 54.6°F (min = 54.1°F; max = 55.5°F). Dissolved oxygen (mg/L) ranged from 10.04 to 12.3 (mean = 11.29 mg/L).
Backwater - Site 157L (RM 54) - Deep backwater, over 4' deep at opening, over 6' deep in opening, snorkeled briefly, did not observe any fish. No environmental sampling conducted at this site.
Backwater - Site 158R (RM 54.1) was sampled on 2014-04-24. Flooded backwater with very small connection to main channel (covered in sticks from beaver), observed 1 juvenile sucker and 3 unidentified juvenile cyprinids. Temperature in the main channel was 54.5°F and dissolved oxygen was 11.14 mg/L. Mean site depth was 1.33 feet (min = 0.8 feet; max = 2.1 feet). Mean site water velocity was 0.02 feet per second ([fps]; min = 0.01 fps; max = 0.03 fps). Mean water temperature was 57.58 °F (min = 55 °F; max = 58.9 °F). Dissolved oxygen (mg/L) ranged from 2.35 to 5.67 (mean = 4.34 mg/L).
Margin - Site 159R (RM 54.4) was sampled on 2014-04-24. Flooded margin with multiple connections to main channel, snorkeled river margin (observed 17 juvenile Chinook), observed 1 trout fry in unit, 3 juvenile Chinook near top of floodplain at point 159-7. Temperature in the main channel was 54°F and dissolved oxygen was 11.04 mg/L. Mean site depth was 1.43 feet (min = 0.9 feet; max = 2.3 feet). Mean site water velocity was 0.19 feet per second ([fps]; min = 0 fps; max = 0.63 fps). Mean water temperature was 53.87°F (min = 53.7°F; max = 54.2°F). Dissolved oxygen (mg/L) ranged from 10.81 to 11.35 (mean = 11.08 mg/L).
Side Channel - Site 160L (RM 55.6) was sampled on 2014-04-30. Russian Rapid side channel, snorkeled and observed 8 rainbow trout (5 adults, 3 juveniles), and 9 juvenile Chinook. Temperature in the main channel was 56.0°F and dissolved oxygen was 10.89 mg/L. Mean site depth was 2.07 feet (min = 1 feet; max = 2.9 feet). Mean site water velocity was 2.09 feet per second ([fps]; min = 0.58 fps; max = 3.83 fps). Mean water temperature was 54.99 °F (min = 54.8 °F; max = 55.5 °F).
Side Channel - Site 161L (RM 56.0) was sampled on 2014-04-30. Snorkeled and observed 1 juvenile rainbow trout, 39 juvenile Chinook, and 40 threespine stickleback. No mid-channel temperature or dissolved oxygen readings were taken. Mean site depth was 3.02 feet (min = 2 feet; max = 4.1 feet). Mean site water velocity was 2.79 feet per second ([fps]; min = 1.43 fps; max = 3.61 fps). Mean water temperature was 54.84°F (min = 54.8°F; max = 55.0°F).
Margin / Backwater - Site 161R (RM 56.2) - Did not sample on 4/24 or 4/30, sampled 161L instead (thought it was the intended location to sample), habitat type from layer.

ATTACHMENT 5

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

The Status of Rainbow Trout (*Oncorhynchus mykiss*) in the Stanislaus River

Summary report of 2015 snorkel surveys

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The Status of Rainbow Trout (*Oncorhynchus mykiss)* in the Stanislaus River: Summary report of 2015 snorkel surveys

Summary

The health of the Stanislaus River population of *Oncorhynchus mykiss* (rainbow trout and steelhead) has become an increasing concern due to changing conditions in the river. Water temperatures have been unusually warm over the past year due to low storage in New Melones Reservoir. The reservoir's coldwater storage has now been depleted by a combination of continued drought and high water releases in recent years. As a result, the temperatures of released water have increased substantially. Annual snorkel surveys to estimate the abundance and distribution of *O. mykiss* provide an opportunity to document shifts in the population in response to changes in habitat and water temperature in the Stanislaus River, and have been conducted every late-summer or early fall since 2009. The 2015 snorkel surveys were completed in mid-August, and reveal a drastic decline in the abundance of the *O. mykiss* population. This report presents our initial findings from the 2015 survey, and explores potential mechanisms leading to the substantial declines in abundance of *O. mykiss* in the Stanislaus River. In addition, the results from the 2015 surveys were compared to results from surveys conducted since 2009.

Key Findings

- *O. mykiss* abundance substantially declined from a long-term average (2009-2014) of just over 20,000 fish to only about 5,000 fish in 2015. The previous low was recorded during 2009, when abundance was estimated to be 14,000.
- Densities, or numbers of *O. mykiss* per river mile or per habitat unit, have been on the decline since 2013, with 2015 densities the lowest on record. The most dramatic decline has been observed between Goodwin Dam and Knights Ferry.
- All age classes were represented in 2015, and there have been no notable shifts in age composition over the period of record. The observation of young-of-year in August 2015 provides evidence of at least some successful reproduction during 2015.
- There has been no change in the downstream extent of distribution of *O. mykiss* since 2009, with *O. mykiss* consistently observed downstream to Highway 120. Highest densities and abundances of *O. mykiss* are consistently found in Goodwin Canyon.
- Small year-to-year variations in flow do not substantially affect abundance. However, abundance may increase in response to extremely high flood control releases and cooler temperatures during years of heavy precipitation.
- Since summer 2014, water temperatures have been elevated to an unprecedented degree due to low reservoir storage. *O. mykiss* abundance has decreased in response to elevated water temperatures, the warmest of which were recorded during the summer of 2015. Although conditions improved in 2016, the water year is still classified as "dry", and *O. mykiss* abundance is expected to decline even further in the summer of 2016.

- Non-salmonid species such as Tule perch and black bass, which generally prefer warmer waters, were observed in greater abundances and further upstream during 2015 than in previous years. Striped bass also appeared to be more abundant in 2015 than in previous years.

METHODS

With the exception of one year (2011) when the lowest reach was not sampled, surveys have been conducted annually from Goodwin Dam to Oakdale (Figure 1). The methodology used is a two-stage sampling scheme originally developed by Hankin and Reeves (1988). The survey methodology has been adapted slightly in order to survey larger and longer habitat units, with the key difference being the use of up to four divers in each selected habitat unit. Detailed survey methodology, key assumptions, and estimation methods can be found in Lee et al. (2015). Briefly, habitat units are classified into four different habitat strata (runs, riffles, pools, and cascades); however, only runs, riffles, and pools are surveyed. Estimated total abundance is calculated by multiplying the average number of fish estimated in each habitat strata (e.g., riffles) by the total number of habitat units. The total abundance does not include *O. mykiss* that potentially reside in cascades or other units that cannot be surveyed due to safety concerns, but these represent a very small amount of total habitat area. The units are randomly selected for the first stage (units are dove one time) and the second stage (units are dove four times).

Snorkel surveys were conducted from August 3–12, 2015, using similar methods relative to previous years, but with an increased sampling rate within each habitat stratum. Survey effort was also shifted from lower reaches (Valley Oak to Oakdale) to upper reaches (Goodwin Canyon) to increase the precision of the abundance estimates. It should be noted that these shifts in sampling effort between reaches do not bias or affect the resulting estimates of abundance in a substantial manner, but they do typically result in greater certainty in the estimates by reducing the confidence intervals surrounding the point estimates. No other changes in methodology or personnel have occurred since 2009.

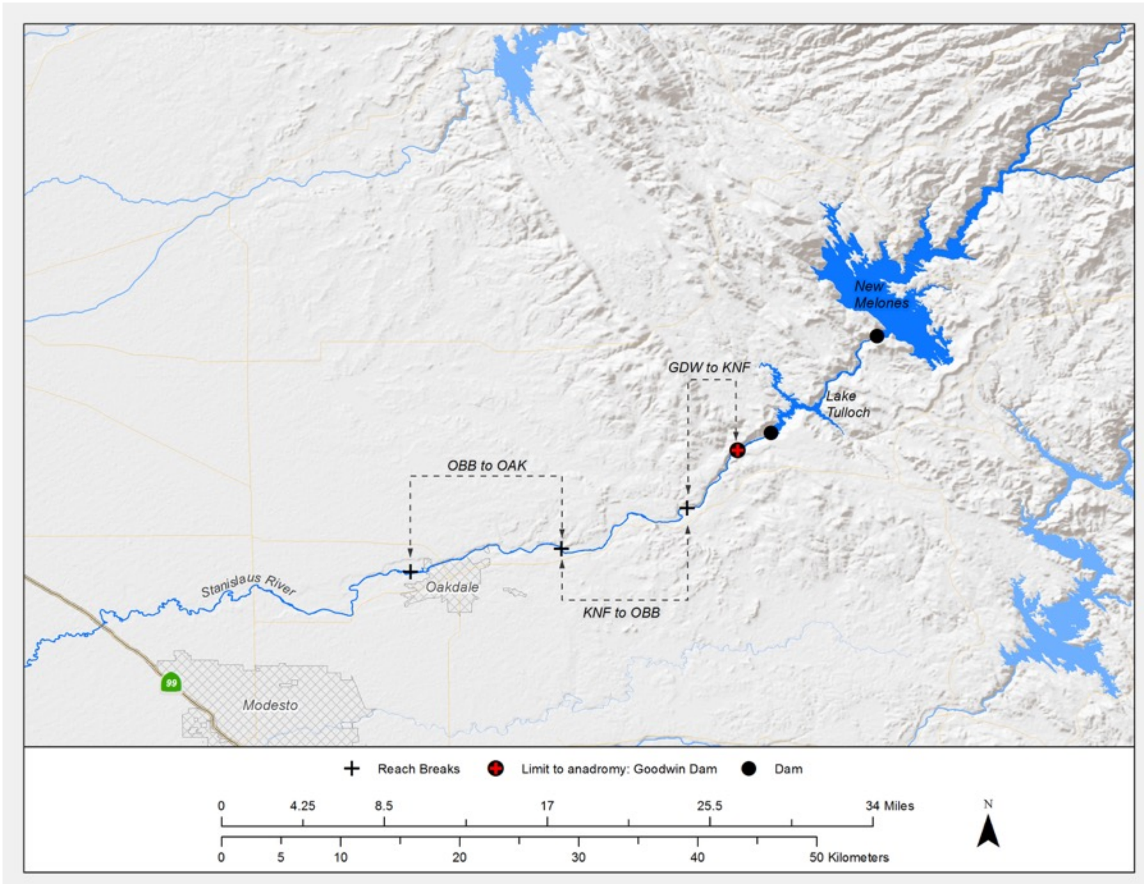

Figure 1. Map of survey reaches.

RESULTS

O. mykiss Population Characteristics

Abundance

The estimated abundance of *O. mykiss* (all life stages combined) in the Stanislaus River based on snorkel surveys in 2015 was 5,012 fish, which is the lowest abundance on record (Figure 2). River-wide abundance estimates from 2009 to 2014 have averaged just over 20,220 *O. mykiss*, and have never been estimated to be less than about 14,000 (2009). In terms of percentage, the 2015 estimate is about 25% of the long-term average and 35% of the previous lowest estimate. Prior to 2015, no significant fluctuations in abundance were observed, with the exception of 2012, when estimates of abundance were > 37,000 *O. mykiss* from Goodwin Dam to Oakdale.

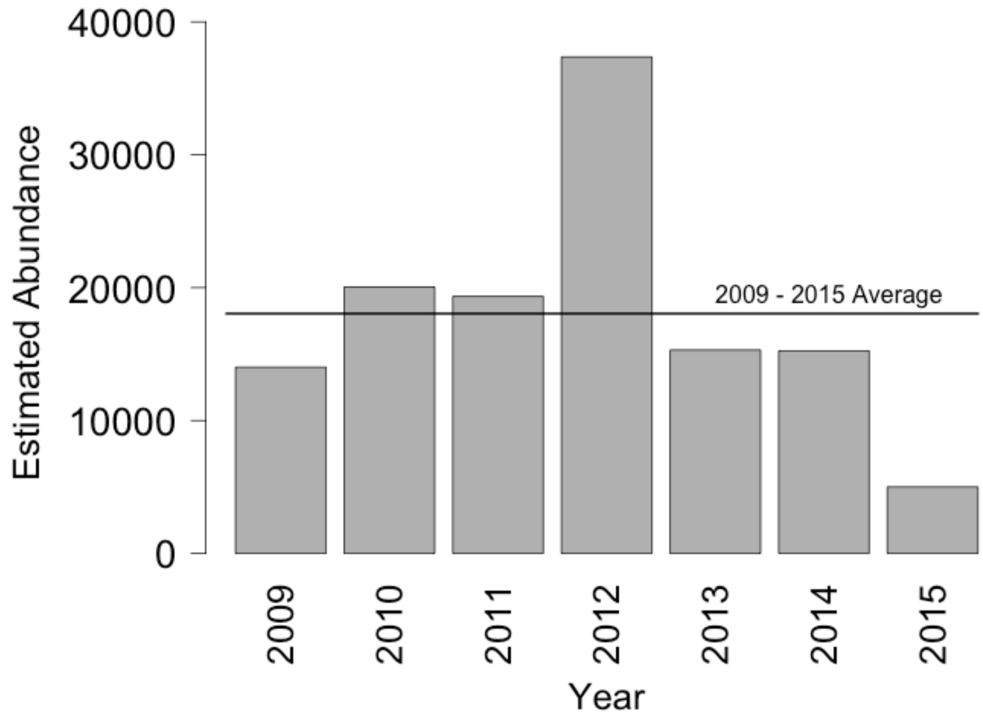

Figure 2. Annual *O. mykiss* abundance in the Stanislaus River during 2009-2015.

Age Composition

Both age classes of *O. mykiss* (young-of-year (YOY) and Age 1+) have been observed each year since 2009, with no notable shifts in age composition over the period of record (Figure 3). The abundance of both age classes has generally declined as total abundance has declined. Although the presence of YOY in 2015 indicates at least some successful *O. mykiss* reproduction during this year, fewer individuals were observed relative to previous years. Low abundance of YOY below Orange Blossom is expected, as nearly all spawning occurs in the Goodwin and Knights Ferry reaches. The most substantial decline in YOY abundance occurred in the Knights Ferry reach, where elevated water temperatures have likely had a greater impact on reproductive success than in the Goodwin reach, which typically has cooler temperatures.

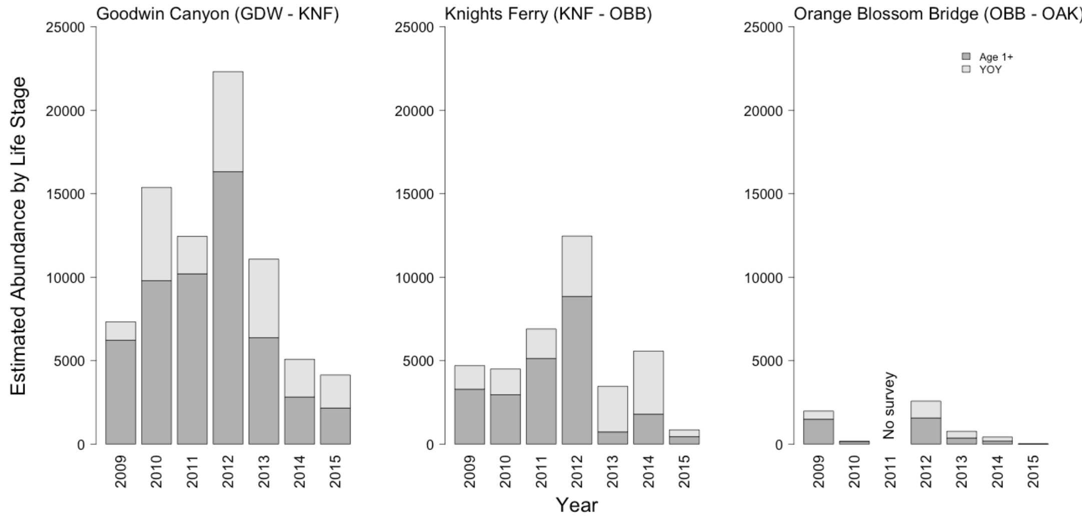

Figure 3. Estimated abundances of age-0 (YOY) *O. mykiss* (light gray bars) and age-1+ and older *O. mykiss* (dark grey bars) by reach and year on the Stanislaus River.

Density

We selected two metrics to describe population density: the number of *O. mykiss* calculated per river mile, and the average number counted in each of the sampled habitat units. Each of these metrics can be compared across reaches both within and between years.

Both metrics showed that the highest densities of *O. mykiss* are consistently found in Goodwin Canyon, with long-term averages of 3,724 *O. mykiss* per mile and 91.9 *O. mykiss* counted per unit sampled during 2009-2014. In 2015, densities in Goodwin Canyon dropped to 635 *O. mykiss* per mile (Figure 4) and 18.6 *O. mykiss* per unit, representing about an 80% decrease in density in 2015 relative to the long-term average.

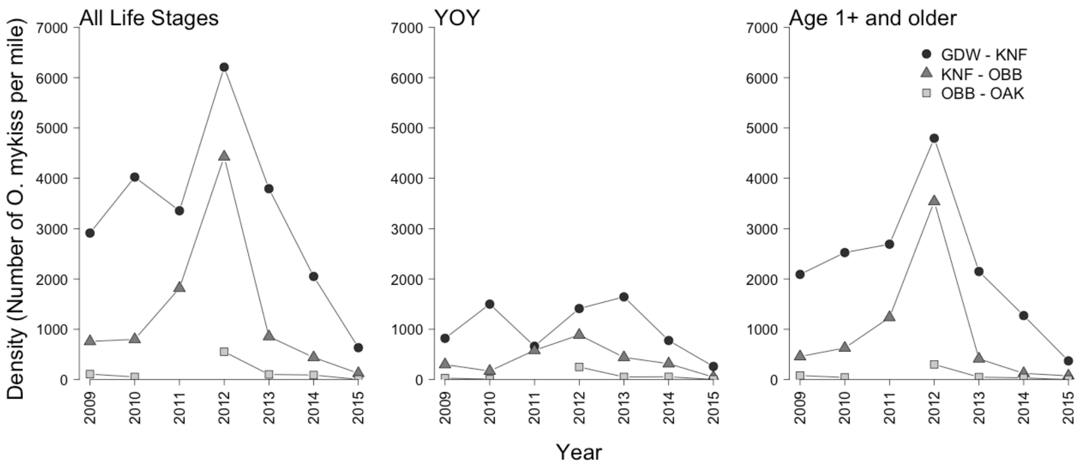

Figure 4. Number of *O. mykiss* per mile in each reach, each year during 2009-2015.

Spatial Distribution

We evaluated occupancy for each year and reach to assess how many sampled habitat units were occupied by at least one *O. mykiss*. From 2009 to 2012, nearly all (~95%) of the sampled units in the Goodwin Canyon and Knights Ferry reaches contained at least one *O. mykiss* (Figure 5). Occupancy in the Knights Ferry reach began to decline in 2013, and in 2015, only 80% of the units sampled had at least one *O. mykiss*. Occupancy in the Goodwin Canyon reach also declined slightly in 2013, but remained high. In 2015, just under 85% of the sampled units were occupied in the Goodwin Canyon reach. A more precipitous decline was observed in the Orange Blossom Bridge reach, from nearly all units occupied in 2012 to less than 10% occupied in 2015.

Interestingly, the range of *O. mykiss* distribution did not substantially change in 2015 compared to previous years, unlike many of the other population characteristics examined. With the exception of 2011 when surveys only extended to Orange Blossom Bridge (RM 46.9), *O. mykiss* have consistently been observed, albeit at low densities, downstream to the Highway 120 Bridge (RM 41). The continued presence of individuals to this downstream extent demonstrates that while the population has sustained substantial impacts, some individuals are still capable of persisting in lower quality habitats and warmer temperatures. These more tolerant individuals are important for resiliency in re-building the population after events such as the current drought.

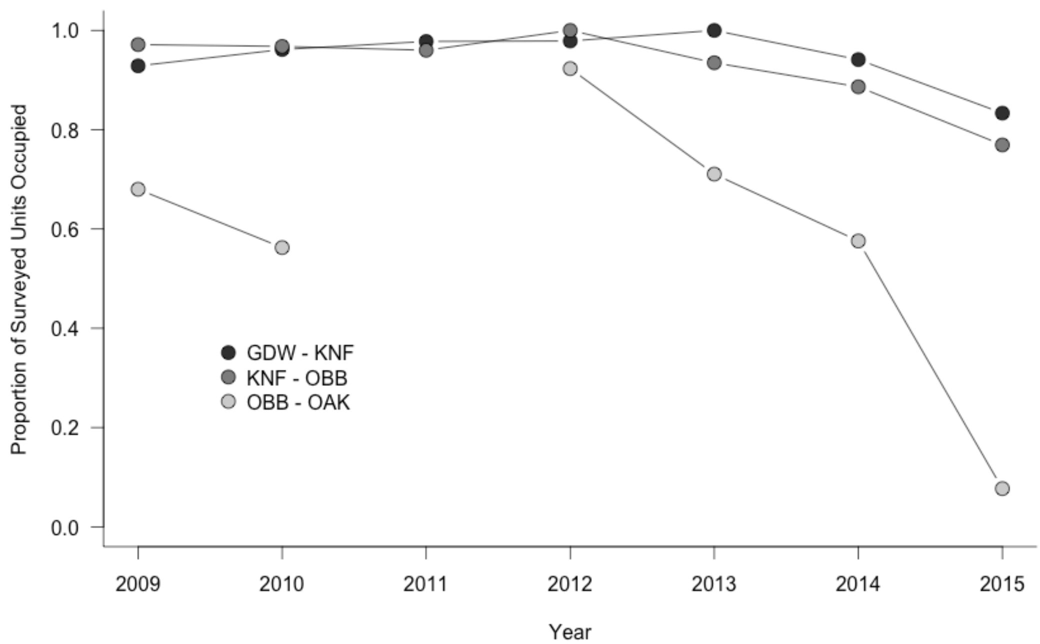

Figure 5. Proportion of sampled habitat units by reach and year occupied by at least one *O. mykiss* during snorkel surveys conducted on the Stanislaus River from 2009 to 2015. Note: no survey was conducted from OBB to OAK in 2011.

Flows and Water Temperatures

To evaluate the potential influence of flow on *O. mykiss* abundance, we plotted trends in abundance and flow, and found that small variations in flow from year-to-year do not substantially affect abundance (Figure 6). With the exception of peak *O. mykiss* abundance occurring in 2012, following extremely high flows due to flood control operations in 2011, abundance estimates have not tracked well with the volume of flow released during January–August of the year prior. For instance, flows were higher at Ripon in 2012 and 2013 than during 2008–2010. However, despite these higher flows, *O. mykiss* abundance was lower in 2013 than during 2009–2011, and abundance has continued to decline to the record low observed in 2015.

Regression analysis was also used to examine potential relationships between *O. mykiss* abundance and flow (Figure 7). While this analysis suggested that higher flows resulted in increased abundance, the trend was entirely driven by the flood control releases in 2011, which are well above the range of managed flows as specified in Table 2e of the Biological Opinion. We explored the relationship between flow and *O. mykiss* abundance under the Table 2e flows by excluding 2011 flows and the corresponding 2012 abundance. This revealed that under Table 2e flows, *O. mykiss* abundance appears to decrease as flows increase. While we believe flow during 2011 was a factor contributing to increased *O. mykiss* abundance in 2012, we do not believe that Table 2e flows directly influence *O. mykiss* abundance. Rather, it appears that differences in temperature among those years are the single most important factor driving abundance.

Due to low storage in New Melones Reservoir, water temperatures have increased substantially in the past several years (Figure 8). Mean monthly water temperatures in 2015 were higher during the months of May, July, and August than the maximum monthly water temperatures during those months from 1998–2012 (Figure 9). Mean monthly water temperatures during June 2015 were approximately the same as the maximum observed during June from 1998–2012. Mean monthly water temperatures were substantially higher (mean difference = 5.8ºF; range 3.1–10.6ºF) in 2015 than the long-term mean monthly water temperature from 1998–2012.

Estimated *O. mykiss* abundance during 2009-2015 tracks very closely with water temperatures, and lower *O. mykiss* abundances was observed in years following warmer summer temperatures (Figure 9). Because this trend shows a one-year lag in the observed response of the population to elevated summer water temperatures, an even greater decline in abundance may be on the horizon for 2016 as a result of the unprecedented temperature conditions during 2015. Further, the number of Age 1+ *O. mykiss*, a portion of which will form the spawning population in winter 2015/2016, has decreased substantially. This is expected to result in reduced production of YOY in 2016 in addition to the reduced Age 1+ population, resulting in an expected further decline in total *O. mykiss* abundance in 2016.

Regression analysis was also used to examine potential relationships between *O. mykiss* abundance and water temperature (Figure 8). Using the same approach as for flow, we analyzed trends with and without the 2012 abundance estimate. This analysis clearly shows declining abundance in response to increasing water temperatures. Water temperatures during summer 2015 were approximately 5ºF warmer than during 2014. Because such temperatures are well beyond the range of temperatures over which *O. mykiss* population response has been measured, we cannot use these relationships to project how low *O. mykiss* abundance is expected to be in 2016. However, the decline is expected to be at a rate at least equal to the decline observed between 2014 and 2015, where abundance in 2015 was only one-third of the estimated abundance in 2014.

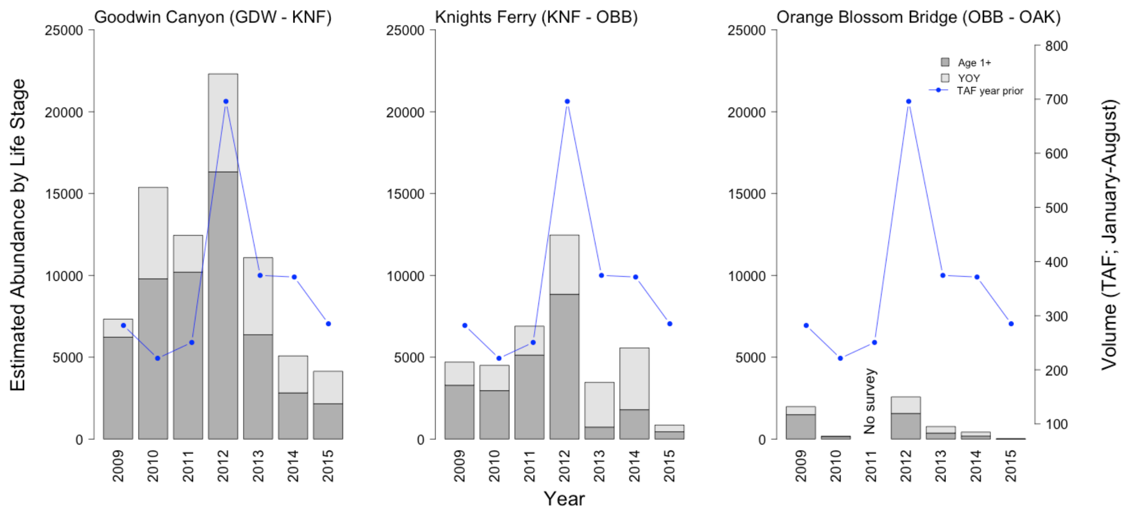

Figure 6. Estimated abundance of *O. mykiss* relative to flow at Ripon during January–August of the previous year.

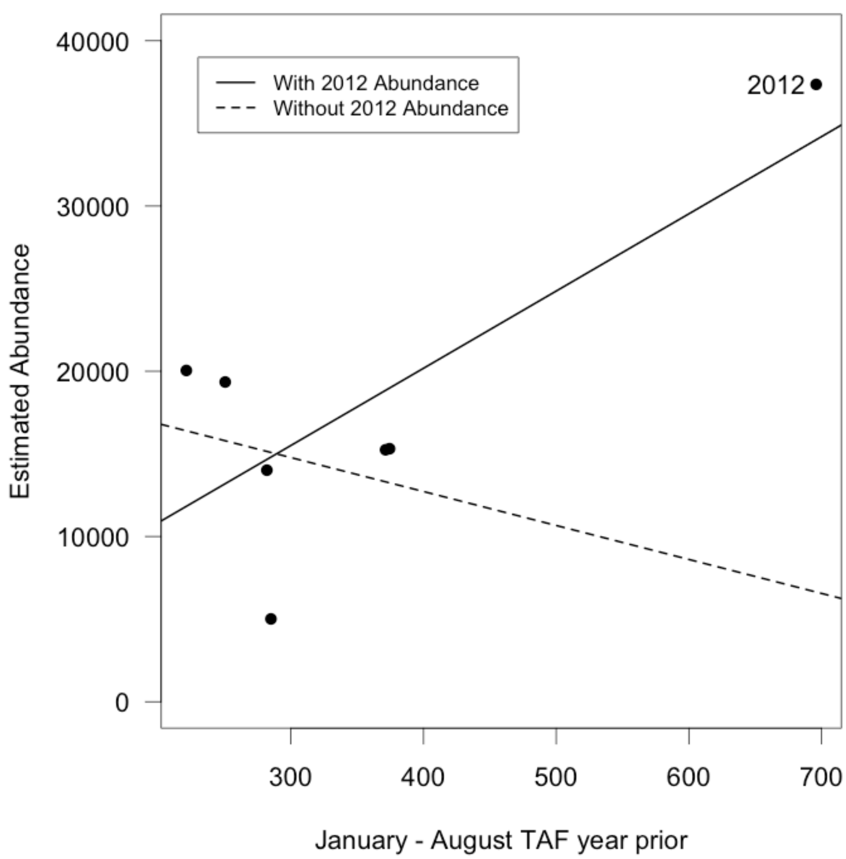

Figure 7. Regression analysis of abundance relative to flow at Ripon during January–August of the previous year.

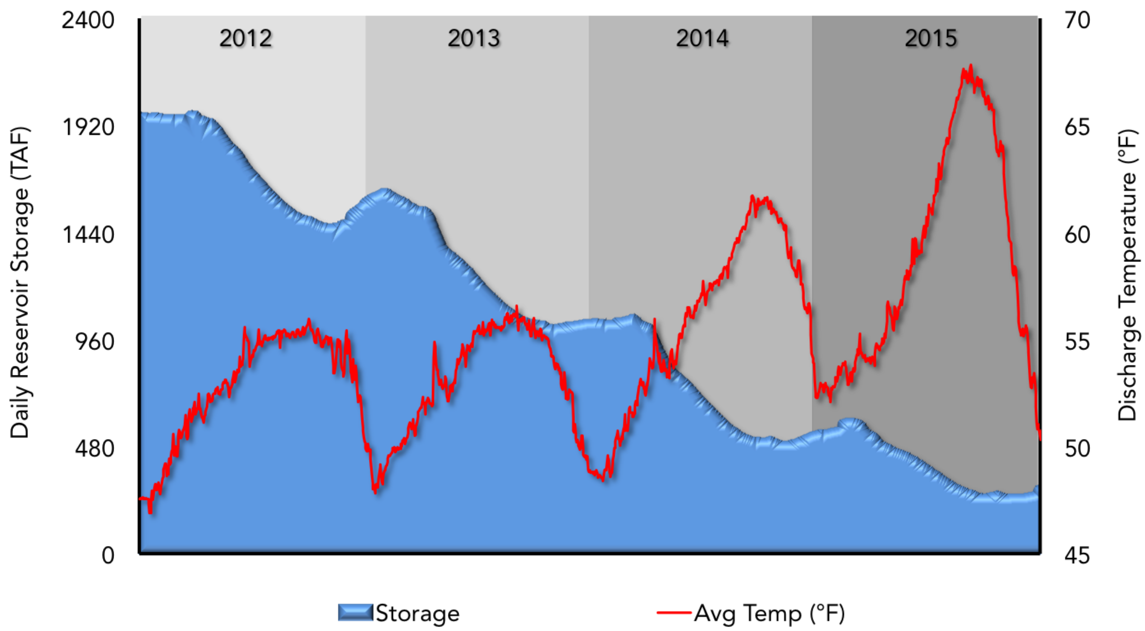

Figure 8. Storage in New Melones Reservoir and average daily water temperatures at Goodwin Dam during the 2012-2015 drought.

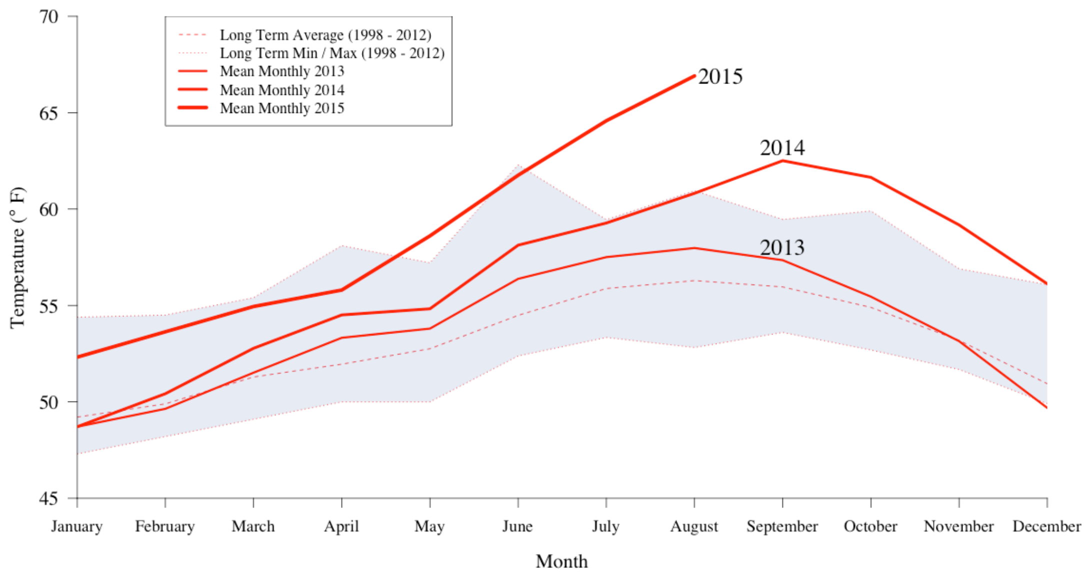

Figure 9. Monthly mean water temperatures (dashed red line denotes long term average) from Knights Ferry from 1998 to 2015. Shaded region denotes range of minimum and maximum monthly water temperatures from 1998 to 2012.

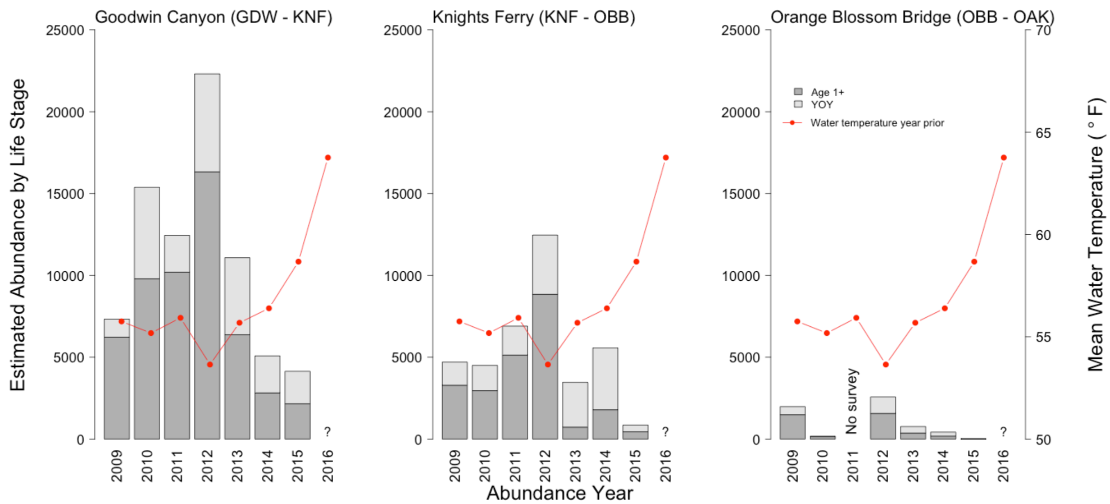

Figure 10. Estimated abundance of *O. mykiss* relative to average summer (June-August) water temperatures the year prior.

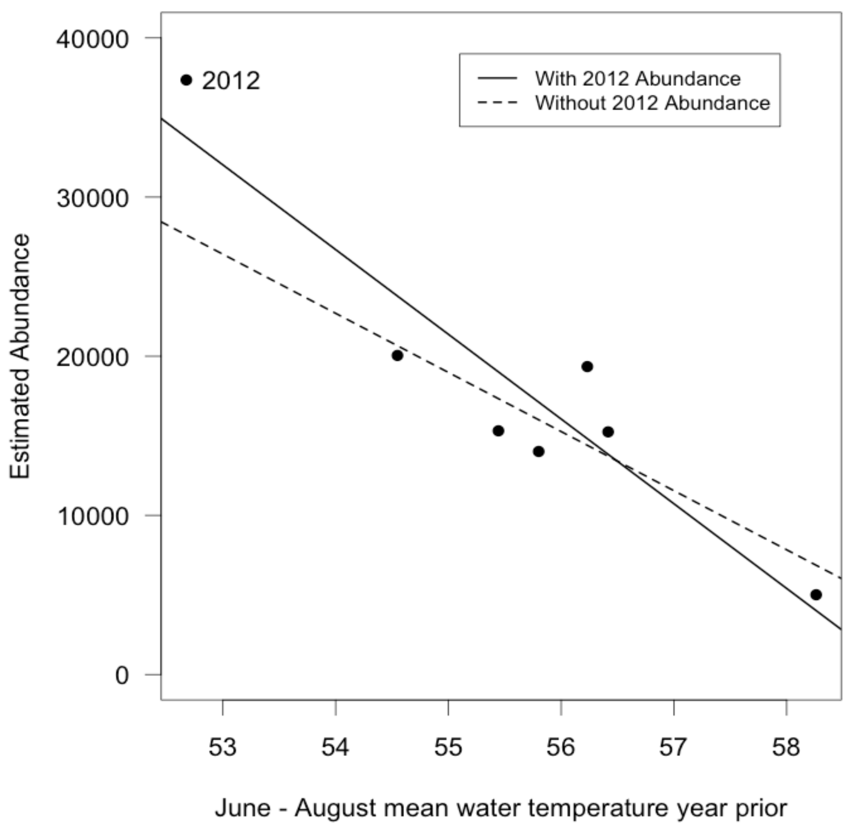

Figure 11. Regression analysis of abundance relative to water temperatures at Goodwin during summer (June – August) of the previous year.

DISCUSSION

The decrease in abundance of *O. mykiss* in the Stanislaus River as evidenced by multiple metrics is alarming, but not surprising given the unprecedented water temperatures due to extremely low storage in New Melones Reservoir. Extensive water temperature modeling previously provided an indication that maintaining coldwater storage behind New Melones Dam is highly important for maintaining suitable temperature conditions downstream. This modeling had suggested minimum storage of at least 300,000 acre-feet in New Melones for maintaining suitable downstream water temperatures. Trends in water temperatures relative to reservoir storage and more recent modeling conducted by the U.S. Bureau of Reclamation now suggest that temperatures begin to rise as storage approaches 500,000 acre-feet. Observed temperature conditions during the recent drought as well as long-term, annual surveys to document the biological response of the *O. mykiss* population to these conditions further underscore the importance of maintaining adequate coldwater supply in New Melones. Elevated water temperatures may have contributed to decreased *O. mykiss* abundance in multiple ways, including mortality due to stress or disease, mortality due to predation, reduced reproductive success, and an increase in downstream migration.

Concurrent with the decline in *O. mykiss* abundance, other changes were observed on the river in 2015, with the substantial increase in water temperatures the likely causative mechanism. A pronounced shift in the fish community was observed below Knights Ferry, with higher relative numbers of Tule perch and black bass compared to previous years. Microhabitat usage by these species was also observed to have shifted relative to previous years. During surveys conducted from 2009 to 2012, observations of Tule perch and black bass were generally limited to slower currents and backwaters. During 2015, it was observed that these species were utilizing areas with higher current velocities near transitions from riffles to pools or runs. In previous years, these zones were more often occupied by *O. mykiss.* However, as a result of elevated water temperatures, occupancy has likely shifted, resulting in reduced *O. mykiss* abundance, and increased abundances of other species, such as black bass, that prefer warmer waters. Other notable changes in the aquatic ecology of the Stanislaus River included the observation of increased numbers of large striped bass as far upstream as Knights Ferry, a pronounced increase in filamentous algae on the substrate, and an apparent decrease in macroinvertebrate densities. All of these factors may be attributed to increased water temperatures and may contribute to reduced abundance of *O. mykiss*.

REFERENCES

Hankin, D. G., and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Science 45:834-844.

Lee, D., M. Hellmair, and M. Peterson. 2015. Big Chico Creek 2014 Fish Population Survey. Report available at: http://fishbio.com/wp-content/uploads/2014-Big-Chico-Creek-Fish-Population-Survey.pdf

ATTACHMENT 6

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY REFER TO:

CVO-100
WTR 4.10

APR 01 2016

VIA ELECTRONIC MAIL

Mr. Thomas Howard
Executive Director
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Dear Mr. Howard:

Subject: Temporary Urgency Change Petition – San Joaquin River Flow at Airport Road Bridge, Vernalis; and Dissolved Oxygen on the Stanislaus River

The U.S. Bureau of Reclamation (Reclamation) requests a modification of Table 3 of Water Rights Decision 1641, River Flows for the San Joaquin at Vernalis for the months of March through June 2016. This request includes both the "base" flows from March 1 to April 14 and May 16 through June 30, as well as the spring "pulse" flows April 15 to May 15. Reclamation also requests modification of the dissolved oxygen objective on the Stanislaus River through the summer of 2016. These requests are consistent with the Central Valley Project and State Water Project Drought Contingency Plan which provides periodic updates of the current and projected hydrologic conditions and actions proposed to balance multiple needs through the remainder of this year. Our petition is enclosed.

Many San Joaquin River indicators continue to remain in drought conditions. California Department of Water Resources' March 1, 2016, runoff forecast indicated that the San Joaquin Valley Index classification is "critical". Unimpaired inflow forecasts for the major tributaries to the San Joaquin River are still only below the historical average. Reservoir storage at New Melones Reservoir, Don Pedro Reservoir, and Lake McClure, are only at about 41%, 82%, and 60% of average for this date.

Granting relief for the base flow requirements for March through June will improve storage conditions at New Melones Reservoir; which will improve water temperatures on the Stanislaus River and will assist in making water available for salinity control at Vernalis, San Joaquin River flows later in the year and in subsequent years.

In the past, in order to assist with initial implementation of the Vernalis pulse flows, Reclamation participated in, and funded in large part, the San Joaquin River Agreement (SJRA) from approximately 2000 through 2009, including two extensions through 2011. Under the SJRA, Reclamation funded annually the availability of water from the senior water right holders on the

Stanislaus River, the reservoir operators on the Tuolumne and Merced Rivers and the San Joaquin River Exchange Contractors Water Authority to contribute to the pulse flows. In 2011, Reclamation attempted to negotiate a similar arrangement with the SJRA parties, but such efforts were not successful. Instead, Reclamation purchased water from Merced Irrigation District on the Merced River in 2012 and 2013 to ensure continued compliance with SJRA flows. Since that time, the sequential critically dry years have severely limited any available water for purchase for this purpose.

Reclamation will present the basic elements of our request and solicit input at the April 5, 2016, Board workshop on this topic. If you have any questions or would like to discuss further, please contact Mr. Jeff Rieker at 916-979-2197.

Sincerely,

Ronald Milligan

Ronald Milligan
Manager, Operations

Enclosure -3

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TEMPORARY URGENCY CHANGE PETITION TO CERTAIN

U.S. BUREAU OF RECLAMATION PERMIT TERMS AND CONDITIONS

Permits for the Central Valley Project

Application Numbers: 14858A

Permit Numbers: 16597

I. Requested Changes

Due to the unprecedented dry conditions of 2014 and 2015, reservoir storage in the San Joaquin River Basin and New Melones is particularly low. These reservoir storage deficiencies, combined with the continued dry conditions, especially in the Stanislaus River basin, faced by California in this current water year, compel the U.S. Bureau of Reclamation (Reclamation) to request modification of certain San Joaquin River flow objectives contained in Water Rights Decision 1641 (D-1641), and modification of certain permit conditions (identified below) related to dissolved oxygen in the Stanislaus River.

This Petition sets forth specific requests for adjustment in flow requirements at Vernalis during the pulse flow period for April and May and adjustment for base, or "shoulder" flow requirements during April through June. Reclamation also proposes modification of permit conditions for dissolved oxygen on the Stanislaus River. The requested modifications were developed consistent with the findings of the January 2016 Central Valley Project and State Water Project Drought Contingency Plan, as updated, (2016 DCP), Governor Brown's January 2014 Emergency Proclamation, the December 2014 Emergency Proclamation, and other gubernatorial and state action addressing the drought.

Reclamation has actively collaborated with the State Water Board throughout this drought to ensure that the scarce water resources at New Melones Reservoir and the San Joaquin River Basin are managed appropriately over this multi-year drought, and the State Water Board has supported these efforts by approving prior Temporary Urgency Change Petitions. These proposed modifications similarly represent necessary compromises toward meeting the goals of D-1641[1] and the 2009 Coordinated Long-Term Operation of the Central Valley Project and State Water Project Biological Opinion issued by the National Marine Fisheries Service (2009

[1] Reclamation reserves and reiterates its past position often communicated to the Board that the issues with the Vernalis minimum instream flow requirements reveal issues with the implementation strategy, rather than Reclamation compliance issues. Reclamation is hopeful that the current Sacramento-San Joaquin River- San Francisco Bay Delta basin planning process will achieve a more reliable implementation of the Vernalis minimum instream flow requirements.

BiOp), while still recognizing the lingering effects from the unprecedented critically dry years of 2014, 2015, and 2016.

The requested modifications in this petition will not have any cascading direct or indirect impacts with respect to other Delta objectives.

A. Modification of San Joaquin River April-May Pulse Flows and Base Flows from April through June

D-1641 requires minimum monthly average flows on the San Joaquin River at Airport Way Bridge, Vernalis from February through June and additional pulse flows in April and May. Reclamation hereby petitions the State Water Board to adopt temporary modifications to the Vernalis base flow for April through June and the pulse flow requirements for April and May.

Reclamation will meet the critical-year March base flow requirement. However, for April through June, Reclamation proposes a base flow requirement of 1,000 cfs April 1-April 15, 2016, and May 15-May 31, 2016. Given the continued dry conditions in the San Joaquin Basin, Reclamation proposes a 500 cfs base flow for the month of June.

For the April-May pulse flow period, Reclamation proposes a modification to the D-1641 Vernalis flow criteria of a dry year (4,880 cfs) criteria. Reclamation proposes that the Stanislaus River flows specified in Appendix 2(E) of the 2009 BiOp be met. In addition, Reclamation has requested that Oakdale Irrigation District and South San Joaquin Irrigation District concur with release of 75,000 acre feet (af) of water during the April-May period to supplement Reclamation's releases from New Melones Reservoir storage to the Stanislaus River. The combined release will create a total flow on the Stanislaus River during the pulse flow period of approximately 2,000 cfs for 31 days. These flows combined with release from the Tuolumne and Merced River and South San Joaquin River accretions will create the overall pulse flow at Vernalis. In total, based on current projections and the proposed releases, the combined pulse flow rate at Vernalis would likely reach flow levels between 3,000 to 3,200 cfs[2].

Reclamation proposes that the Vernalis pulse flow requirement be temporarily adjusted to these levels. Without the proposed change, an additional release of approximately 116,000 acre-feet of stored water would be required to meet the D-1641 flow pulse flow objective of 4,880 cfs. If this release was made exclusively from stored water at New Melones Reservoir, flows on the Stanislaus River would be near 4,000 cfs for this period.

The proposed modifications are prudent and necessary because of the extraordinarily dry conditions of the past several years in combination with low reservoir storage and the competing demands on water supply for fish and wildlife protection, salinity control, carryover

[2] *See* Attached Hydrologic Flow Analysis (Attachment 1)

storage, and water supply needs. The temporary adjustments of flow requirements will conserve reservoir storage levels and help deal with the persistently dry conditions facing California, and provide sufficient carryover into water year 2017 to help meet the 2009 BiOp Appendix 2(E) flows and other fishery requirements.

B. Modification of the Ripon Dissolved Oxygen Requirement

Reclamation also requests that the State Water Board modify Permits 16597 to temporarily change the requirements of the dissolved oxygen objective identified in Reclamation's permits (condition 19). Condition 19 requires, in part, that Reclamation release water stored in New Melones Reservoir to meet the currently applicable dissolved oxygen objectives in the Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin River Basins. Reclamation is requesting that this requirement be relaxed from 7.0 mg/l to 5.0 mg/l through October 1, 2016. This same proposal was made last year to conserve stored water. Given the projected river conditions downstream of Oakdale this summer, there is a low possibility that O'mykiss will be in the lower river due to elevated water temperatures[3].

This proposed change will allow Reclamation to operate New Melones Reservoir to best meet some degree of all its permit terms and requirements of the 2009 BiOp, in coordination with the local water districts, fishery agencies and the State Water Board. Given the low reservoir storage levels, Reclamation will not be able to meet the dissolved oxygen objective and still reliably retain enough water for the October pulse flow, the targeted carryover storage, and fishery needs later in the year if conditions remain dry.

C. Application of a 1:1 Combined Export Ratio

Reclamation is not requesting any changes to D-1641 related to export rates – the following discussion is provided for information purposes only.

Through footnote 18 of Table 3, D-1641 provides that the maximum export rate during spring pulse flow shall be 1,500 cfs or 100% of the 3-day running average of San Joaquin River flow at Vernalis, whichever is greater. The 2009 BiOp also specifies certain conditions that allow for a 1:1 export/import ratio: if the previous two years plus current year of San Joaquin Valley "60-20-20" Water Year Hydrologic Classification and Indicator as defined in D-1641 is 6 or less <u>and</u> the New Melones Index is less than 1 million acre feet (MAF), then exports shall be limited to a 1:1 ratio with San Joaquin River inflow as measured at Vernalis, as shown in the following 2009 BiOp excerpt:

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[3] *See* Attached Water Temperature Analysis (Attachment 2)

Exception procedure for multiple dry years: If the previous 2 years plus current year of San Joaquin Valley "60-20-20" Water Year Hydrologic Classification and Indicator as defined in D-1641 and provided in following table, is 6 or less, AND the New Melones Index is less than 1 MAF, exports shall be limited to a 1:1 ratio with San Joaquin River inflow, as measured at Vernalis.

San Joaquin Valley Classification	Indicator
Critically dry	1
Dry	2
Below normal	3
Above normal	4
Wet	5

In this current situation, the 2014 and 2015 San Joaquin Basin "60-20-20" Indicators were both critically dry, and the 2016 forecast most likely ranges between dry and below normal. Similarly, given the extremely low storage at New Melones Reservoir and current forecasts, the New Melones Index slightly more than 1 MAF. As a result, the combined Water Year Hydrologic Classifications and Indicators are very close to meeting the exception provided in the 2009 BiOp.

These conditions are consistent with the 1:1 export rate outlined in D-1641 and they are extremely close to meeting the 2009 BiOp exception as well. In addition, the supplemental 75,000 af river release will greatly improve outmigration conditions this spring for fall-run Chinook salmon and steelhead trout. Given the dry conditions in the Basin and low reservoir storage levels, combined with Reclamation's diligence in facilitating an additional 75,000 af of water for release, Reclamation is requesting flexibility from NMFS in implementing this specific export limit action found in the 2009 BiOp. The cumulative environmental effects are currently being evaluated by Reclamation and NMFS. We believe this combined export rate reflects an appropriate balance between competing beneficial needs in light of the drought.

Basis to Authorize the Requested Modifications

California Water Code section 1435 provides that the State Water Board may grant a temporary change order for any permittee or licensee where the State Water Board finds the following: (1) the permittee has an urgent need for the proposed change; (2) the proposed change may be made without injury to any other lawful user of water; (3) the proposed change can be made without unreasonably affecting fish, wildlife, or other instream beneficial uses; and (4) the proposed change is in the public interest. The law also requires consultation with representatives of the Department of Fish and Wildlife. Given current conditions, all of the requirements necessary to support this temporary urgency change petition have been met.

A. Reclamation Has an Urgent Need for the Changes

California has just ended four consecutive years of below-average rainfall and snowpack in the Central Valley. WY 2015 was the eighth of nine years with below-average runoff. This extended drought has produced chronic and significant challenges in the San Joaquin River Basin, especially the Stanislaus River basin, including shortages to municipal and industrial, environmental, agricultural, and wildlife refuge water supplies and historically low groundwater levels. The cumulative effects of these sustained dry conditions in the San Joaquin River Basin are demonstrated in reduced natural runoff for streamflow, limited surface water storage in reservoirs, increased groundwater pumping, and significant effects to fish and wildlife populations.

Perhaps the most critical environmental factor necessitating these proposed modifications is the fact that dry conditions in 2014 and 2015 have resulted in exceptionally low reservoir storages, which create near-impossible challenges for Reclamation to deliver critical water supplies, provide adequate cold water for instream fisheries resources, and comply with all D-1641 objectives. As of March 28, the New Melones Reservoir held 611 taf, which is over 800 taf short of the average storage amount (42% average), and only 50 taf more than this time last year. Based on forecasts incorporating the requested modifications and improved runoff in the Stanislaus River, Reclamation projects that it may be able to attain an end of month storage in September (EOMSS) amounting to 415 TAF, which is more than the 267 TAF EOMSS in 2015. However, these storage levels at New Melones are still very low. Even with the requested modifications, recovery in the San Joaquin River Basin will be a slow process, and a closely coordinated effort with local water districts will again be needed through the year to effectively manage limited supplies. Under the current circumstances, Reclamation believes the most prudent course of action is to conserve storage in upstream reservoirs until significant improvement of that storage is realized.

If the requested modifications to D-1641 Table 3 and dissolved oxygen are granted, Reclamation forecasts additional conservation of stored water in upstream reservoirs. Upstream supplies can provide the water necessary to protect fish and wildlife, Delta water quality, and water supply moving into Water Year 2017, including the Appendix 2(E) fall attraction flow required in the 2009 BiOp. However, without a modification to the Vernalis and dissolved oxygen requirements, Reclamation could be obligated to increase releases from upstream storage to meet Vernalis flows of up to 4,880 cfs (amounting to approximately 116 TAF in the pulse flow releases alone) and additional releases to meet dissolved oxygen objectives (up to 6 taf per month from June to October). These estimated impacts to reservoir storage significantly decrease the likelihood that adequate reserves will be available to meet multiple regulatory requirements in the fall of 2016 and beyond.

B. There Will Be No Impact to Other Legal Users of Water

Other legal users of water should not be injured by this action. Delta water quality objectives, protective of municipal/industrial and agricultural uses, remain in place. Reclamation anticipates that these changes will not affect the natural and abandoned flows within the San Joaquin River. The requested changes to D-1641 will reduce Reclamation's anticipated releases of stored water to augment natural and abandoned flow to satisfy regulatory requirements, but these releases would not be flows available for downstream diverters. If the State Water Board approves the requested changes that result in a reduction in the release of stored water, such a reduction would not result in a loss of supply to other legal water users. These flows are intended for the instream benefit of fish and would not be available for appropriation by others.

C. The Changes Will Not Result in Unreasonable Impacts to Fish and Wildlife or Other Instream Uses

Extreme drought conditions inevitably stress aquatic resources of the San Francisco estuary and its watershed. Dry or below normal conditions during winter and spring are expected to adversely affect spawning and rearing conditions for Longfin and Delta Smelt, and migration conditions for winter-run Chinook salmon, spring-run Chinook salmon, steelhead trout, and southern distinct population segment of North American green sturgeon. However, Reclamation has worked with fishery agencies, local interests and the State Water Board to best manage the very limited storage volumes to protect the fishery in the Stanislaus River. Reclamation will maintain releases supporting the Stanislaus River flow schedule contained in 2009 BiOp.

Reclamation will continue to work with the resource agencies to ensure these releases are timed to achieve the highest fishery benefits. In addition, this year the Head of Old River Barrier has been installed and will be functional during the pulse flow period. These efforts will assist in moving O'mykiss and fall-run Chinook salmon smolts from the San Joaquin River and through the Delta.

D. The Changes Serve the Public Interest

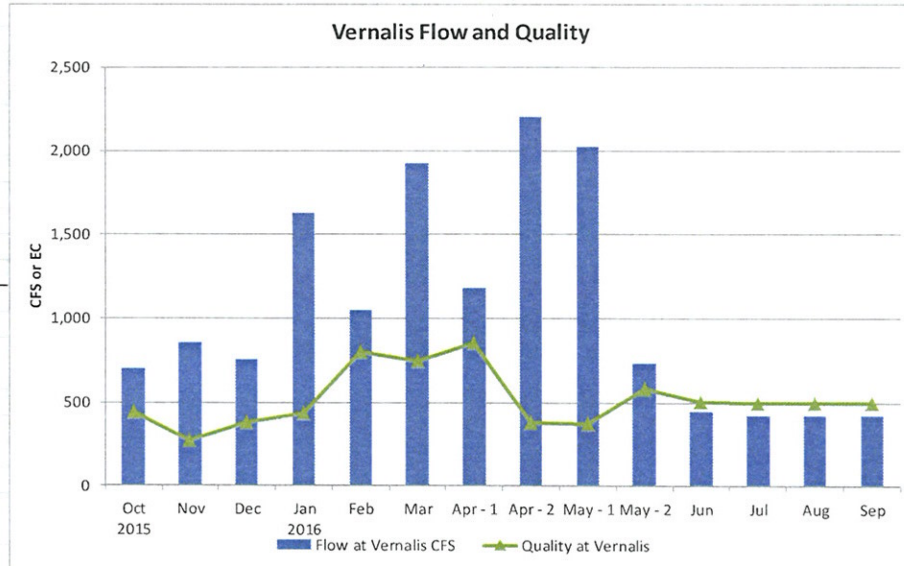
The public interest is best served by maintaining sustainable water diversions and water quality necessary for the protection of critical water supplies. The requested changes are in the public interest because they reserve critical water supplies for use during times when they are more beneficial to the Stanislaus River fishery and serve multiple beneficial uses, while not creating an unreasonable effect on other legal users of water, fish and wildlife, or the environment.

Reclamation Has Exercised Due Diligence

Since December 2013, state and federal agencies that supply water, regulate water quality, and protect fish and wildlife have worked closely together to cope with persistent drought. Reclamation, California Department of Water Resources, California Department of Fish and Wildlife, the State Water Board, U.S. Fish and Wildlife Service, and NMFS have closely coordinated Central Valley Project and State Water Project water operations to manage reservoir water resources through both innovative and real-time efforts, including through drought operations planning and weekly Real-time Drought Operations Management Team Meetings. This cooperative environment has allowed the State and Federal Agencies to collectively provide the necessary information to the State Water Board to support its evaluation of Reclamation's previous and future requests for modifications to operational standards required under D-1641.

The January 2016 Drought Contingency Plan and subsequent monthly updates, along with current conditions and future projections, demonstrate the urgent need to seek the modifications proposed above. The information supportive of this petition has been developed through extensive collaborative agency efforts to examine and determine the narrow and focused changes necessary to address the immediate problem and develop potential future refinements that are dependent upon the evolving hydrology.

3-20-2016	SJR River - 90% Exceedence						FYI
	TAF Merced CRS	TAF Tuolumne La Grange	TAF Stanislaus Goodwin	TAF Combined Tributaries	CFS Combined Tributaries	CFS SJR A/D Vernalis	CFS SJR Vernalis	Vernalis Req - est
Oct 2015	16	9	26	52	838	-133	706	
Nov	14	10	21	45	761	97	858	
Dec	13	10	13	35	577	183	760	
Jan 2016	21	10	13	44	721	911	1,631	
Feb	12	10	12	33	600	453	1,053	602020 D
Mar	24	10	13	47	767	1,155	1,922	X2 West
Apr - 1	7	5	6	17	630	550	1,180	2280
Apr - 2	8	24	22	54	1,702	500	2,202	4880
May - 1	6	23	20	48	1,621	400	2,021	4880
May - 2	6	6	5	17	530	200	730	2280
Jun	6	6	9	21	350	100	450	2280
Jul	5	6	9	20	325	100	425	
Aug	5	6	9	20	325	100	425	
Sep	4	6	9	19	325	100	425	
Oct								
Nov								
Dec								



3-20-2016 SJR River — Generally 90% Exceedence Forecast — All values in 1,000 acre-feet unless otherwise noted

	TAF Merced CRS	TAF Tuolumne La Grange	TAF Total U/S Maze	CFS U/S Maze	CFS A/D Maze	CFS Maze Flow	EC Maze	EC-Load Maze Flow	TAF Stanislaus Goodwin	TAF A/D GDW - Stan	TAF Stanislaus Mouth	CFS Stanislaus Mouth	EC Stanislaus Mouth	EC-Load Stanislaus Mouth	Flow at Vernalis CFS	EC at Vernalis	TAF Vernalis
Oct 2015	16	9	25	408	13	421	670	282,051	26	-9	18	285	100	28,469	706	440	43
Nov	14	10	24	404	221	625	342	213,863	21	-7	14	233	100	23,260	858	276	51
Dec	13	10	23	370	-10	360	687	247,475	13	12	25	399	100	39,938	760	378	47
Jan 2016	21	10	32	516	507	1,023	635	649,403	13	25	37	609	100	60,870	1,631	435	100
Feb	12	10	22	390	363	753	1,077	811,182	12	5	17	300	100	29,967	1,053	799	58
Mar	24	10	34	559	1090	1,649	850	1,401,683	13	4	17	273	100	27,322	1,922	743	118
Apr - 1	7	5	12	430	550	980	1,000	980,057	6	0	6	200	120	24,000	1,180	851	33
Apr - 2	8	24	32	1,014	500	1,514	500	756,995	22	0	22	688	120	82,560	2,202	381	70
May - 1	6	23	29	964	400	1,364	500	682,002	20	0	20	657	120	78,840	2,021	376	60
May - 2	6	6	12	380	200	580	700	405,989	5	0	5	150	120	18,000	730	581	23
Jun	6	6	12	200	100	300	700	209,994	9	0	9	150	120	17,998	450	507	27
Jul	5	6	11	175	100	275	700	192,513	9	0	9	150	120	18,003	425	495	26
Aug	5	6	11	175	100	275	700	192,513	9	0	9	150	120	18,003	425	495	26
Sep	4	6	10	175	100	275	700	192,494	9	0	9	150	120	17,998	425	495	25
Oct																	
Nov																	
Dec																	
WY	147	141	288						185	29	215						708

75 TAF supplement to 2E pulse flow during April and May; 10 TAF to SEWD from OID/SSJID; same upstream operation

90% Forecast – Alt

Version 2 - 75 Sup 2E Pulse | 10 SEWD

Stanislaus River - 2016 Year - 90% UF - 926,000 TAF Inflow

3-20-2016	Upstream Stanislaus				Tulloch Operation					Goodwin Operation						New Melones			
	Stanislaus Unimpaired	Upstr Storage	Upstr Regulation	NM Inflow	Tulloch Local	Tulloch Evap	Tulloch Storage	Tulloch Storage Trgt	Tulloch Release	Goodwin OID/SSJID	Goodwin CVP	Info 2E (cfs)	Fish Require	Fish Req - CFS	River Release	NM Release	NM Net Evap	NM Storage	NM Elev (FT)
Beginning		136					54.684	54.684										267	798
Oct 2015	14	110	25	40	-3.281	0.401	54.015	54.015	31.587	5.1		577	26.5	430	26.5	34.6	1.2	271	799
Nov	19	108	3	22	-3.600	0.169	54.289	54.289	21.497	0.3		200	21.2	357	21.2	25.5	0.5	267	798
Dec	45	100	8	53	4.330	0.091	55.812	55.812	12.716	0.0		200	12.7	207	12.7	10.0	0.3	310	811
Jan 2016	76	89	11	87	9.593	0.186	56.608	56.608	12.611	0.0		213	12.6	205	12.6	4.0	0.6	393	832
Feb	86	101	-12	74	2.079	0.196	54.567	54.567	12.532	0.9		214	11.6	202	11.6	8.6	0.8	458	848
Mar	241	160	-59	182	11.000	0.200	58.000	58.000	29.500	16.7		200	12.8	208	12.8	22.1	0.9	617	880
Apr - 1	83	199	-39	44	0.200	0.250	58.000	58.000	40.554	35.0		200	5.6	200	5.6	40.6	1.2	619	881
Apr - 2	135	258	-59	76	0.200	0.350	61.000	61.000	101.544	41.0		688	60.5	1908	60.5	104.7	1.2	589	875
May - 1	126	304	-46	80	0.200	0.350	64.000	64.000	92.838	37.0		657	55.8	1877	55.8	96.0	1.2	571	872
May - 2	93	332	-28	65	0.200	0.400	65.000	65.000	41.760	37.0		150	4.8	150	4.8	43.0	1.2	592	876
Jun	100	350	-18	82	0.400	1.000	66.000	66.000	90.925	79.0	3.0	150	8.9	150	8.9	92.5	2.0	580	873
Jul	20	330	20	40	0.400	1.000	66.000	66.000	110.225	97.0	4.0	150	9.2	150	9.2	110.8	2.0	507	859
Aug	8	294	36	44	0.400	0.950	65.000	65.000	100.225	88.0	3.0	150	9.2	150	9.2	99.8	2.0	449	846
Sep	3	260	34	37	0.400	0.700	62.000	62.000	71.925	63.0		150	8.9	150	8.9	69.2	1.5	415	838
Oct				20	0.400	0.500	57.020	57.000	35.505	0.0		577	35.5	577	35.5	30.6	1.0	404	835
Nov				20	0.400	0.200	55.000	55.000	11.901	0.0		200	11.9	200	11.9	9.7	1.0	413	837
Dec				20	1.000	0.200	56.000	56.000	12.298	0.0		200	12.3	200	12.3	12.5	0.5	420	839
	Approx			Approx	Approx					Approx			Approx		Approx		Approx		
WY 2016	1,050			926	23	NMI =				500	10		260		260		17		
NMI:	1,107					Formula =											1,000 acre-feet unless noted		

75% Forecast – Alt

Version 2 - 75 Sup 2E Pulse | 10 SEWD

Stanislaus River - 2016 Year - 75% UF - 996,000 TAF Inflow

3-20-2016	Upstream Stanislaus				Tulloch Operation				Goodwin Operation						New Melones			
	Stanislaus Unimpaired	Upstr Storage	Upstr Regulation	NM Inflow	Tulloch Local	Tulloch Evap	Tulloch Storage	Tulloch Release	Goodwin OID/SSJID	Goodwin CVP	Info 2E (cfs)	Fish Require	Fish Req - CFS	River Release	NM Release	NM Net Evap	NM Storage	NM Elev (FT)
Beginning		136					54.684										267	798
Oct 2015	14	110	25	40	-3.281	0.401	54.015	31.587	5.1		577	26.5	430	26.5	34.6	1.2	271	799
Nov	19	108	3	22	-3.600	0.169	54.289	21.497	0.3		200	21.2	357	21.2	25.5	0.5	267	798
Dec	45	100	8	53	4.330	0.091	55.812	12.716	0.0		200	12.7	207	12.7	10.0	0.3	310	811
Jan 2016	76	89	11	87	9.593	0.186	56.608	12.611	0.0		213	12.6	205	12.6	4.0	0.6	393	832
Feb	86	101	-12	74	2.079	0.196	54.567	12.532	0.9		214	11.6	202	11.6	8.6	0.8	458	848
Mar	241	160	-59	182	11.000	0.200	58.000	29.500	16.7		200	12.8	208	12.8	22.1	0.9	617	880
Apr - 1	86	201	-42	44	0.200	0.250	58.000	40.554	35.0		200	5.6	200	5.6	40.6	1.2	619	881
Apr - 2	139	260	-59	80	0.200	0.350	61.000	101.544	41.0		688	60.5	1908	60.5	104.7	1.2	594	876
May - 1	144	309	-49	95	0.200	0.350	64.000	92.838	37.0		657	55.8	1877	55.8	96.0	1.2	591	876
May - 2	106	334	-25	81	0.200	0.400	65.000	41.760	37.0		150	4.8	150	4.8	43.0	1.2	628	883
Jun	125	350	-15	110	0.400	1.000	66.000	90.925	79.0	3.0	150	8.9	150	8.9	92.5	2.0	643	885
Jul	25	331	19	44	0.400	1.000	66.000	110.225	97.0	4.0	150	9.2	150	9.2	110.8	2.0	574	872
Aug	9	294	37	46	0.400	0.950	65.000	100.225	88.0	3.0	150	9.2	150	9.2	99.8	2.0	518	861
Sep	4	260	34	38	0.400	0.700	62.000	71.925	63.0		150	8.9	150	8.9	69.2	1.5	485	854
Oct				20	0.400	0.500	57.020	35.505	0.0		577	35.5	577	35.5	30.6	1.0	474	851
Nov				20	0.400	0.200	55.000	11.901	0.0		200	11.9	200	11.9	9.7	1.0	483	853
Dec				20	1.000	0.200	56.000	12.298	0.0		200	12.3	200	12.3	12.5	0.5	490	855
	Approx			Approx	Approx				Approx			Approx		Approx		Approx		
WY 2016	1,120			996	23	NMI =			500	10		260		260		17		
NMI:	1,177					Formula =										1,000 acre-feet unless noted		

50% Forecast – Alt

Version 2 - 75 Sup 2E Pulse | 10 SEWD

Stanislaus River - 2016 Year - 50% UF - 1076,000 TAF Inflow

3-20-2016	Upstream Stanislaus				Tulloch Operation				Goodwin Operation						New Melones			
	Stanislaus Unimpaired	Upstr Storage	Upstr Regulation	NM Inflow	Tulloch Local	Tulloch Evap	Tulloch Storage	Tulloch Release	Goodwin OID/SSJID	Goodwin CVP	Info 2E (cfs)	Fish Require	Fish Req - CFS	River Release	NM Release	NM Net Evap	NM Storage	NM Elev (FT)
Beginning		136					54.684										267	798
Oct 2015	14	110	25	40	-3.281	0.401	54.015	31.587	5.1		577	26.5	430	26.5	34.6	1.2	271	799
Nov	19	108	3	22	-3.600	0.169	54.289	21.497	0.3		200	21.2	357	21.2	25.5	0.5	267	798
Dec	45	100	8	53	4.330	0.091	55.812	12.716	0.0		200	12.7	207	12.7	10.0	0.3	310	811
Jan 2016	76	89	11	87	9.593	0.186	56.608	12.611	0.0		213	12.6	205	12.6	4.0	0.6	393	832
Feb	86	101	-12	74	2.079	0.196	54.567	12.532	0.9		214	11.6	202	11.6	8.6	0.8	458	848
Mar	243	161	-60	183	11.000	0.200	58.000	29.500	16.7		200	12.8	208	12.8	22.1	0.9	617	881
Apr - 1	108	213	-52	56	0.200	0.250	58.000	40.554	35.0		200	5.6	200	5.6	40.6	1.2	632	883
Apr - 2	132	267	-54	78	0.200	0.350	61.000	101.544	41.0		688	60.5	1908	60.5	104.7	1.2	604	878
May - 1	160	322	-54	106	0.200	0.350	64.000	92.838	37.0		657	55.8	1877	55.8	96.0	1.2	612	880
May - 2	120	350	-29	91	0.200	0.400	65.000	41.760	37.0		150	4.8	150	4.8	43.0	1.2	659	888
Jun	150	351	-1	149	0.400	1.000	66.000	90.925	79.0	3.0	150	8.9	150	8.9	92.5	2.0	714	898
Jul	30	333	18	48	0.400	1.000	66.000	110.225	97.0	4.0	150	9.2	150	9.2	110.8	2.0	649	887
Aug	11	296	37	48	0.400	0.950	65.000	100.225	88.0	3.0	150	9.2	150	9.2	99.8	2.0	595	876
Sep	5	260	36	41	0.400	0.700	62.000	71.925	63.0		150	8.9	150	8.9	69.2	1.5	566	871
Oct				20	0.400	0.500	57.020	35.505	0.0		577	35.5	577	35.5	30.6	1.0	554	868
Nov				20	0.400	0.200	55.000	11.901	0.0		200	11.9	200	11.9	9.7	1.0	563	870
Dec				20	1.000	0.200	56.000	12.298	0.0		200	12.3	200	12.3	12.5	0.5	570	872
	Approx			Approx	Approx				Approx			Approx		Approx		Approx		
WY 2016	1,200			1,076	23	NMI =			500	10		260		260		17		
NMI:	1,257					Formula =											1,000 acre-feet unless noted	

United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY
REFER TO:

NOV 2 2 2016

CVO-100
PRJ-23.00

VIA ELECTRONIC MAIL

Thomas Howard, Executive Director
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

Subject: April 19, 2016, Temporary Urgency Change Order – Meeting D-1641 San Joaquin River Flow Objectives in Future Years

Dear Mr. Howard:

On April 1, 2016, Reclamation filed a Temporary Urgency Change Petition (TUCP) to temporarily modify requirements in its water right permits for the New Melones Project. The resulting April 19, 2016, Temporary Urgency Change Order (TUCO) from the State Water Resources Control Board (SWRCB) requires Reclamation to:

"...submit a proposal to the Executive Director by November 1, 2016, identifying how it plans to address its difficulty meeting D-1641 San Joaquin river flow requirements until such time as the State Water Board updates and implements the San Joaquin River flow objectives."

Reclamation has had difficulty meeting D-1641 San Joaquin River flow requirements since the San Joaquin River Agreement (SJRA) expired in 2011, which expired on its own terms (i.e, it was not prematurely withdrawn from by any party). The expiration of the SJRA has significant implications to whether the spring pulse flow requirements are supported with currently available water supplies. In addition, even prior to the expiration of the SJRA, Reclamation had difficulty meeting the February through June base flows contained in Table 3 of D-1641 TUCPs were submitted in 2003, 2004, 2005, 2009, 2015, and 2016) due to concerns about the base and pulse flow impacts to New Melones Reservoir storage.

Reclamation has not operated to the D-1641 April-May pulse flows for the San Joaquin River at Vernalis contained in Table 3. Modified spring pulse flows were implemented on an interim basis through the SJRA. The SWRCB record is clear that instream flows for the San Joaquin River cannot consistently be met with such heavy reliance on New Melones yield, a reservoir situated on a single tributary to the San Joaquin River. This situation is further complicated due to the senior water right obligations at New Melones, and the potential for slow refill of New Melones given the variable hydrology of the Stanislaus River.

When the SJRA ended on December 31, 2011, after twelve years, Reclamation was unsuccessful in negotiating a temporary agreement to extend the SJRA with the original partners. Reclamation was able to negotiate an additional 2-year agreement with Merced Irrigation District in order to continue to provide a 31-day spring pulse flow similar to SJRA spring pulse flow operations.

However, the advent of the drought in 2013, and the sequential critically dry years in the San Joaquin Basin, has severely limited any available water for purchase for Vernalis pulse flows. The past five years have also demonstrated the futility of relying solely on New Melones Reservoir to meet Delta water quality and flow requirements, and the lack of a durable implementation plan to provide for these flows, especially during prolonged droughts.

Oakdale Irrigation District and South San Joaquin Irrigation District (Districts) have provided some additional volumes of water post-SJRA for the purpose of fish and wildlife preservation and enhancement in the Stanislaus and San Joaquin Rivers. A spring 2013 release of 80,000 acre-feet augmented the 2009 National Marine Fisheries Service (NMFS) Biological Opinion Appendix 2E schedule for a pulse flow in the April-May pulse period. In 2015, due to the lack of Central Valley Project water in the extremely low storage in New Melones Reservoir, the Districts made available about 23,000 acre-feet of water during the October-November time period for the fall pulse flow. This water was provided by the Districts using water they conserved over the summer of 2015 through water conservation efforts. In April-May 2016 the Districts contributed 75,000 acre-feet of water for the spring pulse flow in addition to the Appendix 2E flow volume and the October-November fall pulse flow (Appendix 2E volume of 23,200 acre-feet) was supplemented by an additional 16,000 acre-feet of the Districts' water.

After four years of extended drought, 2016 hydrologic conditions improved somewhat, however, in spite of average to slightly above average precipitation, runoff was significantly below average due to replenishment of depleted soil moisture, increased uptake by vegetation and less precipitation falling as snow. Conditions at New Melones Reservoir at the end of Water Year 2016, have improved slightly in comparison with the end of Water Year 2015 (end of September storage in 2016 is approximately 260 thousand acre-feet higher than in 2015), however, overall storage is currently only 22% of total capacity and 39% of the historical average to date. In comparison, New Don Pedro Reservoir storage is presently at 65% of total capacity and 98% of the historical average and Lake McClure (New Exchequer) is at 36% of total capacity and 80% of the historical average. The entire San Joaquin basin remains in a depleted hydrologic state and may face continuing drought conditions in the months ahead.

Condition 3 of the TUCO required Reclamation to provide an analysis of water rights for water stored in New Melones Reservoir from October 15, 2015, through September 30, 2016. The result of that analysis showed that Reclamation does not have adequate carryover water available in New Melones Reservoir to meet all future water rights terms and conditions and other regulatory requirements if drought conditions persist. The potential carryover volume into water year 2017, was only about 71,000 acre-feet. Very little storage has been built up over the past years of drought, leaving the Project heavily dependent on future inflow. It may be as long as a decade before New Melones Reservoir storage recovers with only average inflows.

In the future and until the updates to the Bay-Delta Plan are completed and implemented, Reclamation anticipates that flow releases to the Stanislaus River will be consistent with the provisions of the NMFS Biological Opinion and the actions under its Reasonable and Prudent Alternatives. Flows will follow the Appendix 2E schedule as modified through the Stanislaus Operations Group and Reclamation will continue to meet the D-1641 salinity objective at Vernalis. Reclamation will continue to work closely with the Districts to facilitate the release of any water they are able to provide to help meet flows additional to the Appendix 2E flows and including the fall attraction flows. Any future release of the Districts' water will likely involve the participation of other parties willing to pay for the release and will be contingent on that water contributing to improved water supplies in other areas of the State. Such agreements are often dependent on the hydrologic conditions at the time and are difficult to evaluate well in advance of the action given the complex hydrodynamics and fishery concerns involved. Such coordinated actions require close involvement with the Federal and State fishery agencies on a case-by-case basis.

In addition, Reclamation will also work closely with the Federal fishery agencies and the California Department of Fish and Wildlife to coordinate the Stanislaus River flows with the Federal Energy Regulatory Commission flows on the Merced and Tuolumne rivers.

If you have any questions or would like further discussion, please contact Elizabeth Kiteck at 916-979-2684.

Sincerely,

Ronald Milligan
Operations Manager

cc: Ms. Maria Rea
Assistant Regional Administrator
California Central Valley Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Mr. Chuck Bonham
Director
California Dept. of Fish and Wildlife
1416 Ninth Street
Sacramento, CA 95814

Continued on next page.

Mr. Mark Cowin
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California Dept. of Water Resources
1416 Ninth Street
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Ms. Kaylee Allen
Field Supervisor
Bay Delta Fish and Wildlife Office
U.S. Fish and Wildlife Service
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Sacramento, CA 95814

Mr. John Leahigh
Operations Control Office
California Department of Water Resources
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Sacramento, CA 95821

Mr. Paul Souza
Regional Director
Pacific Southwest Region
U. S. Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825

Mr. David Murillo
Regional Director
Mid-Pacific Region
Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825

Ms. Michelle Banonis
Area Manager
Bay-Delta Office
Bureau of Reclamation
801 I Street, Suite 140
Sacramento, CA 95814

January 19, 2017

Mr. Ronald Milligan
Operations Manager
U. S. Bureau of Reclamation
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, CA 95821

Dear Mr. Milligan:

PROPOSAL FOR MEETING SAN JOAQUIN RIVER FLOW OBJECTIVES IN FUTURE YEARS

This letter is in response to your letter dated November 22, 2016, identifying how the U. S. Bureau of Reclamation (Reclamation) plans to address its continuing difficulties with meeting its responsibilities under State Water Resources Control Board (State Water Board or Board) Decision 1641 (D-1641) for implementing the San Joaquin river flow objectives included in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. To address ongoing compliance issues with the San Joaquin River flow objectives, Condition 4 of my April 19, 2016 approval of a Temporary Urgency Change Petition to modify Reclamation's requirement to meet the San Joaquin River flow objectives in 2016[1] required Reclamation to submit a proposal for addressing compliance this year and in future years until such time as the State Water Board completes its update and implementation of the objectives. In your letter, you indicate that until the update of the San Joaquin River flow objectives is completed and implemented Reclamation anticipates that flow releases from the Stanislaus River will be consistent with the National Marine Fisheries Service Biological Opinion flow requirements. You also indicate that Reclamation will work with water districts to facilitate additional voluntary water releases that may increase flows as well as improve water supplies in other areas of the State, but that such arrangements are difficult to evaluate in advance and will be made on a case by case basis in consultation with State and federal fisheries agencies.

Thank you for your response and willingness to work cooperatively with other water users and the fisheries agencies; however, Reclamation's proposal does not adequately address the requirements of condition 4 or Reclamation's water right requirements under D-1641. In particular, Reclamation should not assume that it is absolved of responsibility to meet the flow objectives (and dissolved oxygen objective). Instead, Reclamation should strive to meet all of

[1] Available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/transfers_tu_notices/2016/sjr_tucp_order_041916.pdf.

bcc: Diane Riddle
Les Grober
Chris Carr
Dana Heinrich

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

IN REPLY REFER TO:

MP-440
WTR- 4.10

FEB 15 2017

Thomas Howard, Executive Director
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

Subject: Proposal For Meeting San Joaquin River Flow Objectives in Future Years (Your Letter Dated January 19, 2017)

Dear Mr. Howard:

Reclamation is in receipt of the above-mentioned letter, which responds to Reclamation's November 22, 2016 letter submitting its proposal to contribute to San Joaquin River flow objectives pursuant to your April 19, 2016 approval of Reclamation's Temporary Urgency Change Petition (TUCP). Your letter states that it is in response to Reclamation's "plans to address its continuing difficulties with meeting its responsibilities under State Water Resources Control Board (State Water Board or Board) Decision 1641 (D-1641) for implementing the San Joaquin river flow objectives included in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary."

Statement of the issue in this manner makes it clear that the conflicting views of Reclamation and the State Board could lead to impasse. Reclamation has neither the legal authority, nor the legal obligation to implement the State Board's Water Quality Control Plan. Instead, California's Porter-Cologne Water Quality Control Act places that responsibility with the State Board. Cal. Water Code § 13242. In addition, the Water Quality Control Plan does not apply organically to the permits of the Central Valley Project (CVP). Instead, if the Board uses its authority over water rights to implement flow objectives in a water quality control plan, it is the Board's obligation to assign responsibility to water right holders, after a hearing, and to follow the law with respect to regulation of property interests, including federal property interests. In that regard, Reclamation does not believe that the Board's post-San Joaquin River Agreement (SJRA) interpretation of D-1641 is supported by sufficient procedural or substantive due process, and raises serious concerns for viable, sustainable operations of New Melones, and, therefore, could also conflict with clear Congressional directives for the CVP.

As you know, for the first twelve or more years following the Board's issuance of D-1641 in 2000, Reclamation paid water users on the Stanislaus River and the other tributaries under the San Joaquin River Agreement (SJRA) to make water available for contributions to the instream spring pulse flows on the mainstem of the lower San Joaquin at Vernalis.[1] The SJRA was entered into in lieu of the Board holding a protracted adjudication process, and assisted the Board with its initial implementation of the instream flows in the lower San Joaquin. During the term of the SJRA, the Board was supposed to take actions necessary to permanently assign responsibility for the flow standards among other diverters. The Board did not do so. Since the expiration of the SJRA, the Board has taken the untenable position that the sole responsibility for the April/May San Joaquin river flows in the Water Quality Control Plan is on Reclamation's New Melones Reservoir, not on an "interim" basis, but until such time as it sees fit to establish an alternative implementation plan, now 17 years since the Board adopted D-1641. Reclamation, on the other hand, is willing to work with the Board to fashion a reasonable contribution to instream flow objectives for Reclamation in light of the circumstances, and is committed to continuing to meeting flows required by Appendix 2E of the National Marine Fisheries Service 2009 Biological Opinion (2009 NMFS BO).

The Board is well aware that New Melones is a multi-year facility with a re-fill period ranging anywhere from 2 to 17 years, depending on the hydrology of the Stanislaus River. When Reclamation first applied to the Board for water rights for New Melones, it estimated that the amount of water available for appropriation, after subtracting prior rights and using 1923-1953 hydrology, would range from 335,000 acre-feet to 1,198,000 acre-feet, with zero water available in nine years of this period. At that time, the fishery flow and water quality demands were capped at approximately 170,000 acre-feet per year.[2] Since that time, Reclamation has estimated that the amount of water needed for salinity control has been anywhere from two to three times the original 70,000 acre-feet requirement in D-1422. When the Board issued D-1641, modeling results in the Board's November 1999 Final Environmental Impact Report showed that even with the SJRA in place, carryover storage in New Melones would be reduced by an annual average of 151,000 acre-feet, including reductions of 356,000 acre-feet in critical drought periods. Those same modeling results show that if Reclamation were to be solely responsible for the instream flows on the mainstem San Joaquin contained in Table 3 of D-1641, using its available supplies on the Stanislaus, the reduction in carryover would be an average of 305,000 acre-feet, with a reduction of 593,000 acre-feet in critical drought periods. Operation of New Melones in this manner is unsustainable, drastically increasing the potential number of years that zero water will be available for storage, and does not result in durable instream flows on the mainstem. Reclamation believes that the 1999 modeling is flawed and underestimates the true impact of operating New Melones to these flow requirements. Such operations have not been vetted through a due process hearing, and threaten the ability of New Melones to store and deliver water to its federal contractors in all but the wettest years.

While we understand the Board's desire to manage and balance beneficial uses at New Melones on a monthly basis, Reclamation does not agree that simple management to an annual carryover target will result in durable contributions to the instream flows from New Melones, given the demands of prior rights, salinity control, dissolved oxygen, and other requirements. In addition,

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[1] Reclamation paid approximately $75 million to make water available for instream flow purposes during this period.

[2] See D-1422, pp. 10-11.

given the Board's view that it is Reclamation's sole responsibility to implement the San Joaquin river flows, this places a disparate impact of the flow requirements on our contractors. As usual, we would be happy to work with the Board on a reasonable contribution to the instream flows, especially the April/May pulse flow objectives for the San Joaquin, for various year-types, until the Board can complete its current basin planning and water rights process. However, we believe that such contribution should not disproportionately result in federal contractors shouldering the entire burden of the flows in many years when other similarly situated diverters in the San Joaquin River basin, who also impact river flows, experience no shortages.

With respect to 2017, your January 19 letter states 1) Reclamation's proposal "does not adequately address the requirements of condition 4 (of the TUCP approval) or Reclamation's water right requirements under D-1641"; 2) Reclamation "should strive to meet all of the requirements of its water right permits" and "should operate New Melones Reservoir in a manner that achieves a more reasonable balance between competing water right permit requirements. Further, Reclamation should meet all of its permit requirements before delivering any water under its own water rights."; 3) "Reclamation shall submit a revised proposal for the coming year by February 15, 2017, with monthly updates due by the first of each month for the following month. Prior to each monthly submittal, Reclamation shall consult with State Water Board staff regarding its proposal. Reclamation shall provide monthly updates on its plans to the State Water Board during its monthly drought updates at the Board's regularly scheduled Board meetings."; 4) "Reclamation shall prepare and submit a simple and clearly labeled monthly accounting on the first of each month starting on February 1, 2017, of diversions to New Melones Reservoir and releases from the reservoir from October 1, 2016 on. Specifically, the accounting should specify the amount of water in New Melones Reservoir that is stored under Reclamation's water rights and the amount that is stored under other water rights, all releases and losses from New Melones, the reason or purpose for those releases, and the water right under which they were made."

The abundant precipitation for Water Year 2016-17 is a welcome respite from the very dry conditions prevailing since 2012, and has allowed New Melones Reservoir to recover some storage. However, it would be a mistake to presume that this year's precipitation signals a return to "normal" weather patterns, and assume there will be sufficient precipitation in future years to support increased releases from New Melones Reservoir. Therefore, Reclamation's proposal for meeting San Joaquin flow objectives pursuant to condition 4 of the April 19 2016 approval remains the same as the proposal contained it its letter of November 22, 2016. In summary, Reclamation intends to make releases from New Melones Reservoir consistent with the provisions of Appendix 2E of the 2009 NMFS BO. Reclamation will work with Oakdale and South San Joaquin Irrigation Districts to make available flows in addition to those required by Appendix 2E (including fall attraction flows). In addition, Reclamation will continue to meet D-1641 salinity objectives at Vernalis.

Reclamation agrees to provide monthly updates on this proposal to State Board staff and as part of the monthly drought updates at regularly scheduled Board meetings. Reclamation will also provide the monthly accounting requested in your January 19 letter.

Reclamation looks forward to working with the State Board on this matter. Please contact me at (916) 978-5201, or via email at rwoodley@usbr.gov, if you have any questions.

Sincerely,

Richard J Woodley
Regional Resources Manager

ATTACHMENT 7

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

TO:	Tim O'Laughlin
FROM:	Andrea Fuller, Michele Palmer, and Shaara Ainsley
DATE:	February 23, 2012
SUBJECT:	Review of the scientific basis for increasing San Joaquin River flows during June to facilitate outmigration of juvenile Central Valley fall-run Chinook salmon and Central Valley steelhead through the Delta

The purpose of this memorandum is to review the scientific basis for increasing San Joaquin River flows during June to facilitate outmigration of juvenile Central Valley fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley steelhead (*Oncorhynchus mykiss*) through the Delta. The State Water Resources Control Board, California Department of Fish and Game and others have contended that juvenile salmon and *O. mykiss* migration occurs during June and that increasing San Joaquin River flows at Vernalis will facilitate migration and increase salmon abundance. This memorandum discusses outmigration timing of juvenile salmon and *O. mykiss* from the San Joaquin Basin, how Delta conditions for migration during June are less favorable for juvenile salmon and *O. mykiss* outmigration, how juvenile salmon and *O. mykiss* outmigration during June will not be "assisted" by increased river flows at Vernalis, and how higher flows in June will not increase escapement.

Key findings from this review include:

- With the exception of wet and above normal water years when the average flow at Vernalis exceeds approximately 5,000 cfs at Vernalis during 90% of the smolt outmigration, 0.7% or less of total juvenile salmon (i.e., fry, parr, and smolts) outmigration, and 0.8% or less of salmon smolt outmigration occurs during June. Therefore, improving smolt/juvenile salmon survival during June, is not likely to have much, if any, impact on adult returns.
- Central Valley *O. mykiss* may be found migrating downstream throughout the year, but the majority of outmigration to the ocean occurs during January through May 15, so increased flows during June would provide little benefit to juvenile *O. mykiss*.
- Delta conditions during June are less favorable for salmon smolt oumigration than during April and May, so survival is likely lower. Flow has little to no effect on water velocities, water temperatures, or predation. Therefore, salmon smolt survival through the Delta during June is not likely to be increased by increasing flows.
- Due to the Pacific Fishery Management Council's strategy for managing fall-run Chinook salmon harvest, any improvements in juvenile salmon production that could potentially be realized as a result of any effective restoration or management action, would likely be off-set by increased harvest, resulting in little to no increase in adult escapement.

THE MAJORITY OF JUVENILE SALMON AND O. MYKISS OUTMIGRATE FROM THE SAN JOAQUIN BASIN BEFORE JUNE

Juvenile Fall-run Chinook Salmon Outmigration Timing. Similar to Sacramento River Fall-run Chinook salmon (Lindley et al 2009), San Joaquin Basin fall-run Chinook salmon exhibit three distinct outmigration strategies: (1) ***fry migrants***, which are typically the most abundant, migrate from the tributaries soon after emergence to rear in the Delta; (2) ***smolt migrants*** remain near freshwater spawning areas for several months, migrating primarily from the tributaries during April and May and passing quickly (i.e., approximately seven days) through the Delta (SJRGA 2011); and (3) an unknown, but presumably very small, portion of ***yearling migrants*** remain in their natal streams through the summer and migrate during the fall or winter.

Rotary screw traps operated in the Stanislaus River at Caswell (Caswell RST) and the Tuolumne River at Grayson (Grayson RST) provide several years of comprehensive, continuous monitoring data to describe trends in overall total juvenile salmon (i.e., fry, parr, smolts) outmigration timing from the tributaries[1]; and the Mossdale trawl provides several years of monitoring data for only the smolt portion of the juvenile outmigration since sampling during the winter is limited and the gear is not very effective for fry.

Daily catch of juvenile salmon at each site is a composite reflection of both abundance and capture efficiency. Since capture efficiency is not constant and is affected by conditions such as channel geometry, trap position, river flow, and fish size, it must be estimated frequently at each monitoring site to generate reliable estimates of juvenile salmon abundance. Daily estimates of juvenile salmon abundance in the Stanislaus River at Caswell, the Tuolumne River at Grayson, and the San Joaquin River at Mossdale are calculated based on daily catches adjusted for estimated capture efficiency (Sonke and others 2012, Fuller and others 2002, CDFG 2003).

For the purpose of data analyses, there are at least three types of criteria that have been used in the San Joaquin Basin to distinguish smolt outmigrants from fry including (1) appearance, where fish are rated as fry, parr, or smolt based on characteristics of smolting; (2) fork length, where fish larger than selected criteria (i.e., 50 mm or 70 mm) are identified as smolts; and (3) date of migration, where fish outmigrating after a certain date--independent of size--are identified as smolts. Appearance ratings are subjective and therefore rarely used. While fork length has been the criteria most commonly used at the rotary screw traps, this approach is subject to bias if sampling effort is not consistent across years and between sites as is the case in the San Joaquin Basin. For instance, abundance has rarely been estimated at Mossdale prior to April 1, yet based on data from the rotary screw traps, salmon that would be classified as smolts based on length criteria are migrating prior to April 1. Therefore, date

[1] Rotary screw trap monitoring on the Merced River has been infrequent, and in many years incomplete, so only data from Caswell and Grayson RSTs information is used.

of migration (all juvenile salmon classified as smolts beginning April 1) was used for our analysis because this criterion provides the most comparable data across years and between sites, while also generally providing the most conservative estimates of the proportion of smolts migrating during June since it does not include any smolt outmigration prior to April 1. Figure 1 indicates how length versus date at migration criteria can affect interpretation of the timing of the 90th percentile of smolt outmigration using rotary screw trap data from the Stanislaus River at Caswell. In 8 of 11 years, the date of migration is equally or more conservative as length criteria for smolt classification.

Generalized timing of juvenile outmigration based on abundance estimates from rotary screw trap sampling in the Stanislaus and Tuolumne Rivers shows that in all but wet and above normal years, at least 99.3% of all juvenile salmon (i.e., fry, parr, smolts) migrate from late January through May (Table 1 and Table 2), and 99.2% of smolts have migrated by May 31 (Figure 2, and Tables 3, 4, 5). During years of extremely high flows such as during spring 1998 and 2006 when San Joaquin River flows at Vernalis were at or near flood monitor stage (approx. 22,000 cfs) or flood stage (approx. 34,000 cfs), smolt outmigration occurred later, with 90% of smolts migrating by June 5, 1998, and June 3, 2006 (Figure 2).

While smolt size at outmigration tends to be larger during wet years when river flows are unmanaged and are on average at least 7,500 cfs at Vernalis (Figure 3), outmigration also occurs later under these conditions (Figure 2) suggesting that the apparent difference is more likely due to an increase in rearing time than it is to an increase in growth rate.

Juvenile *O. mykiss* Outmigration Timing. Juvenile *O. mykiss* may be found migrating downstream throughout the year, but the majority of outmigration to the ocean occurs episodically between March and May (Hallock et al. 1961; NMFS 2009) The Environmental Impact Report/Statement prepared for the South Delta Improvement Program noted that "although steelhead have been collected in most months at the state and federal pumping plants in the Delta, the peak numbers salvaged at these facilities occur in March and April in most years (CDWR and BOR 2001)." Salvage of non ad-clipped *O. mykiss* is summarized in Table 6, and shows that 90-99% of salvaged *O. mykiss* are encountered between January and May depending on water year type.

In the San Joaquin River Basin, the Caswell and Grayson RSTs and Mossdale Trawl provide information on the timing of juvenile *O. mykiss* outmigration from the tributaries and into the Delta. Unlike salmon where abundance estimates are available, raw catch numbers are used for *O. mykiss* because estimates of abundance cannot be generated as a result of infrequent catches and associated inability to conduct capture efficiency estimates with too few fish. In the Tuolumne River, only four (4) *O. mykiss* have been captured at Grayson RST during 13 sampling seasons (1999-2011), and these individuals were observed between February 21 and May 14 (Table 7). Based on Caswell and Grayson RSTs and Mossdale Trawl catches, the majority of juvenile *O. mykiss* outmigrate by mid to late May (Tables 8 and 9).

DELTA CONDITIONS DURING JUNE ARE LESS FAVORABLE FOR JUVENILE SALMON AND O. MYKISS OUTMIGRATION

The few salmon and *O. mykiss* that may outmigrate during June, generally limited to wet years, face conditions that are less favorable for outmigration than earlier migrants including higher water temperatures, higher exports, lower dissolved oxygen concentrations, and increased predation. These less favorable conditions are described in individual sections below. As conditions now are less favorable even under high flow conditions of approximately 20,000-30,000 cfs in the wettest years of 1998 and 2006, it is clear that increasing San Joaquin River flows at Vernalis during June is not likely to produce any benefit.

Absence of Head of Old River Barrier during June. Operation of the Head of Old River Barrier (HORB), a temporary rock barrier, has been shown to improve survival of salmon smolts outmigrating from the San Joaquin Basin. The barrier has historically been operated between approximately April 15 and May 31 (DWR 2012), and NMFS recommendation to operate the barrier during 2012 does not include operation during June. In the absence of the barrier, a statistically significant relationship between flow and survival does not exist (Newman 2008), therefore there is no justification for increasing flows during June when the barrier is not in operation. In the absence of the barrier, survival of the few smolts migrating during June after the HORB has been breached is likely to be lower than survival during April and May with the HORB in place.

Higher Delta water temperatures in June. While studies have not been conducted to determine the temperature requirements of San Joaquin Basin salmon, temperature guidelines that were recently used by the EPA as the basis for listing of the San Joaquin River as temperature impaired suggest that seven day average daily maximum (7DADM) temperatures should be less than 18°C for smolt outmigration, or less than 20°C in the lower part of river basins that likely reach this temperature naturally. On average, maximum daily water temperatures are at or above 20°C at Vernalis, Mossdale, and RRI after May 15 (Figure 4), and by June 16-30, even the coolest year on record (2005) was only slightly below 20°C at Vernalis, at 20°C at Mossdale, and above 20°C RRI. Ambient air temperatures are the primary factor controlling water temperatures during June. Based on data from the Western Regional Climate Center for Stockton during 1948-2006 (station 048558 WSO; http://www.wrcc.dri.edu), the average daily air temperature at Stockton during June is 22.6°C, and therefore the guideline used by EPA which is nearly 3°C cooler, will never be met during June.

Lower dissolved oxygen concentrations during June. Smolt outmigration during June may overlap with low dissolved oxygen periods in the Stockton Deep Water Ship Channel (Newcomb and others 2010). Low dissolved oxygen levels can lead to decreased swimming performance, reduced growth, impaired development and increased susceptibility to predation, parasites/pathogens and contaminants. However, Newcomb and others (2010) concluded that most juvenile salmon and O. *mykiss* are likely to move downstream prior to June when flows are higher in the late winter and spring, and it is not expected that this overlap would result in a population level effect since only a small portion of the juvenile salmon and *O. mykiss* encounter low dissolved oxygen and do so only for a limited amount of time.

Higher exports during June. More than 90% of fall-run Chinook salmon entrained by State Water Project (SWP) and Central Valley Project (CVP) pumping are believed to have originated from the San Joaquin River Basin (Jones and Stokes 2006), and a greater fraction of juvenile production may be entrained in years with relatively low San Joaquin River flow.

Historically, combined CVP/SWP exports and the ratio of combined exports to San Joaquin River flow at Vernalis are generally higher in June than during April and May (Table 10); however, these conditions may have changed due to recently adopted requirements to manage flows in Old and Middle Rivers. The 2009 OCAP Biological Opinion requires that exports be reduced as necessary, to limit negative flows to -2,500 to -5,000 cfs in Old and Middle Rivers, depending on the presence of salmon and *O. mykiss*. This requirement is effective from January 1 through June 15, or until average daily water temperature at Mossdale is greater than 22°C for 7 consecutive days, whichever is earlier.

Higher risk of predation during June. Non-native species have become more abundant than native species in the South Delta. The Delta and lower tributaries are full of large non-native predators such as striped bass (*Morone saxatilis*) that feed "voraciously" throughout long annual freshwater stays (McGinnis 2006). Lee (2000) found a remarkable increase in the number of black bass tournaments and angler effort devoted to catching bass in the Delta over the last 15 years. According to Nobriga and Feyrer (2007), "largemouth bass likely have the highest per capita impact on nearshore fishes, including native fishes," and "shallow water piscivores are widespread in the Delta and generally respond in a density-dependent manner to seasonal changes in prey availability." The impacts of the two recent invaders—spotted bass (*Micropterus punctulatus*) and redeye bass (*Micropterus coosae*)—remain undetermined; however, redeye bass "devastated the native fish fauna of the Cosumnes River basin" (Moyle et al. 2003 as cited by Cohen and Moyle 2004).

High predation losses at the State Water Project (SWP) are particularly detrimental to San Joaquin Chinook salmon populations since over 50% of juvenile salmon from the San Joaquin travel through Old River on their way to the ocean, exposing them to predation at Clifton Court Forebay (CCF) (66-99% of salmon smolts; Gingras 1997; Buell 2003; Kimmerer and Brown 2006). Striped bass are generally associated with the bulk of predation in CCF (Healey 1997; Cohen and Moyle 2004); however, six additional invasive predators occur in the CCF (i.e., white catfish, black crappie, largemouth bass, smallmouth bass, spotted bass, redeye bass). Additionally, predators congregate around the numerous smaller underwater structures in the lower San Joaquin River and South Delta including bridge pilings, barriers, and pump platforms (Hanson 2009, Miranda and Padilla 2010, Vogel 2010).

There is evidence that at least one predatory species, striped bass, is positively associated with higher river flows (Feyrer and Healey 2003). Salmon and steelhead suffer poor survival rates due to predation, and while the precise impact of striped bass predation on salmon, *O. mykiss*, and other listed species is unknown, the best available science indicates that the impact is substantial (CDFG 2011). An increase in June flows could benefit this known predator, further increasing the already substantial losses of salmon, *O. mykiss,* and other listed species.

Also, striped bass, largemouth bass, and smallmouth bass all are considered non-native warmwater fishes that prefer warmer temperatures like those that occur in the San Joaquin Basin during June. Striped bass generally prefer water temperatures of 20°C to 24°C (Emmett et al. 1991); while, largemouth bass prefer temperatures greater than 27°C (Moyle 2002). Smallmouth bass predation has been documented to depend on water temperatures, with predation becoming notable at water temperatures exceeding 15.5°C (Loomis 1998), and have been found to consume more juvenile salmonids than co-occurring native pikeminnow at temperatures exceeding 21°C (Tabor et al. 1993). Based on Vernalis water temperatures (Figure 4 and Figure 5), these predatory species can be expected to actively feed during June with negligible, if any effects, to feeding rates associated with increased June flows.

JUVENILE SALMON O. MYKISS OUTMIGRATION DURING JUNE WILL NOT BE "ASSISTED" BY INCREASED RIVER FLOWS AT VERNALIS

Outmigration during June is generally limited to years of extremely high flows (i.e., >10,000 cfs on average) when flows are not managed, but are controlled to the extent possible to maintain reservoir storage below mandated limits for flood control, and river flows below warning and flood stages at several points in the tributaries, the San Joaquin River, and Delta. Under such conditions, further increasing river flows at Vernalis is not likely to improve outmigration conditions during June. In the absence of prolonged, extremely high flows, juvenile salmonids are generally not present in June to benefit from any sort of "assistance", and the unfavorable conditions during June are relatively insensitive to flow.

Water velocities and salmon migration rates will not be increased. It has been hypothesized that increasing water velocity by increasing flow will improve smolt survival by reducing transit time through the Delta (i.e., increased migration rates). However, there is no evidence that increased flows will move smolts through the Delta any faster. Baker and Morhardt (2001) examined the relationship between mean smolt migration rates from three locations (one above and two below the Head of the Old River to Chipps Island) and San Joaquin flow (average for the seven days following release) and found no significant relationships at the 95% confidence level. Therefore, there is no reason to believe that increasing flows during June will increase migration rates or survival.

The lack of a relationship between flow and migration rates may be explained by the relationship between river flow and water velocities. Data collected by the USGS (http://waterdata.usgs.gov/ca/nwis/measurements?site_no=11303500) to calibrate the flow gauge at Vernalis indicate that measured velocities at flows less than approximately 7,500 cfs are highly variable and generally range between approximately 0.5 ft/s and 2.5 ft/s, while velocities range between approximately 2 ft/s to 3 ft/s at Vernalis when flows are between approximately 7,500 cfs and 25,000 cfs (Figure 6). Similarly, modeling also suggests that velocities at the Head of Old River may increase by about 1 ft/s with an additional 6,000 cfs San Joaquin River flow. However, modeling predicts little to no change in velocity (<0.5 ft/s) at other stations in the South Delta (Paulsen and List 2008). Thus, increased flows may increase water velocity near the boundary of the Delta, but will not substantially increase velocity through the Delta.

Lack of floodplain benefit for juvenile O. mykiss and salmon rearing. Juvenile *O. mykiss* generally do not use floodplains at any time of year and juvenile salmon do not typically use floodplains during their outmigration from April-June. Therefore, there are no benefits to salmonids from floodplain inundation during April-June.

Steelhead juveniles are not known to rear in floodplain habitats to any great degree at any time of year, as illustrated by the rare observation of steelhead in watershed throughout the Pacific Northwest (Bustard and Narver 1975, Swales and Levings 1989, Keeley et al. 1996), and more local areas (i.e., the Sutter and Yolo bypasses and the Cosumnes River floodplain; Feyrer et al. 2006, Moyle et al. 2007). Based on multi-year studies in the Cosumnes River, Moyle et al. (2007) concluded that steelhead were not adapted for floodplain use and the few steelhead observed were inadvertent floodplain users (i.e., uncommon and highly erratic in occurrence) that were "presumably…carried on to the floodplain by accident." Therefore, the available data indicate that steelhead are not likely to use floodplains and thus would not benefit from floodplain inundation, regardless of the season. #

Unlike steelhead, salmon are known to use floodplains for rearing during their fry lifestage. In general it is believed that juvenile salmon benefit from the use of floodplains during the rearing phase, through higher growth, greater feeding success and higher survival (Sommer et al. 2001, Moyle et al. 2007). Chinook salmon have been documented to utilize the floodplain habitat in the Sutter Bypass, Yolo Bypass, and in the Cosumnes River for rearing and migration between January and May (Feyrer et al. 2006, Sommer et al. 2001, Sommer et al. 2005, Moyle 2007). In the Cosumnes River, where annual floodplain inundation ranged from 6-158 days beginning as early as the second week of December to as late as the fourth week of June (1998-2005), Moyle et al (2007) found that "in general, native fishes predominated [on the Cosumnes River floodplains] early in the flooding season [with Chinook salmon being the most abundant species found in February and March], while alien species predominated at the end". Likewise, Feyrer et al. (2006) found that juvenile Chinook salmon were common on the Sutter Bypass from January through May, but were relatively rare in June; and on the Yolo Bypass they occurred primarily in March (Figure 5).

Similar to the Cosumnes River, non-native species, such as striped bass, were more prevalent in the summer, beginning in May and June. Furthermore, studies indicate that salmon smolts generally migrate from the San Joaquin Basin during April and May (see *Timing of Fall-run Chinook salmon juvenile outmigration from the San Joaquin Basin*, page 2), making their way through the delta and entering the San Francisco Estuary primarily in May and June (MacFarlane and Norton 2002). No Chinook were caught by MacFarlane and Norton (2002) in the estuary after June 27th, indicating that the Chinook salmon smolts pass out of the floodplains and through the estuary in late May and early June. Based on timing of documented floodplain usage (Jan-May) and smolt migration (May-June), it is unlikely that Chinook salmon would utilize floodplain habitat in the tributaries or San Joaquin River during May or June.

In the Central Valley water temperatures begin to rise in the late spring due to increasing air temperatures. Given the shallow depths of floodplain habitats, temperatures at this time are expected to be warmer on the floodplains than in the river channels. In a regression analysis examining the relationship between Chinook abundance and independent environmental variables (i.e., site, temperature and flow), Feyrer et al. (2006) found that site (i.e., Sutter vs. Yolo) and temperature were the most influential variables predicting the proportional abundance of salmon on the bypasses. According to Feyrer et al. (2006), the water temperatures on the Sutter and Yolo bypasses rose to about 24°C by June 2002 and 2004. These temperatures are approaching the chronic upper lethal limit for Central Valley Chinook salmon (approximately 25°C) according to Myrick and Cech (2001), who caution that juvenile Chinook salmon reared at temperatures between 21 and 24°C were more vulnerable to striped bass predation than those reared at lower temperatures. The increase in temperatures on the Sutter and Yolo bypasses in June also corresponds with an increase in striped bass abundance. Given the expected warm temperatures, it is unlikely that Chinook salmon would use any floodplain habitat that was inundated during June.

According to Figure 3.13 in the final technical report (SWRCB 2011, page 3-41), a total of 11,150 cfs (approximately 4,900 cfs for the Stanislaus; 4,000 cfs for the Tuolumne; and 2,250 cfs for the Merced) would be required to just *begin* to inundate floodplains (Figure 3.13, SWRCB 2011, page 3-41). Taking into consideration recommend minimum and preferred inundation duration targets of five and 18 days, respectively (McBain and Trush 2009), a total of 110,580 to 398,088 AF would be required to provide a *minimal* amount of floodplain. Given the small proportion of juvenile salmon that remain in the system after mid-May, and evidence that larger migrating juveniles typically use mid-channel, higher velocity areas for migration (Kemp et al. 2005; Svendsen et al. 2007), it is highly unlikely that the remaining juvenile salmon will utilize this floodplain habitat. Even if some smolts did use floodplain areas, no evidence has been presented to indicate that floodplain usage would improve survival for this lifestage nor increase the number of returning adults; therefore, it is unlikely that salmon escapement would be increased by floodplain inundation during May and June.

Water temperatures will not be decreased with increased June flows. While water temperatures at Vernalis during June generally decrease as river flows increase up to approximately 2,500 cfs at Vernalis, temperatures still exceed the guidelines used by the EPA, and increasing river flows above approximately 2,500 cfs provides no additional benefit in terms of reducing water temperatures at Vernalis (Figure 7), or at locations further downstream in the San Joaquin River (Figure 8 and Figure 9).

Exports. To estimate the potential proportion of salmon smolts passing Mossdale that may be entrained by the SWP and CVP exports, a ratio of salvage and losses at the export facilities to abundance at Mossdale was calculated (Table 11). Generally the numbers of smolts potentially affected by the export facilities are relatively low during June because so few smolts are present. The exception is during wet and above normal years when a low proportion of outmigration continues into June. Although the export to inflow ratios are lower during wet and above normal years, more salmon smolts are salvaged since more are present in the system during June.

HIGHER FLOWS IN JUNE WILL NOT INCREASE ESCAPEMENT

There are three primary reasons why higher flows at Vernalis during June will not increase salmon escapement to the San Joaquin Basin: (1) the numbers of juvenile salmon migrating during June are very low, (2) higher flows will not increase survival of the few fish migrating during June, and (3) harvest management. While information has already been presented in this document to demonstrate that the number of juvenile salmon migrating during June are low and that higher flows will not increase survival, these factors were not discussed in the context of escapement. The following discussion is intended to provide this context in addition to describing the influence of a third factor, harvest management.

During 1996-2005, the estimated number of smolts passing Mossdale during June was less than 70,000 each year. In a dry year, when only 0.8% of smolt outmigrate during June, this would correspond to approximately 875,000 smolts migrating during April and May. Since the HORB is not operated in June, and a clear, statistically significant relationship of flow to survival without the HORB in place has not been identified (Newman 2008), there is no basis to estimate how changes in flow could change the number of smolts entering the ocean. However, it is valuable to explore how many more salmon smolts could enter the ocean due to any changes in survival rate during June. If it can be assumed that outmigrants entering the ocean during April and May have an equal probability of contributing to adult escapement as outmigrants entering the ocean during June, and that smolt outmigrants are the primary contributors to adult escapement, the estimated differences in numbers of smolts entering the ocean under theoretical survival scenarios would also be expected to carry through to differences in adult escapement.

For example, results of VAMP studies indicate salmon smolt survival rates around 5% during April and May when conditions are more favorable in the Delta for outmigration than during June. With approximately 925,000 smolts at Mossdale, 5% survival through the Delta would result in approximately 47,250 smolts entering the ocean. If survival during April and May could be increased from 5% to 6% without any change in survival during June, the number of smolts entering the ocean would increase to 56,000. Based on results of studies over the past two decades, survival during April and May can be increased by operation of the HORB and by increasing flows with the HORB present. NMFS has recently concluded that gains in survival of 9-12% for salmon and *O. mykiss* can be expected through operation of the HORB (NMFS 2012). In contrast, there are no clear mechanisms to increase survival during June and survival would need to be increased to 18% to achieve a similar number of smolts entering the ocean as compared to a 1% increase in survival during April and May.

Harvest management would be further likely to preclude any increase in salmon abundance. Under the Federal Endangered Species Act, San Joaquin fall-run Chinook salmon are not a distinct population segment, but are instead part of the Central Valley fall-run Chinook salmon Evolutionarily Significant Unit (*64 FR 50394*). They are also not considered as an individual fishery management stock by the Pacific Fishery Management Council (PFMC), but are considered to be part of the Central Valley Fall Chinook stock complex. The Sacramento River Fall-run Chinook (SRFC) is the indicator stock for the Central Valley complex and SRFC abundance is estimated with the Sacramento Index (SI). Management of the SRFC is intended "to provide adequate escapement of natural and hatchery production for Sacramento and San Joaquin fall and late-fall stocks" (PFMC 2003). The PFMC manages the SRFC to achieve an escapement goal of 122,000 to 180,000 hatchery and natural area adults, which is inconsistent with goals established under the Central Valley Project Improvement Act. As a result of this management strategy, any production in excess of this goal may be harvested. Managing the population in this manner almost ensures that most increases in ocean abundance resulting from improved juvenile production will be lost to harvest. Until these practices change, any increase in the number of fall-run Chinook entering the ocean will not necessarily translate into an increase in returns due to the additional allowable harvest.

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FIGURES

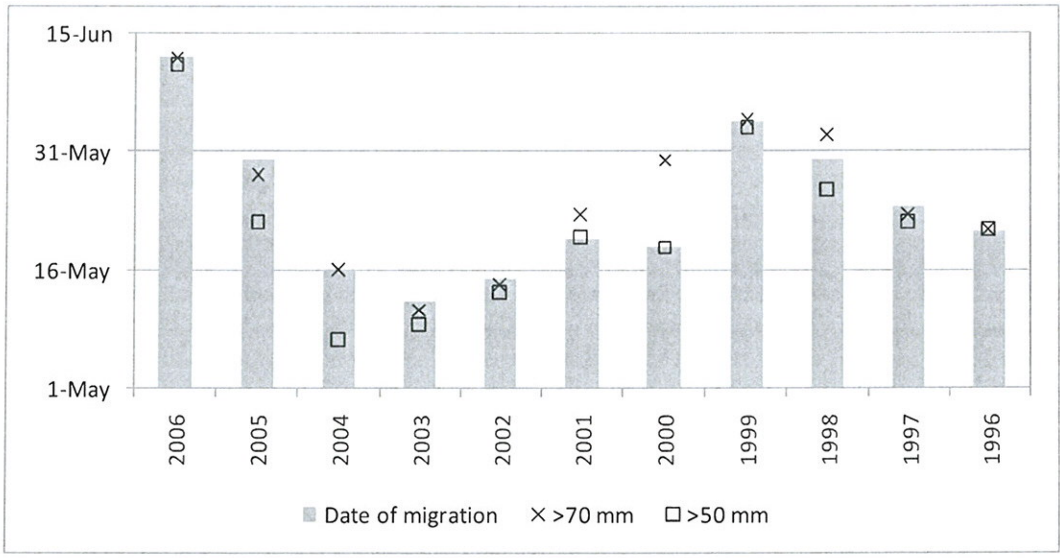

Figure 1. Comparison of dates of 90th percentile for smolt outmigration from the Stanislaus River at Caswell calculated using date of migration criteria and length criteria of 50 mm and 70 mm.

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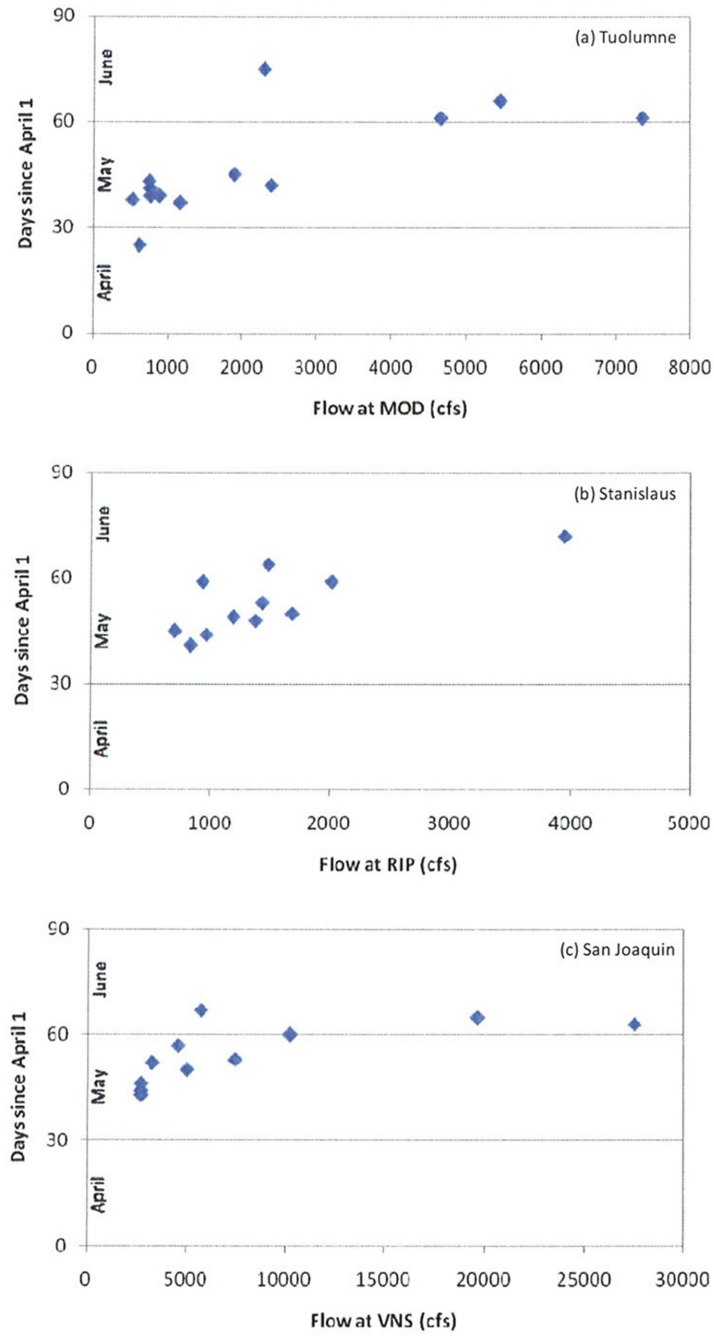


Figure 2. Timing of the 90th percentile of smolt outmigration in (a) the Tuolumne River at Grayson (1999-2011) relative to average flow at Modesto (April 1 to date of 90% passage), (b) the Stanislaus River at Caswell (1996-2006) relative to average flow at Ripon, and (c) the San Joaquin River at Mossdale (1996-2006) relative to average flow at Vernalis.

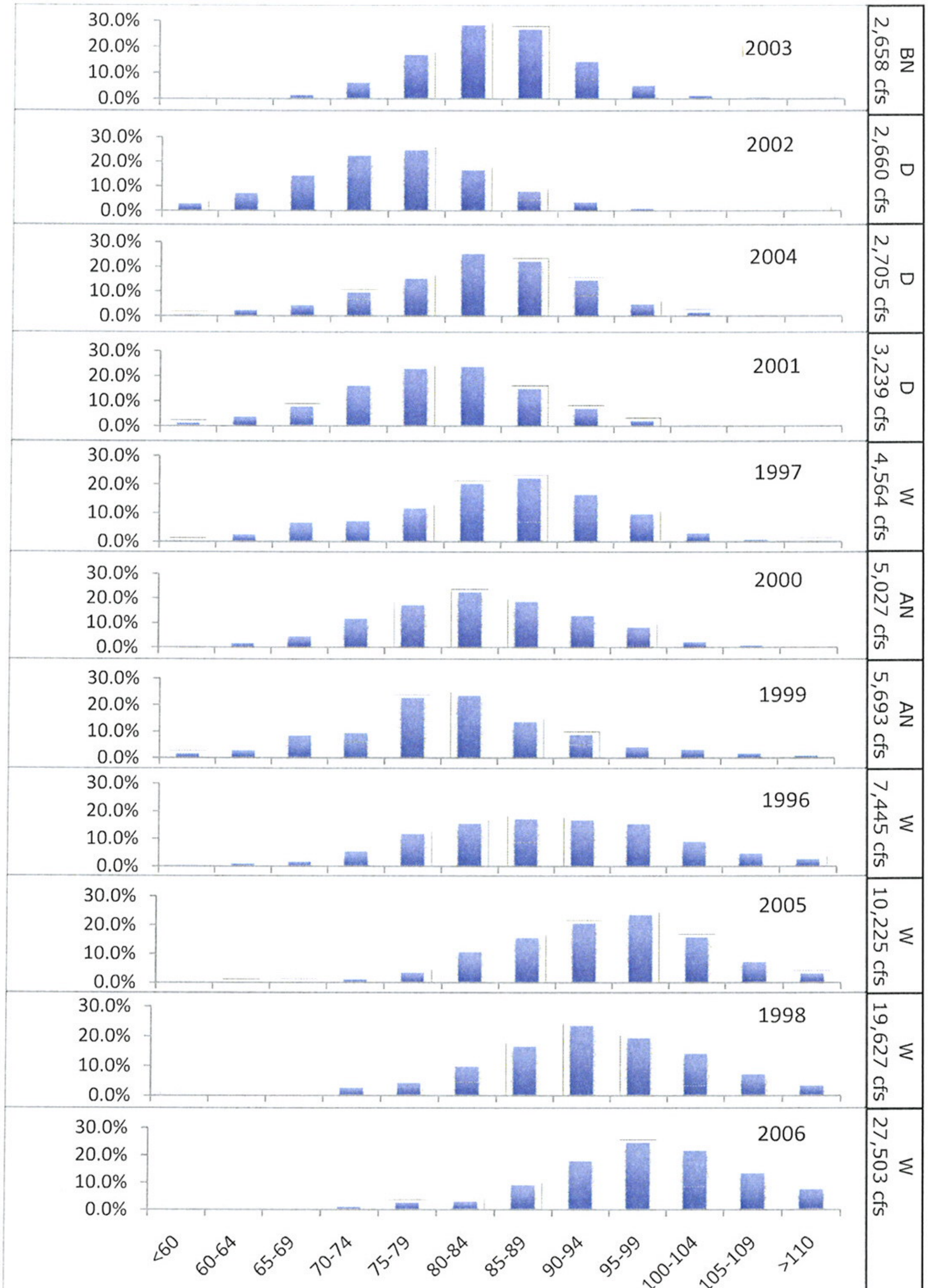


Figure 3. Frequency distributions of salmon smolt size at outmigration in the San Joaquin River at Mossdale, ranked in order of average flow at Vernalis between April 1 and the data of 90% smolt outmigration from lowest (2003) to highest (2006).

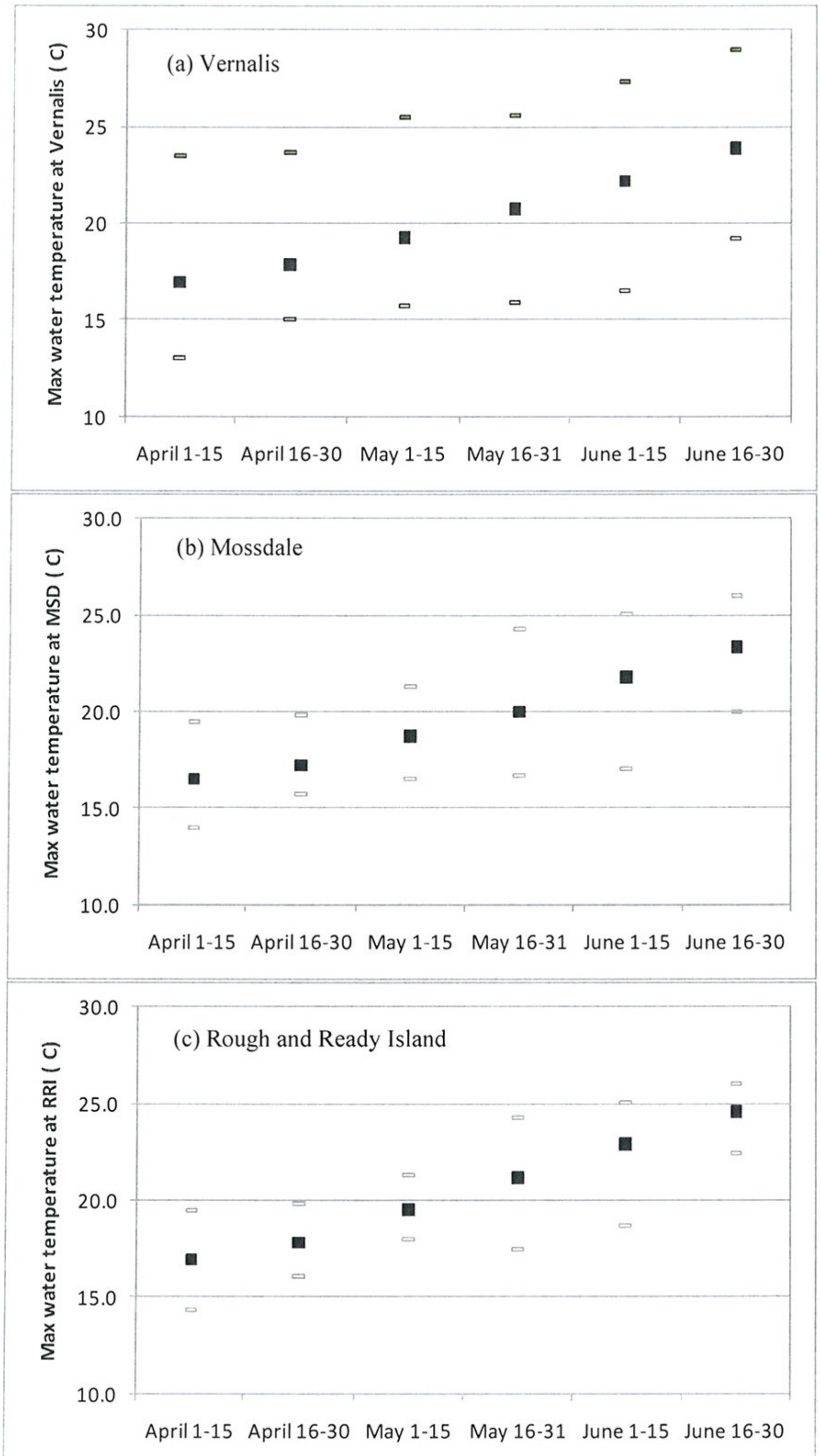


Figure 4. Minimum, mean, and maximum of average maximum water temperatures at (a) Vernalis 1973-2011, (b) Mossdale 2002-2011, and (c) Rough and Ready Island 2001-2011

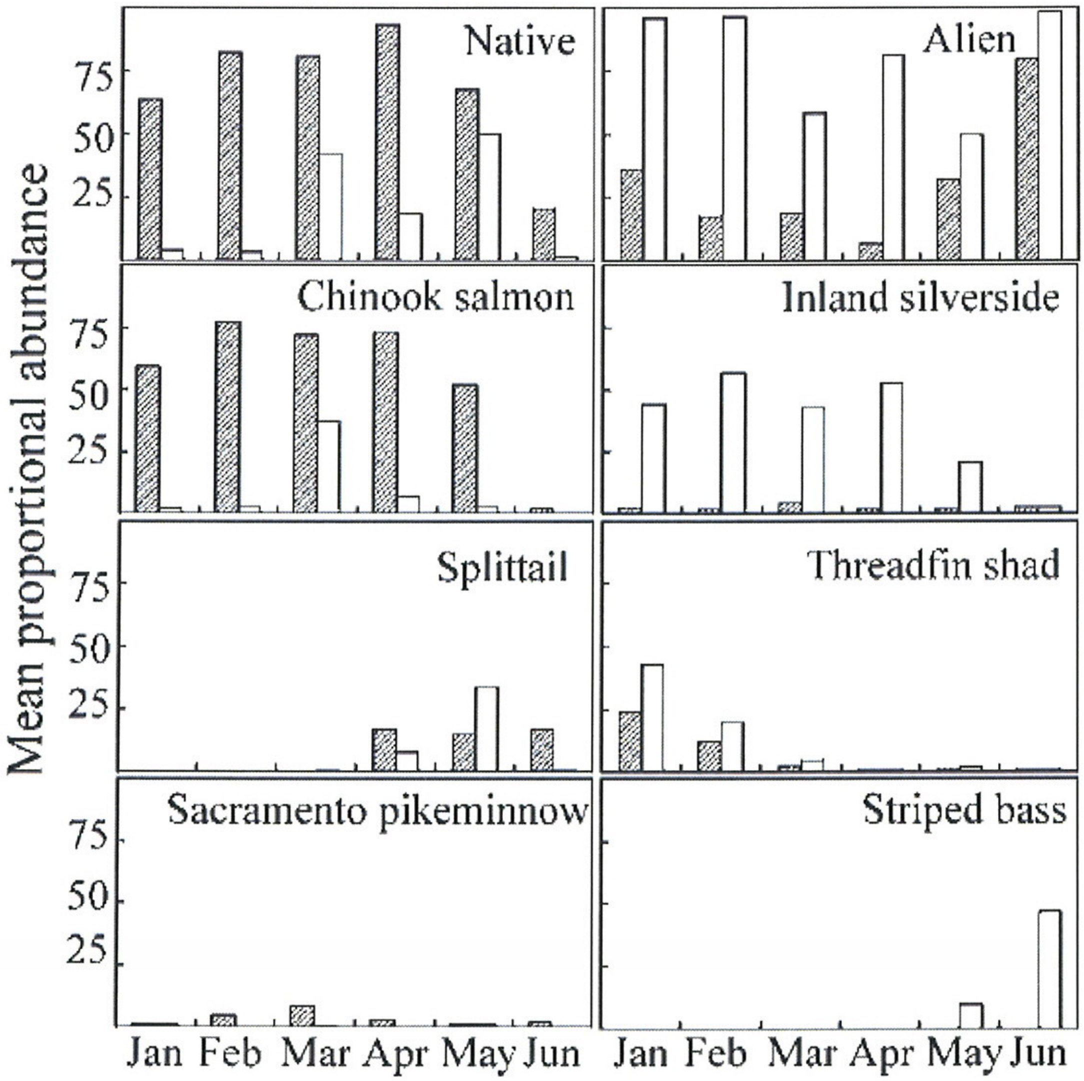


Figure 5. Monthly changes in the mean proportional abundance of selected fishes caught on the floodplains of the Yolo (white bars) and Sutter (black bars) bypasses using rotary screw traps, for the years 2002 and 2004. Source: Feyrer et al. 2006, Figure 4.

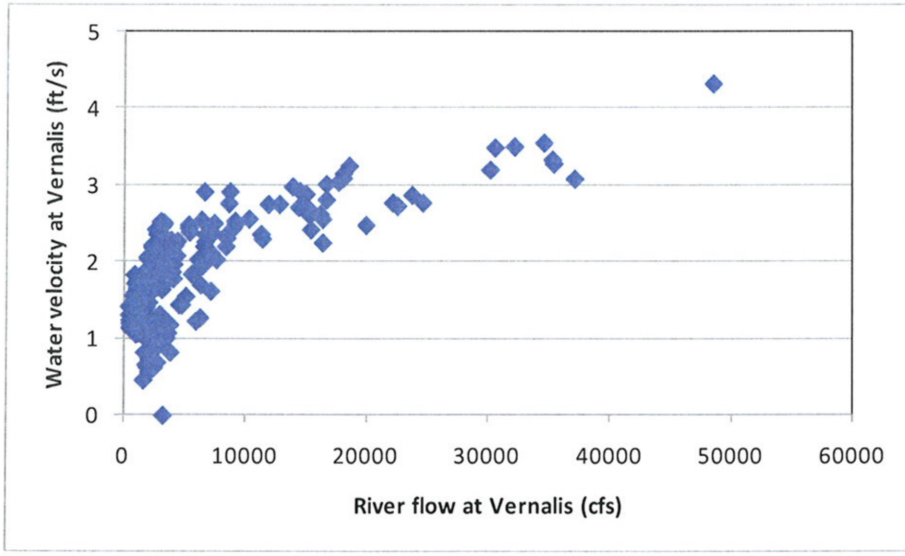


Figure 6. Water velocities and river flows measured by USGS at Vernalis.

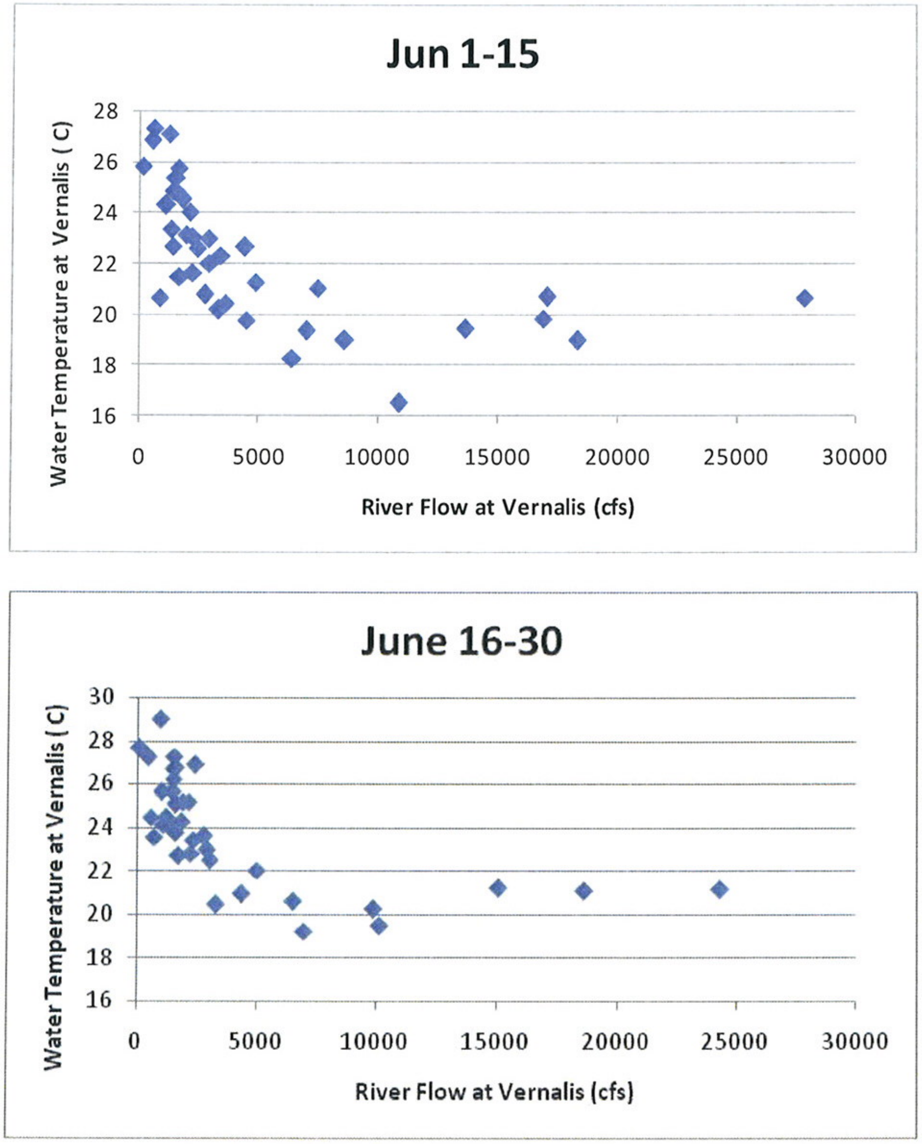


Figure 7. Average river flow (cfs) and average maximum water temperature (°C) at Vernalis, 1973-2011.

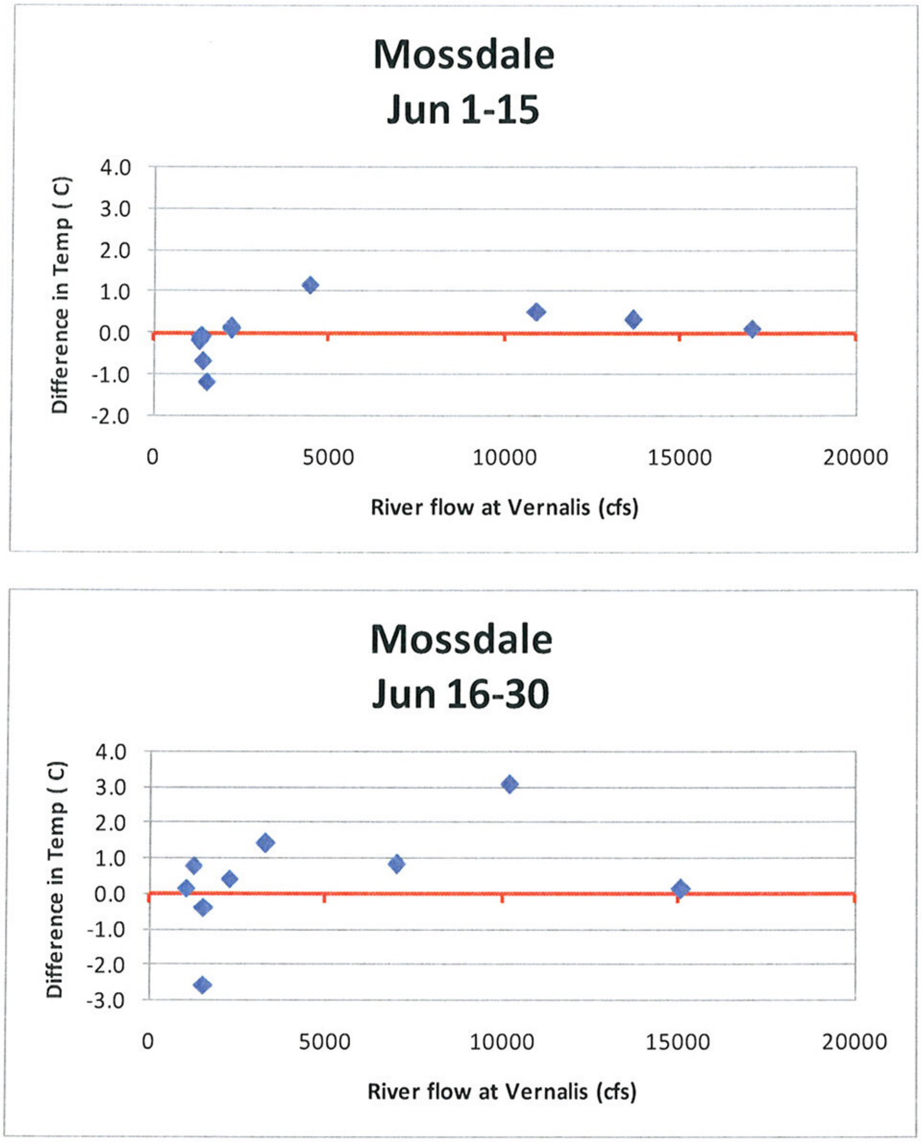
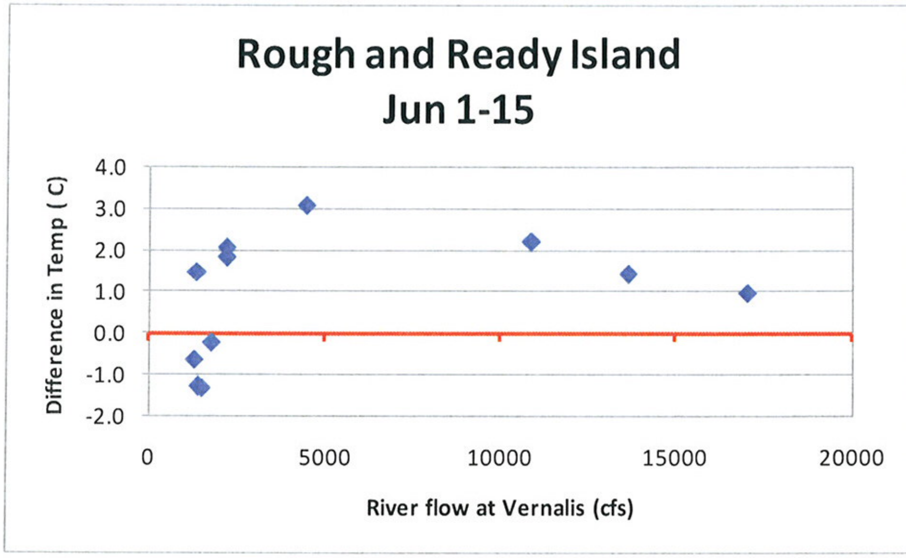


Figure 8. Differences between average maximum water temperatures (°C) in the San Joaquin River at Vernalis and at Mossdale, 2002-2011.



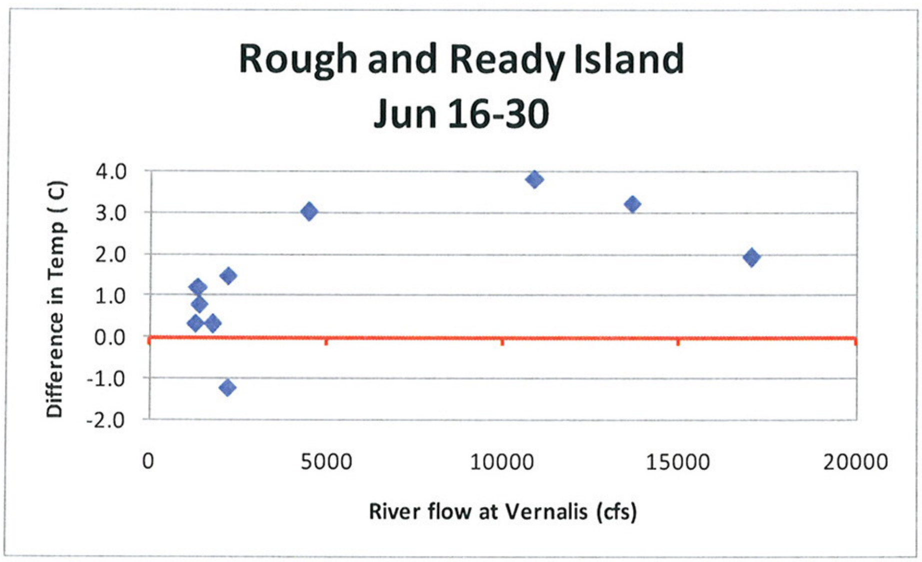


Figure 9. Differences between average maximum water temperatures (°C) in the San Joaquin River at Vernalis and Rough and Ready Island, 2001-2011.

TABLES

Table 1. Stanislaus River juvenile Chinook salmon outmigration timing at Caswell (RM 8.6; 1998-2005).

		Wet (n=2)	Above Normal (n=2)	Below Normal (n=1)	Dry (n=3)	Critical (n=0)
Fry	Jan 1-15	0.7%	0.0%	0.0%	0.0%	-
	Jan 16-31	22.5%	12.4%	39.3%	0.1%	-
	Feb 1-15	22.6%	26.0%	3.3%	0.4%	-
	Feb 16-28	11.8%	27.4%	1.4%	14.4%	-
	Mar 1-15	8.8%	8.9%	2.9%	17.6%	-
	Mar 16-31	7.9%	7.7%	8.3%	5.3%	-
Smolt	Apr 1- 15	3.9%	4.5%	4.5%	16.3%	-
	Apr 16-30	3.9%	5.1%	26.5%	21.0%	-
	May 1-15	8.6%	3.5%	11.3%	17.8%	-
	May 16-31	7.0%	3.3%	2.5%	6.4%	-
	Jun 1- 15	2.1%	1.0%	0.1%	0.7%	-
	Jun 16-30	0.3%	0.2%	0.0%	0.0%	-

Table 2. Tuolumne River juvenile Chinook salmon outmigration timing at Grayson (RM 5.2; 1999-2002, 2006-2011).

		Wet (n=2)	Above Normal (n=3)	Below Normal (n=1)	Dry (n=2)	Critical (n=2)
Fry	Jan 1-15	1.3%	0.0%	0.0%	0.0%	0.0%
	Jan 16-31	8.1%	7.2%	0.0%	0.2%	1.1%
	Feb 1-15	3.6%	18.3%	0.0%	2.1%	3.0%
	Feb 16-28	1.4%	18.1%	0.0%	16.7%	10.2%
	Mar 1-15	3.2%	7.1%	3.6%	11.2%	1.0%
	Mar 16-31	2.7%	3.0%	0.0%	5.3%	0.4%
Smolt	Apr 1- 15	5.5%	3.8%	0.0%	9.6%	6.0%
	Apr 16-30	7.3%	8.8%	7.0%	33.8%	62.8%
	May 1-15	26.8%	8.2%	84.5%	18.6%	13.3%
	May 16-31	27.1%	16.1%	4.9%	2.6%	2.3%
	Jun 1- 15	10.8%	8.0%	0.0%	0.0%	0.0%
	Jun 16-30	2.2%	1.4%	0.0%	0.0%	0.0%

Table 3. Tuolumne River Chinook salmon smolt outmigration timing by water year type at Grayson (RM 5.2; 1999-2011).

	Wet (n=3)	Above Normal (n=3)	Below Normal (n=2)	Dry (n=3)	Critical (n=2)
Apr 1- 15	5.1%	10.9%	8.9%	26.5%	7.9%
Apr 16-30	13.9%	34.0%	20.7%	47.8%	69.4%
May 1-15	32.2%	21.6%	67.3%	23.3%	19.3%
May 16-31	34.3%	22.6%	3.1%	2.5%	3.4%
Jun 1- 15	12.5%	9.3%	0.0%	0.0%	0.0%
Jun 16-30	2.0%	1.6%	0.0%	0.0%	0.0%

Table 4. Stanislaus River Chinook salmon smolt outmigration timing by water year type at Caswell (RM 8.6; 1996-2006).

	Wet (n=5)	Above Normal (n=2)	Below Normal (n=1)	Dry (n=3)	Critical (n=0)
Apr 1- 15	15.8%	23.7%	10.1%	22.6%	-
Apr 16-30	23.9%	27.1%	58.9%	39.0%	-
May 1-15	24.0%	20.7%	25.1%	27.1%	-
May 16-31	22.0%	20.4%	5.6%	10.5%	-
Jun 1- 15	12.7%	6.9%	0.3%	0.8%	-
Jun 16-30	1.6%	1.3%	0.0%	0.0%	-

Table 5. San Joaquin River Chinook salmon smolt outmigration timing by water year type Mossdale (RM 54; 1996-2006)

	Wet (n=5)	Above Normal (n=2)	Below Normal (n=1)	Dry (n=3)	Critical (n=0)
Apr 1- 15	12.4%	18.0%	12.1%	9.5%	-
Apr 16-30	24.0%	24.7%	40.2%	31.6%	-
May 1-15	17.9%	12.0%	38.6%	43.7%	-
May 16-31	32.4%	35.1%	8.6%	14.5%	-
Jun 1- 15	11.8%	8.7%	0.4%	0.8%	-
Jun 16-30	1.5%	1.5%	0.0%	0.0%	-

Table 6. *O. mykiss* salvage at the CVP/SWP by water year type (1997-2011)

	Wet (n=5)	Above Normal (n=3)	Below Normal (n=2)	Dry (n=3)	Critical (n=2)
Jan	8.3%	4.8%	35.5%	9.5%	3.2%
Feb	13.2%	52.8%	13.2%	30.9%	43.8%
Mar	36.1%	13.5%	37.2%	51.0%	30.9%
Apr	21.8%	20.6%	8.4%	6.0%	19.7%
May	11.2%	5.3%	3.5%	1.2%	1.9%
Jun	6.5%	1.3%	1.1%	0.6%	0.4%
Jul	1.3%	0.1%	0.4%	0.1%	0.1%
Aug	0.0%	0.1%	0.0%	0.0%	0.0%
Sep	0.2%	0.0%	0.0%	0.0%	0.0%
Oct	0.6%	0.1%	0.0%	0.0%	0.0%
Nov	0.5%	0.7%	0.0%	0.1%	0.0%
Dec	0.3%	0.8%	0.6%	0.6%	0.0%

Table 7. Juvenile *O. mykiss* captured in the Tuolumne River at Grayson, 1999-2011

Date	Fork length (mm)
21-Feb-00	230
14-May-05	33
28-Feb-08	224
31-Mar-08	200

Table 8. Stanislaus River juvenile *O. mykiss* outmigration timing by water year type at Caswell (RM 8.6; 1995-2011).

	Wet (n=7)	Above Normal (n=3)	Below Normal (n=2)	Dry (n=3)	Critical (n=2)
Jan 1-15	0.0%	0.0%	0.0%	1.0%	0.0%
Jan 16-31	0.0%	4.4%	10.0%	0.0%	0.0%
Feb 1-15	7.1%	7.2%	13.8%	2.7%	0.0%
Feb 16-28	10.1%	7.2%	3.8%	23.0%	10.9%
Mar 1-15	2.6%	2.8%	37.7%	27.0%	0.0%
Mar 16-31	17.2%	5.0%	7.7%	9.2%	6.5%
Apr 1- 15	16.8%	8.3%	0.0%	5.3%	8.7%
Apr 16-30	15.8%	13.9%	23.1%	12.0%	4.3%
May 1-15	2.6%	38.3%	3.8%	16.1%	54.3%
May 16-31	10.0%	5.0%	0.0%	3.7%	8.7%
Jun 1- 15	17.9%	2.8%	0.0%	0.0%	6.5%
Jun 16-30	0.0%	5.0%	0.0%	0.0%	0.0%

Table 9. San Joaquin River juvenile *O. mykiss* outmigration timing by water year type at Mossdale (RM 54; 1988-2011). Known adipose fin-clipped fish were excluded.

	Wet (n=7)	Above Normal (n=3)	Below Normal (n=2)	Dry (n=3)	Critical (n=8)
Jan 1-15	0.0%	0.0%	0.0%	0.0%	0.0%
Jan 16-31	0.0%	0.0%	0.0%	0.0%	0.0%
Feb 1-15	0.0%	0.0%	0.0%	3.7%	0.0%
Feb 16-28	0.0%	0.0%	0.0%	0.0%	0.3%
Mar 1-15	0.0%	0.0%	0.0%	3.7%	0.0%
Mar 16-31	10.5%	0.0%	0.0%	3.7%	6.4%
Apr 1- 15	22.8%	33.3%	58.8%	14.8%	10.1%
Apr 16-30	25.8%	44.4%	2.9%	49.1%	35.5%
May 1-15	29.4%	11.1%	29.4%	13.9%	31.2%
May 16-31	5.0%	5.6%	8.8%	11.1%	16.5%
Jun 1- 15	6.5%	5.6%	0.0%	0.0%	0.0%
Jun 16-30	0.0%	0.0%	0.0%	0.0%	0.0%

Table 10. Ratio of combined CVP/SWP exports to San Joaquin River flow at Vernalis, 1996-2007.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average
Apr 1- 15	0.9	1.7	0.1	1.0	1.7	2.4	3.8	3.6	2.8	0.6	0.1	3.2	1.8
Apr 16-30	0.2	0.4	0.1	0.5	0.4	0.6	0.4	0.4	0.5	0.5	0.1	1.1	0.4
May 1-15	0.2	0.4	0.0	0.4	0.4	0.4	0.4	0.5	0.4	0.3	0.1	0.5	0.3
May 16-31	0.7	1.0	0.0	0.7	0.9	0.4	0.6	1.5	1.0	0.3	0.2	0.4	0.6
Jun 1- 15	2.2	2.1	0.2	1.1	2.1	1.5	3.0	4.9	3.4	0.7	0.4	0.5	1.8
Jun 16-30	3.0	3.3	0.3	1.7	3.1	2.1	3.5	4.4	3.7	1.4	0.5	2.9	2.5

Table 11. Proportion of SJB smolts potentially affected by exports. Relative abundance exports:Mossdale and then adjusted for proportion of total smolts passing Mossdale during that interval. 1996-2006.

	Wet (n=5)	Above Normal (n=2)	Below Normal (n=1)	Dry (n=3)	Critical (n=0)
Apr 1- 15	0.1%	2.5%	0.3%	1.8%	-
Apr 16-30	0.2%	7.5%	0.5%	2.2%	-
May 1-15	0.8%	6.8%	0.8%	1.9%	-
May 16-31	2.4%	14.2%	0.6%	0.5%	-
Jun 1- 15	1.3%	4.4%	0.3%	0.1%	-
Jun 16-30	0.2%	0.2%	0.0%	0.0%	-
	5.0%	35.5%	2.5%	6.4%	

ATTACHMENT 8

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

COPY

AGREEMENT
AMONG
THE UNITED STATES OF AMERICA
AND
THE OAKDALE IRRIGATION DISTRICT
AND
THE SOUTH SAN JOAQUIN IRRIGATION DISTRICT
FOR THE
OPERATION OF NEW MELONES DAM AND RESERVOIR
AND TULLOCH DAM AND RESERVOIR

Agreement No.
8-07-20-W0714

THIS AGREEMENT, made this 30th day of August, 1988, between the UNITED STATES OF AMERICA acting by and through the Bureau of Reclamation, Department of the Interior represented by the Contracting Officer executing this Agreement, hereinafter referred to as the United States, and the OAKDALE IRRIGATION DISTRICT and the SOUTH SAN JOAQUIN IRRIGATION DISTRICT hereinafter referred to as the Districts,

WITNESSETH THAT:

EXPLANATORY RECITALS

WHEREAS, the United States Corps of Engineers has constructed and the Secretary of the Interior is operating the New Melones Project on the Stanislaus River, California; and

WHEREAS, the Districts obtained License No. 2067 from the Federal Power Commission (now the Federal Energy Regulatory Commission) for the Tulloch Power Project. Article 29 of that License requires the Districts to enter into an agreement with the United States, satisfactory to the Commission, whereby the United States, will be permitted to use Tulloch Dam and Reservoir, referred to in License No. 2067 as Tulloch Power Project, for necessary afterbay reregulation of water releases through the New Melones Powerplant; and

WHEREAS, this Agreement does not address the issue of payment of compensation by the United States to the Districts for the United States use of the Tulloch Dam and Reservoir as an afterbay, because the parties recognize that Article 31 of License No. 2067 provides that the Federal Energy Regulatory Commission reserves the right to determine such compensation, if any; and

WHEREAS, this Agreement does not address the issue of whether the Districts should be required to pay to the United States any headwater benefits charge for the Tulloch Power Project, nor does it set forth the manner in which such charge, if any, should be computed, because the parties recognize that the Federal Energy Regulatory Commission is the federal agency empowered to compute and require the payment of such a charge; and

WHEREAS. The United States entered into an Agreement and Stipulation with the Districts. dated October 24. 1972. hereinafter referred to as the 1972 Agreement, superseded by a new Agreement and Stipulation dated August 30. 1988. hereinafter referred to as the 1988 Agreement, a copy of which is and attached hereto as Exhibit A. which recognizes the water rights of the Districts on the Stanislaus River:

WHEREAS. it is in the best interest of the United States and the Districts to operate New Melones Dam. Tulloch Dam. Goodwin Dam. and their respective reservoirs and power facilities in accordance with the terms and conditions set forth below.

NOW. THEREFORE. IT IS AGREED:

DEFINITIONS

1. When used herein:

(a) The term "New Melones Project" shall mean the Federal reclamation project including the New Melones Dam, Reservoir and appurtenant facilities on the Stanislaus River constructed by the United States and operated as the New Melones Unit of the Central Valley Project in accordance with the Flood Control Act of December 22, 1944, 58 Stat. 887, P.L. 78-534, as modified by Section 203 of the Flood Control Act of October 23, 1962. 76 Stat. 1191, P.L. 87-874;

(b) The term "Tri Dam Project" shall mean Donnells. Beardsley, Goodwin, and Tulloch Dams and their respective reservoirs with associated powerplants and appurtenant facilities;

(c) The term "Goodwin Diversion Dam" shall mean the Districts' dam about 1 and 3/4 miles downstream from Tulloch Dam.

(d) The term "Project Water" shall mean water appropriated by the United States for direct diversion or for storage behind and rediversion from New Melones Dam and Reservoir:

(e) The term "Districts' conserved water" shall mean water stored in New Melones Reservoir and available to the Districts in accordance with Article 4 of the 1988 Agreement:

(f) The term "water year" shall mean October 1 of each calendar year through September 30 of the following year: and

(g) The term "Secretary" or "Contracting Officer" shall mean the Secretary of the Interior or his duly authorized representative

TERM. REVIEW. AND MODIFICATION

2. (a) The parties intend to review this Operation Agreement periodically. Either the United States or the Districts may at any time request modification of a specific provision or provisions of this Agreement.

   (b) Upon such a request, the parties shall, within 90 days, negotiate a modification of the disputed issue or issues. Should the parties be unable, within such period, to agree upon such a modification, each party reserves all rights and remedies available to it for a resolution of the disputed issue.

   (c) Upon the lapse of the 90-day negotiation period, either party may initiate a dispute resolution proceeding concerning the disputed provision, in which event;

      (i) The disputed provision shall cease to be in effect (unless the parties otherwise agree),

      (ii) All remaining terms and provisions of this Agreement shall remain in effect.

OPERATION OF NEW MELONES DAM AND RESERVOIR TO SATISFY AGREEMENT AND STIPULATION BETWEEN UNITED STATES AND DISTRICTS

3. The United States and the Districts shall comply with the 1988 Agreement and any amendments thereto.

OPERATION OF TULLOCH DAM AND RESERVOIR

4. (a) Tulloch Dam and Reservoir shall be operated by the Districts as an afterbay for the New Melones Project. The Districts shall make releases from Tulloch Reservoir for New Melones Project requirements in accordance with United States instructions. The Districts may also make releases from Tulloch Reservoir to utilize the quantities of water to which the Districts are entitled under the terms of the 1988 Agreement. The United States shall endeavor to operate the New Melones Project to maintain the Tulloch reservoir water surface elevation at or above 501.6 feet m.s.l. from March 20 to November 1 of each year unless otherwise required for maintenance or emergencies. Tulloch Reservoir water surface shall not be reduced below elevation 495.0 feet m.s.l. for maintenance of New Melones Dam and Reservoir without prior agreement between the parties. Further, it is recognized that power operation of the New Melones Project may subject Tulloch Reservoir to daily fluctuations in water surface elevations.

(b) The Districts shall operate Tulloch Dam and Reservoir for flood control purposes in accordance with directions from the United States Bureau of Reclamation to permit the United States Bureau of Reclamation to comply with the United States Corps of Engineers' Reservoir flood control criteria [1] unless the Districts determine that a variation is necessary to protect the safety of Tulloch Dam. Goodwin Dam, their respective reservoirs, their respective appurtenances, or any of them, or to avoid serious hazards. Any variation shall be reported by the Districts by the fastest means available to the Central Valley Operations Control Center and the Districts shall transmit written confirmation of such variance to the Corps of Engineers within 48 hours. The United States shall consult with the Districts to optimize power production at Tulloch Dam and Reservoir during flood control operations.

MONITORING

5. (a) The quantity of water stored in New Melones Reservoir shall be computed by the United States at midnight of each calendar day based upon the water surface elevation of the Reservoir and the United States Corps of Engineers' area capacity tables dated October 1978, or any subsequent revisions thereof.

(b) Daily inflow to New Melones Reservoir shall be the sum of:

(i) the daily change in storage in New Melones Reservoir;

(ii) the daily releases and diversions from New Melones Reservoir; and

(iii) the daily evaporation loss from New Melones Reservoir utilizing the most currently accepted means of accurately measuring evaporation.

Precipitation on the Reservoir surface is accounted for in storage and shall not be considered separate from the daily inflow.

(c) The quantity of water stored in Tulloch Reservoir shall be computed by the Districts at midnight of each calendar day based on the water surface elevation of Tulloch Reservoir and area capacity tables prepared by the Districts.

[1] "New Melones dam and Lake, Stanislaus River, California, Report on Reservoir Regulation for Flood Control, Appendix V, to Master Manual of Reservoir Regulation, San Joaquin River Basin, California," dated January, 1980, along with any subsequent revisions.

(d) The Districts shall measure and maintain records of the releases and spills from Tulloch Dam and Reservoir. diversions to the Districts. releases and spills to the Stanislaus River at Goodwin Dam. and diversion to others at Goodwin Dam.

(e) Water measurement devices utilized by the Districts and the United States shall be operated and maintained to tolerances of accuracy agreed upon by the United States and the Districts. The parties shall examine. test and service their respective devices regularly to assure their accuracy. Either party may inspect the measuring devices installed, operated and maintained by the other party at any reasonable time. The party operating those devices shall promptly correct any deficiencies in those devices noted during such inspections.

EXCHANGE OF OPERATIONAL DATA

6. (a) On a daily basis, the United States shall provide the Districts with operational data regarding New Melones Dam and Reservoir and Project water requirements and the Districts shall provide the United States with operational data regarding Tulloch and Goodwin Dams and Reservoirs. The operational data shall include, as a minimum, reservoir storage, computed inflow, total releases from the facility, and changes in storage.

(b) Beginning with February of each year, after the Bureau has provided its preliminary forecast of inflow in accordance with paragraph 4 of the 1988 Agreement. the Districts shall provide the United States with a forecast of diversions for the irrigation season. Said forecast shall be updated by the end of each month during the irrigation season. Diversion forecasts shall include estimated monthly diversions to the Districts' canals from Goodwin Dam.

(c) On or before December 31 of each year, the parties shall exchange, in writing, schedules of the maintenance and replacement work which the parties intend to perform on their respective facilities during the following calendar year, and which would affect the other party or parties. The parties shall notify each other of any proposed revision in these schedules.

(d) The United States and the Districts shall operate and maintain the telemetry equipment purchased and installed in accordance with Contract No. 2-07-20-x0242. as amended. a copy of which is attached hereto as Exhibit B.

INCREASED OPERATING COSTS

7. (a) The United States shall reimburse the Districts for any reasonable increased costs incurred by them subsequent to November 20, 1979 resulting from the operation of Tulloch Reservoir as an afterbay for the New Melones Project and/or Goodwin Dam for regulation and diversion of Project Water. The costs incurred by the Districts as a result of the of diversion of any Project Water from Goodwin Reservoir shall be addressed in a separate agreement between the Districts and the user of the Project Water.

(b) Within 60 days after the signing of this Agreement, the Districts shall submit to the Contracting Officer, in such detail as he/she shall reasonably require, a statement of such costs incurred by the Districts due to operation of New Melones Dam and Reservoir through September 30, 1987.

(c) Within 60 days after the signing of this Agreement, the Districts shall submit to the Contracting Officer, in such detail as he/she shall reasonably require, an estimate of such costs, if any, anticipated to be incurred by the Districts beginning October 1, 1988 through the next three succeeding water years: including the Districts' share of the anticipated costs of operating the telemetry equipment used jointly by the United States and the District. On or before March 1 of each water year thereafter, the Districts shall submit to the Contracting Officer a similar estimate of such costs for the three succeeding water years. These estimates shall be based on operating plans submitted by the United States to the Districts by February 1 of each year.

(d) On or before December 31, following the signing of this Agreement, and on or before each succeeding December 31, the Districts shall submit to the Contracting Officer in such detail as he/she may require, a statement of such costs actually incurred by the Districts, if any, during the preceding water year.

(e) The Contracting Officer shall reasonably review and approve the payment of such costs.

(f) The United States shall, within 90 days of receipt of the statements described in Subarticles 7(b) and 7(d) above, subject to the appropriation of funds, reimburse the Districts for such costs, which are approved by the Contracting Officer. All such costs to the Districts approved by the Contracting Officer, which are in excess of appropriated funds shall be included in the statements described in Subarticles 7(b) and 7 (d) submitted for the succeeding years' expenses:

Provided, That the parties reserve all their respective rights, remedies and defenses with regard to the disapproval by the United States of any such costs remaining unpaid and the timeliness of the United States payments of such costs.

RECORDS

8. The parties hereto shall maintain adequate and appropriate operational records for their facilities, such records to be subject at reasonable times for inspection by authorized representatives of either party.

UNCONTROLLABLE FORCE - HOLD HARMLESS

9. No party shall be considered to be in default of any obligation assumed hereunder, if prevented from fulfilling such obligation by reason of uncontrollable forces, including drought, flood, earthquake, storm, lightning, fire, epidemic, war, riot, civil disturbance, sabotage, and restraint by court of public authority, which by exercise of due diligence and foresight, such party could not reasonably have been expected to avoid. Either party rendered unable to fulfill any obligation by reason of uncontrollable forces shall exercise due diligence to remove such inability with all reasonable dispatch. This paragraph shall not be applicable to the 1988 Agreement.

Additional Tulloch/Goodwin Hydroelectric Facilities

10. This Agreement is entered into in light of the following facts:

   (a) The reauthorization of the New Melones Project in Section 203 of the Flood Control Act of 1962 (P.L. 87-874, 76 Stat. 1173) did not include authorization for construction by the United States of powerplants at Tulloch or Goodwin Dams and the United States does not object, at this time, to such construction by the Districts.

   (b) The Districts have invested substantial monies in the development of the necessary permits and plans for development and installation of:

      (i) power generation facilities utilizing the power head at Goodwin Reservoir; and

      (ii) additional generating capacity at Tulloch Reservoir to provide for the passage of additional water through the power generation facilities in lieu of spilling water over Tulloch spillway.

(c) At such time as the Districts have finalized their plans for such facilities, they shall submit those plans to the United States to provide for the coordinated use and operation of the facilities described in Paragraph 10(b) with the New Melones Project. Any terms of this Agreement required to be modified and/or new terms added as a result, shall be incorporated herein by mutual consent.

OFFICIALS NOT TO BENEFIT

11. No member of or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this Agreement or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

ASSIGNMENT LIMITED - SUCCESSORS AND ASSIGNS OBLIGATED

12. The provisions of this Agreement shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this Agreement or any right or interest therein shall be valid until approved in writing by the Contracting Officer.

CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS

13. The expenditure or advance of any money or the performance of any work by the Districts hereunder which may require appropriation of money by the Congress or the allotment of funds shall be contingent upon such appropriation or allotment being made. The failure of the Congress to appropriate funds or the absence of any allotment of funds shall not relieve the Districts from any obligation under this Agreement. No liability shall accrue to the United States in case such funds are not appropriated or allotted.

NOTICES

14. Unless specifically otherwise provided for in this Agreement, any notice, demand, or request authorized or required by this Agreement, excepting operational communications, shall be deemed to have been given, on behalf of the Districts, when mailed, postage prepaid, or delivered to the Regional Director, Mid-Pacific Region, Bureau of Reclamation, 2800 Cottage Way, Sacramento, CA 95825, and on behalf of the United States, when mailed, postage prepaid, or delivered to the Board of Directors of the following:

Tri Dam Project
Star Route 1303
Sonora, CA 95370

Oakdale Irrigation District
Post Office Box 188
Oakdale, California 95361

South San Joaquin Irrigation District
11011 East Highway 120
Manteca, CA 95336

The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed the day and year first hereinabove written.

THE UNITED STATES OF AMERICA

By [signature]

Acting Regional Director, Mid-Pacific Region
Bureau of Reclamation

OAKDALE IRRIGATION DISTRICT

By [signature]
President

Attest:

[signature: Eugene O. Bergeron]
Secretary

SOUTH SAN JOAQUIN IRRIGATION DISTRICT

By [signature]
President

Attest:

[signature]
Secretary

RESOLUTION NO. 88-312:
RESOLUTION DECLARING EMERGENCY PURSUANT
TO CALIFORNIA ENVIRONMENTAL QUALITY ACT

WHEREAS, the Oakdale Irrigation District and the South San Joaquin Irrigation Districts hold extensive water rights to the flows of the Stanislaus River, and those Districts did in 1972 enter into a Stipulation and Agreement with the Bureau of Reclamation of the United States Department of Interior providing for the recognition of those water rights; and

WHEREAS, the Oakdale Irrigation District and the South San Joaquin Irrigation Districts have pursuant to the rights recognized in the 1972 Stipulation and Agreement an entitlement to the full inflow into New Melones Reservoir up to the total of 654,000 acre-feet in any water year; and

WHEREAS, during the 1987 and 1988 water years the inflow into New Melones Reservoir is approximately one half of such amount and provides an inadequate amount of water to irrigate the lands within the boundaries of the respective Districts without supplemental water supplies or storage of water; and

WHEREAS, the Department of Interior, Bureau of Reclamation has proposed that if the Oakdale Irrigation District and South San Joaquin Irrigation District will enter into a modification of the 1972 Stipulation providing for a reduction in the maximum amounts of inflow which may be diverted by the Districts by 54,000 acre-feet in each water year, the Bureau of Reclamation will provide to the Districts during the 1988 water year and in each water year hereafter in which the inflow is less than 600,000 acre feet, an amount equal to one third of the shortfall in water inflow below 600,000 acre-feet; and

WHEREAS, the Bureau of Reclamation has further asked that as a condition of such stipulation and the receipt of up to an additional 100,000 acre-feet during the 1988 water year (provided it can be utilized prior to October 1, 1988) and a similar amount in similar future drought conditions that the Districts recognize the right of the Bureau in the operation of New Melones Reservoir to release waters for generation by the Districts at Tulloch Reservoir with the Districts accepting such releases in satisfaction of the Districts' prior power generation rights; and

WHEREAS, the Bureau of Reclamation has further proposed a conservation account which would permit water saved in any year to be carried forward under certain restrictive conditions into later dry years.

1. THE BOARD OF DIRECTORS OF THE OAKDALE IRRIGATION DISTRICT DOES HEREBY FIND, DECLARE AND RESOLVE AS FOLLOWS:

a. There is an emergency condition within the Oakdale Irrigation District in that the water supplies available to the District are inadequate to permit any irrigation of lands or water supply for any purposes after August 18, 1988. The lack of water thereafter will result in the loss of permanent pasture, permanent tree crops if there is no alternative water supply and the loss and damage to annual crops for which there is no alternative water supply. Unless water can be provided, the approximately 116,014 acres irrigated within the Districts will be without water supply unless the lands have alternative onsite water supplies available to them.

b. The lack of water creates a severe economic hardship to the landowners and water users within the boundaries of the District in that they cannot continue to raise the crops planted upon the property without alternative water supplies which in general are more expensive and often prohibitively expensive in light of the crop value.

c. The emergency extends to and includes the potential of future drought years upon the Stanislaus River in which the same conditions will reoccur. The project of entering into a revised stipulation providing additional waters in drought years and less maximum entitlement in more abundant water years poses the possibility of eliminating or reducing emergency drought conditions within the District both in the short term and long term.

d. Unless action is taken to provide for additional waters to the lands within the Oakdale Irrigation District in 1988, damage to crops, reduction in the value of real property and economic hardship to the landowners and residents within the District will occur immediately and in similar circumstances in future drought years.

2. The Board of Directors having found each of the above findings to be true and correct, the Board does hereby on the basis thereof, declare that an Emergency exists as defined in Section 21060.3 of the California Administrative Code in that there is a "sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to property.."

3. The Board of Directors does hereby resolve that the Secretary is authorized to execute on behalf of the Board the attached Notice of Exemption to cause the filing and posting of that Notice together with this Resolution and the taking of all other steps and measures to satisfy the requirements of the California Environmental Quality Act in regard and respect to the proposed project of executing an Amendment of the 1972 Stipulation and Agreement by executing the 1988 Agreement and Stipulation together with the agreement for provision

of water pursuant to such 1988 Agreement during the water year ending October 1, 1988 and further executing the Operating Agreement for the Tulloch Reservoir and Goodwin Reservoir.

Adopted this 24th day of August 1988 by the following vote:

Ayes: Directors Kuhlman, Van Lier, Van Ruiten and Webb

Noes: None

Abstain: None

Absent: Director Lutz

D. E. Kuhlman, President
Board of Directors

Eugene O. Bergeron, Secretary
Oakdale Irrigation District

Agreement and Stipulation

This Agreement and Stipulation is made by and between the United States of America, by and through the United States Department of the Interior, Bureau of Reclamation, Mid-Pacific Region, hereinafter referred to as the "United States", and the Oakdale Irrigation District and the South San Joaquin Irrigation District, hereinafter referred to as the "Districts".

WITNESSETH:

WHEREAS, the United States has constructed New Melones Dam and Reservoir and is operating it in conjunction with other facilities of the Central Valley Project (CVP) and other facilities on the Stanislaus River, and

WHEREAS, said Dam and Reservoir inundated the pre-existing Melones Dam and Reservoir of the Districts, and

WHEREAS, the Districts and the United States entered into an Agreement and Stipulation regarding the Districts' water rights on the Stanislaus River on October 24, 1972, and

WHEREAS, the following is substituted for that Agreement and Stipulation.

NOW, THEREFORE, THE PARTIES FURTHER AGREE AS FOLLOWS:

The October 24, 1972 Agreement and Stipulation is hereby superseded and in recognition of the water rights of the Districts, the United States will deliver each water year to the Districts for diversion at Goodwin Diversion Dam the following quantity of water:

1. The inflow to New Melones plus the amount derived by the following formula: (600,000 - inflow) divided by 3: limited to a maximum entitlement of 600,000 acre-feet of water each water year. The inflow used herein is the total inflow into New Melones Reservoir during the water year, expressed in acre-feet, as computed by the Bureau of Reclamation Central Valley Operations Coordinating Office in consultation with the Districts.

2. The water year shall be from October 1 of each year through September 30 of the following year.

3. For the purposes of estimating the amount of water available for the Districts, the Bureau of Reclamation will furnish a forecast in April of the inflow to New Melones Reservoir for the water year. Preliminary forecasts will be made available to the Districts in February and March.

4. Commencing September 30, 1989 and at the close of each water year thereafter, the Districts' conserved water, for that water year, shall be computed as the difference between the Districts' entitlement, as computed in paragraph 1 above, and the water delivered to the Districts at Goodwin Dam. The Districts' conserved water may be stored in New Melones Reservoir up to a cumulative total amount of 200,000 acre-feet. Said conserved water may be used by the Districts, in whole or part in any subsequent water year, to augment their entitlement, for that water year, as computed in paragraph 1 and may be utilized in the same manner as water made available to the Districts under paragraph 1.

Provided; That, in the event water is released for flood control purposes, the Districts' conserved water stored in New Melones Reservoir will be the first water so released.

Provided Further; That, in any year CVP users taking water from the Stanislaus River are being assessed shortages to their firm contractual supplies, the Districts may not use conserved water to provide total diversions in excess of 450,000 acre-feet unless the quantity derived by applying the shortage percentage being assessed to the CVP users taking water from the Stanislaus River to Districts' 600,000 acre-feet entitlement provides a greater amount.

Provided Further; That in any case, the Districts' total diversions shall not exceed 600,000 acre-feet in any one water year.

Provided Further; That, the term "water released for flood control purposes" as used herein is water released from New Melones Reservoir to maintain the flood control criteria as defined by the United States Corps of Engineers [1/], and such water which is released is in excess of water needed to satisfy all requirements for fish and wildlife, water quality, downstream prior rights, CVP contracts for use of water from the Stanislaus River, and operating agreements between the United States and others. Any other water released from New Melones Reservoir, including but not limited to excess anticipatory flood control releases, which based upon subsequent events would not have been necessary to maintain the flood control criteria referred to above, will not be considered as water released for flood control purposes. At least seven days advance notice shall be provided to the Districts prior to release of any Districts' conserved water during the months of September and October for flood control purposes.

5. The amounts of water specified in paragraphs 1 and 4 above, are derived as an equitable satisfaction of all Districts' consumptive water rights affected by the operation of New Melones Dam and Reservoir including, but not limited to, the Districts' storage of water in Melones,

1/ "New Melones Dam and Lake, Stanislaus River, California, Report on Reservoir Regulation for Flood Control, Appendix V, to Master Manual of Reservoir Regulation, San Joaquin River Basin, California," dated January, 1980, along with any subsequent revisions.

Tulloch and Woodward Reservoirs, evaporation from Melones, Tulloch, and Goodwin Reservoirs and accretions and losses to the Stanislaus River flows between New Melones and Goodwin Dams. The United States will make the quantity of water specified in paragraph 1 and 4 above available to the Districts as requested at any time during the water year. However, the Districts are responsible for restricting the total quantity of water used during the water year, as measured at the South San Joaquin Canal, near Knights Ferry (USGS Gage #11300500) and the Oakdale Canal near Knights Ferry (USGS #11301000), to the amount determined available under the terms of this agreement. This Agreement and Stipulation shall not subject the water provided pursuant to paragraph 1 and 4 to payment by the Districts or to the provisions of the Federal Reclamation Reform Act of 1982 or Federal reclamation law.

6. The Districts have rights under water right Applications 12614, 12783 and 13310 and permits and licenses issued thereon. These instruments entitle the Districts to Stanislaus River water for power generation purposes at the Districts' power plants. The parties agree nothing contained within this Agreement and Stipulation abrogates, limits or diminishes those rights. So long as the United States shall perform each and every term and provision of this Agreement and Stipulation, the Districts will accept the amounts, timing and quantities of water released from New Melones Reservoir through Tulloch Reservoir and shall not object to, protest or complain that those releases do not satisfy or are a derogation or violation of the said power generation water rights of the Districts. Districts shall have the right to utilize the amounts of water specified in paragraphs 1 and 4 for power generation purposes under their said power generation permits and licenses, now existing, and as may be subsequently amended, or under power generation permits or licenses hereafter acquired by the Districts. In addition, water released from New Melones Reservoir through Tulloch Reservoir to meet obligations of the United States, including but not limited to, releases for downstream water quality and fish requirements, releases for parties and agencies contracting with the United States and water released for flood control purposes may be used by the Districts in the exercise of their said power generation water rights.

Provided; That, none of the parties to this Agreement and Stipulation shall be deemed in any proceeding before the Federal Energy Regulatory Commission, by entering into this Agreement and Stipulation, to have waived any claims or defenses regarding the Districts' or the United States entitlements to compensation for the benefits and/or detrimental impacts or offsets against such benefits or detrimental impacts of the New Melones Unit of the Central Valley Project upon the Districts' rights.

This Agreement and Stipulation shall become effective and supersede the Agreement and Stipulation of October 24, 1972 upon and at such time as the State Water Resources Control Board issues an order or otherwise provides that the permits of the United States of America issued pursuant to Decision 1422 shall be subject to this 1988 Agreement and Stipulation in the place of the 1972 Agreement and Stipulation.

Provided Further; That, if the State Water Resources Control Board so acts but imposes any new conditions or modifies any water right permit or license of the Districts or of the United States other than as agreed to herein, the affected party or parties shall have the right to withdraw from this Agreement and Stipulation by giving the other party or parties thirty days advance written notice.

Dated as of this 30th day of Aug., 1988.

THE UNITED STATES OF AMERICA

By [signature]

Acting Regional Director, Mid-Pacific Region
Bureau of Reclamation

OAKDALE IRRIGATION DISTRICT

By [signature]
President

Attest:

[signature]
Secretary

SOUTH SAN JOAQUIN IRRIGATION DISTRICT

By [signature]
President

Attest:

[signature]
Secretary

RESOLUTION NO. 88-312:
RESOLUTION DECLARING EMERGENCY PURSUANT
TO CALIFORNIA ENVIRONMENTAL QUALITY ACT

WHEREAS, the Oakdale Irrigation District and the South San Joaquin Irrigation Districts hold extensive water rights to the flows of the Stanislaus River, and those Districts did in 1972 enter into a Stipulation and Agreement with the Bureau of Reclamation of the United States Department of Interior providing for the recognition of those water rights; and

WHEREAS, the Oakdale Irrigation District and the South San Joaquin Irrigation Districts have pursuant to the rights recognized in the 1972 Stipulation and Agreement an entitlement to the full inflow into New Melones Reservoir up to the total of 654,000 acre-feet in any water year; and

WHEREAS, during the 1987 and 1988 water years the inflow into New Melones Reservoir is approximately one half of such amount and provides an inadequate amount of water to irrigate the lands within the boundaries of the respective Districts without supplemental water supplies or storage of water; and

WHEREAS, the Department of Interior, Bureau of Reclamation has proposed that if the Oakdale Irrigation District and South San Joaquin Irrigation District will enter into a modification of the 1972 Stipulation providing for a reduction in the maximum amounts of inflow which may be diverted by the Districts by 54,000 acre-feet in each water year, the Bureau of Reclamation will provide to the Districts during the 1988 water year and in each water year hereafter in which the inflow is less than 600,000 acre feet, an amount equal to one third of the shortfall in water inflow below 600,000 acre-feet; and

WHEREAS, the Bureau of Reclamation has further asked that as a condition of such stipulation and the receipt of up to an additional 100,000 acre-feet during the 1988 water year (provided it can be utilized prior to October 1, 1988) and a similar amount in similar future drought conditions that the Districts recognize the right of the Bureau in the operation of New Melones Reservoir to release waters for generation by the Districts at Tulloch Reservoir with the Districts accepting such releases in satisfaction of the Districts' prior power generation rights; and

WHEREAS, the Bureau of Reclamation has further proposed a conservation account which would permit water saved in any year to be carried forward under certain restrictive conditions into later dry years.

1. THE BOARD OF DIRECTORS OF THE OAKDALE IRRIGATION DISTRICT DOES HEREBY FIND, DECLARE AND RESOLVE AS FOLLOWS:

a. There is an emergency condition within the Oakdale Irrigation District in that the water supplies available to the District are inadequate to permit any irrigation of lands or water supply for any purposes after August 18, 1988. The lack of water thereafter will result in the loss of permanent pasture, permanent tree crops if there is no alternative water supply and the loss and damage to annual crops for which there is no alternative water supply. Unless water can be provided, the approximately 116,014 acres irrigated within the Districts will be without water supply unless the lands have alternative onsite water supplies available to them.

b. The lack of water creates a severe economic hardship to the landowners and water users within the boundaries of the District in that they cannot continue to raise the crops planted upon the property without alternative water supplies which in general are more expensive and often prohibitively expensive in light of the crop value.

c. The emergency extends to and includes the potential of future drought years upon the Stanislaus River in which the same conditions will reoccur. The project of entering into a revised stipulation providing additional waters in drought years and less maximum entitlement in more abundant water years poses the possibility of eliminating or reducing emergency drought conditions within the District both in the short term and long term.

d. Unless action is taken to provide for additional waters to the lands within the Oakdale Irrigation District in 1988, damage to crops, reduction in the value of real property and economic hardship to the landowners and residents within the District will occur immediately and in similar circumstances in future drought years.

2. The Board of Directors having found each of the above findings to be true and correct, the Board does hereby on the basis thereof, declare that an Emergency exists as defined in Section 21060.3 of the California Administrative Code in that there is a "sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to property.."

3. The Board of Directors does hereby resolve that the Secretary is authorized to execute on behalf of the Board the attached Notice of Exemption to cause the filing and posting of that Notice together with this Resolution and the taking of all other steps and measures to satisfy the requirements of the California Environmental Quality Act in regard and respect to the proposed project of executing an Amendment of the 1972 Stipulation and Agreement by executing the 1988 Agreement and Stipulation together with the agreement for provision

of water pursuant to such 1988 Agreement during the water year ending October 1, 1988 and further executing the Operating Agreement for the Tulloch Reservoir and Goodwin Reservoir.

Adopted this 24th day of August 1988 by the following vote:

Ayes: Directors Kuhlman, Van Lier, Van Ruiten and Webb

Noes: None

Abstain: None

Absent: Director Lutz

D. E. Kuhlman, President
Board of Directors

Eugene O. Bergeron, Secretary
Oakdale Irrigation District

Categorical Exclusion Checklist

Project: 1988 Agreement and Stipulation Between the USBR and Oakdale and South San Joaquin Irrigation Districts for use of Water from New Melones Reservoir

Date: 8/29/88

Nature of Action: In the 1950's, the Oakdale and South San Joaquin Irrigation Districts formed the Tri-Dam Project and constructed three reservoirs on the Stanislaus River. One of these reservoirs, Tulloch Dam and Reservoir, was below the proposed site of the federally authorized New Melones Dam and Reservoir. One of the requirements in the power license issued by the Federal Power Commission, now the Federal Energy Regulatory Commission, was that the Districts enter into an agreement with the United States for the use of Tulloch Reservoir as an afterbay for the New Melones powerplant.

A 1972 Agreement and Stipulation was entered into among the Districts and the United States to resolve the districts protest of the granting of water rights to the United States for the operation of the New Melones Project. This agreement has been difficult to administer and a dispute arose regarding its interpretation. To resolve this dispute the 1972 Agreement has been renegotiated. The 1988 Agreement and Stipulation defines the prior water rights of the Districts and will be used to determine the water available to the Districts in the operation of the New Melones Unit of the Central Valley Project (CVP).

The 1988 Agreement will provide for a more dependable water supply to the Districts by reducing their maximum entitlement and making that water available to the Districts by guaranteeing an additional amount of water to the Districts from New Melones Reservoir in dry periods. The net result of the Agreement is that at full development, New Melones Reservoir may be at higher elevations during normal and wet years and will be at the same level in drier periods.

The CVP will realize a slight increase in yield of approximately 7,000 acre-feet of water. Other benefits will be additional instream flows in some dry years under the interim agreements with the California Department of Fish and Game and the South Delta Water Agency. Under the 1988 Agreement, releases for instream flows will be greater than under the 1972 Agreement.

The Agreement for the Operation of New Melones Dam and Reservoir will not result in any adverse environmental impact. It is an agreement as to the manner in which the parties to the Agreement will operate their respective project facilities, monitor and exchange data on operations, and pay the increased operating costs due to the United States operation of the New Melones Unit of the CVP.

Exclusion Category: D.4 Approval and execution of water service contracts for long-term water use where the action does not lead to long-term changes and where the impacts are expected to be localized.

Evaluation of criteria for Categorical Exclusion

1. This action or group of actions would have a significant effect on the quality of the human environment	No X	Uncertain	Yes
2. This action or group of actions would involve unresolved conflicts concerning alternative uses of available resources	No X	Uncertain	Yes

Evaluation of exceptions to actions within Categorical Exclusion

1. This action would have significant adverse effects on public health or safety	No X	Uncertain ___	Yes ___
2. This action would affect unique geographical features as: wetlands, wild or scenic rivers, refuges, floodplains, etc.	No X	Uncertain ___	Yes ___
3. The action will have highly controversial environmental effects	No X	Uncertain ___	Yes ___
4. The action will have highly uncertain environmental effects or involve unique or unknown environmental risk	No X	Uncertain ___	Yes ___
5. This action will establish a precedent for future actions	No X	Uncertain ___	Yes ___
6. This action is related to other actions with individually insignificant but cumulatively significant environmental effects	No X	Uncertain ___	Yes ___
7. This action will affect properties listed or	No X	Uncertain ___	Yes ___

eligible for listing in
the National Register
of Historic Places

8. This action will affect a species listed or proposed to be listed as endangered or threatened — No X Uncertain ____ Yes ____

9. This action threatens to violate Federal, State, local or tribal law or requirements imposed for protection of the environment — No X Uncertain ____ Yes ____

NEPA Action: Categorical Exclusion X EA ____ EIS ____

Explanation and/or remarks:

Preparer's Name and Title: William D. Payne, Environmental Specialist
Date: August 29, 1988

Regional Archeologist concurrence with item 7: [signature]

Concur: [signature] Date: 8/29/88
Division/Office Chief

Concur: Roderick M Hall Date: 8/29/88
Regional Environmental Officer

disk:data disk; file:tridam.cec

ATTACHMENT 9

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

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ARTICLE

Environmental Factors Associated with the Upstream Migration of Fall-Run Chinook Salmon in a Regulated River

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Abstract
We examined upstream migration patterns of adult Chinook Salmon *Oncorhynchus tshawytscha* in relation to environmental factors and two management actions (installation of a rock barrier at a distributary and managed pulse flows). Data was collected using a portable resistance board weir and a Vaki Riverwatcher system that provided accurate daily counts of fall-run Chinook Salmon on their spawning migration. Akaike's information criterion and multimodel inferential approaches, as well as generalized additive models, were used to assess the relative influence of water temperature, flow, moon illumination, weather, operation of a rock barrier, and managed pulse flows to explain the magnitude of daily counts and proportions of Chinook Salmon observed at the weir. Over the 12-year study period (2003–2014), we observed 38,206 Chinook Salmon. The installation of a rock barrier in the lower reaches of the San Joaquin River had positive and consistent influences on daily counts in the years it was installed. Although managed pulse flows to stimulate upstream migration have been used since the early 1990s, our analyses found managed pulse flows only appeared in the top generalized linear models in 2 of the 11 complete years of data analyzed. Managed pulse flows resulted in immediate increases in daily passages, but the response was brief and represented a small portion of the total run. A strong nonlinear response between migratory activity and discharge levels was observed for Chinook Salmon, indicating no additional increase in daily counts when pulse flows exceeded 20 m^3/s. Current management requirements in the Stanislaus River exceed this level and adjustment should be considered based on the findings of this study, particularly given the need to balance beneficial uses of a limited water supply. This study provides a scientific approach to determine biologically relevant flow prescriptions for upstream migration of fish in regulated streams.

Nearly all rivers in California's Central Valley are regulated to some extent for hydroelectric, agricultural, recreational, and/or flood control purposes (Kelley 1989; Mount 1995; Hundley 2001). The long history of habitat degradation and impacts has reduced the overall abundance of native salmonids within the basin (Yoshiyama et al. 1998, 2001; Lindley et al. 2004; Moyle et al. 2008). As a result, winter- and spring-run Chinook Salmon *Oncorhynchus tshawytscha* and the Central Valley distinct population segment of steelhead *O. mykiss* are listed under the U.S. Endangered Species Act (NMFS 1989, 1994, 1999, 2006).

In regulated rivers, pulse flows have been used to mimic natural hydrologic processes for habitat creation and maintenance and/or elicit migration and spawning of fish. Notable examples can be found throughout North America and include pulse flows on the Colorado River to mobilize sediments (Patten et al. 2001; Schmidt et al. 2001) and on the Platte River to restore and create habitats for populations of whooping crane *Grus americana*, sandhill crane *G. canadensis*, interior least tern *Sterna antillarum*, and piping plover *Charadrius melodus* (Freeman 2012). In California, pulse flows have been used to minimize the risk and spread of disease among

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Chinook Salmon in the lower Klamath River (Strange 2007) and to restore and create habitats on the Trinity River to benefit salmonids (Beechie et al. 2015).

An extensive body of literature exists on the relationship between flows and fish migration patterns, and numerous studies have focused on Atlantic Salmon *Salmo salar* and sea-run Brown Trout *S. trutta* (Trépanier et al. 1996; Thorstad et al. 2003, 2008), as well as on Chinook Salmon and steelhead (Quinn et al. 1997; Strange 2012; Hasler et al. 2014). Most of the previous studies have not found clear associations between flow and fish passage and have shown high variability both within and between rivers (Milner et al. 2012; Jones and Petreman 2014). Other environmental factors, such as water temperature, meteorological events (rain events or changes in atmospheric pressure), and moon illumination, have also been examined to explain fish migration patterns (Strange 2010; Hasegawa 2012; Slavík et al. 2012).

In the San Joaquin River and the associated Sacramento–San Joaquin Delta (hereafter “Delta”), many other alterations and subsequent management actions may influence the migratory patterns of adult Chinook Salmon. Besides flow, low dissolved oxygen levels, flow routing exacerbated by pumping facilities, and periodic installation of flow barriers may be additional factors that affect migrations of Chinook Salmon within the basin. Previous research in the San Joaquin River basin has suggested delayed upstream passage of migrating Chinook Salmon during periods of low dissolved oxygen levels and high water temperatures in the lower San Joaquin River (Hallock et al. 1970). In the Stanislaus River, a major tributary of the San Joaquin River, managed pulse flows have been conducted every October since the fall of 1992. However, analyses have not been conducted to determine the biological responses of Chinook Salmon within the Stanislaus River to managed pulse flows.

In this study, we analyzed adult Chinook Salmon migration data collected over 11 complete migration seasons to investigate factors (flow and nonflow) that were hypothesized to influence the migration of salmonids into the Stanislaus River. Objectives of this study were to (1) explore factors that have influenced the daily upstream passages of fall-run Chinook Salmon, with particular focus on managed pulse flows, (2) evaluate the relative influence of those factors, and (3) describe broad-scale relationships between environmental conditions in the watershed and run timing in the Stanislaus River. Findings of the study will contribute to an improved understanding of the efficacy of managed pulse flows for adult Chinook Salmon upstream migration within the context of a broader suite of flow and nonflow factors.

STUDY SITE

The San Joaquin River drains the southern portion of California’s Central Valley, and its major tributaries include the Stanislaus, Tuolumne, and Merced rivers. The Stanislaus River drains an area of about 2,849 km^2, yielding an average annual unimpaired runoff of about 1.1 million acre-feet (1 acre-foot = 1,233.5 m^3). Goodwin Dam (completed in 1912) and New Melones Dam (1979), along with 30 other smaller dams in the watershed, have all contributed to alteration of the Stanislaus River hydrograph (Schneider et al. 2000). With a capacity of 2.4 million acre-feet, roughly 2.2 times the average annual run-off in the Stanislaus River basin (CDWR 1994), New Melones Reservoir has reduced the frequency and magnitude of winter rainfall peaks, snowmelt peaks, and snowmelt recession limbs (Schneider et al. 2000; Kondolf et al. 2001).

Anadromous fish habitat is accessible up to Goodwin Dam at river kilometer (rkm) 96.9 (measured from the confluence with the San Joaquin River; Figure 1). The Stanislaus weir (rkm 52.6) is located downstream from the majority of spawning habitat for Chinook Salmon, although spawning has been occasionally documented to occur up to approximately 2 km below the weir (FISHBIO, unpublished data). In most years, conditions for monitoring fish passage with the weir and the Vaki Riverwatcher infrared camera system (hereafter “Riverwatcher”; Camera Riverwatcher model, Vaki Aquaculture Systems, Kópavogur, Iceland) are ideal due to relatively low discharge patterns and clear water. No major tributaries are located below Goodwin Dam, and turbidity typically remains relatively low, even during rainfall events, due to upstream dams. Eighty-four percent of instantaneous daily turbidity levels measured at the weir from 2003 to 2013 (n = 2,160) were less than 3 NTU and 96% were less than 10 NTU (FISHBIO, unpublished data).

METHODS

Field Methods

Historically, a variety of methods to estimate escapement of Chinook Salmon (typically mark–recapture carcass surveys) have been used throughout the basin with varying degrees of accuracy (Carlson and Satterthwaite 2011; Bergman et al. 2012). To provide more accurate escapement estimates for the Stanislaus River and to provide more precise information on run timing, an Alaskan-style resistance board weir (hereafter “weir”; Stewart 2002, 2003) and Riverwatcher were deployed annually from 2003 to 2014. Prior to installation, the Riverwatcher was tested for functionality by passing known objects through the opening where fish pass through the weir (i.e., the swim channel) and Riverwatcher system. The Riverwatcher produces an infrared beam between two plates, and interruption of the infrared beam by a passing fish or object triggers the scanner to record a silhouette image to an onsite computer. Specific technical details and accuracy assessments of the Riverwatcher can be found in Shardlow and Hyatt (2004) and Baumgartner et al. (2012). The weir and Riverwatcher were installed prior to the adult Chinook Salmon migration in each year (median date, September 9) and operated at least through the end of the Chinook Salmon spawning run (typically around late December). The only exception was during the fall of 2011, when flood control releases prevented installation of the weir until November 8, 2011.

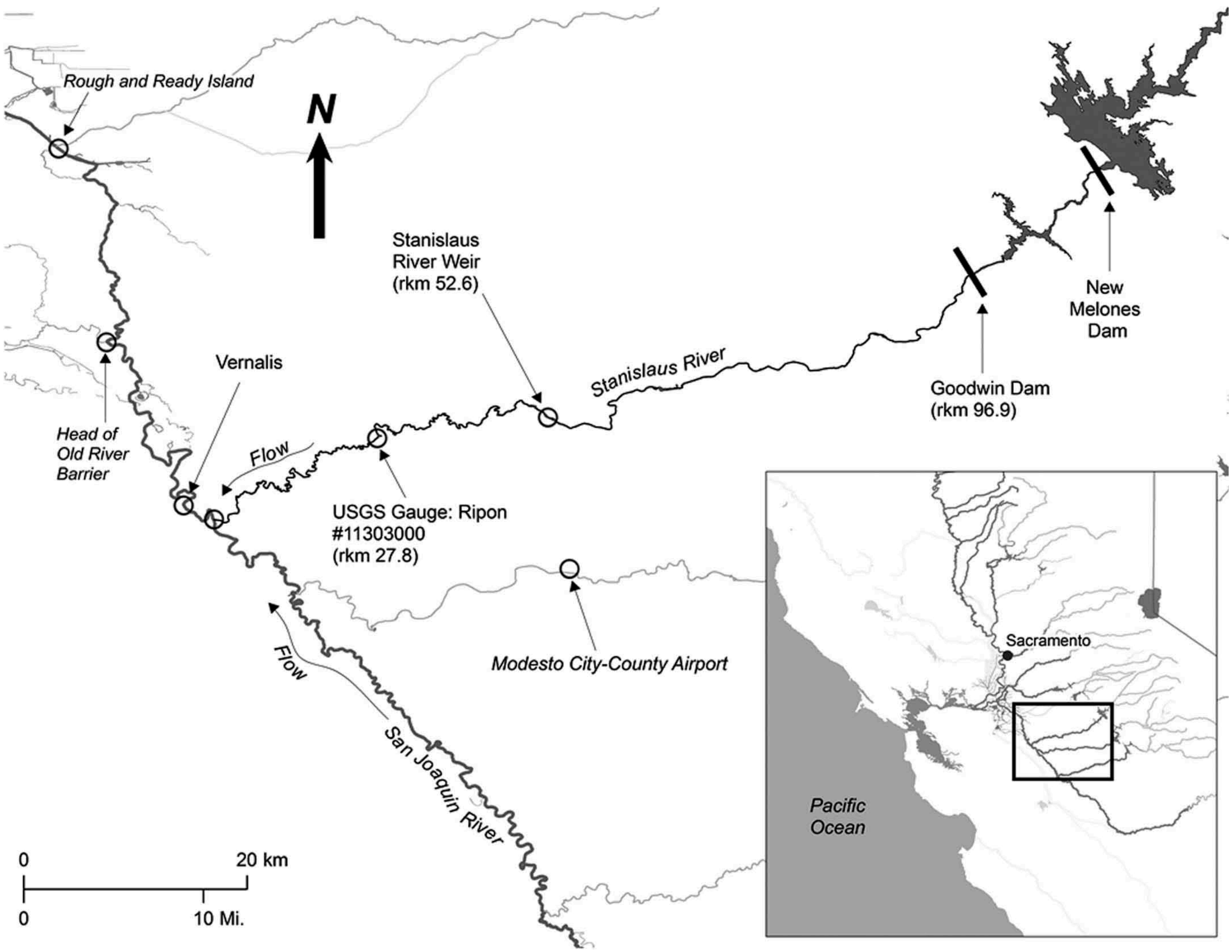

FIGURE 1. The Stanislaus River with locations of the Stanislaus River weir, Goodwin Dam, and water quality monitoring stations.

Video Review and Data Preparation

The Riverwatcher infrared scanner provides silhouettes and still photographs of passing objects within the swim channel. When detection of an object occurs, the system records the time, speed, direction, and depth (i.e., body depth of fish) of any object. Total length is estimated by applying a body depth–TL relationship derived from measurements obtained from fish trapped at the weir (FISHBIO, unpublished data). Photos obtained during each passage event provide additional information on the species, sex, TL, presence or absence of an adipose fin, and condition of the fish. To ensure accurate daily counts, two experienced reviewers reviewed all silhouette images and still photographs from each passage event. For each day, the net upstream count of Chinook Salmon was calculated as the difference between the total number of upstream passages of Chinook Salmon and the total number of downstream passages of Chinook Salmon.

Three response variables were used in this study. First, daily counts of net upstream passages between September 1 and December 31 were used to standardize among monitoring periods and to capture nearly all of the migratory period of fall-run Chinook Salmon in the Stanislaus River. Nearly all of the days had a nonnegative upstream passage count. However, 4 d had negative counts (−3, −2, −1, and −1) and were changed to zeros (i.e., representing zero upstream passage) in order to be included in analyses of count data, all of which required nonnegative response variables. Second, daily proportions of Chinook Salmon (scaled by the annual abundance estimate from the weir) were scaled due to the high interannual variation in upstream passages, which ranged from 433 in 2007 to 7,061 in 2012. Finally, cumulative run metrics and the dates on which each occurred were also calculated to describe patterns in overall run timing of the population.

While there were 12 monitoring seasons across the study period, monitoring was incomplete during 2011. No data were used from 2011, unless specifically noted.

Environmental Variables

A total of 11 environmental variables were used in this study (Table 1). We used averaged daily measurements of discharge on the Stanislaus and San Joaquin rivers (measured at gauging stations located at Ripon and Vernalis; Figure 1), water temperature (measured at Ripon and Vernalis), and dissolved oxygen measurements from the San Joaquin River at Rough and Ready Island. To investigate the effect of variation of daily measurements in models to explain fish passage, we calculated the CV (SD/mean) for discharge and water temperature measurements. Moon illumination was expressed as a proportion, and data for each year were obtained from the U.S. Naval Observatory (http://aa.usno.navy.mil/data/docs/MoonFraction.php; data accessed on June 23, 2015). Precipitation (from the Modesto County Airport; Figure 1) was expressed as a daily total, and these data were included to account for potential changes in weather (i.e., changes in barometric pressure and/or cloud cover). Binary variables were used to indicate whether a managed pulse flow or the Head of Old River Barrier (HORB) was in place. The HORB, when constructed, causes a higher proportion of water to be routed into the main channel of the San Joaquin River towards the Deep Water Ship Channel (DWSC) near Rough and Ready Island (Figure 1). It has been used to improve low dissolved oxygen conditions in the DWSC in certain years (California Department of Water Resources, http://baydeltaoffice.water.ca.gov/sdb/tbp/web_pg/tempbsch.cfm), then removed when water quality conditions improve.

Each environmental variable was lagged by 0, 1, 2, 3, 5, and 7 d to account for the uncertainty in the exact location of Chinook Salmon within the watershed in relation to the weir. The range in lags was used to explore whether upstream passages of Chinook Salmon were related to changes in environmental variables that occurred from the day of to a week prior to the passage event. The limited available information on migratory rates of Chinook Salmon within the San Joaquin River basin suggests that adult salmon migrate through the lower reaches of San Joaquin River and into its tributaries (e.g., Stanislaus and Merced rivers) in approximately 2–12 d (CDFW 2014; Cyril Michel, National Oceanic and Atmospheric Organization–Fisheries, personal communication). Although not presented, we ran all data analyses with all lags to determine which lag explained the most variation in the data. We observed that shorter lags (0, 1, and 2 d) of variables closer to the weir tended to explain more variation than longer lags of the same variables. Similarly, longer lags (3, 5, and 7 d) of variables in the San Joaquin River (Vernalis and Rough and Ready Island) generally explained more variation than shorter ones. The final set of variables and lags are described in Table 1.

Data Analysis

Seasonal run timing.—Correlation analyses were used to examine correlation between the dates when 5, 10, 25, and 50% of the cumulative run passed the weir and the dates when certain temperature and dissolved oxygen criteria or objectives were met within the San Joaquin River. Dissolved oxygen levels at Rough and Ready Island are managed to remain above 6.0 mg/L from September to November and above 5.0 mg/L for the remainder of the year (RWQCB Central Valley Region 2005). We used 21, 22, and 23°C to characterize thermal regimes during the study period. Temperatures ranging from 21°C to 23°C have been cited as temperature thresholds at which migration of adult salmonids can be delayed and sublethal effects can occur (McCullough et al. 2001; Keefer et al. 2004; Richter and Kolmes 2005).

Generalized linear models.—To model associations between daily counts of upstream passages and environmental factors, we first considered using a generalized linear model (GLM) with a Poisson distribution. However, because high levels of overdispersion were observed and unrealistic coefficient estimates, a negative binomial GLM analysis was used instead ("aod" in R package; Lesnoff and Lancelot 2012). This approach was necessary to reduce overly optimistic levels of precision among associations between dependent variables and daily counts of upstream passages.

Prior to data analyses, all variables were examined for multicollinearity using variation inflation factors (Naimi 2013; "usdm" in R package). Based on the variance inflation factors and correlation analyses, we excluded the variable $X_{T,vns}$ due to the high positive correlation between it and $X_{T,rip}$ (Pearson's correlation test: $r = 0.96$, $P = 0.001$). Using the remaining 10 explanatory variables (Table 1), a total of 49 candidate models were developed to investigate associations between upstream counts of Chinook Salmon and environmental variables (Table 2). This step was used to identify potential useful models and/or variables associated with the migratory response of Chinook Salmon. The overall magnitude and direction of effect could also be estimated. The number of Chinook Salmon passing the previous day was included in all models to account for serial autocorrelation in the time-series data, similar to methods used by Binder et al. (2010).

To determine the best model or set of models with the negative binomial GLMs, model selection analyses were performed with the MuMIn package in R (Bartoń 2014). The Akaike information criterion corrected for small samples sizes (AIC_c) was used to select the most parsimonious models for each year of data examined. The AIC_c score, the differences (Δ_i) between each model and the best model, and AIC_c weights (w_i) were used to quantitatively rank each model. Models that have Δ_i values less than 2 are considered to be most supported by the data (Burnham and Anderson 2002); however, models that had Δ_i values less than 10 can also be supported in some situations. We summarized the number of models that had Δ_i <2 and Δ_i <10 (Table 1).

TABLE 1. Descriptions of 11 parameters used to explain upstream daily passages at the Stanislaus River weir (2003–2014). The number of times each variable appeared in the top model in models with ΔAIC_c <2 and ΔAIC_c <10 are also presented.

Variable	Description	Top model	ΔAIC_c <2	ΔAIC_c <10
$X_{T,rip}$	Average daily water temperature at Ripon lagged 5 d.	5	6	26
$X_{T,CV,rip}$	CV (SD/mean) of daily water temperatures at Ripon lagged 2 d.	3	5	24
$X_{Q,vns}$	Average daily discharge at Vernalis lagged 3 d.	1	3	22
$X_{Q,rip}$	Average daily discharge at Ripon lagged 2 d.	1	1	18
$X_{Q,CV,rip}$	CV of daily discharge at Ripon lagged 2 d.	0	1	12
$X_{Q,pulse}$	Indicator variable (i.e., 1 = managed pulse in effect) to denote if pulse in effect or not (lagged 2 d).	2	5	19
$X_{DO,rri}$	Average daily dissolved oxygen levels at Rough and Ready Island lagged 7 d.	2	5	24
X_{Illum}	The proportion of the moon that was illuminated (ranges from 0 to 1) lagged 7 d.	1	2	10
X_{Precip}	Total daily precipitation measured at the Modesto County Airport lagged 7 d.	2	4	14
X_{HORB}	Indicator variable (i.e., 1 = Head of Old River Barrier in place) to denote if Head of Old River Barrier in place or not (lagged 3 d).	6	7	30
X_{CDB}	Net upstream count of Chinook Salmon from day prior to date of passage.	All	All	All

To determine relative importance of variables within each model, we used multimodel inferential (MMI) analyses. For the MMI analyses, all predictor variables appeared an equal number of times (nine times) within the candidate model set, following recommendations by Burnham and Anderson (2002). Therefore, each variable was weighted equally. Specific details for model selection, model averaging, and MMI analyses can be found in Binder et al. (2010) and Burnham and Anderson (2002).

Generalized additive models.—We modeled both daily counts and proportions of upstream passages with generalized additive models (GAMs; "mgcv" in R package: Wood 2006).

TABLE 2. Candidate models used to explain upstream daily counts of Chinook Salmon migrating past the Stanislaus River weir (2003 – 2014). Subscript definitions: *CDB* = Chinook Salmon count the day before; *T,rip* = daily average water temperature from Ripon; *T,CV,rip* = daily CV of water temperature from Ripon; *Precip* = Daily precipitation total from Modesto City–County Airport; *Q,rip* = daily average discharge from Ripon; *Q,CV,rip* = daily CV of discharge from Ripon; *Q,vns* = daily average discharge from Vernalis; *Q,pulse* = indicator variable to indicate managed pulse flow at Ripon; *DO,rri* = daily average dissolved oxygen level from Rough and Ready Island; *Illum* = daily proportion of the moon illuminated; and, *HORB* = indicator variable to indicate the Head of Old River Barrier installed. Locations of each site are provided in Figure 1 and full descriptions of each variable are provided in Table 1.

(Model number) and candidate model		
(1) Null	(18) $Y = X_{CDB} + X_{T,rip} + X_{HORB}$	(35) $Y = X_{CDB} + X_{Q,rip} + X_{Q,pulse}$
(2) $Y = X_{CDB}$	(19) $Y = X_{CDB} + X_{T,rip} + X_{Illum}$	(36) $Y = X_{CDB} + X_{Q,CV,rip} + X_{T,CV,rip}$
(3) $Y = X_{CDB} + X_{T,rip}$	(20) $Y = X_{CDB} + X_{T,CV,rip} + X_{Q,pulse}$	(37) $Y = X_{CDB} + X_{Q,CV,rip} + X_{DO,rri}$
(4) $Y = X_{CDB} + X_{T,CV,rip}$	(21) $Y = X_{CDB} + X_{T,CV,rip} + X_{DO,rri}$	(38) $Y = X_{CDB} + X_{Q,CV,rip} + X_{Illum}$
(5) $Y = X_{CDB} + X_{Precip}$	(22) $Y = X_{CDB} + X_{T,CV,rip} + X_{Q,rip}$	(39) $Y = X_{CDB} + X_{Q,CV,rip} + X_{HORB}$
(6) $Y = X_{CDB} + X_{Q,rip}$	(23) $Y = X_{CDB} + X_{T,CV,rip} + X_{Q,vns}$	(40) $Y = X_{CDB} + X_{Q,CV,rip} + X_{Q,pulse}$
(7) $Y = X_{CDB} + X_{Q,CV,rip}$	(24) $Y = X_{CDB} + X_{T,CV,rip} + X_{Illum}$	(41) $Y = X_{CDB} + X_{Q,vns} + X_{Precip}$
(8) $Y = X_{CDB} + X_{Q,vns}$	(25) $Y = X_{CDB} + X_{Precip} + X_{Q,pulse}$	(42) $Y = X_{CDB} + X_{Q,vns} + X_{DO,rri}$
(9) $Y = X_{CDB} + X_{Q,pulse}$	(26) $Y = X_{CDB} + X_{Precip} + X_{DO,rri}$	(43) $Y = X_{CDB} + X_{Q,vns} + X_{Illum}$
(10) $Y = X_{CDB} + X_{DO,rri}$	(27) $Y = X_{CDB} + X_{Precip} + X_{Illum}$	(44) $Y = X_{CDB} + X_{Q,vns} + X_{HORB}$
(11) $Y = X_{CDB} + X_{Illum}$	(28) $Y = X_{CDB} + X_{Precip} + X_{HORB}$	(45) $Y = X_{CDB} + X_{T,CV,rip} + X_{HORB}$
(12) $Y = X_{CDB} + X_{HORB}$	(29) $Y = X_{CDB} + X_{Precip} + X_{Q,CV,rip}$	(46) $Y = X_{CDB} + X_{Q,pulse} + X_{Q,vns}$
(13) $Y = X_{CDB} + X_{T,rip} + X_{Q,pulse}$	(30) $Y = X_{CDB} + X_{Q,rip} + X_{DO,rri}$	(47) $Y = X_{CDB} + X_{Q,pulse} + X_{DO,rri}$
(14) $Y = X_{CDB} + X_{T,rip} + X_{DO,rri}$	(31) $Y = X_{CDB} + X_{Q,rip} + X_{Illum}$	(48) $Y = X_{CDB} + X_{T,rip} + X_{Q,pulse} + X_{DO,rri}$
(15) $Y = X_{CDB} + X_{T,rip} + X_{Q,CV,rip}$	(32) $Y = X_{CDB} + X_{Q,rip} + X_{HORB}$	(49) $Y = X_{CDB} + X_{T,CV,rip} + X_{Precip} + X_{Q,vns}$
(16) $Y = X_{CDB} + X_{T,rip} + X_{Q,vns}$	(33) $Y = X_{CDB} + X_{Q,rip} + X_{Q,CV,rip}$	
(17) $Y = X_{CDB} + X_{T,rip} + X_{Precip}$	(34) $Y = X_{CDB} + X_{Q,rip} + X_{Q,vns}$	

Generalized additive models were used to identify nonlinear or threshold types of responses and, unlike GLMs, are not constrained by assumptions about underlying distributions of the data (Wood 2006; Zuur et al. 2009). We constructed models using smoothing functions and cross validation to determine the optimal amount of smoothing for each variable. Unlike GLM data analyses, the entire data set was used for GAM analyses, which incorporated year as a random effect. In addition, the binary variables of HORB and pulse were treated as factors. To test the robustness of each relationship, we examined the residuals of each model, evaluated differing spline types (i.e., cubic regression and thin-plate), and plotted each model run with a varying amount of complexity by adjusting the number of knots (from simple, less complex smooths to increasingly complex smooths). For the count data, we also constructed models with specified assumptions about the underlying distributions of the data (i.e., Poisson, zero-inflated Poisson, or negative binomial). Similar to GLM analyses, we evaluated the GAMs based on AIC scores. All data analyses were performed in R programming language (R Core Team 2015).

RESULTS

Weir Reliability and Performance

Excluding 2011 (when weir installation was delayed due to very high flows), the weir operated more than 95% of the time between 2003 and 2014 in flows of up to 50.9 m^3/s. During each sampling season, the weir was operated between 54 (2011) and 120 d (median, 112 d). Either high flows or high amounts of debris caused at least some water to spill over the weir an average of 6 d/year. We noted that on 84 of the total 1,272 d (6.6%) when the weir was operational, the weir either had some spill (or high debris) or a problem was detected with the Riverwatcher.

Seasonal Run Timing

Across the 11 seasons of complete monitoring, the median dates of 5, 50, and 95% of cumulative passage of Chinook Salmon occurred on October 2, October 29, and December 5, respectively (Table 3). Run timing was notably consistent over the 11 years analyzed, and the difference between the earliest and latest dates for each of the 5, 50, and 95 percentiles of cumulative run passage ranged from 16 to 21 d. Run timing was latest in 2014, a year in which fall water temperatures throughout the Stanislaus River were, on average, 3°C higher. Prior to 2014, a strong negative correlation was found between the dates when 50% of the run had been observed at the weir and the dates when daily average water temperatures at Vernalis were first below 22°C ($r = -0.70$, $P = 0.035$; Figure 2).

The negative relationship suggests that warmer water temperatures at Vernalis early in the migratory period are associated with a larger portion of the Chinook Salmon run arriving at the weir earlier. However, with the inclusion of the 2014 data point, no statistical correlation was observed, as the run timing was much later in 2014 than in all other years (Figure 2).

The relationship between run timing and dissolved oxygen levels contrasted with that of temperature. A significant positive correlation was found between the dates when 50% of the run had been observed at the weir and the dates when daily average dissolved oxygen levels at Rough and Ready Island were first greater than 6.5 mg/L ($r = 0.74$, $P = 0.023$; Figure 2). No significant correlations were found between cumulative run timing and the dates when daily average dissolved oxygen levels at Rough and Ready Island were first greater than 5.0 or 6.0 mg/L, likely because these dissolved oxygen thresholds were reached very early in the migratory period (early to mid-September; Table 3).

Summary of Environmental Conditions

With the exception of 2006 and 2011, the hydrologic regime during each fall was similar across years, with daily flows averaging 7.7 m^3/s and ranging from 6.0 to 9.9 m^3/s until mid-October (Figure 3). In those 2 years, flood control releases occurred from early September to late October, and base flows were elevated compared with other years. Pulse flows were conducted in mid to late October and were typically centered around October 15 (starting October 9 and ending October 25; Figure 3). The magnitude and duration of the pulse flows depended on water availability in each year; however, the National Marine Fisheries Service prescribed higher and longer flows for the protection of steelhead in a Biological Opinion in 2009 (NMFS 2009, 2011). Beginning in 2009, the pulse flows were larger in magnitude (mean volume = 27,300 versus 12,535 acre-feet; Welch's *t*-test: $P = 0.002$) and longer in duration (16 versus 9 d; Welch's *t*-test: $P = 0.008$) from 2009 to 2014 compared with the period from 2003 to 2008.

Dissolved oxygen levels were suitable for salmonid migration (i.e., have met or exceeded the required management criteria of 6.0 mg/L from September 1 to November 30) for an average of 39 d before the implementation of pulse flows. With the exception of 2004 (i.e., in 10 of 11 years), management criteria for dissolved oxygen of more than 5.0 mg/L at Rough and Ready Island and more than 6.0 mg/L at Ripon were met prior to the date when 5% of cumulative passage of Chinook Salmon were observed at the weir (Table 3). Dissolved oxygen levels as measured at Rough and Ready Island were especially poor during the early portion of the migratory period in 2003 and 2004 (Figure 3).

Generalized Linear Models

Over the 11 complete seasons analyzed, strong support (i.e., $w_i > 0.8$) was found for a single top candidate model in 5 of 11 years (2005, 2007, 2009, 2010, and 2014), and moderate support ($w_i > 0.5$) was found for a single top candidate model in 4 years (2003, 2004, 2006, and 2008; Figure 4). There was marginal support for a top candidate model in 2013 and essentially no support was found for any candidate model in 2012. Model 18, which contained the variables HORB (3-d lag) and variation in

TABLE 3. Summary of cumulative seasonal fish passage and year dates (calendar dates in parentheses) when dissolved oxygen and temperature criteria were met. Data from 2011 were excluded due to a shortened monitoring period. CP = cumulative passage; RRI = Rough and Ready Island; RIP = Ripon; and VNS = Vernalis.

Metric	Median year date	Mean year date	SD	Minimum	Maximum
Run timing					
5% CP	275 (Oct 2)	274 (Oct 1)	6.1	265 (Sep 22)	281 (Oct 8)
10% CP	284 (Oct 11)	281 (Oct 8)	5.8	273 (Sep 30)	292 (Oct 19)
25% CP	292 (Oct 19)	292 (Oct 19)	6.3	282 (Oct 9)	302 (Oct 20)
50% CP	302 (Oct 29)	304 (Oct 31)	6.1	295 (Oct 22)	316 (Nov 12)
75% CP	316 (Nov 12)	316 (Nov 11)	4.9	309 (Nov 5)	327 (Nov 23)
90% CP	327 (Nov 23)	328 (Nov 24)	4.4	324 (Nov 20)	336 (Dec 2)
95% CP	339 (Dec 5)	339 (Dec 5)	6.1	328 (Nov 24)	346 (Dec 12)
Environmental variables					
Daily average dissolved oxygen > 5.0 mg/L at RRI	245 (Sep 2)	249 (Sep 6)	11.8	244 (Sep 1)	281 (Oct 8)
Daily average dissolved oxygen > 6.0 mg/L at RRI	248 (Sep 4)	255 (Sep 12)	16.5	244 (Sep 1)	299 (Oct 26)
Daily average water temperature < 20°C at RIP	263 (Sep 20)	261 (Sep 18)	13.1	244 (Sep 1)	287 (Oct 14)
Daily average water temperature < 22°C at VNS	259 (Sep 16)	257 (Sep 14)	8.6	244 (Sep 1)	271 (Sep 28)
Date when pulse flow started (excludes 2011)	291 (Oct 18)	291 (Oct 18)	5.4	284 (Oct 11)	300 (Oct 27)
Date when pulse flow started (includes 2011)	290 (Oct 17)	288 (Oct 15)	11.8	256 (Sep 13)	300 (Oct 27)

daily water temperature at Ripon (2-d lag), was identified as the top candidate model in 4 of the 11 years. Support for this model was strong in 3 years and moderate in 1 year. This was the only model selected as the top candidate in more than 1 year.

Candidate models that contained the variable HORB were observed to be the top model in all 6 years that the HORB was installed (2003–2005, 2007, 2008, and 2014). In each model, the installation of the HORB (3-d lag) was positively associated with daily counts of upstream passages at the weir. The HORB was estimated to increase daily counts at the weir by an average of 263% (range, 80–382%).

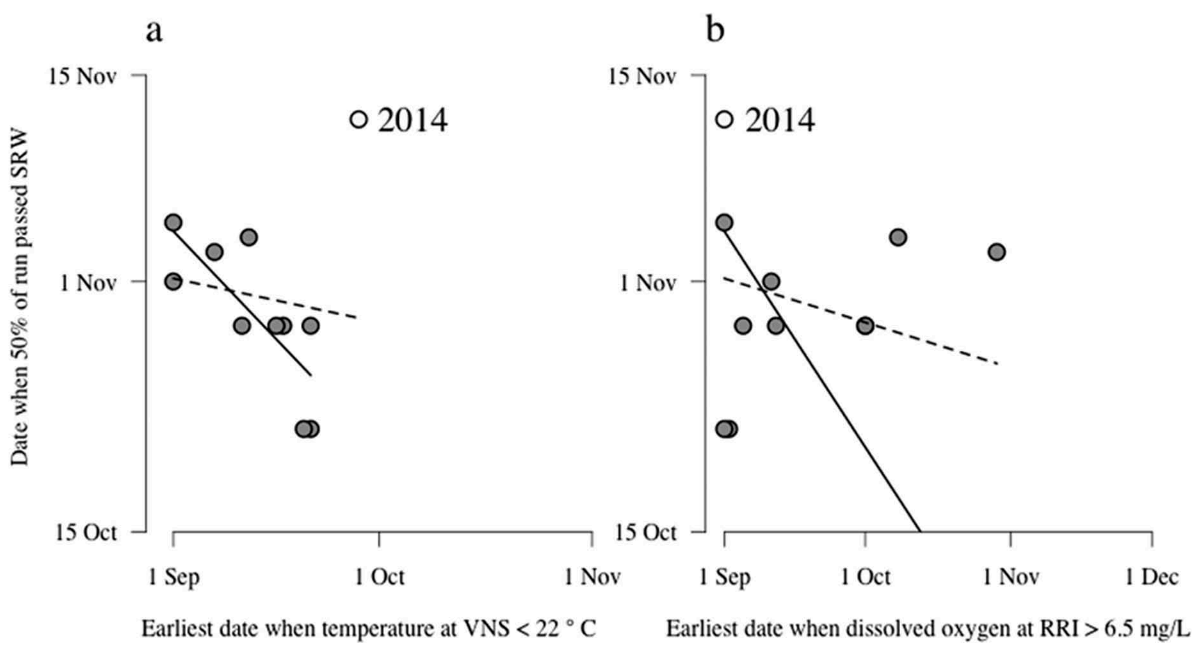

FIGURE 2. Simple linear regressions of dates of cumulative passage of Chinook Salmon at the Stanislaus River weir versus dates when **(a)** temperature at Vernalis (VNS) first reached 22°C and **(b)** dissolved oxygen concentrations at Rough and Ready Island (RRI) first reached 6.5 mg/L. Data points from 2014 are denoted with open circles. Regression lines were fitted to all data (with 2014 data included; dashed line) and excluding 2014 data (solid line).

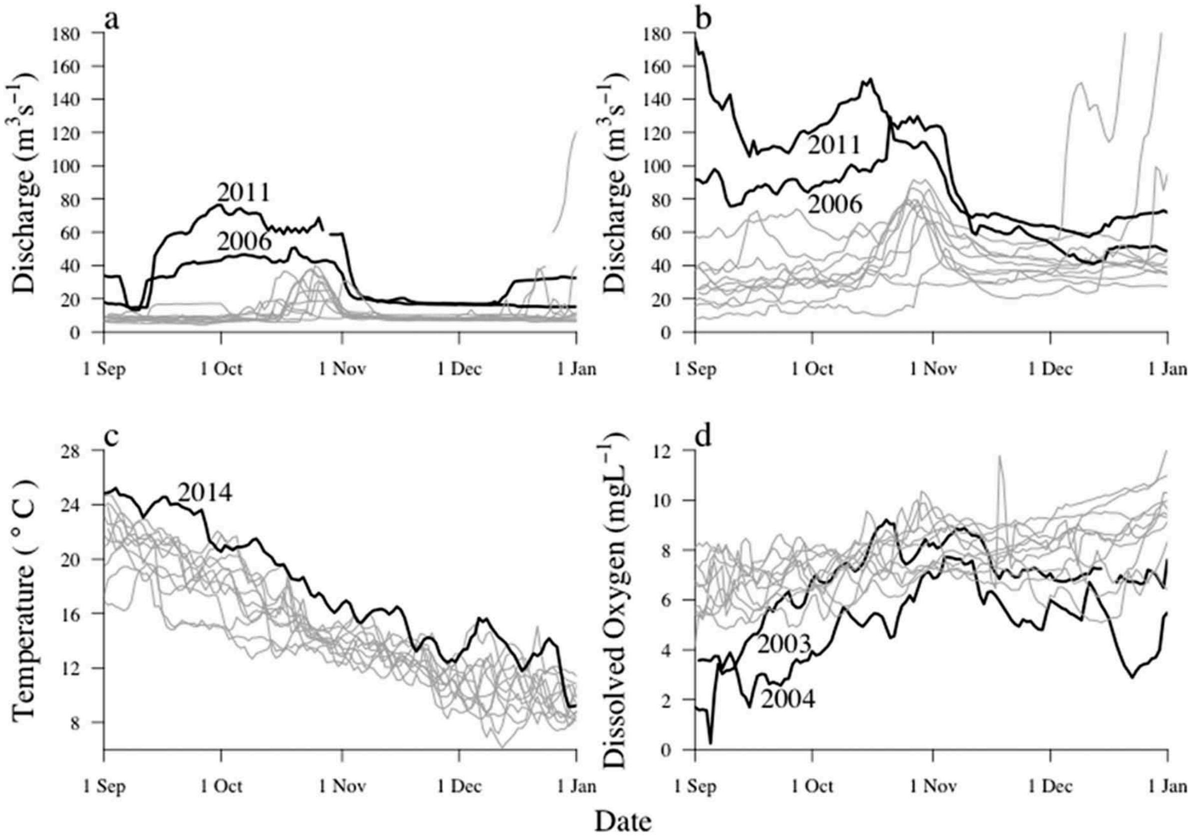

FIGURE 3. **(a)** Daily average discharges from Ripon (U.S. Geological Survey [USGS] gauge) on the Stanislaus River, **(b)** Vernalis on the San Joaquin River (USGS), **(c)** daily average water temperatures from Ripon (USGS), and **(d)** daily average dissolved oxygen measurements at Rough and Ready Island. All data are from September 1 to December 31 from 2003 to 2014 with notable years indicated in bold.

Variation in daily water temperature at Ripon (2-d lag) appeared in 3 of the 11 top models, and in all 3 years (2003, 2010, and 2013) had a consistent negative association with daily counts of upstream passages at the weir. This observation suggests that less upstream migration occurs when daily water temperatures were more variable.

There were no consistent trends in daily counts relative to any variables other than HORB or variation in daily water temperature at Ripon. For instance, lagged discharge at Vernalis and lagged discharge at Ripon each appeared in one top model, but the direction of effects differed (Figure 4). The pulse flow (2-d lag) appeared in only two top models (model 25) and had a positive effect on daily counts. Daily variation in flows and moon illumination were the weakest predictors of any examined.

Generalized Additive Models

Daily proportions of Chinook Salmon at the weir showed a variety of responses to the environmental variables examined. We observed strong nonlinear relationships between daily proportions and lagged discharge and temperature at Ripon, dissolved oxygen at Rough and Ready Island, and calendar date (Figure 5). Curvilinear responses were observed for discharge at Ripon and precipitation. Predicted responses of daily proportions were highest when discharges at Ripon were around 20 m^3/s, temperatures at Ripon were around 15°C, and dissolved oxygen levels at Rough and Ready Island were around 8 mg/L (Figure 5). The influence of the HORB was statistically significant but relatively small, with an expected increase in daily proportions of upstream passages of about 0.5% when installed (Figure 6). Nonlinear responses were observed between daily proportions and discharge at Vernalis. There was no effect of moon illumination on daily proportions at the weir.

Generalized additive models using daily counts of Chinook Salmon showed very similar responses to those modeled with daily proportions (Figure 7). The count models, especially those using a negative binomial distribution, performed much better (in terms of AIC_c) than those modeled with a Poisson or Gaussian distribution. This is consistent with observations from GLM analyses. The count models also explained a much higher portion of variation than the proportion models. Predicted responses of daily counts were highest when discharges at Ripon were around 25 m^3/s, temperatures at Ripon were around 15°C, and dissolved oxygen levels at Rough and Ready Island were around 8 mg/L.

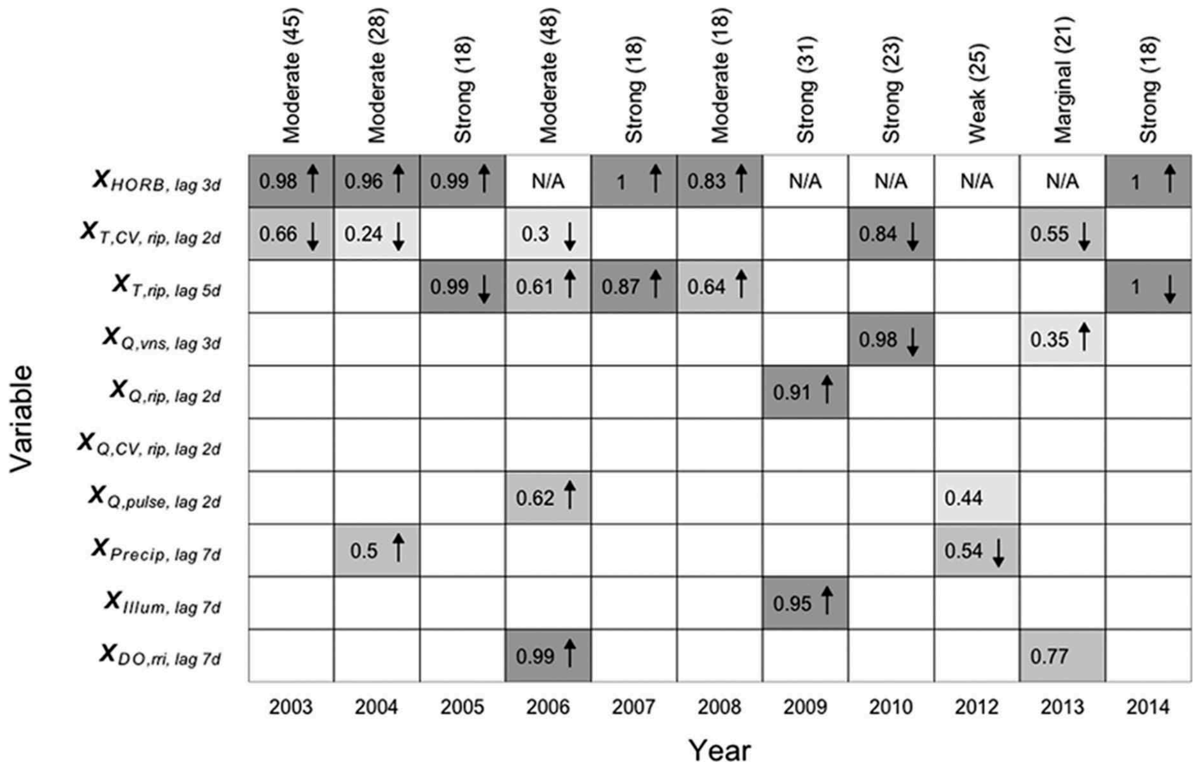

FIGURE 4. Relative importance values (on a scale from 0 to 1) and direction of effect (denoted by arrow) for each variable from model averaging examined to explain daily counts of Chinook Salmon at the Stanislaus River weir. Only variables with importance values greater than 0.20 were included for clarity. Numbers in parentheses refer to the top candidate model in each year. Shading refers to the relative level of influence for each variable in each year (darker shading indicates higher importance) and text across the top of the diagram refers to the relative statistical support for each top model in each year. Arrows were only shown if the CIs of the model-averaged coefficient estimates did not contain zero. N/A denote the years in which the Head of Old River Barrier was not installed.

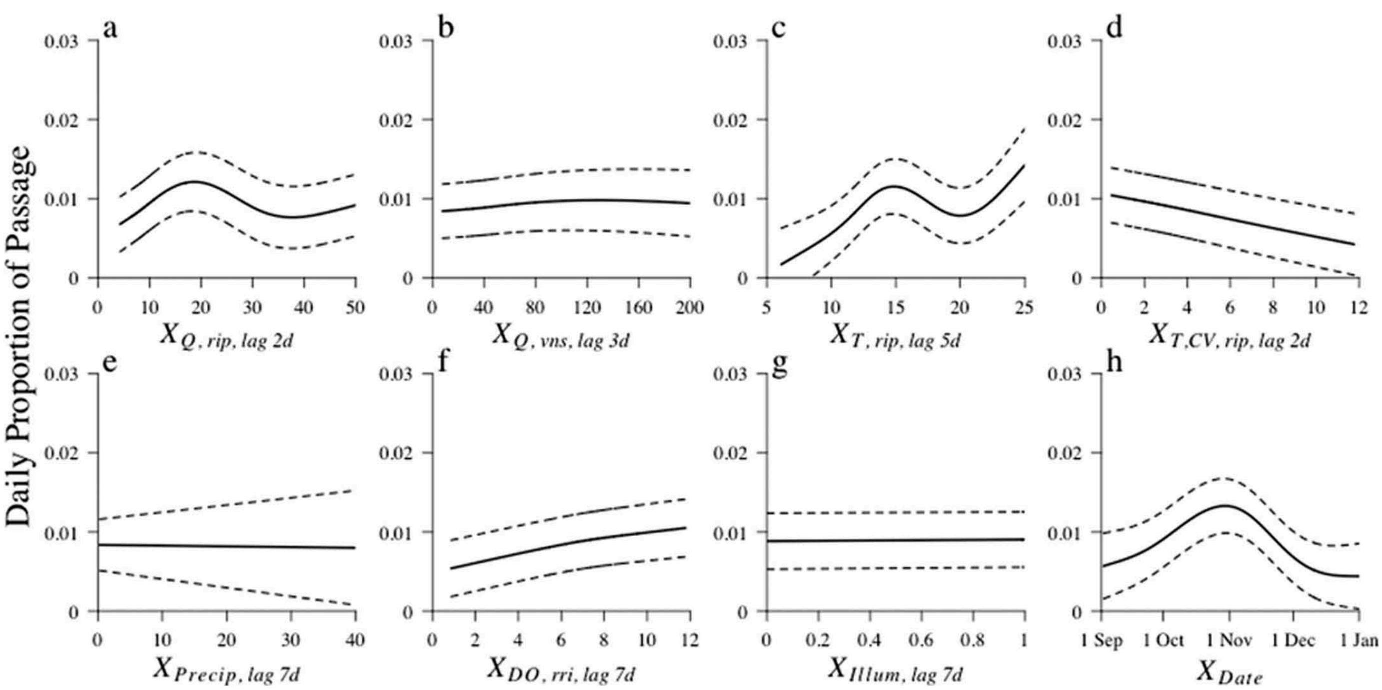

FIGURE 5. Predicted response (±SE) of daily proportions of Chinook Salmon passage in relation to the eight explanatory variables from GAM analyses (family = Gaussian).

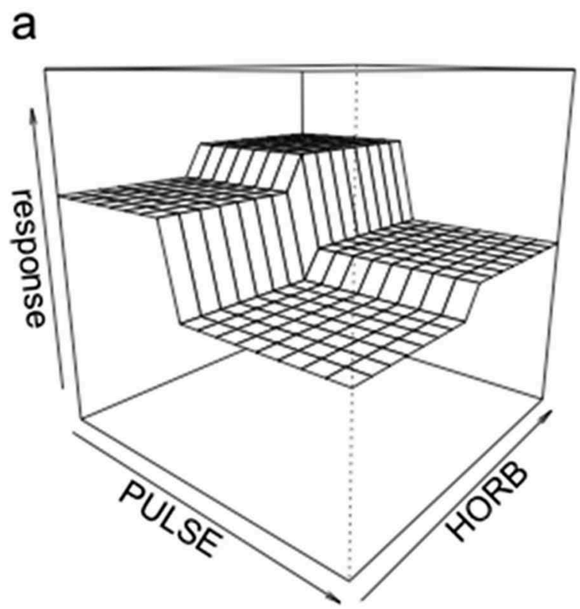

FIGURE 6. Response surfaces (**a**: counts; **b**: daily proportions) of the pulse flow and HORB (both treated as factors) plotted together as two-dimensional step functions.

Similar to the proportion model, the influence of the HORB was expected to have a positive effect on daily counts of upstream passages (about an 8.5% increase) but was not statistically significant ($P = 0.125$).

Response of Chinook Salmon to Pulse Flows

We graphically examined daily counts and proportions of Chinook Salmon in relation to discharge patterns before, during, and after the pulse flows conducted on the Stanislaus River.

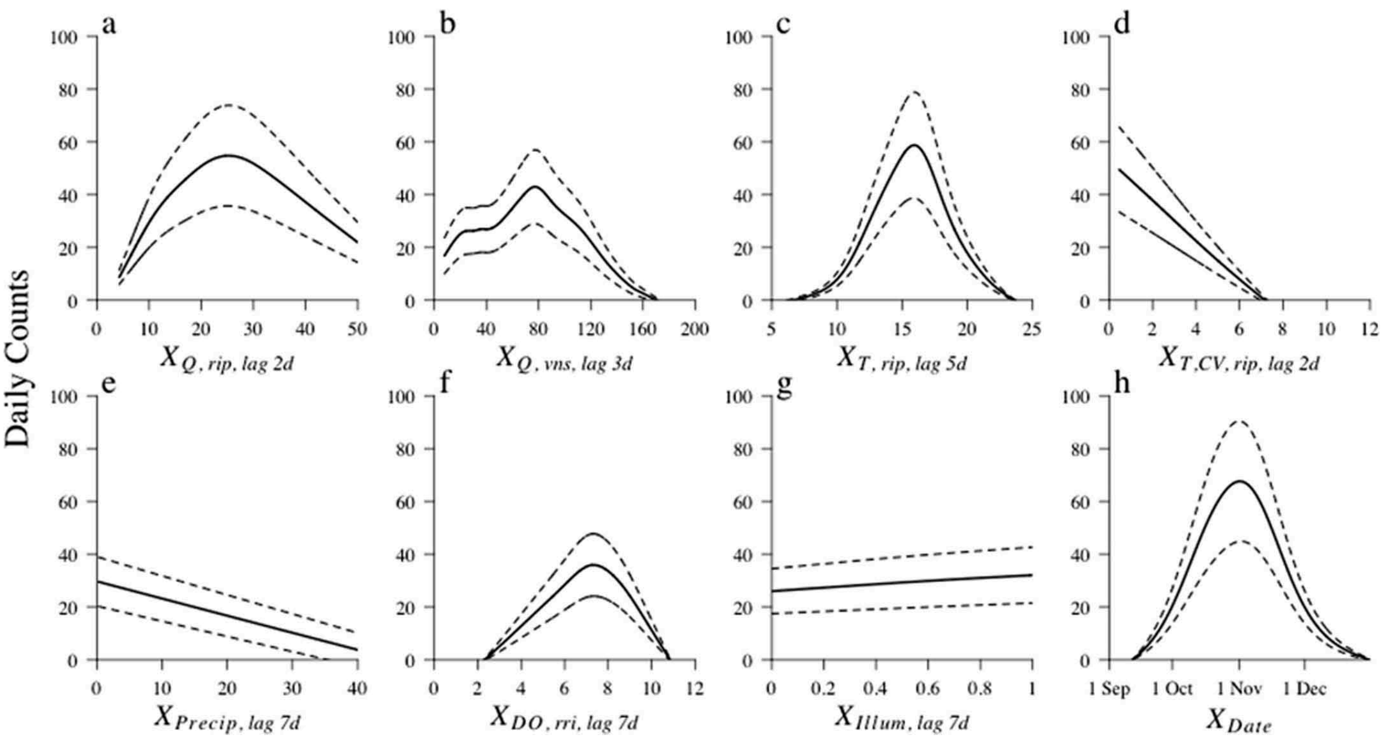

FIGURE 7. Predicted response (±SE) of daily counts of Chinook Salmon passage in relation to the eight explanatory variables from GAM analyses.

Daily passages increased during the initial few days of the pulse in 7 out of 10 years (excluding 2006). Support was found for this observation through GAM analyses. While daily discharge itself did not explain a large amount of variation in daily proportions, discharge lagged by 1 and 2 d explained 8.3% and 7.6% of variation, respectively. In comparison, discharge lagged by 5 and 7 d only explained 4.7% and 5.4% of the variation in daily proportions, respectively.

We also tested whether there were fundamental differences in the relationships between daily proportions and discharge levels before and after the implementation of much larger and longer pulse flows (i.e., before and after the Biological Opinion implemented in 2009; NMFS 2009). Similar to previous GAM analyses, daily proportions of Chinook Salmon passing the weir were at their maximums at discharges around 17 m^3/s prior to the Biological Opinion and around 20 m^3/s after implementation of larger magnitude pulse flows pursuant to the Biological Opinion (Figure 8). Functionally, daily proportions increased at approximately the same rate until reaching their aforementioned maximum levels. However, at discharges higher than 20 m^3/s, no subsequent increases in daily proportions were observed; that is, daily proportions at the higher discharge levels tended to decline for both pre- and post-Biological Opinion relationships.

Robustness of GAMs

To assess the robustness of the GAM technique, we tested a variety of distributions, spline-fitting methods, and complexities of fits with Chinook Salmon data. In general, models that fit daily proportions with environmental variables were more robust (or resistant to wide swings in variation) than models that used daily counts. For example, we tested daily proportions and counts with lagged discharge data (Figure 9; lagged 1, 2, 3, 5, and 7 d). For daily proportion models, varying model complexity did not typically result in drastically differing relationships and nearly always resulted in similar estimates of the maximum response. The discharge level at corresponding daily proportions was similar across lag periods (with the exception of the 7 d lag) and model complexities (Figure 9, upper panels). In contrast, by varying the model complexity, much more variation was observed in the daily counts across differing lag periods (Figure 9, lower panels). Despite the higher variation with model complexity, the discharge level at corresponding daily counts was similar across lag periods (with the exception of the 5-d lag).

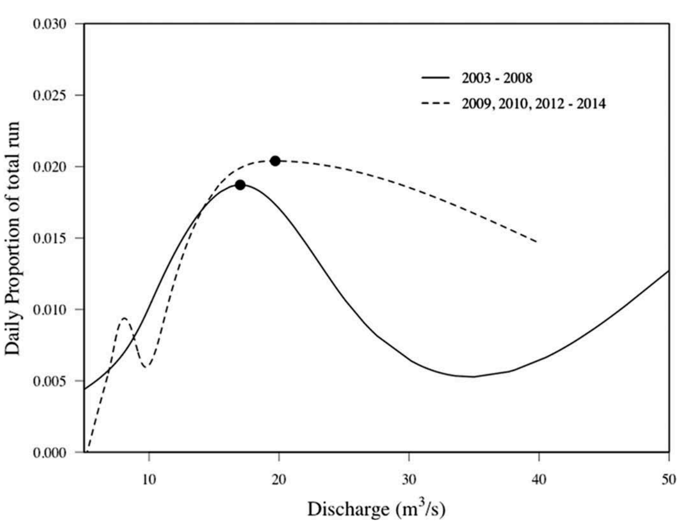

FIGURE 8. Predicted response between 1-d lagged discharge and daily proportion of Chinook Salmon passing through the Stanislaus River weir in years before (2003–2008; solid black line) and years after (2009–2014, excluding 2011; dashed line) implementation of the Biological Opinion. The filled circle denotes the discharge level at which daily passage proportions reach their maximum.

DISCUSSION

A resistance board weir and Riverwatcher that operated successfully on the Stanislaus River over a 12-year period from 2003 through 2014 provided a long-term data set, which enabled exploration of run-timing patterns of Chinook Salmon relative to managed flows and other environmental cues. The use of a variety of metrics and modeling techniques allowed us to explore a variety of responses by migrating adult Chinook Salmon in the Stanislaus River.

Examination of cumulative run timing of Chinook Salmon revealed two important findings. First, we observed consistent timing as evidenced by the relatively low variation among dates when 5, 50, and 95% of the run had passed the weir. Second, water temperatures at Vernalis and dissolved oxygen levels at Rough and Ready Island may have had a substantial effect on the overall run timing of Chinook Salmon in some years. The inference and interpretations of results based on the GLMs were limited to some degree by the nonlinear responses of both daily counts and proportions of Chinook Salmon passing the weir in relation to a variety of environmental factors. Without the use of GAMs and based solely on GLMs, we would not have been able to detect consistent nonlinear relationships from year to year between environmental variables and migration characteristics. Additionally, the GAMs allowed the estimation of minimal or maximal responses to important environmental variables (e.g., a maximal response of daily proportions at a flow of around 20 m^3/s; Figure 5).

One of the more consistent results from the study is that we found high interannual variation in migratory responses of fall-run Chinook Salmon to certain environmental factors. In this study, the high amount of interannual variation could be due to variable migration rates of Chinook Salmon in the San Joaquin and Stanislaus rivers both within and between years examined. Most variables showed consistent associations between daily counts and each lag within years. For instance, all lags of the HORB variable in 2003 showed consistent positive associations with daily counts at the weir. However, precipitation and moon illumination did not show a similar pattern. Precipitation, at shorter lags, appeared to positively influence daily counts of

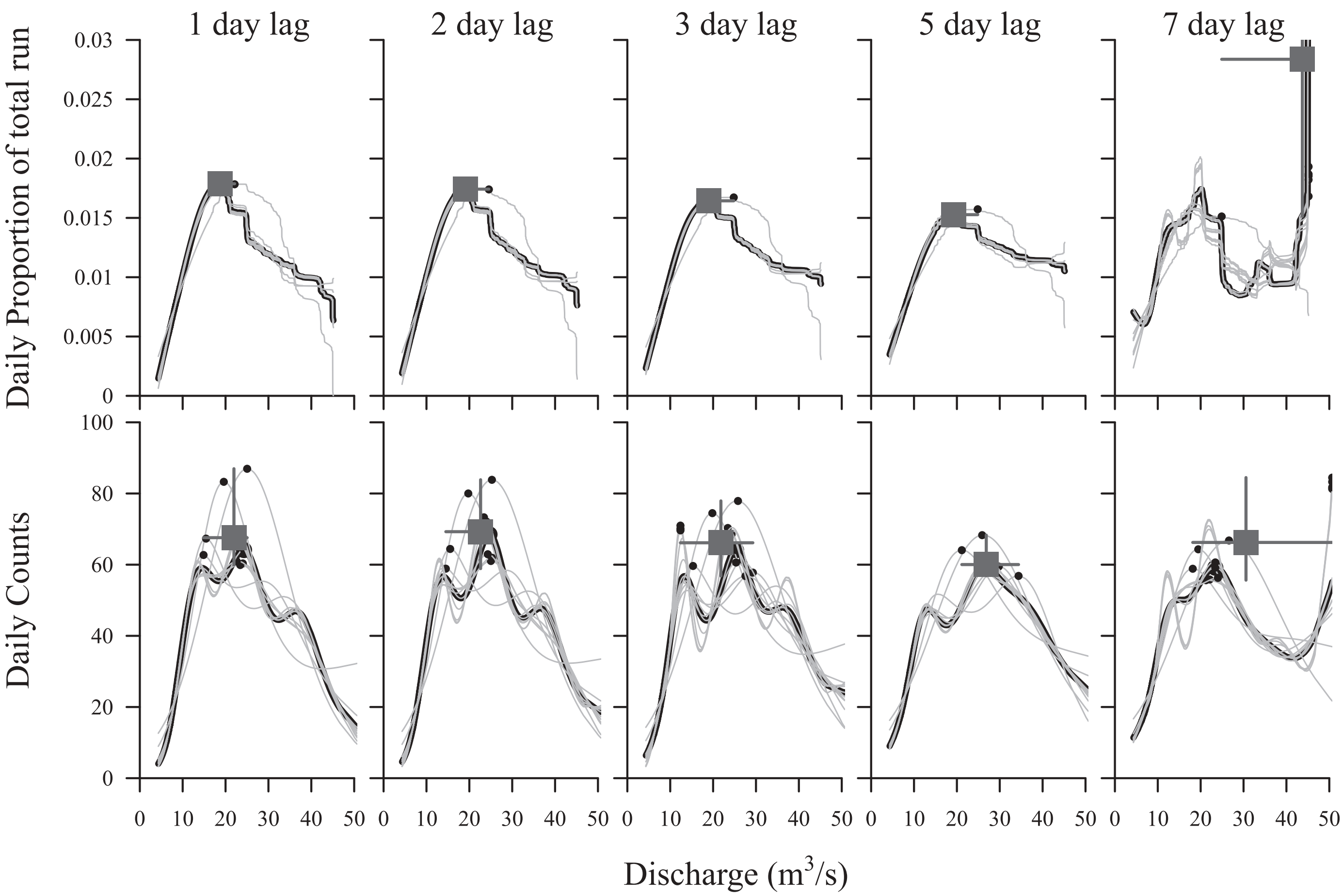

FIGURE 9. Consistency or robustness of 1-, 2-, 3-, 5-, and 7-d lags of daily proportions (upper panels) and daily counts (lower panels) of Chinook Salmon and discharge. Gray lines indicate predictions of GAMs (family = Gaussian, basis = cubic regression spline) to either daily counts or daily proportions (scaled for abundance) ranging from simple (k = 3) to complex (k = 15) fits to the data. The solid black line is the optimal fit based on the modeling algorithm. The filled gray square indicates the mean response and discharge level, and dark gray lines indicate the range of each model outcome with varying complexity of fit. The small black circles indicate the peak value for each fit.

Chinook Salmon at the Stanislaus River weir but only in 3 years. Interestingly, even in 2006, when flood control releases were conducted, precipitation (lagged 0 d) emerged in the top model for that particular year. Precipitation was used as a proxy for large-scale weather events in the area; therefore, the underlying mechanism (e.g., increased cloud cover or decrease in perceived predation risk) associated with the increases in daily counts remains unclear. The positive relationship between precipitation and daily counts did not remain when the lag was changed to a 7-d lag.

Variation in the influence and effect of discharge for salmonids has been well documented. During a 12-year time series, the number of Atlantic Salmon ascending a fish ladder was associated with changes in discharge in only half the years (Trépanier et al. 1996). Jones and Petreman (2014) observed interannual variation in the preferences for flows used by migrating adult Chinook Salmon and Pink Salmon *O. gorbuscha*. During the first year of that study, a strong preference for higher flows was observed; however, in the second year, there was no evident preference for higher flows and perhaps even a preference for lower flows.

In this study, pulse flows appeared to influence daily passages in the first few days after the initiation of the pulse but the elevated response of daily passages was not sustained. More variation was explained by short lag periods versus longer lag periods between discharge and daily proportions of Chinook Salmon, suggesting that Chinook Salmon were relatively close to the weir at the time of the pulse flow and/or that Chinook Salmon migrated upstream in temporally staggered discrete groups. Managed pulse flows only appeared in the top candidate models during 2 of the 11 years analyzed (2006 and 2012); however, the 2006 pulse flow was not provided as an attraction flow, but rather as a flood control release. Therefore, without 2006 included, the pulse flow appeared in the top model in only 1 of 10 years (2012).

These results are consistent with other research conducted on pulse flows. Contrary to expectations of resource managers, no substantial differences in migration rates in fall-run Chinook Salmon in the Klamath and Trinity rivers were observed between years with managed pulse flows and years without pulse flows (Strange 2007). Those pulse flows were conducted to trigger or cue migration of Chinook Salmon out of areas with high risk of infection of *Ichthyophthirius multifiliis*; however, due to the lack of a pronounced migratory response by Chinook Salmon, these flows are currently not recommended unless under emergency conditions (USBR 2014). While this study focused on daily passages of Chinook Salmon, hourly passages of Atlantic Salmon through a weir did not differ between periods of pulse flows and residual flows, although mean migration rates were elevated during three of the six pulses conducted (Thorstad and Heggberget 1998). Similarly, in the Puntledge River, British Columbia, hourly migration rates of Chinook Salmon did not differ during 11 pulse-flow episodes and no significant differences were observed between migration rates before, during, or after the pulse flows (Hasler et al. 2014).

The variable HORB appeared in the top model in all 6 years it was installed (2003–2005, 2007, 2008, and 2014) and positively influenced daily counts of Chinook Salmon at the weir. Daily average dissolved oxygen levels at Rough and Ready Island were positively correlated with the installation of the HORB, suggesting that an improvement in dissolved oxygen levels is the mechanism for the increase, potentially acting as a cue for migration of Chinook Salmon.

Annual run timing at the weir was consistent from year to year. The range of timing of the median dates of 50% cumulative passage of Stanislaus River Chinook Salmon was 19 d, which is relatively consistent with ranges in run timing of Chinook Salmon reported elsewhere (Keefer et al. 2004; Salinger and Anderson 2006; Mundy and Evenson 2011). Prior to the fall of 2014, the latest 50% cumulative date of passage (November 4, 2006) in the Stanislaus River occurred during a fall in which flood control releases were conducted. Similarly, Keefer et al. (2004) noted that run timing of multiple Columbia River stocks was later when discharge during the migratory period was higher.

We found evidence that both temperature and dissolved oxygen conditions affected the overall run timing of Chinook Salmon at the Stanislaus River weir. Sustained higher temperatures during the early migration period appeared to influence the overall run timing in two different ways. First, high water temperatures during the fall of 2014 delayed the overall run timing of Chinook Salmon by as much as 11 d, which was a significant departure from the overall average run timing observed in our study. Hallock et al. (1970) also noted such delays in the San Joaquin River in the mid-1960s. In contrast to 2014, higher water temperatures during previous years (2003–2013, excluding 2011) appeared to be associated with earlier (on average) run timing of Chinook Salmon through the weir. Specifically, there was a statistically significant negative relationship between the dates when daily average temperatures at Vernalis decreased to 22°C and the dates when 50% of the Chinook Salmon had passed the Stanislaus River weir. Similarly, Dahl et al. (2004) observed that the timing of the spawning migrations of Atlantic Salmon and Brown Trout was earlier when seasonal temperatures were higher. Rising seasonal temperatures have also been associated with earlier run timing in various salmonid species and locations (Quinn and Adams 1996; Quinn et al. 1997; Juanes et al. 2004).

The preceding finding may indicate that migrating adult Chinook Salmon in the southern portion of the Delta and lower San Joaquin River exhibit a behavioral response (i.e., faster migration rates) to warmer water conditions, within a certain temperature range. However, we cannot rule out the alternative explanation that overall run timing simply may have been earlier due to earlier entry into freshwater during those particular years. Martin et al. (2015) predicted that migration speeds of Chinook Salmon could be affected either negatively or positively depending on flow velocity, which is similar to findings of Salinger and Anderson (2006). At low flows, temperature more strongly affected migration rates; at high flows, flow velocity more strongly affected migration rates (Martin et al. 2015). Metabolic costs for migration were predicted to be especially costly where warm water temperatures combined with high water velocities, and the optimal migration strategy was to migrate more rapidly through warmer water conditions, assuming no energy constraints (Martin et al. 2015).

We conservatively estimated, assuming a short migratory period (1–2 d), that a small fraction (3.7%) of Chinook Salmon that passed the weir had migrated through the lower San Joaquin River when daily average temperatures exceeded 21°C, which is the upper migration limit for Chinook salmon (McCullough 1999; McCullough et al. 2001; Richter and Kolmes 2005). The maximum daily average water temperature observed at Vernalis during the study period that may have been experienced by a Stanislaus River Chinook Salmon was 23.7°C, which is higher than the upper thermal limit of 23°C proposed for the Klamath River fall-run Chinook Salmon (Strange 2010). We estimated that 0.14% of Chinook Salmon may have experienced temperatures that exceeded 23°C. We caution that these estimates may be imprecise because our study lacks the fine-scale resolution of the temperature data used by Strange (2010).

In years in which dissolved oxygen conditions were poor and sustained (i.e., 2003 through 2005), the overall timing of Chinook Salmon passing the Stanislaus River weir was later compared with the period from 2006 to 2013. Hallock et al. (1970) showed that individually telemetered salmon tagged in the lower San Joaquin River were first observed above Stockton when dissolved oxygen levels reached 5.0 mg/L. Hallock et al. (1970) also noted that while a few salmon would migrate during periods with low dissolved oxygen (similar to this study), the majority of salmon migrated when dissolved oxygen conditions improved. Based on our conservative assumption of travel times (1–2 d) between the lower San Joaquin River and the weir, 1.3% and 8.2% of Chinook Salmon were estimated to have migrated through when the daily average dissolved oxygen concentration was less than 5.0 and 6.0 mg/L, respectively.

Despite potentially high thermal exposures and exposure to poor water quality (especially in 2004 and 2005), the rates of prespawning mortality remained relatively low during the same time period. During a 4-year survey conducted on the Stanislaus River by the California Department of Fish and Wildlife, fresh carcasses of 750 female Chinook Salmon were examined to quantify egg retention. Nearly 97% were classified as completely spawned, 1.6% were classified as partially spawned, and 1.5% were classified as completely unspawned (Guignard 2005, 2006, 2007, 2008). To our knowledge, this assessment represents the best available information about prespawning mortality rates in the San Joaquin basin.

Management Implications

This study provides the first formal look at relationships between environmental factors, managed pulse flows, and Chinook Salmon migration in a regulated California Central Valley river. Pulse flows remain an important tool for managers in the context of restoring and maintaining habitat in regulated river systems such as the Colorado River (Patten et al. 2001; Schmidt et al. 2001). However, results from this study indicate that other factors may be of greater importance and that there may be thresholds in timing and magnitude of discharges beyond which there is no additional benefit. In the Stanislaus River, support for managed pulse flows to increase daily counts of Chinook Salmon at the weir was only found in 2 of 11 years (2006 and 2012). If managed pulse flows are continued, we recommend that (1) they be conducted in a more experimental fashion (i.e., varied timing and "control" or no-pulse years) with consideration of the 20-m^3/s threshold identified by this study, (2) they mimic the natural hydrograph for the time of year (e.g., short peaks, not extended blocks), and (3) an economics model, as suggested by Young et al. (2011), be developed that allows consideration of multiple factors such as fish abundance (in this case, timing), water storage for future needs (carryover storage), agricultural usage, and power generation.

During periods of drought, other viable management actions should be considered instead of pulse flows, such as the installation of the HORB. We found a positive effect of the HORB on daily counts in both GLM and GAM modeling, which suggests that daily counts of Chinook Salmon at the weir can be increased by the periodic installation of the HORB. This management option could serve as a balance between needs of fisheries resources and societal needs. The recent drought in California has already presented many challenges in water allocation in the past several years, and with the likelihood of more frequent and intense droughts (Diffenbaugh et al. 2015; Mann and Gleick 2015), such challenges in water management will continue and grow more complex (Wilson et al. 2016). Addressing these challenges requires more flexible approaches in reservoir management (Georgakakos et al. 2012), water conservation measures (Wilson et al. 2016), and further refinements and evaluations of management actions to benefit valued fisheries resources.

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ATTACHMENT 10

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

Avg Water Duty:	Price per MWh:	Total Period: Total 40% Gen	Total Period: Total Base Gen	Total Period: Difference	February -June: Total 40% Gen	February -June: Total Base Gen	February -June: Difference	July - September: Total 40% Gen	July - September: Total Base Gen	July - September: Difference
10.25	$ 69.00	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
			Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1921	10	38.5459	38.5459	-	15	-	1,295.6	1,295.6	4,781	4,781	-	-	-	-	-	-	-
10/31/1921	10	40.9289	40.9289	-	16	-	1,289.7	1,289.7	5,076	5,076	-	-	-	-	-	-	-
11/15/1921	11	14.8399	14.8399	-	15	-	498.8	498.8	1,840	1,840	-	-	-	-	-	-	-
11/30/1921	11	14.8399	14.8399	-	15	-	498.8	498.8	1,840	1,840	-	-	-	-	-	-	-
12/15/1921	12	7.5288	7.5288	-	15	-	253.0	253.0	934	934	-	-	-	-	-	-	-
12/31/1921	12	7.9187	7.9187	-	16	-	249.5	249.5	982	982	-	-	-	-	-	-	-
1/15/1922	1	8.0974	8.0974	-	15	-	272.2	272.2	1,004	1,004	-	-	-	-	-	-	-
1/31/1922	1	8.5252	8.5252	-	16	-	268.6	268.6	1,057	1,057	-	-	-	-	-	-	-
2/15/1922	2	23.7327	11.5697	12.1630	15	810.8658	797.7	388.9	2,943	1,435	1,508	2,943	1,435	1,508	-	-	-
2/28/1922	2	20.7923	10.0271	10.7653	13	828.0966	806.4	388.9	2,579	1,244	1,335	2,579	1,244	1,335	-	-	-
3/15/1922	3	23.5848	9.5998	13.9851	15	932.3381	792.7	322.7	2,925	1,191	1,734	2,925	1,191	1,734	-	-	-
3/31/1922	3	25.0452	10.1278	14.9174	16	932.3381	789.2	319.1	3,106	1,256	1,850	3,106	1,256	1,850	-	-	-
4/14/1922	4	76.5753	76.5753	-	14	-	2,757.6	2,757.6	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1922	4	88.4967	88.4967	-	16	-	2,788.5	2,788.5	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1922	5	144.0656	94.3273	49.7384	15	3,315.8903	4,842.1	3,170.4	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1922	5	152.9884	83.5221	69.4663	16	4,341.6423	4,820.7	2,631.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1922	6	128.2360	63.4459	64.7901	15	4,319.3389	4,310.1	2,132.5	9,225	7,869	1,356	9,225	7,869	1,356	-	-	-
6/30/1922	6	128.2360	63.4459	64.7901	15	4,319.3389	4,310.1	2,132.5	9,225	7,869	1,356	9,225	7,869	1,356	-	-	-
7/15/1922	7	64.3416	64.3416	-	15	-	2,162.6	2,162.6	7,980	7,980	-	-	-	-	7,980	7,980	-
7/31/1922	7	67.7843	67.7843	-	16	-	2,135.9	2,135.9	8,407	8,407	-	-	-	-	8,407	8,407	-
8/15/1922	8	63.1662	63.1662	-	15	-	2,123.1	2,123.1	7,834	7,834	-	-	-	-	7,834	7,834	-
8/31/1922	8	66.5306	66.5306	-	16	-	2,096.4	2,096.4	8,251	8,251	-	-	-	-	8,251	8,251	-
9/15/1922	9	45.7359	45.7359	-	15	-	1,537.2	1,537.2	5,672	5,672	-	-	-	-	5,672	5,672	-
9/30/1922	9	45.7359	45.7359	-	15	-	1,537.2	1,537.2	5,672	5,672	-	-	-	-	5,672	5,672	-
10/15/1922	10	38.1336	38.1336	-	15	-	1,281.7	1,281.7	4,729	4,729	-	-	-	-	-	-	-
10/31/1922	10	40.4892	40.4892	-	16	-	1,275.8	1,275.8	5,022	5,022	-	-	-	-	-	-	-
11/15/1922	11	7.5929	7.5929	-	15	-	255.2	255.2	942	942	-	-	-	-	-	-	-
11/30/1922	11	7.5929	7.5929	-	15	-	255.2	255.2	942	942	-	-	-	-	-	-	-
12/15/1922	12	7.1659	7.1659	-	15	-	240.9	240.9	889	889	-	-	-	-	-	-	-
12/31/1922	12	7.5316	7.5316	-	16	-	237.3	237.3	934	934	-	-	-	-	-	-	-
1/15/1923	1	8.1587	8.1587	-	15	-	274.2	274.2	1,012	1,012	-	-	-	-	-	-	-
1/31/1923	1	8.5906	8.5906	-	16	-	270.7	270.7	1,065	1,065	-	-	-	-	-	-	-
2/15/1923	2	13.2568	8.2715	4.9852	15	332.3495	445.6	278.0	1,644	1,026	618	1,644	1,026	618	-	-	-
2/28/1923	2	11.7132	7.3927	4.3205	13	332.3495	454.3	286.7	1,453	917	536	1,453	917	536	-	-	-
3/15/1923	3	36.8435	27.8907	8.9528	15	596.8542	1,238.3	937.4	4,569	3,459	1,110	4,569	3,459	1,110	-	-	-
3/31/1923	3	39.1877	29.6380	9.5497	16	596.8542	1,234.8	933.9	4,860	3,676	1,184	4,860	3,676	1,184	-	-	-
4/14/1923	4	69.2522	71.4717	(2.2195)	14	(158.5359)	2,493.9	2,573.8	8,589	8,610	(21)	8,589	8,610	(21)	-	-	-
4/30/1923	4	77.6846	82.6639	(4.9793)	16	(311.2065)	2,447.8	2,604.7	9,635	9,840	(205)	9,635	9,840	(205)	-	-	-
5/15/1923	5	120.8148	97.9797	22.8351	15	1,522.3419	4,060.7	3,293.2	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1923	5	128.1875	87.4180	40.7695	16	2,548.0939	4,039.2	2,754.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1923	6	84.7660	77.6676	7.0984	15	473.2277	2,849.0	2,610.5	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1923	6	84.7660	77.6676	7.0984	15	473.2277	2,849.0	2,610.5	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1923	7	64.3343	64.3343	-	15	-	2,162.3	2,162.3	7,979	7,979	-	-	-	-	7,979	7,979	-
7/31/1923	7	67.7766	67.7766	-	16	-	2,135.6	2,135.6	8,406	8,406	-	-	-	-	8,406	8,406	-
8/15/1923	8	63.1662	63.1662	-	15	-	2,123.1	2,123.1	7,834	7,834	-	-	-	-	7,834	7,834	-
8/31/1923	8	66.5306	66.5306	-	16	-	2,096.4	2,096.4	8,251	8,251	-	-	-	-	8,251	8,251	-
9/15/1923	9	41.2098	41.2478	(0.0380)	15	(2.5344)	1,385.1	1,386.4	5,111	5,116	(5)	-	-	-	5,111	5,116	(5)
9/30/1923	9	41.2098	41.2478	(0.0380)	15	(2.5344)	1,385.1	1,386.4	5,111	5,116	(5)	-	-	-	5,111	5,116	(5)
10/15/1923	10	23.6479	27.7748	(4.1269)	15	(275.1266)	794.8	933.5	2,933	3,445	(512)	-	-	-	-	-	-
10/31/1923	10	25.0377	29.4397	(4.4020)	16	(275.1266)	788.9	927.6	3,105	3,651	(546)	-	-	-	-	-	-
11/15/1923	11	14.2229	14.2229	-	15	-	478.0	478.0	1,764	1,764	-	-	-	-	-	-	-
11/30/1923	11	14.2229	14.2229	-	15	-	478.0	478.0	1,764	1,764	-	-	-	-	-	-	-
12/15/1923	12	7.6159	7.6159	-	15	-	256.0	256.0	945	945	-	-	-	-	-	-	-
12/31/1923	12	8.0116	8.0116	-	16	-	252.4	252.4	994	994	-	-	-	-	-	-	-
1/15/1924	1	8.1845	8.3764	(0.1919)	15	(12.7966)	275.1	281.5	1,015	1,039	(24)	-	-	-	-	-	-
1/31/1924	1	8.6181	8.8229	(0.2047)	16	(12.7966)	271.6	278.0	1,069	1,094	(25)	-	-	-	-	-	-
2/15/1924	2	14.9611	15.1736	(0.2125)	15	(14.1676)	502.9	510.0	1,856	1,882	(26)	1,856	1,882	(26)	-	-	-
2/29/1924	2	14.0757	14.2740	(0.1983)	14	(14.1677)	506.9	514.0	1,746	1,770	(25)	1,746	1,770	(25)	-	-	-
3/15/1924	3	25.6615	26.6905	(1.0290)	15	(68.6000)	862.5	897.1	3,183	3,310	(128)	3,183	3,310	(128)	-	-	-
3/31/1924	3	27.3722	28.4012	(1.0290)	16	(64.3125)	862.5	894.9	3,395	3,522	(128)	3,395	3,522	(128)	-	-	-
4/14/1924	4	26.7168	27.8743	(1.1575)	14	(82.6775)	962.1	1,003.8	3,314	3,457	(144)	3,314	3,457	(144)	-	-	-
4/30/1924	4	36.7244	39.5419	(2.8175)	16	(176.0938)	1,157.2	1,246.0	4,555	4,904	(349)	4,555	4,904	(349)	-	-	-
5/15/1924	5	51.0672	53.8847	(2.8175)	15	(187.8333)	1,716.4	1,811.1	6,334	6,683	(349)	6,334	6,683	(349)	-	-	-
5/31/1924	5	50.5224	46.3842	4.1382	16	258.6360	1,592.0	1,461.6	6,266	5,753	513	6,266	5,753	513	-	-	-
6/15/1924	6	50.3987	53.2162	(2.8175)	15	(187.8333)	1,693.9	1,788.6	6,251	6,600	(349)	6,251	6,600	(349)	-	-	-
6/30/1924	6	50.3987	53.2162	(2.8175)	15	(187.8333)	1,693.9	1,788.6	6,251	6,600	(349)	6,251	6,600	(349)	-	-	-
7/15/1924	7	51.1577	54.3427	(3.1850)	15	(212.3333)	1,719.4	1,826.5	6,345	6,740	(395)	-	-	-	6,345	6,740	(395)
7/31/1924	7	54.5682	57.7532	(3.1850)	16	(199.0625)	1,719.4	1,819.8	6,768	7,163	(395)	-	-	-	6,768	7,163	(395)
8/15/1924	8	49.8323	53.0173	(3.1850)	15	(212.3333)	1,674.9	1,781.9	6,180	6,575	(395)	-	-	-	6,180	6,575	(395)
8/31/1924	8	53.1545	56.3395	(3.1850)	16	(199.0625)	1,674.9	1,775.3	6,592	6,987	(395)	-	-	-	6,592	6,987	(395)
9/15/1924	9	34.8729	37.6904	(2.8175)	15	(187.8333)	1,172.1	1,266.8	4,325	4,674	(349)	-	-	-	4,325	4,674	(349)
9/30/1924	9	34.8729	37.6904	(2.8175)	15	(187.8333)	1,172.1	1,266.8	4,325	4,674	(349)	-	-	-	4,325	4,674	(349)
10/15/1924	10	22.6589	24.3739	(1.7150)	15	(114.3333)	761.6	819.2	2,810	3,023	(213)	-	-	-	-	-	-
10/31/1924	10	24.1695	25.8845	(1.7150)	16	(107.1875)	761.6	815.6	2,998	3,210	(213)	-	-	-	-	-	-
11/15/1924	11	5.9279	6.9569	(1.0290)	15	(68.6000)	199.2	233.8	735	863	(128)	-	-	-	-	-	-
11/30/1924	11	5.9279	6.9569	(1.0290)	15	(68.6000)	199.2	233.8	735	863	(128)	-	-	-	-	-	-
12/15/1924	12	5.8923	6.9213	(1.0290)	15	(68.6000)	198.0	232.6	731	858	(128)	-	-	-	-	-	-
12/31/1924	12	6.2852	7.3142	(1.0290)	16	(64.3125)	198.0	230.5	780	907	(128)	-	-	-	-	-	-

Avg Water Duty:	10.25
Price per MWh:	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/1925	1	6.2908	7.3198	(1.0290)	15	(68.6000)	211.4	246.0	780	908	(128)	-	-	-	-	-	-
1/31/1925	1	6.7101	7.7391	(1.0290)	16	(64.3125)	211.4	243.9	832	960	(128)	-	-	-	-	-	-
2/15/1925	2	32.1188	8.7732	23.3456	15	1,556.3718	1,079.5	294.9	3,983	1,088	2,895	3,983	1,088	2,895	-	-	-
2/28/1925	2	27.8363	7.6034	20.2328	13	1,556.3718	1,079.5	294.9	3,452	943	2,509	3,452	943	2,509	-	-	-
3/15/1925	3	28.8730	12.2486	16.6244	15	1,108.2929	970.4	411.7	3,581	1,519	2,062	3,581	1,519	2,062	-	-	-
3/31/1925	3	30.7293	12.9532	17.7761	16	1,111.0054	968.3	408.2	3,811	1,606	2,205	3,811	1,606	2,205	-	-	-
4/14/1925	4	72.3361	44.9079	27.4282	14	1,959.1574	2,604.9	1,617.2	8,610	5,570	3,040	8,610	5,570	3,040	-	-	-
4/30/1925	4	82.2673	65.7304	16.5370	16	1,033.5603	2,592.2	2,071.2	9,840	8,152	1,688	9,840	8,152	1,688	-	-	-
5/15/1925	5	101.5186	69.7750	31.7437	15	2,116.2441	3,412.1	2,345.2	9,225	8,654	571	9,225	8,654	571	-	-	-
5/31/1925	5	108.0987	51.0342	57.0645	16	3,566.5301	3,406.2	1,608.1	9,840	6,329	3,511	9,840	6,329	3,511	-	-	-
6/15/1925	6	78.8577	59.4652	19.3925	15	1,292.8333	2,650.5	1,998.7	9,225	7,375	1,850	9,225	7,375	1,850	-	-	-
6/30/1925	6	78.8577	59.4652	19.3925	15	1,292.8333	2,650.5	1,998.7	9,225	7,375	1,850	9,225	7,375	1,850	-	-	-
7/15/1925	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1925	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1925	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1925	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1925	9	37.9213	45.3288	(7.4075)	15	(493.8333)	1,274.6	1,523.5	4,703	5,622	(919)	-	-	-	4,703	5,622	(919)
9/30/1925	9	37.9213	45.3288	(7.4075)	15	(493.8333)	1,274.6	1,523.5	4,703	5,622	(919)	-	-	-	4,703	5,622	(919)
10/15/1925	10	34.3854	37.1980	(2.8125)	15	(187.5026)	1,155.7	1,250.2	4,265	4,613	(349)	-	-	-	-	-	-
10/31/1925	10	36.5635	39.4912	(2.9277)	16	(182.9818)	1,152.1	1,244.4	4,535	4,898	(363)	-	-	-	-	-	-
11/15/1925	11	15.0862	15.7372	(0.6510)	15	(43.4000)	507.1	528.9	1,871	1,952	(81)	-	-	-	-	-	-
11/30/1925	11	15.0862	15.7372	(0.6510)	15	(43.4000)	507.1	528.9	1,871	1,952	(81)	-	-	-	-	-	-
12/15/1925	12	6.9649	7.6159	(0.6510)	15	(43.4000)	234.1	256.0	864	945	(81)	-	-	-	-	-	-
12/31/1925	12	7.3606	8.0116	(0.6510)	16	(40.6875)	231.9	252.4	913	994	(81)	-	-	-	-	-	-
1/15/1926	1	7.3415	8.1845	(0.8429)	15	(56.1966)	246.8	275.1	911	1,015	(105)	-	-	-	-	-	-
1/31/1926	1	7.7624	8.6181	(0.8557)	16	(53.4841)	244.6	271.6	963	1,069	(106)	-	-	-	-	-	-
2/15/1926	2	16.5728	14.9708	1.6019	15	106.7956	557.0	503.2	2,055	1,857	199	2,055	1,857	199	-	-	-
2/28/1926	2	14.5003	13.1987	1.3015	13	100.1187	562.3	511.9	1,798	1,637	161	1,798	1,637	161	-	-	-
3/15/1926	3	36.2796	44.5034	(8.2238)	15	(548.2530)	1,219.4	1,495.8	4,500	5,519	(1,020)	4,500	5,519	(1,020)	-	-	-
3/31/1926	3	38.6982	47.4017	(8.7034)	16	(543.9655)	1,219.4	1,493.6	4,799	5,879	(1,079)	4,799	5,879	(1,079)	-	-	-
4/14/1926	4	66.7269	34.7782	31.9488	14	2,282.0558	2,402.9	1,252.4	8,276	4,313	3,962	8,276	4,313	3,962	-	-	-
4/30/1926	4	76.2594	54.4945	21.7648	16	1,360.3030	2,402.9	1,717.1	9,458	6,759	2,699	9,458	6,759	2,699	-	-	-
5/15/1926	5	71.1084	67.1767	3.9317	15	262.1118	2,390.0	2,257.9	8,819	8,331	488	8,819	8,331	488	-	-	-
5/31/1926	5	75.8490	66.3658	9.4832	16	592.6975	2,390.0	2,091.2	9,407	8,231	1,176	9,407	8,231	1,176	-	-	-
6/15/1926	6	51.0093	55.2998	(4.2904)	15	(286.0288)	1,714.5	1,858.7	6,326	6,858	(532)	6,326	6,858	(532)	-	-	-
6/30/1926	6	51.0093	55.2998	(4.2904)	15	(286.0288)	1,714.5	1,858.7	6,326	6,858	(532)	6,326	6,858	(532)	-	-	-
7/15/1926	7	51.6416	54.8266	(3.1850)	15	(212.3333)	1,735.7	1,842.8	6,405	6,800	(395)	-	-	-	6,405	6,800	(395)
7/31/1926	7	55.0843	58.2693	(3.1850)	16	(199.0625)	1,735.7	1,836.1	6,832	7,227	(395)	-	-	-	6,832	7,227	(395)
8/15/1926	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/1926	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/1926	9	35.4729	38.2904	(2.8175)	15	(187.8333)	1,192.3	1,287.0	4,399	4,749	(349)	-	-	-	4,399	4,749	(349)
9/30/1926	9	35.4729	38.2904	(2.8175)	15	(187.8333)	1,192.3	1,287.0	4,399	4,749	(349)	-	-	-	4,399	4,749	(349)
10/15/1926	10	32.0368	33.7518	(1.7150)	15	(114.3333)	1,076.8	1,134.4	3,973	4,186	(213)	-	-	-	-	-	-
10/31/1926	10	34.1726	35.8876	(1.7150)	16	(107.1875)	1,076.8	1,130.8	4,238	4,451	(213)	-	-	-	-	-	-
11/15/1926	11	5.8154	6.8444	(1.0290)	15	(68.6000)	195.5	230.0	721	849	(128)	-	-	-	-	-	-
11/30/1926	11	5.8154	6.8444	(1.0290)	15	(68.6000)	195.5	230.0	721	849	(128)	-	-	-	-	-	-
12/15/1926	12	5.9214	6.9504	(1.0290)	15	(68.6000)	199.0	233.6	734	862	(128)	-	-	-	-	-	-
12/31/1926	12	6.3161	7.3451	(1.0290)	16	(64.3125)	199.0	231.4	783	911	(128)	-	-	-	-	-	-
1/15/1927	1	6.2400	7.2690	(1.0290)	15	(68.6000)	209.7	244.3	774	902	(128)	-	-	-	-	-	-
1/31/1927	1	6.6560	7.6850	(1.0290)	16	(64.3125)	209.7	242.2	825	953	(128)	-	-	-	-	-	-
2/15/1927	2	34.0634	8.5607	25.5027	15	1,700.1786	1,144.9	287.7	4,225	1,062	3,163	4,225	1,062	3,163	-	-	-
2/28/1927	2	29.5216	7.4193	22.1023	13	1,700.1786	1,144.9	287.7	3,661	920	2,741	3,661	920	2,741	-	-	-
3/15/1927	3	37.8263	29.6514	8.1750	15	544.9972	1,271.4	996.6	4,691	3,677	1,014	4,691	3,677	1,014	-	-	-
3/31/1927	3	40.2795	31.5161	8.7634	16	547.7097	1,269.2	993.1	4,996	3,909	1,087	4,996	3,909	1,087	-	-	-
4/14/1927	4	78.2310	51.3342	26.8968	14	1,921.2022	2,817.2	1,848.6	8,610	6,367	2,243	8,610	6,367	2,243	-	-	-
4/30/1927	4	89.0044	71.1874	17.8170	16	1,113.5603	2,804.5	2,243.1	9,840	8,829	1,011	9,840	8,829	1,011	-	-	-
5/15/1927	5	110.2517	83.1532	27.0985	15	1,806.5666	3,705.6	2,794.8	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1927	5	117.4140	82.6866	34.7274	16	2,170.4612	3,699.7	2,605.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1927	6	93.5910	95.3606	(1.7696)	15	(117.9761)	3,145.7	3,205.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1927	6	93.5910	95.3606	(1.7696)	15	(117.9761)	3,145.7	3,205.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1927	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1927	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1927	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1927	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1927	9	38.0642	45.4717	(7.4075)	15	(493.8333)	1,279.4	1,528.3	4,721	5,640	(919)	-	-	-	4,721	5,640	(919)
9/30/1927	9	38.0642	45.4717	(7.4075)	15	(493.8333)	1,279.4	1,528.3	4,721	5,640	(919)	-	-	-	4,721	5,640	(919)
10/15/1927	10	21.7472	24.5597	(2.8125)	15	(187.5026)	730.9	825.5	2,697	3,046	(349)	-	-	-	-	-	-
10/31/1927	10	23.0827	26.0104	(2.9277)	16	(182.9818)	727.3	819.6	2,863	3,226	(363)	-	-	-	-	-	-
11/15/1927	11	6.9569	7.6079	(0.6510)	15	(43.4000)	233.8	255.7	863	944	(81)	-	-	-	-	-	-
11/30/1927	11	6.9569	7.6079	(0.6510)	15	(43.4000)	233.8	255.7	863	944	(81)	-	-	-	-	-	-
12/15/1927	12	6.9213	7.5723	(0.6510)	15	(43.4000)	232.6	254.5	858	939	(81)	-	-	-	-	-	-
12/31/1927	12	7.3142	7.9652	(0.6510)	16	(40.6875)	230.5	251.0	907	988	(81)	-	-	-	-	-	-
1/15/1928	1	7.3270	8.1700	(0.8429)	15	(56.1966)	246.3	274.6	909	1,013	(105)	-	-	-	-	-	-
1/31/1928	1	7.7469	8.6026	(0.8557)	16	(53.4841)	244.1	271.1	961	1,067	(106)	-	-	-	-	-	-
2/15/1928	2	10.7971	8.1050	2.6921	15	179.4718	362.9	272.4	1,339	1,005	334	1,339	1,005	334	-	-	-
2/29/1928	2	10.1459	7.6767	2.4692	14	176.3718	365.4	276.4	1,258	952	306	1,258	952	306	-	-	-
3/15/1928	3	59.5401	18.2028	41.3373	15	2,755.8219	2,001.2	611.8	7,384	2,258	5,127	7,384	2,258	5,127	-	-	-
3/31/1928	3	63.5094	19.3043	44.2052	16	2,762.8219	2,001.2	608.3	7,877	2,394	5,482	7,877	2,394	5,482	-	-	-

Avg Water Duty:	
	10.25
Price per MWh:	
$	69.00

Total Period		
Total 40% Gen	Total Base Gen	Difference
11,191,837	11,464,645	(272,808)
	Revenue:	$ (18,823,762)

February -June		
Total 40% Gen	Total Base Gen	Difference
6,211,725	5,887,134	324,591
	Revenue:	$ 22,396,769

July - September		
Total 40% Gen	Total Base Gen	Difference
3,576,928	3,919,235	(342,307)
	Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/1928	4	72.5602	56.7228	15.8374	14	1,131.2407	2,613.0	2,042.7	8,610	7,035	1,575	8,610	7,035	1,575	-	-	-
4/30/1928	4	82.9259	79.2331	3.6928	16	230.7998	2,613.0	2,496.6	9,840	9,827	13	9,840	9,827	13	-	-	-
5/15/1928	5	90.3358	83.8613	6.4745	15	431.6365	3,036.2	2,818.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1928	5	96.3582	68.6453	27.7129	16	1,732.0583	3,036.2	2,163.0	9,840	8,514	1,326	9,840	8,514	1,326	-	-	-
6/15/1928	6	56.2643	60.6893	(4.4250)	15	(295.0000)	1,891.1	2,039.8	6,978	7,527	(549)	6,978	7,527	(549)	-	-	-
6/30/1928	6	56.2643	60.6893	(4.4250)	15	(295.0000)	1,891.1	2,039.8	6,978	7,527	(549)	6,978	7,527	(549)	-	-	-
7/15/1928	7	51.6416	64.3416	(12.7000)	15	(846.6667)	1,735.7	2,162.6	6,405	7,980	(1,575)	-	-	-	6,405	7,980	(1,575)
7/31/1928	7	55.0843	67.7843	(12.7000)	16	(793.7500)	1,735.7	2,135.9	6,832	8,407	(1,575)	-	-	-	6,832	8,407	(1,575)
8/15/1928	8	50.4662	63.1662	(12.7000)	15	(846.6667)	1,696.2	2,123.1	6,259	7,834	(1,575)	-	-	-	6,259	7,834	(1,575)
8/31/1928	8	53.8306	66.5306	(12.7000)	16	(793.7500)	1,696.2	2,096.4	6,676	8,251	(1,575)	-	-	-	6,676	8,251	(1,575)
9/15/1928	9	35.4729	45.6979	(10.2250)	15	(681.6667)	1,192.3	1,535.9	4,399	5,668	(1,268)	-	-	-	4,399	5,668	(1,268)
9/30/1928	9	35.4729	45.6979	(10.2250)	15	(681.6667)	1,192.3	1,535.9	4,399	5,668	(1,268)	-	-	-	4,399	5,668	(1,268)
10/15/1928	10	33.9448	38.4724	(4.5275)	15	(301.8360)	1,140.9	1,293.1	4,210	4,771	(562)	-	-	-	-	-	-
10/31/1928	10	36.2078	40.8505	(4.6427)	16	(290.1693)	1,140.9	1,287.2	4,491	5,066	(576)	-	-	-	-	-	-
11/15/1928	11	5.9429	7.6229	(1.6800)	15	(112.0000)	199.7	256.2	737	945	(208)	-	-	-	-	-	-
11/30/1928	11	5.9429	7.6229	(1.6800)	15	(112.0000)	199.7	256.2	737	945	(208)	-	-	-	-	-	-
12/15/1928	12	5.9286	7.6086	(1.6800)	15	(112.0000)	199.3	255.7	735	944	(208)	-	-	-	-	-	-
12/31/1928	12	6.3239	8.0039	(1.6800)	16	(105.0000)	199.3	252.2	784	993	(208)	-	-	-	-	-	-
1/15/1929	1	6.2980	8.1700	(1.8719)	15	(124.7966)	211.7	274.6	781	1,013	(232)	-	-	-	-	-	-
1/31/1929	1	6.7179	8.6026	(1.8847)	16	(117.7966)	211.7	271.1	833	1,067	(234)	-	-	-	-	-	-
2/15/1929	2	6.2790	8.1715	(1.8925)	15	(126.1677)	211.0	274.7	779	1,013	(235)	779	1,013	(235)	-	-	-
2/28/1929	2	5.4418	7.3060	(1.8642)	13	(143.3984)	211.0	283.3	675	906	(231)	675	906	(231)	-	-	-
3/15/1929	3	24.0054	23.4081	0.5973	15	39.8192	806.8	786.8	2,977	2,903	74	2,977	2,903	74	-	-	-
3/31/1929	3	25.6058	24.9001	0.7057	16	44.1067	806.8	784.6	3,176	3,088	88	3,176	3,088	88	-	-	-
4/14/1929	4	50.8447	41.7848	9.0599	14	647.1337	1,831.0	1,504.7	6,306	5,182	1,124	6,306	5,182	1,124	-	-	-
4/30/1929	4	58.2726	61.0901	(2.8175)	16	(176.0938)	1,836.2	1,924.9	7,227	7,577	(349)	7,227	7,577	(349)	-	-	-
5/15/1929	5	82.6011	67.6372	14.9639	15	997.5957	2,776.3	2,273.3	9,225	8,389	836	9,225	8,389	836	-	-	-
5/31/1929	5	88.1079	58.3155	29.7923	16	1,862.0205	2,776.3	1,837.5	9,840	7,232	2,608	9,840	7,232	2,608	-	-	-
6/15/1929	6	55.5352	46.3527	9.1825	15	612.1667	1,866.6	1,557.9	6,888	5,749	1,139	6,888	5,749	1,139	-	-	-
6/30/1929	6	55.5352	46.3527	9.1825	15	612.1667	1,866.6	1,557.9	6,888	5,749	1,139	6,888	5,749	1,139	-	-	-
7/15/1929	7	51.1577	54.3427	(3.1850)	15	(212.3333)	1,719.4	1,826.5	6,345	6,740	(395)	-	-	-	6,345	6,740	(395)
7/31/1929	7	54.5682	57.7532	(3.1850)	16	(199.0625)	1,719.4	1,819.8	6,768	7,163	(395)	-	-	-	6,768	7,163	(395)
8/15/1929	8	49.8323	53.0173	(3.1850)	15	(212.3333)	1,674.9	1,781.9	6,180	6,575	(395)	-	-	-	6,180	6,575	(395)
8/31/1929	8	53.1545	56.3395	(3.1850)	16	(199.0625)	1,674.9	1,775.3	6,592	6,987	(395)	-	-	-	6,592	6,987	(395)
9/15/1929	9	34.6467	37.4642	(2.8175)	15	(187.8333)	1,164.5	1,259.2	4,297	4,646	(349)	-	-	-	4,297	4,646	(349)
9/30/1929	9	34.6467	37.4642	(2.8175)	15	(187.8333)	1,164.5	1,259.2	4,297	4,646	(349)	-	-	-	4,297	4,646	(349)
10/15/1929	10	20.0794	35.6598	(15.5804)	15	(1,038.6952)	674.9	1,198.5	2,490	4,423	(1,932)	-	-	-	-	-	-
10/31/1929	10	18.3247	37.9228	(19.5981)	16	(1,224.8827)	577.4	1,194.9	2,273	4,703	(2,431)	-	-	-	-	-	-
11/15/1929	11	5.9504	16.9127	(10.9623)	15	(730.8222)	200.0	568.4	738	2,098	(1,360)	-	-	-	-	-	-
11/30/1929	11	5.9504	16.9127	(10.9623)	15	(730.8222)	200.0	568.4	738	2,098	(1,360)	-	-	-	-	-	-
12/15/1929	12	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
12/31/1929	12	6.3471	7.3761	(1.0290)	16	(64.3125)	200.0	232.4	787	915	(128)	-	-	-	-	-	-
1/15/1930	1	6.2472	7.2762	(1.0290)	15	(68.6000)	210.0	244.6	775	902	(128)	-	-	-	-	-	-
1/31/1930	1	6.6637	7.6927	(1.0290)	16	(64.3125)	210.0	242.4	826	954	(128)	-	-	-	-	-	-
2/15/1930	2	10.1893	7.3080	2.8813	15	192.0848	342.5	245.6	1,264	906	357	1,264	906	357	-	-	-
2/28/1930	2	8.8307	6.4708	2.3599	13	181.5309	342.5	250.9	1,095	803	293	1,095	803	293	-	-	-
3/15/1930	3	19.8605	18.0510	1.8095	15	120.6336	667.5	606.7	2,463	2,239	224	2,463	2,239	224	-	-	-
3/31/1930	3	21.1845	19.2544	1.9301	16	120.6336	667.5	606.7	2,627	2,388	239	2,627	2,388	239	-	-	-
4/14/1930	4	49.6524	47.3281	2.3243	14	166.0223	1,788.1	1,704.4	6,158	5,870	288	6,158	5,870	288	-	-	-
4/30/1930	4	54.6028	64.2935	(9.6907)	16	(605.6702)	1,720.5	2,025.9	6,772	7,974	(1,202)	6,772	7,974	(1,202)	-	-	-
5/15/1930	5	62.0654	62.3358	(0.2704)	15	(18.0279)	2,086.1	2,095.1	7,698	7,731	(34)	7,698	7,731	(34)	-	-	-
5/31/1930	5	66.2031	53.0617	13.1414	16	821.3402	2,086.1	1,672.0	8,211	6,581	1,630	8,211	6,581	1,630	-	-	-
6/15/1930	6	56.9122	49.9718	6.9404	15	462.6915	1,912.9	1,679.6	7,058	6,198	861	7,058	6,198	861	-	-	-
6/30/1930	6	56.9122	49.9718	6.9404	15	462.6915	1,912.9	1,679.6	7,058	6,198	861	7,058	6,198	861	-	-	-
7/15/1930	7	38.2499	51.1577	(12.9078)	15	(860.5176)	1,285.6	1,719.4	4,744	6,345	(1,601)	-	-	-	4,744	6,345	(1,601)
7/31/1930	7	40.7999	54.5682	(13.7683)	16	(860.5176)	1,285.6	1,719.4	5,060	6,768	(1,708)	-	-	-	5,060	6,768	(1,708)
8/15/1930	8	36.7284	48.7742	(12.0458)	15	(803.0515)	1,234.5	1,639.3	4,555	6,049	(1,494)	-	-	-	4,555	6,049	(1,494)
8/31/1930	8	39.1770	52.0258	(12.8488)	16	(803.0515)	1,234.5	1,639.3	4,859	6,452	(1,594)	-	-	-	4,859	6,452	(1,594)
9/15/1930	9	13.2000	34.1943	(20.9943)	15	(1,399.6206)	443.7	1,149.3	1,637	4,241	(2,604)	-	-	-	1,637	4,241	(2,604)
9/30/1930	9	15.8000	34.1943	(18.3943)	15	(1,226.2873)	531.0	1,149.3	1,960	4,241	(2,281)	-	-	-	1,960	4,241	(2,281)
10/15/1930	10	17.1794	19.1276	(1.9482)	15	(129.8774)	577.4	642.9	2,131	2,372	(242)	-	-	-	-	-	-
10/31/1930	10	18.3247	20.4028	(2.0780)	16	(129.8774)	577.4	642.9	2,273	2,530	(258)	-	-	-	-	-	-
11/15/1930	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/1930	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/1930	12	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/31/1930	12	6.3471	6.3471	-	16	-	200.0	200.0	787	787	-	-	-	-	-	-	-
1/15/1931	1	6.3053	6.3053	-	15	-	211.9	211.9	782	782	-	-	-	-	-	-	-
1/31/1931	1	6.7256	6.7256	-	16	-	211.9	211.9	834	834	-	-	-	-	-	-	-
2/15/1931	2	6.6615	6.6615	-	15	-	223.9	223.9	826	826	-	826	826	-	-	-	-
2/28/1931	2	5.7733	5.7733	-	13	-	223.9	223.9	716	716	-	716	716	-	-	-	-
3/15/1931	3	14.8867	26.6091	(11.7224)	15	(781.4903)	500.4	894.3	1,846	3,300	(1,454)	1,846	3,300	(1,454)	-	-	-
3/31/1931	3	15.8792	28.3830	(12.5038)	16	(781.4903)	500.4	894.3	1,969	3,520	(1,551)	1,969	3,520	(1,551)	-	-	-
4/14/1931	4	26.1390	58.5693	(32.4303)	14	(2,316.4510)	941.3	2,109.2	3,242	7,264	(4,022)	3,242	7,264	(4,022)	-	-	-
4/30/1931	4	29.8732	62.7027	(32.8296)	16	(2,051.8473)	941.3	1,975.8	3,705	7,777	(4,072)	3,705	7,777	(4,072)	-	-	-
5/15/1931	5	33.5635	59.3941	(25.8305)	15	(1,722.0365)	1,128.1	1,996.3	4,163	7,366	(3,204)	4,163	7,366	(3,204)	-	-	-
5/31/1931	5	35.4678	67.8989	(32.4311)	16	(2,026.9440)	1,117.6	2,139.5	4,399	8,421	(4,022)	4,399	8,421	(4,022)	-	-	-
6/15/1931	6	19.6000	47.7427	(28.1427)	15	(1,876.1768)	658.8	1,604.7	2,431	5,921	(3,490)	2,431	5,921	(3,490)	-	-	-
6/30/1931	6	22.4000	47.7427	(25.3427)	15	(1,689.5101)	752.9	1,604.7	2,778	5,921	(3,143)	2,778	5,921	(3,143)	-	-	-

Avg Water Duty:	Total Period			February -June			July - September		
10.25	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$ 69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
7/15/1931	7	25.8871	51.1577	(25.2706)	15	(1,684.7058)	870.1	1,719.4	3,211	6,345	(3,134)	-	-	-	3,211	6,345	(3,134)
7/31/1931	7	26.4129	54.5682	(28.1553)	16	(1,759.7058)	832.3	1,719.4	3,276	6,768	(3,492)	-	-	-	3,276	6,768	(3,492)
8/15/1931	8	26.4194	49.5505	(23.1311)	15	(1,542.0759)	888.0	1,665.4	3,277	6,145	(2,869)	-	-	-	3,277	6,145	(2,869)
8/31/1931	8	23.9806	52.8539	(28.8732)	16	(1,804.5759)	755.6	1,665.4	2,974	6,555	(3,581)	-	-	-	2,974	6,555	(3,581)
9/15/1931	9	16.8000	34.6467	(17.8467)	15	(1,189.7794)	564.7	1,164.5	2,084	4,297	(2,213)	-	-	-	2,084	4,297	(2,213)
9/30/1931	9	7.4000	34.6467	(27.2467)	15	(1,816.4460)	248.7	1,164.5	918	4,297	(3,379)	-	-	-	918	4,297	(3,379)
10/15/1931	10	17.1794	34.0183	(16.8389)	15	(1,122.5954)	577.4	1,143.4	2,131	4,219	(2,088)	-	-	-	-	-	-
10/31/1931	10	18.3247	36.2862	(17.9615)	16	(1,122.5954)	577.4	1,143.4	2,273	4,500	(2,228)	-	-	-	-	-	-
11/15/1931	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/1931	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/1931	12	5.6746	5.6746	-	15	-	190.7	190.7	704	704	-	-	-	-	-	-	-
12/31/1931	12	6.0529	6.0529	-	16	-	190.7	190.7	751	751	-	-	-	-	-	-	-
1/15/1932	1	6.1819	6.1819	-	15	-	207.8	207.8	767	767	-	-	-	-	-	-	-
1/31/1932	1	6.5940	6.5940	-	16	-	207.8	207.8	818	818	-	-	-	-	-	-	-
2/15/1932	2	26.8216	6.4139	20.4076	15	1,360.5081	901.5	215.6	3,326	795	2,531	3,326	795	2,531	-	-	-
2/29/1932	2	25.0334	5.9863	19.0471	14	1,360.5081	901.5	215.6	3,105	742	2,362	3,105	742	2,362	-	-	-
3/15/1932	3	36.3143	40.7798	(4.4655)	15	(297.6988)	1,220.5	1,370.6	4,504	5,058	(554)	4,504	5,058	(554)	-	-	-
3/31/1932	3	38.7352	43.4984	(4.7632)	16	(297.6988)	1,220.5	1,370.6	4,804	5,395	(591)	4,804	5,395	(591)	-	-	-
4/14/1932	4	70.1236	78.9197	(8.7961)	14	(628.2919)	2,525.2	2,842.0	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1932	4	80.1413	58.1189	22.0223	16	1,376.3967	2,525.2	1,831.3	9,840	7,208	2,632	9,840	7,208	2,632	-	-	-
5/15/1932	5	113.2156	58.8536	54.3621	15	3,624.1387	3,805.2	1,978.1	9,225	7,299	1,926	9,225	7,299	1,926	-	-	-
5/31/1932	5	120.7634	69.2356	51.5278	16	3,220.4853	3,805.2	2,181.6	9,840	8,587	1,253	9,840	8,587	1,253	-	-	-
6/15/1932	6	102.6643	53.4359	49.2284	15	3,281.8951	3,450.6	1,796.0	9,225	6,627	2,598	9,225	6,627	2,598	-	-	-
6/30/1932	6	102.6643	53.4359	49.2284	15	3,281.8951	3,450.6	1,796.0	9,225	6,627	2,598	9,225	6,627	2,598	-	-	-
7/15/1932	7	51.5206	51.5206	-	15	-	1,731.6	1,731.6	6,390	6,390	-	-	-	-	6,390	6,390	-
7/31/1932	7	54.9553	54.9553	-	16	-	1,731.6	1,731.6	6,816	6,816	-	-	-	-	6,816	6,816	-
8/15/1932	8	50.4662	50.4662	-	15	-	1,696.2	1,696.2	6,259	6,259	-	-	-	-	6,259	6,259	-
8/31/1932	8	53.8306	53.8306	-	16	-	1,696.2	1,696.2	6,676	6,676	-	-	-	-	6,676	6,676	-
9/15/1932	9	35.4729	35.4729	-	15	-	1,192.3	1,192.3	4,399	4,399	-	-	-	-	4,399	4,399	-
9/30/1932	9	35.4729	35.4729	-	15	-	1,192.3	1,192.3	4,399	4,399	-	-	-	-	4,399	4,399	-
10/15/1932	10	34.6520	34.6520	-	15	-	1,164.7	1,164.7	4,298	4,298	-	-	-	-	-	-	-
10/31/1932	10	36.9621	36.9621	-	16	-	1,164.7	1,164.7	4,584	4,584	-	-	-	-	-	-	-
11/15/1932	11	15.8742	15.8742	-	15	-	533.5	533.5	1,969	1,969	-	-	-	-	-	-	-
11/30/1932	11	15.8742	15.8742	-	15	-	533.5	533.5	1,969	1,969	-	-	-	-	-	-	-
12/15/1932	12	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/31/1932	12	6.3471	6.3471	-	16	-	200.0	200.0	787	787	-	-	-	-	-	-	-
1/15/1933	1	6.2617	6.2617	-	15	-	210.5	210.5	777	777	-	-	-	-	-	-	-
1/31/1933	1	6.6792	6.6792	-	16	-	210.5	210.5	828	828	-	-	-	-	-	-	-
2/15/1933	2	6.3192	6.3192	-	15	-	212.4	212.4	784	784	-	784	784	-	-	-	-
2/28/1933	2	5.4766	5.4766	-	13	-	212.4	212.4	679	679	-	679	679	-	-	-	-
3/15/1933	3	7.2968	33.4476	(26.1508)	15	(1,743.3872)	245.2	1,124.2	905	4,148	(3,243)	905	4,148	(3,243)	-	-	-
3/31/1933	3	7.7832	35.6774	(27.8942)	16	(1,743.3872)	245.2	1,124.2	965	4,425	(3,460)	965	4,425	(3,460)	-	-	-
4/14/1933	4	29.7914	52.5521	(22.7606)	14	(1,625.7580)	1,072.8	1,892.5	3,695	6,518	(2,823)	3,695	6,518	(2,823)	-	-	-
4/30/1933	4	32.6188	68.9587	(36.3399)	16	(2,271.2416)	1,027.8	2,172.9	4,045	8,552	(4,507)	4,045	8,552	(4,507)	-	-	-
5/15/1933	5	61.0904	58.9092	2.1812	15	145.4130	2,053.3	1,980.0	7,577	7,306	271	7,577	7,306	271	-	-	-
5/31/1933	5	65.1631	50.2310	14.9321	16	933.2581	2,053.3	1,582.8	8,082	6,230	1,852	8,082	6,230	1,852	-	-	-
6/15/1933	6	71.4422	50.6509	20.7913	15	1,386.0890	2,401.2	1,702.4	8,860	6,282	2,579	8,860	6,282	2,579	-	-	-
6/30/1933	6	71.4422	50.6509	20.7913	15	1,386.0890	2,401.2	1,702.4	8,860	6,282	2,579	8,860	6,282	2,579	-	-	-
7/15/1933	7	38.2499	51.6416	(13.3916)	15	(892.7756)	1,285.6	1,735.7	4,744	6,405	(1,661)	-	-	-	4,744	6,405	(1,661)
7/31/1933	7	40.7999	55.0843	(14.2844)	16	(892.7756)	1,285.6	1,735.7	5,060	6,832	(1,772)	-	-	-	5,060	6,832	(1,772)
8/15/1933	8	37.4888	50.4662	(12.9774)	15	(865.1607)	1,260.0	1,696.2	4,649	6,259	(1,609)	-	-	-	4,649	6,259	(1,609)
8/31/1933	8	39.9880	53.8306	(13.8426)	16	(865.1607)	1,260.0	1,696.2	4,959	6,676	(1,717)	-	-	-	4,959	6,676	(1,717)
9/15/1933	9	13.1000	35.4729	(22.3729)	15	(1,491.5254)	440.3	1,192.3	1,625	4,399	(2,775)	-	-	-	1,625	4,399	(2,775)
9/30/1933	9	15.7000	35.4729	(19.7729)	15	(1,318.1921)	527.7	1,192.3	1,947	4,399	(2,452)	-	-	-	1,947	4,399	(2,452)
10/15/1933	10	17.1794	19.1276	(1.9482)	15	(129.8774)	577.4	642.9	2,131	2,372	(242)	-	-	-	-	-	-
10/31/1933	10	18.3247	20.4028	(2.0780)	16	(129.8774)	577.4	642.9	2,273	2,530	(258)	-	-	-	-	-	-
11/15/1933	11	5.9504	12.5888	(6.6384)	15	(442.5567)	200.0	423.1	738	1,561	(823)	-	-	-	-	-	-
11/30/1933	11	5.9504	12.5888	(6.6384)	15	(442.5567)	200.0	423.1	738	1,561	(823)	-	-	-	-	-	-
12/15/1933	12	5.8561	5.8561	-	15	-	196.8	196.8	726	726	-	-	-	-	-	-	-
12/31/1933	12	6.2465	6.2465	-	16	-	196.8	196.8	775	775	-	-	-	-	-	-	-
1/15/1934	1	6.2327	6.2327	-	15	-	209.5	209.5	773	773	-	-	-	-	-	-	-
1/31/1934	1	6.6482	6.6482	-	16	-	209.5	209.5	825	825	-	-	-	-	-	-	-
2/15/1934	2	9.4580	6.1906	3.2674	15	217.8276	317.9	208.1	1,173	768	405	1,173	768	405	-	-	-
2/28/1934	2	8.1970	5.3652	2.8318	13	217.8276	317.9	208.1	1,017	665	351	1,017	665	351	-	-	-
3/15/1934	3	19.5048	20.6073	(1.1024)	15	(73.4943)	655.6	692.6	2,419	2,556	(137)	2,419	2,556	(137)	-	-	-
3/31/1934	3	20.8052	21.9811	(1.1759)	16	(73.4943)	655.6	692.6	2,580	2,726	(146)	2,580	2,726	(146)	-	-	-
4/14/1934	4	29.4457	50.8400	(21.3943)	14	(1,528.1669)	1,060.4	1,830.8	3,652	6,305	(2,653)	3,652	6,305	(2,653)	-	-	-
4/30/1934	4	33.3665	55.5426	(22.1761)	16	(1,386.0047)	1,051.4	1,750.1	4,138	6,889	(2,750)	4,138	6,889	(2,750)	-	-	-
5/15/1934	5	36.1119	49.5243	(13.4124)	15	(894.1588)	1,213.7	1,664.5	4,479	6,142	(1,663)	4,479	6,142	(1,663)	-	-	-
5/31/1934	5	37.7194	56.0607	(18.3413)	16	(1,146.3307)	1,188.5	1,766.5	4,678	6,953	(2,275)	4,678	6,953	(2,275)	-	-	-
6/15/1934	6	30.3925	35.7172	(5.3247)	15	(354.9794)	1,021.5	1,200.5	3,769	4,430	(660)	3,769	4,430	(660)	-	-	-
6/30/1934	6	30.3925	35.7172	(5.3247)	15	(354.9794)	1,021.5	1,200.5	3,769	4,430	(660)	3,769	4,430	(660)	-	-	-
7/15/1934	7	30.8871	38.4999	(7.6128)	15	(507.5216)	1,038.1	1,294.0	3,831	4,775	(944)	-	-	-	3,831	4,775	(944)
7/31/1934	7	33.0129	41.0499	(8.0370)	16	(502.3132)	1,040.2	1,293.5	4,094	5,091	(997)	-	-	-	4,094	5,091	(997)
8/15/1934	8	31.4194	37.4888	(6.0694)	15	(404.6276)	1,056.0	1,260.0	3,897	4,649	(753)	-	-	-	3,897	4,649	(753)
8/31/1934	8	31.9806	39.9880	(8.0074)	16	(500.4609)	1,007.7	1,260.0	3,966	4,959	(993)	-	-	-	3,966	4,959	(993)
9/15/1934	9	12.4000	24.9498	(12.5498)	15	(836.6509)	416.8	838.6	1,538	3,094	(1,556)	-	-	-	1,538	3,094	(1,556)
9/30/1934	9	7.6000	24.9498	(17.3498)	15	(1,156.6509)	255.4	838.6	943	3,094	(2,152)	-	-	-	943	3,094	(2,152)

Avg Water Duty:		Total Period				February -June				July - September		
10.25		Total 40% Gen	Total Base Gen	Difference		Total 40% Gen	Total Base Gen	Difference		Total 40% Gen	Total Base Gen	Difference
Price per MWh:		11,191,837	11,464,645	(272,808)		6,211,725	5,887,134	324,591		3,576,928	3,919,235	(342,307)
$	69.00		Revenue:	$ (18,823,762)			Revenue:	$ 22,396,769			Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1934	10	17.1794	17.1794	-	15	-	577.4	577.4	2,131	2,131	-	-	-	-	-	-	-
10/31/1934	10	18.3247	18.3247	-	16	-	577.4	577.4	2,273	2,273	-	-	-	-	-	-	-
11/15/1934	11	5.9429	5.9429	-	15	-	199.7	199.7	737	737	-	-	-	-	-	-	-
11/30/1934	11	5.9429	5.9429	-	15	-	199.7	199.7	737	737	-	-	-	-	-	-	-
12/15/1934	12	5.9214	5.9214	-	15	-	199.0	199.0	734	734	-	-	-	-	-	-	-
12/31/1934	12	6.3161	6.3161	-	16	-	199.0	199.0	783	783	-	-	-	-	-	-	-
1/15/1935	1	6.0875	6.0875	-	15	-	204.6	204.6	755	755	-	-	-	-	-	-	-
1/31/1935	1	6.4934	6.4934	-	16	-	204.6	204.6	805	805	-	-	-	-	-	-	-
2/15/1935	2	10.0071	40.0271	(30.0200)	15	(2,001.3327)	336.3	1,345.3	1,241	4,964	(3,723)	1,241	4,964	(3,723)	-	-	-
2/28/1935	2	8.6729	34.6902	(26.0173)	13	(2,001.3327)	336.3	1,345.3	1,076	4,302	(3,227)	1,076	4,302	(3,227)	-	-	-
3/15/1935	3	15.5903	24.5863	(8.9960)	15	(599.7341)	524.0	826.4	1,934	3,049	(1,116)	1,934	3,049	(1,116)	-	-	-
3/31/1935	3	16.6297	26.2254	(9.5957)	16	(599.7341)	524.0	826.4	2,062	3,253	(1,190)	2,062	3,253	(1,190)	-	-	-
4/14/1935	4	72.4434	19.1971	53.2463	14	3,803.3058	2,608.8	691.3	8,610	2,381	6,229	8,610	2,381	6,229	-	-	-
4/30/1935	4	82.7924	37.0901	45.7023	16	2,856.3967	2,608.8	1,168.7	9,840	4,600	5,240	9,840	4,600	5,240	-	-	-
5/15/1935	5	112.9374	59.7366	53.2008	15	3,546.7193	3,795.9	2,007.8	9,225	7,409	1,816	9,225	7,409	1,816	-	-	-
5/31/1935	5	120.4666	50.3345	70.1321	16	4,383.2576	3,795.9	1,586.0	9,840	6,243	3,597	9,840	6,243	3,597	-	-	-
6/15/1935	6	92.6568	79.5645	13.0923	15	872.8226	3,114.3	2,674.2	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1935	6	92.6568	79.5645	13.0923	15	872.8226	3,114.3	2,674.2	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1935	7	51.6270	51.6270	-	15	-	1,735.2	1,735.2	6,403	6,403	-	-	-	-	6,403	6,403	-
7/31/1935	7	55.0688	55.0688	-	16	-	1,735.2	1,735.2	6,830	6,830	-	-	-	-	6,830	6,830	-
8/15/1935	8	50.2535	50.2535	-	15	-	1,689.1	1,689.1	6,233	6,233	-	-	-	-	6,233	6,233	-
8/31/1935	8	53.6037	53.6037	-	16	-	1,689.1	1,689.1	6,648	6,648	-	-	-	-	6,648	6,648	-
9/15/1935	9	35.4729	35.4729	-	15	-	1,192.3	1,192.3	4,399	4,399	-	-	-	-	4,399	4,399	-
9/30/1935	9	35.4729	35.4729	-	15	-	1,192.3	1,192.3	4,399	4,399	-	-	-	-	4,399	4,399	-
10/15/1935	10	22.6589	22.6589	-	15	-	761.6	761.6	2,810	2,810	-	-	-	-	-	-	-
10/31/1935	10	24.1695	24.1695	-	16	-	761.6	761.6	2,998	2,998	-	-	-	-	-	-	-
11/15/1935	11	13.1599	13.1599	-	15	-	442.3	442.3	1,632	1,632	-	-	-	-	-	-	-
11/30/1935	11	13.1599	13.1599	-	15	-	442.3	442.3	1,632	1,632	-	-	-	-	-	-	-
12/15/1935	12	5.9432	5.9432	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
12/31/1935	12	6.3394	6.3394	-	16	-	199.8	199.8	786	786	-	-	-	-	-	-	-
1/15/1936	1	6.1093	6.1093	-	15	-	205.3	205.3	758	758	-	-	-	-	-	-	-
1/31/1936	1	6.5166	6.5166	-	16	-	205.3	205.3	808	808	-	-	-	-	-	-	-
2/15/1936	2	41.0922	20.2733	20.8189	15	1,387.9275	1,381.1	681.4	5,096	2,514	2,582	5,096	2,514	2,582	-	-	-
2/29/1936	2	38.3528	18.9218	19.4310	14	1,387.9275	1,381.1	681.4	4,757	2,347	2,410	4,757	2,347	2,410	-	-	-
3/15/1936	3	34.5206	11.6936	22.8270	15	1,521.8026	1,160.3	393.0	4,281	1,450	2,831	4,281	1,450	2,831	-	-	-
3/31/1936	3	36.8220	12.4046	24.4174	16	1,526.0901	1,160.3	390.9	4,567	1,538	3,028	4,567	1,538	3,028	-	-	-
4/14/1936	4	79.5385	34.1497	45.3888	14	3,242.0558	2,864.3	1,229.8	8,610	4,235	4,375	8,610	4,235	4,375	-	-	-
4/30/1936	4	90.9011	53.7763	37.1248	16	2,320.3030	2,864.3	1,694.5	9,840	6,670	3,170	9,840	6,670	3,170	-	-	-
5/15/1936	5	102.0471	60.7606	41.2865	15	2,752.4344	3,429.9	2,042.2	9,225	7,536	1,689	9,225	7,536	1,689	-	-	-
5/31/1936	5	108.8502	47.8861	60.9641	16	3,810.2566	3,429.9	1,508.9	9,840	5,939	3,901	9,840	5,939	3,901	-	-	-
6/15/1936	6	79.0252	58.5324	20.4927	15	1,366.1830	2,656.1	1,967.3	9,225	7,259	1,966	9,225	7,259	1,966	-	-	-
6/30/1936	6	79.0252	58.5324	20.4927	15	1,366.1830	2,656.1	1,967.3	9,225	7,259	1,966	9,225	7,259	1,966	-	-	-
7/15/1936	7	51.3232	54.5082	(3.1850)	15	(212.3333)	1,725.0	1,832.1	6,365	6,760	(395)	-	-	-	6,365	6,760	(395)
7/31/1936	7	54.7448	57.9298	(3.1850)	16	(199.0625)	1,725.0	1,825.4	6,790	7,185	(395)	-	-	-	6,790	7,185	(395)
8/15/1936	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/1936	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/1936	9	33.9015	36.7190	(2.8175)	15	(187.8333)	1,139.4	1,234.1	4,205	4,554	(349)	-	-	-	4,205	4,554	(349)
9/30/1936	9	33.9015	36.7190	(2.8175)	15	(187.8333)	1,139.4	1,234.1	4,205	4,554	(349)	-	-	-	4,205	4,554	(349)
10/15/1936	10	28.1313	29.8463	(1.7150)	15	(114.3333)	945.5	1,003.2	3,489	3,702	(213)	-	-	-	-	-	-
10/31/1936	10	30.0067	31.7217	(1.7150)	16	(107.1875)	945.5	999.5	3,722	3,934	(213)	-	-	-	-	-	-
11/15/1936	11	16.1837	17.2127	(1.0290)	15	(68.6000)	543.9	578.5	2,007	2,135	(128)	-	-	-	-	-	-
11/30/1936	11	16.1837	17.2127	(1.0290)	15	(68.6000)	543.9	578.5	2,007	2,135	(128)	-	-	-	-	-	-
12/15/1936	12	5.9359	6.9649	(1.0290)	15	(68.6000)	199.5	234.1	736	864	(128)	-	-	-	-	-	-
12/31/1936	12	6.3316	7.3606	(1.0290)	16	(64.3125)	199.5	231.9	785	913	(128)	-	-	-	-	-	-
1/15/1937	1	6.2400	7.2690	(1.0290)	15	(68.6000)	209.7	244.3	774	902	(128)	-	-	-	-	-	-
1/31/1937	1	6.6560	7.6850	(1.0290)	16	(64.3125)	209.7	242.2	825	953	(128)	-	-	-	-	-	-
2/15/1937	2	22.7759	10.5047	12.2712	15	818.0772	765.5	353.1	2,825	1,303	1,522	2,825	1,303	1,522	-	-	-
2/28/1937	2	19.7391	9.1041	10.6350	13	818.0772	765.5	353.1	2,448	1,129	1,319	2,448	1,129	1,319	-	-	-
3/15/1937	3	25.6790	9.3094	16.3696	15	1,091.3058	863.1	312.9	3,185	1,155	2,030	3,185	1,155	2,030	-	-	-
3/31/1937	3	27.3910	9.8181	17.5729	16	1,098.3058	863.1	309.4	3,397	1,218	2,179	3,397	1,218	2,179	-	-	-
4/14/1937	4	55.7325	44.0018	11.7307	14	837.9074	2,007.0	1,584.6	6,912	5,457	1,455	6,912	5,457	1,455	-	-	-
4/30/1937	4	63.6943	64.6948	(1.0005)	16	(62.5335)	2,007.0	2,038.5	7,900	8,024	(124)	7,900	8,024	(124)	-	-	-
5/15/1937	5	122.3479	82.7766	39.5713	15	2,638.0881	4,112.2	2,782.2	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1937	5	130.5044	64.9026	65.6018	16	4,100.1137	4,112.2	2,045.1	9,840	8,049	1,791	9,840	8,049	1,791	-	-	-
6/15/1937	6	76.1868	60.6118	15.5750	15	1,038.3333	2,560.7	2,037.2	9,225	7,517	1,708	9,225	7,517	1,708	-	-	-
6/30/1937	6	76.1868	60.6118	15.5750	15	1,038.3333	2,560.7	2,037.2	9,225	7,517	1,708	9,225	7,517	1,708	-	-	-
7/15/1937	7	51.6343	64.3343	(12.7000)	15	(846.6667)	1,735.5	2,162.3	6,404	7,979	(1,575)	-	-	-	6,404	7,979	(1,575)
7/31/1937	7	55.0766	67.7766	(12.7000)	16	(793.7500)	1,735.5	2,135.6	6,831	8,406	(1,575)	-	-	-	6,831	8,406	(1,575)
8/15/1937	8	50.4662	63.1662	(12.7000)	15	(846.6667)	1,696.2	2,123.1	6,259	7,834	(1,575)	-	-	-	6,259	7,834	(1,575)
8/31/1937	8	53.8306	66.5306	(12.7000)	16	(793.7500)	1,696.2	2,096.4	6,676	8,251	(1,575)	-	-	-	6,676	8,251	(1,575)
9/15/1937	9	35.4729	45.6979	(10.2250)	15	(681.6667)	1,192.3	1,535.9	4,399	5,668	(1,268)	-	-	-	4,399	5,668	(1,268)
9/30/1937	9	35.4729	45.6979	(10.2250)	15	(681.6667)	1,192.3	1,535.9	4,399	5,668	(1,268)	-	-	-	4,399	5,668	(1,268)
10/15/1937	10	31.3225	35.8500	(4.5275)	15	(301.8360)	1,052.8	1,204.9	3,885	4,446	(562)	-	-	-	-	-	-
10/31/1937	10	33.4107	38.0534	(4.6427)	16	(290.1693)	1,052.8	1,199.1	4,144	4,720	(576)	-	-	-	-	-	-
11/15/1937	11	13.0691	14.7491	(1.6800)	15	(112.0000)	439.3	495.7	1,621	1,829	(208)	-	-	-	-	-	-
11/30/1937	11	13.0691	14.7491	(1.6800)	15	(112.0000)	439.3	495.7	1,621	1,829	(208)	-	-	-	-	-	-
12/15/1937	12	5.8125	7.4925	(1.6800)	15	(112.0000)	195.4	251.8	721	929	(208)	-	-	-	-	-	-
12/31/1937	12	6.2000	7.8800	(1.6800)	16	(105.0000)	195.4	248.3	769	977	(208)	-	-	-	-	-	-

Avg Water Duty:		Total Period			February -June			July - September		
10.25		Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:		11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$	69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/1938	1	6.2400	8.1119	(1.8719)	15	(124.7966)	209.7	272.6	774	1,006	(232)	-	-	-	-	-	-
1/31/1938	1	6.6560	8.5407	(1.8847)	16	(117.7966)	209.7	269.1	825	1,059	(234)	-	-	-	-	-	-
2/15/1938	2	36.4205	17.1402	19.2803	15	1,285.3535	1,224.1	576.1	4,517	2,126	2,391	4,517	2,126	2,391	-	-	-
2/28/1938	2	31.5645	14.8549	16.7096	13	1,285.3535	1,224.1	576.1	3,915	1,842	2,072	3,915	1,842	2,072	-	-	-
3/15/1938	3	49.4913	52.0826	(2.5913)	15	(172.7538)	1,663.4	1,750.5	6,138	6,459	(321)	6,138	6,459	(321)	-	-	-
3/31/1938	3	52.6787	55.4428	(2.7641)	16	(172.7538)	1,659.9	1,747.0	6,533	6,876	(343)	6,533	6,876	(343)	-	-	-
4/14/1938	4	88.0777	99.1658	(11.0880)	14	(792.0030)	3,171.8	3,571.1	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1938	4	99.1995	63.7016	35.4980	16	2,218.6227	3,125.8	2,007.2	9,840	7,900	1,940	9,840	7,900	1,940	-	-	-
5/15/1938	5	159.2156	117.2556	41.9600	15	2,797.3342	5,351.3	3,941.0	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1938	5	169.1484	109.1051	60.0433	16	3,752.7061	5,329.9	3,437.9	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1938	6	132.8052	85.5324	47.2727	15	3,151.5152	4,463.7	2,874.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1938	6	132.8052	85.5324	47.2727	15	3,151.5152	4,463.7	2,874.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1938	7	65.1150	68.9540	(3.8390)	15	(255.9317)	2,188.6	2,317.6	8,076	8,552	(476)	-	-	-	8,076	8,552	(476)
7/31/1938	7	68.6093	72.7042	(4.0949)	16	(255.9317)	2,161.9	2,290.9	8,509	9,017	(508)	-	-	-	8,509	9,017	(508)
8/15/1938	8	63.6724	66.6477	(2.9752)	15	(198.3471)	2,140.1	2,240.1	7,897	8,266	(369)	-	-	-	7,897	8,266	(369)
8/31/1938	8	67.0706	70.2442	(3.1736)	16	(198.3471)	2,113.4	2,213.4	8,318	8,712	(394)	-	-	-	8,318	8,712	(394)
9/15/1938	9	45.8783	48.8535	(2.9752)	15	(198.3471)	1,542.0	1,642.0	5,690	6,059	(369)	-	-	-	5,690	6,059	(369)
9/30/1938	9	45.8783	48.8535	(2.9752)	15	(198.3471)	1,542.0	1,642.0	5,690	6,059	(369)	-	-	-	5,690	6,059	(369)
10/15/1938	10	34.3973	35.7409	(1.3436)	15	(89.5761)	1,156.1	1,201.3	4,266	4,433	(167)	-	-	-	-	-	-
10/31/1938	10	36.5037	37.9370	(1.4332)	16	(89.5761)	1,150.2	1,195.4	4,527	4,705	(178)	-	-	-	-	-	-
11/15/1938	11	16.6345	19.6097	(2.9752)	15	(198.3471)	559.1	659.1	2,063	2,432	(369)	-	-	-	-	-	-
11/30/1938	11	16.6345	19.6097	(2.9752)	15	(198.3471)	559.1	659.1	2,063	2,432	(369)	-	-	-	-	-	-
12/15/1938	12	7.6086	10.5838	(2.9752)	15	(198.3471)	255.7	355.7	944	1,313	(369)	-	-	-	-	-	-
12/31/1938	12	8.0039	11.1774	(3.1736)	16	(198.3471)	252.2	352.2	993	1,386	(394)	-	-	-	-	-	-
1/15/1939	1	8.5611	12.3041	(3.7430)	15	(249.5334)	287.7	413.5	1,062	1,526	(464)	-	-	-	-	-	-
1/31/1939	1	9.0199	13.0124	(3.9925)	16	(249.5334)	284.2	410.0	1,119	1,614	(495)	-	-	-	-	-	-
2/15/1939	2	8.6126	12.4379	(3.8253)	15	(255.0177)	289.5	418.0	1,068	1,543	(474)	1,068	1,543	(474)	-	-	-
2/28/1939	2	7.6883	11.0035	(3.3152)	13	(255.0177)	298.2	426.7	954	1,365	(411)	954	1,365	(411)	-	-	-
3/15/1939	3	25.7949	18.0737	7.7212	15	514.7445	867.0	607.5	3,199	2,242	958	3,199	2,242	958	-	-	-
3/31/1939	3	27.4459	19.1666	8.2793	16	517.4570	864.8	603.9	3,404	2,377	1,027	3,404	2,377	1,027	-	-	-
4/14/1939	4	75.3967	90.2503	(14.8537)	14	(1,060.9764)	2,715.1	3,250.0	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1939	4	85.7651	104.1253	(18.3601)	16	(1,147.5086)	2,702.5	3,281.0	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1939	5	64.8057	96.9910	(32.1853)	15	(2,145.6850)	2,178.2	3,259.9	8,037	9,225	(1,188)	8,037	9,225	(1,188)	-	-	-
5/31/1939	5	68.9383	86.3634	(17.4251)	16	(1,089.0684)	2,172.2	2,721.3	8,550	9,840	(1,290)	8,550	9,840	(1,290)	-	-	-
6/15/1939	6	54.4893	63.9067	(9.4174)	15	(627.8278)	1,831.4	2,147.9	6,758	7,926	(1,168)	6,758	7,926	(1,168)	-	-	-
6/30/1939	6	54.4893	63.9067	(9.4174)	15	(627.8278)	1,831.4	2,147.9	6,758	7,926	(1,168)	6,758	7,926	(1,168)	-	-	-
7/15/1939	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1939	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1939	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1939	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1939	9	31.1118	38.5573	(7.4455)	15	(496.3678)	1,045.7	1,295.9	3,859	4,782	(923)	-	-	-	3,859	4,782	(923)
9/30/1939	9	31.1118	38.5573	(7.4455)	15	(496.3678)	1,045.7	1,295.9	3,859	4,782	(923)	-	-	-	3,859	4,782	(923)
10/15/1939	10	33.7518	40.6912	(6.9394)	15	(462.6292)	1,134.4	1,367.7	4,186	5,047	(861)	-	-	-	-	-	-
10/31/1939	10	35.8876	43.2173	(7.3297)	16	(458.1084)	1,130.8	1,361.8	4,451	5,360	(909)	-	-	-	-	-	-
11/15/1939	11	16.9866	17.6376	(0.6510)	15	(43.4000)	570.9	592.8	2,107	2,187	(81)	-	-	-	-	-	-
11/30/1939	11	16.9866	17.6376	(0.6510)	15	(43.4000)	570.9	592.8	2,107	2,187	(81)	-	-	-	-	-	-
12/15/1939	12	6.9722	7.6232	(0.6510)	15	(43.4000)	234.3	256.2	865	945	(81)	-	-	-	-	-	-
12/31/1939	12	7.3684	8.0194	(0.6510)	16	(40.6875)	232.2	252.7	914	995	(81)	-	-	-	-	-	-
1/15/1940	1	7.0294	8.0643	(1.0349)	15	(68.9932)	236.3	271.0	872	1,000	(128)	-	-	-	-	-	-
1/31/1940	1	7.4295	8.4900	(1.0605)	16	(66.2807)	234.1	267.5	921	1,053	(132)	-	-	-	-	-	-
2/15/1940	2	36.4031	8.0615	28.3416	15	1,889.4421	1,223.5	271.0	4,515	1,000	3,515	4,515	1,000	3,515	-	-	-
2/29/1940	2	34.0449	7.6361	26.4088	14	1,886.3421	1,226.0	275.0	4,222	947	3,275	4,222	947	3,275	-	-	-
3/15/1940	3	54.6227	48.7779	5.8448	15	389.6562	1,835.9	1,639.5	6,774	6,050	725	6,774	6,050	725	-	-	-
3/31/1940	3	58.1523	51.9178	6.2345	16	389.6562	1,832.4	1,635.9	7,212	6,439	773	7,212	6,439	773	-	-	-
4/14/1940	4	81.3566	78.2097	3.1469	14	224.7778	2,929.8	2,816.4	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1940	4	91.5183	75.1709	16.3473	16	1,021.7081	2,883.7	2,368.6	9,840	9,323	517	9,840	9,323	517	-	-	-
5/15/1940	5	120.2237	110.7766	9.4471	15	629.8055	4,040.8	3,723.3	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1940	5	127.5570	94.2073	33.3496	16	2,084.3509	4,019.3	2,968.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1940	6	84.0818	81.0488	3.0331	15	202.2039	2,826.0	2,724.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1940	6	84.0818	81.0488	3.0331	15	202.2039	2,826.0	2,724.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1940	7	64.3343	65.3728	(1.0385)	15	(69.2348)	2,162.3	2,197.2	7,979	8,108	(129)	-	-	-	7,979	8,108	(129)
7/31/1940	7	67.7766	68.8843	(1.1078)	16	(69.2348)	2,135.6	2,170.5	8,406	8,543	(137)	-	-	-	8,406	8,543	(137)
8/15/1940	8	63.1662	63.6724	(0.5063)	15	(33.7510)	2,123.1	2,140.1	7,834	7,897	(63)	-	-	-	7,834	7,897	(63)
8/31/1940	8	66.5306	67.0706	(0.5400)	16	(33.7510)	2,096.4	2,113.4	8,251	8,318	(67)	-	-	-	8,251	8,318	(67)
9/15/1940	9	45.5431	47.0687	(1.5256)	15	(101.7080)	1,530.7	1,582.0	5,648	5,838	(189)	-	-	-	5,648	5,838	(189)
9/30/1940	9	45.5431	47.0687	(1.5256)	15	(101.7080)	1,530.7	1,582.0	5,648	5,838	(189)	-	-	-	5,648	5,838	(189)
10/15/1940	10	35.8500	40.6488	(4.7987)	15	(319.9147)	1,204.9	1,366.2	4,446	5,041	(595)	-	-	-	-	-	-
10/31/1940	10	38.0534	43.1720	(5.1186)	16	(319.9147)	1,199.1	1,360.3	4,720	5,354	(635)	-	-	-	-	-	-
11/15/1940	11	17.5392	17.5392	-	15	-	589.5	589.5	2,175	2,175	-	-	-	-	-	-	-
11/30/1940	11	17.5392	17.5392	-	15	-	589.5	589.5	2,175	2,175	-	-	-	-	-	-	-
12/15/1940	12	7.4998	7.4998	-	15	-	252.1	252.1	930	930	-	-	-	-	-	-	-
12/31/1940	12	7.8878	7.8878	-	16	-	248.5	248.5	978	978	-	-	-	-	-	-	-
1/15/1941	1	8.0321	8.4160	(0.3839)	15	(25.5932)	270.0	282.9	996	1,044	(48)	-	-	-	-	-	-
1/31/1941	1	8.4555	8.8650	(0.4095)	16	(25.5932)	266.4	279.3	1,049	1,099	(51)	-	-	-	-	-	-
2/15/1941	2	24.4452	8.3153	16.1299	15	1,075.3247	821.6	279.5	3,032	1,031	2,000	3,032	1,031	2,000	-	-	-
2/28/1941	2	21.4098	7.4306	13.9792	13	1,075.3247	830.3	288.2	2,655	922	1,734	2,655	922	1,734	-	-	-
3/15/1941	3	34.7526	48.8432	(14.0906)	15	(939.3761)	1,168.1	1,641.7	4,310	6,058	(1,748)	4,310	6,058	(1,748)	-	-	-
3/31/1941	3	36.9574	51.9874	(15.0300)	16	(939.3761)	1,164.5	1,638.1	4,584	6,448	(1,864)	4,584	6,448	(1,864)	-	-	-

Avg Water Duty:	
	10.25
Price per MWh:	
$	69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/1941	4	58.2003	68.6801	(10.4798)	14	(748.5556)	2,095.9	2,473.3	7,218	8,518	(1,300)	7,218	8,518	(1,300)	-	-	-
4/30/1941	4	65.0539	64.2799	0.7740	16	48.3747	2,049.8	2,025.5	8,068	7,972	96	8,068	7,972	96	-	-	-
5/15/1941	5	134.2019	107.9161	26.2858	15	1,752.3862	4,510.6	3,627.1	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1941	5	142.4671	91.1562	51.3109	16	3,206.9316	4,489.1	2,872.3	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1941	6	99.6118	80.9788	18.6331	15	1,242.2039	3,348.0	2,721.7	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1941	6	99.6118	80.9788	18.6331	15	1,242.2039	3,348.0	2,721.7	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1941	7	64.3343	65.3728	(1.0385)	15	(69.2348)	2,162.3	2,197.2	7,979	8,108	(129)	-	-	-	7,979	8,108	(129)
7/31/1941	7	67.7766	68.8843	(1.1078)	16	(69.2348)	2,135.6	2,170.5	8,406	8,543	(137)	-	-	-	8,406	8,543	(137)
8/15/1941	8	63.1662	63.6724	(0.5063)	15	(33.7510)	2,123.1	2,140.1	7,834	7,897	(63)	-	-	-	7,834	7,897	(63)
8/31/1941	8	66.5306	67.0706	(0.5400)	16	(33.7510)	2,096.4	2,113.4	8,251	8,318	(67)	-	-	-	8,251	8,318	(67)
9/15/1941	9	45.6979	47.2235	(1.5256)	15	(101.7080)	1,535.9	1,587.2	5,668	5,857	(189)	-	-	-	5,668	5,857	(189)
9/30/1941	9	45.6979	47.2235	(1.5256)	15	(101.7080)	1,535.9	1,587.2	5,668	5,857	(189)	-	-	-	5,668	5,857	(189)
10/15/1941	10	33.2924	38.0912	(4.7987)	15	(319.9147)	1,119.0	1,280.3	4,129	4,724	(595)	-	-	-	-	-	-
10/31/1941	10	35.3253	40.4439	(5.1186)	16	(319.9147)	1,113.1	1,274.4	4,381	5,016	(635)	-	-	-	-	-	-
11/15/1941	11	15.9634	15.9634	-	15	-	536.5	536.5	1,980	1,980	-	-	-	-	-	-	-
11/30/1941	11	15.9634	15.9634	-	15	-	536.5	536.5	1,980	1,980	-	-	-	-	-	-	-
12/15/1941	12	7.5215	7.5215	-	15	-	252.8	252.8	933	933	-	-	-	-	-	-	-
12/31/1941	12	7.9110	7.9110	-	16	-	249.3	249.3	981	981	-	-	-	-	-	-	-
1/15/1942	1	7.7127	8.0966	(0.3839)	15	(25.5932)	259.2	272.1	957	1,004	(48)	-	-	-	-	-	-
1/31/1942	1	8.1149	8.5244	(0.4095)	16	(25.5932)	255.7	268.6	1,006	1,057	(51)	-	-	-	-	-	-
2/15/1942	2	23.4300	8.3716	15.0584	15	1,003.8961	787.5	281.4	2,906	1,038	1,868	2,906	1,038	1,868	-	-	-
2/28/1942	2	20.5300	7.4794	13.0506	13	1,003.8961	796.2	290.1	2,546	928	1,619	2,546	928	1,619	-	-	-
3/15/1942	3	26.5627	55.2831	(28.7203)	15	(1,914.6893)	892.8	1,858.1	3,294	6,856	(3,562)	3,294	6,856	(3,562)	-	-	-
3/31/1942	3	28.2216	58.8566	(30.6350)	16	(1,914.6893)	889.3	1,854.6	3,500	7,300	(3,799)	3,500	7,300	(3,799)	-	-	-
4/14/1942	4	61.8754	83.2301	(21.3547)	14	(1,525.3363)	2,228.2	2,997.2	7,674	8,610	(936)	7,674	8,610	(936)	-	-	-
4/30/1942	4	69.2540	45.4894	23.7646	16	1,485.2893	2,182.2	1,433.4	8,589	5,642	2,947	8,589	5,642	2,947	-	-	-
5/15/1942	5	113.9697	111.1064	2.8632	15	190.8826	3,830.6	3,734.4	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1942	5	120.8860	102.5459	18.3401	16	1,146.2545	3,809.1	3,231.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1942	6	117.6518	85.7791	31.8727	15	2,124.8486	3,954.4	2,883.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1942	6	117.6518	85.7791	31.8727	15	2,124.8486	3,954.4	2,883.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1942	7	64.3270	69.2045	(4.8775)	15	(325.1666)	2,162.1	2,326.0	7,978	8,583	(605)	-	-	-	7,978	8,583	(605)
7/31/1942	7	67.7688	72.9715	(5.2027)	16	(325.1666)	2,135.4	2,299.3	8,405	9,050	(645)	-	-	-	8,405	9,050	(645)
8/15/1942	8	63.1662	66.6477	(3.4815)	15	(232.0981)	2,123.1	2,240.1	7,834	8,266	(432)	-	-	-	7,834	8,266	(432)
8/31/1942	8	66.5306	70.2442	(3.7136)	16	(232.0981)	2,096.4	2,213.4	8,251	8,712	(461)	-	-	-	8,251	8,712	(461)
9/15/1942	9	45.7359	50.1987	(4.4628)	15	(297.5206)	1,537.2	1,687.2	5,672	6,226	(553)	-	-	-	5,672	6,226	(553)
9/30/1942	9	45.7359	50.1987	(4.4628)	15	(297.5206)	1,537.2	1,687.2	5,672	6,226	(553)	-	-	-	5,672	6,226	(553)
10/15/1942	10	40.4723	42.4878	(2.0155)	15	(134.3642)	1,360.3	1,428.0	5,020	5,269	(250)	-	-	-	-	-	-
10/31/1942	10	42.9838	45.1336	(2.1498)	16	(134.3642)	1,354.4	1,422.2	5,331	5,598	(267)	-	-	-	-	-	-
11/15/1942	11	7.5554	10.5306	(2.9752)	15	(198.3471)	253.9	353.9	937	1,306	(369)	-	-	-	-	-	-
11/30/1942	11	7.5554	10.5306	(2.9752)	15	(198.3471)	253.9	353.9	937	1,306	(369)	-	-	-	-	-	-
12/15/1942	12	7.4925	10.4677	(2.9752)	15	(198.3471)	251.8	351.8	929	1,298	(369)	-	-	-	-	-	-
12/31/1942	12	7.8800	11.0536	(3.1736)	16	(198.3471)	248.3	348.3	977	1,371	(394)	-	-	-	-	-	-
1/15/1943	1	7.9410	11.8759	(3.9350)	15	(262.3300)	266.9	399.2	985	1,473	(488)	-	-	-	-	-	-
1/31/1943	1	8.3583	77.7322	(69.3738)	16	(4,335.8640)	263.4	2,449.3	1,037	9,641	(8,604)	-	-	-	-	-	-
2/15/1943	2	26.6202	67.7239	(41.1037)	15	(2,740.2476)	894.7	2,276.2	3,302	8,399	(5,098)	3,302	8,399	(5,098)	-	-	-
2/28/1943	2	23.2948	58.6940	(35.3992)	13	(2,723.0168)	903.4	2,276.2	2,889	7,279	(4,390)	2,889	7,279	(4,390)	-	-	-
3/15/1943	3	64.3332	107.9457	(43.6125)	15	(2,907.5007)	2,162.3	3,628.1	7,979	9,225	(1,246)	7,979	9,225	(1,246)	-	-	-
3/31/1943	3	68.5101	117.1749	(48.6648)	16	(3,041.5515)	2,158.8	3,692.2	8,497	9,840	(1,343)	8,497	9,840	(1,343)	-	-	-
4/14/1943	4	87.9197	97.4205	(9.5008)	14	(678.6289)	3,166.1	3,508.2	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1943	4	99.0190	61.7070	37.3119	16	2,331.9967	3,120.1	1,944.4	9,840	7,653	2,187	9,840	7,653	2,187	-	-	-
5/15/1943	5	110.3355	118.4677	(8.1322)	15	(542.1487)	3,708.4	3,981.8	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1943	5	113.0477	110.3980	2.6497	16	165.6093	3,562.1	3,478.6	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1943	6	91.2743	85.8016	5.4727	15	364.8486	3,067.8	2,883.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1943	6	91.2743	85.8016	5.4727	15	364.8486	3,067.8	2,883.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1943	7	65.3728	69.2118	(3.8390)	15	(255.9317)	2,197.2	2,326.3	8,108	8,584	(476)	-	-	-	8,108	8,584	(476)
7/31/1943	7	68.8843	72.9792	(4.0949)	16	(255.9317)	2,170.5	2,299.6	8,543	9,051	(508)	-	-	-	8,543	9,051	(508)
8/15/1943	8	63.6724	66.6477	(2.9752)	15	(198.3471)	2,140.1	2,240.1	7,897	8,266	(369)	-	-	-	7,897	8,266	(369)
8/31/1943	8	67.0706	70.2442	(3.1736)	16	(198.3471)	2,113.4	2,213.4	8,318	8,712	(394)	-	-	-	8,318	8,712	(394)
9/15/1943	9	47.2235	50.1987	(2.9752)	15	(198.3471)	1,587.2	1,687.2	5,857	6,226	(369)	-	-	-	5,857	6,226	(369)
9/30/1943	9	47.2235	50.1987	(2.9752)	15	(198.3471)	1,587.2	1,687.2	5,857	6,226	(369)	-	-	-	5,857	6,226	(369)
10/15/1943	10	40.6415	41.9851	(1.3436)	15	(89.5761)	1,366.0	1,411.1	5,040	5,207	(167)	-	-	-	-	-	-
10/31/1943	10	43.1643	44.5975	(1.4332)	16	(89.5761)	1,360.1	1,405.3	5,353	5,531	(178)	-	-	-	-	-	-
11/15/1943	11	15.9634	18.9386	(2.9752)	15	(198.3471)	536.5	636.5	1,980	2,349	(369)	-	-	-	-	-	-
11/30/1943	11	15.9634	18.9386	(2.9752)	15	(198.3471)	536.5	636.5	1,980	2,349	(369)	-	-	-	-	-	-
12/15/1943	12	7.6159	10.5911	(2.9752)	15	(198.3471)	256.0	356.0	945	1,314	(369)	-	-	-	-	-	-
12/31/1943	12	8.0116	11.1852	(3.1736)	16	(198.3471)	252.4	352.4	994	1,387	(394)	-	-	-	-	-	-
1/15/1944	1	8.5466	12.2896	(3.7430)	15	(249.5334)	287.3	413.1	1,060	1,524	(464)	-	-	-	-	-	-
1/31/1944	1	9.0044	12.9969	(3.9925)	16	(249.5334)	283.7	409.5	1,117	1,612	(495)	-	-	-	-	-	-
2/15/1944	2	8.5301	12.3553	(3.8253)	15	(255.0177)	286.7	415.3	1,058	1,532	(474)	1,058	1,532	(474)	-	-	-
2/29/1944	2	8.0734	11.6436	(3.5702)	14	(255.0177)	290.7	419.3	1,001	1,444	(443)	1,001	1,444	(443)	-	-	-
3/15/1944	3	29.3878	21.9834	7.4044	15	493.6284	987.7	738.9	3,645	2,726	918	3,645	2,726	918	-	-	-
3/31/1944	3	31.2350	23.3370	7.8981	16	493.6284	984.2	735.3	3,874	2,894	980	3,874	2,894	980	-	-	-
4/14/1944	4	57.3435	79.5363	(22.1928)	14	(1,585.2026)	2,065.0	2,864.2	7,112	8,610	(1,498)	7,112	8,610	(1,498)	-	-	-
4/30/1944	4	74.4769	91.8807	(17.4038)	16	(1,087.7355)	2,346.8	2,895.2	9,237	9,840	(603)	9,237	9,840	(603)	-	-	-
5/15/1944	5	104.4245	100.3636	4.0609	15	270.7290	3,509.8	3,373.3	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1944	5	110.7045	89.9608	20.7437	16	1,296.4810	3,488.3	2,834.7	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1944	6	77.4352	63.6451	13.7901	15	919.3389	2,602.6	2,139.2	9,225	7,893	1,332	9,225	7,893	1,332	-	-	-
6/30/1944	6	77.4352	63.6451	13.7901	15	919.3389	2,602.6	2,139.2	9,225	7,893	1,332	9,225	7,893	1,332	-	-	-

Avg Water Duty:	10.25
Price per MWh:	$ 69.00

Total Period		
Total 40% Gen	Total Base Gen	Difference
11,191,837	11,464,645	(272,808)
	Revenue:	$ (18,823,762)

February -June		
Total 40% Gen	Total Base Gen	Difference
6,211,725	5,887,134	324,591
	Revenue:	$ 22,396,769

July - September		
Total 40% Gen	Total Base Gen	Difference
3,576,928	3,919,235	(342,307)
	Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
7/15/1944	7	64.3416	64.3416	-	15	-	2,162.6	2,162.6	7,980	7,980	-	-	-	-	7,980	7,980	-
7/31/1944	7	67.7843	67.7843	-	16	-	2,135.9	2,135.9	8,407	8,407	-	-	-	-	8,407	8,407	-
8/15/1944	8	63.1662	63.1662	-	15	-	2,123.1	2,123.1	7,834	7,834	-	-	-	-	7,834	7,834	-
8/31/1944	8	66.5306	66.5306	-	16	-	2,096.4	2,096.4	8,251	8,251	-	-	-	-	8,251	8,251	-
9/15/1944	9	45.4717	45.5097	(0.0380)	15	(2.5344)	1,528.3	1,529.6	5,640	5,644	(5)	-	-	-	5,640	5,644	(5)
9/30/1944	9	45.4717	45.5097	(0.0380)	15	(2.5344)	1,528.3	1,529.6	5,640	5,644	(5)	-	-	-	5,640	5,644	(5)
10/15/1944	10	26.5298	30.6567	(4.1269)	15	(275.1266)	891.7	1,030.4	3,290	3,802	(512)	-	-	-	-	-	-
10/31/1944	10	28.1117	32.5138	(4.4020)	16	(275.1266)	885.8	1,024.5	3,487	4,032	(546)	-	-	-	-	-	-
11/15/1944	11	7.5479	7.5479	-	15	-	253.7	253.7	936	936	-	-	-	-	-	-	-
11/30/1944	11	7.5479	7.5479	-	15	-	253.7	253.7	936	936	-	-	-	-	-	-	-
12/15/1944	12	7.5651	7.5651	-	15	-	254.3	254.3	938	938	-	-	-	-	-	-	-
12/31/1944	12	7.9574	7.9574	-	16	-	250.7	250.7	987	987	-	-	-	-	-	-	-
1/15/1945	1	8.1700	8.3619	(0.1919)	15	(12.7966)	274.6	281.0	1,013	1,037	(24)	-	-	-	-	-	-
1/31/1945	1	8.6026	8.8074	(0.2047)	16	(12.7966)	271.1	277.5	1,067	1,092	(25)	-	-	-	-	-	-
2/15/1945	2	40.3559	7.9421	32.4138	15	2,160.9209	1,356.4	266.9	5,005	985	4,020	5,005	985	4,020	-	-	-
2/28/1945	2	35.1991	7.1071	28.0920	13	2,160.9209	1,365.1	275.6	4,366	881	3,484	4,366	881	3,484	-	-	-
3/15/1945	3	22.4308	48.9085	(26.4777)	15	(1,765.1825)	753.9	1,643.8	2,782	6,066	(3,284)	2,782	6,066	(3,284)	-	-	-
3/31/1945	3	23.8142	52.0571	(28.2429)	16	(1,765.1825)	750.4	1,640.3	2,954	6,456	(3,503)	2,954	6,456	(3,503)	-	-	-
4/14/1945	4	80.0961	81.9292	(1.8330)	14	(130.9312)	2,884.4	2,950.4	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1945	4	90.0777	79.4217	10.6560	16	665.9991	2,838.3	2,502.6	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1945	5	117.3689	110.4379	6.9310	15	462.0636	3,944.8	3,711.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1945	5	124.5118	93.8461	30.6657	16	1,916.6090	3,923.4	2,957.1	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1945	6	98.1277	80.0946	18.0331	15	1,202.2039	3,298.1	2,692.0	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1945	6	98.1277	80.0946	18.0331	15	1,202.2039	3,298.1	2,692.0	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1945	7	64.3416	65.3801	(1.0385)	15	(69.2348)	2,162.6	2,197.5	7,980	8,109	(129)	-	-	-	7,980	8,109	(129)
7/31/1945	7	67.7843	68.8921	(1.1078)	16	(69.2348)	2,135.9	2,170.8	8,407	8,544	(137)	-	-	-	8,407	8,544	(137)
8/15/1945	8	63.1662	63.6724	(0.5063)	15	(33.7510)	2,123.1	2,140.1	7,834	7,897	(63)	-	-	-	7,834	7,897	(63)
8/31/1945	8	66.5306	67.0706	(0.5400)	16	(33.7510)	2,096.4	2,113.4	8,251	8,318	(67)	-	-	-	8,251	8,318	(67)
9/15/1945	9	43.8288	45.3545	(1.5256)	15	(101.7080)	1,473.1	1,524.4	5,436	5,625	(189)	-	-	-	5,436	5,625	(189)
9/30/1945	9	43.8288	45.3545	(1.5256)	15	(101.7080)	1,473.1	1,524.4	5,436	5,625	(189)	-	-	-	5,436	5,625	(189)
10/15/1945	10	24.8593	29.6580	(4.7987)	15	(319.9147)	835.5	996.8	3,083	3,678	(595)	-	-	-	-	-	-
10/31/1945	10	26.3299	31.4485	(5.1186)	16	(319.9147)	829.7	990.9	3,266	3,900	(635)	-	-	-	-	-	-
11/15/1945	11	7.6004	7.6004	-	15	-	255.5	255.5	943	943	-	-	-	-	-	-	-
11/30/1945	11	7.6004	7.6004	-	15	-	255.5	255.5	943	943	-	-	-	-	-	-	-
12/15/1945	12	7.3038	7.3038	-	15	-	245.5	245.5	906	906	-	-	-	-	-	-	-
12/31/1945	12	7.6787	7.6787	-	16	-	242.0	242.0	952	952	-	-	-	-	-	-	-
1/15/1946	1	8.0756	8.4595	(0.3839)	15	(25.5932)	271.4	284.3	1,002	1,049	(48)	-	-	-	-	-	-
1/31/1946	1	8.5020	8.9115	(0.4095)	16	(25.5932)	267.9	280.8	1,054	1,105	(51)	-	-	-	-	-	-
2/15/1946	2	12.1077	8.6207	3.4870	15	232.4676	406.9	289.7	1,502	1,069	432	1,502	1,069	432	-	-	-
2/28/1946	2	10.7173	7.6952	3.0221	13	232.4676	415.6	298.4	1,329	954	375	1,329	954	375	-	-	-
3/15/1946	3	28.5861	51.5800	(22.9939)	15	(1,532.9244)	960.8	1,733.6	3,545	6,397	(2,852)	3,545	6,397	(2,852)	-	-	-
3/31/1946	3	30.3799	54.9066	(24.5268)	16	(1,532.9244)	957.3	1,730.1	3,768	6,810	(3,042)	3,768	6,810	(3,042)	-	-	-
4/14/1946	4	87.6376	86.0777	1.5598	14	111.4175	3,155.9	3,099.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1946	4	98.6965	84.1629	14.5336	16	908.3478	3,109.9	2,652.0	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1946	5	107.9406	106.2355	1.7051	15	113.6765	3,628.0	3,570.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1946	5	114.4550	89.3635	25.0916	16	1,568.2219	3,606.5	2,815.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1946	6	80.0818	81.0488	(0.9669)	15	(64.4627)	2,691.6	2,724.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1946	6	80.0818	81.0488	(0.9669)	15	(64.4627)	2,691.6	2,724.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1946	7	64.2206	65.2591	(1.0385)	15	(69.2348)	2,158.5	2,193.4	7,965	8,094	(129)	-	-	-	7,965	8,094	(129)
7/31/1946	7	67.6553	68.7631	(1.1078)	16	(69.2348)	2,131.8	2,166.7	8,391	8,528	(137)	-	-	-	8,391	8,528	(137)
8/15/1946	8	63.1662	63.6724	(0.5063)	15	(33.7510)	2,123.1	2,140.1	7,834	7,897	(63)	-	-	-	7,834	7,897	(63)
8/31/1946	8	66.5306	67.0706	(0.5400)	16	(33.7510)	2,096.4	2,113.4	8,251	8,318	(67)	-	-	-	8,251	8,318	(67)
9/15/1946	9	45.2455	46.7711	(1.5256)	15	(101.7080)	1,520.7	1,572.0	5,611	5,801	(189)	-	-	-	5,611	5,801	(189)
9/30/1946	9	45.2455	46.7711	(1.5256)	15	(101.7080)	1,520.7	1,572.0	5,611	5,801	(189)	-	-	-	5,611	5,801	(189)
10/15/1946	10	24.0858	28.8845	(4.7987)	15	(319.9147)	809.5	970.8	2,987	3,582	(595)	-	-	-	-	-	-
10/31/1946	10	25.5048	30.6234	(5.1186)	16	(319.9147)	803.7	964.9	3,163	3,798	(635)	-	-	-	-	-	-
11/15/1946	11	14.4854	14.4854	-	15	-	486.9	486.9	1,797	1,797	-	-	-	-	-	-	-
11/30/1946	11	14.4854	14.4854	-	15	-	486.9	486.9	1,797	1,797	-	-	-	-	-	-	-
12/15/1946	12	7.5869	7.5869	-	15	-	255.0	255.0	941	941	-	-	-	-	-	-	-
12/31/1946	12	7.9807	7.9807	-	16	-	251.5	251.5	990	990	-	-	-	-	-	-	-
1/15/1947	1	8.1845	8.5684	(0.3839)	15	(25.5932)	275.1	288.0	1,015	1,063	(48)	-	-	-	-	-	-
1/31/1947	1	8.6181	9.0276	(0.4095)	16	(25.5932)	271.6	284.5	1,069	1,120	(51)	-	-	-	-	-	-
2/15/1947	2	18.5282	15.8983	2.6299	15	175.3247	622.7	534.4	2,298	1,972	326	2,298	1,972	326	-	-	-
2/28/1947	2	16.2818	14.0026	2.2792	13	175.3247	631.4	543.0	2,019	1,737	283	2,019	1,737	283	-	-	-
3/15/1947	3	51.6183	57.5536	(5.9353)	15	(395.6876)	1,734.9	1,934.4	6,402	7,138	(736)	6,402	7,138	(736)	-	-	-
3/31/1947	3	54.9909	61.2785	(6.2876)	16	(392.9751)	1,732.8	1,930.9	6,820	7,600	(780)	6,820	7,600	(780)	-	-	-
4/14/1947	4	72.2671	84.5467	(12.2796)	14	(877.1122)	2,602.4	3,044.6	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1947	4	82.1885	92.3182	(10.1297)	16	(633.1064)	2,589.8	2,908.9	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1947	5	81.7807	83.7145	(1.9338)	15	(128.9172)	2,748.7	2,813.7	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1947	5	87.0449	69.8961	17.1489	16	1,071.8052	2,742.8	2,202.4	9,840	8,669	1,171	9,840	8,669	1,171	-	-	-
6/15/1947	6	56.4902	59.4545	(2.9643)	15	(197.6210)	1,898.7	1,998.3	7,006	7,374	(368)	7,006	7,374	(368)	-	-	-
6/30/1947	6	56.4902	59.4545	(2.9643)	15	(197.6210)	1,898.7	1,998.3	7,006	7,374	(368)	7,006	7,374	(368)	-	-	-
7/15/1947	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1947	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1947	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1947	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1947	9	38.0642	45.4717	(7.4075)	15	(493.8333)	1,279.4	1,528.3	4,721	5,640	(919)	-	-	-	4,721	5,640	(919)
9/30/1947	9	38.0642	45.4717	(7.4075)	15	(493.8333)	1,279.4	1,528.3	4,721	5,640	(919)	-	-	-	4,721	5,640	(919)

Avg Water Duty:	10.25
Price per MWh:	$ 69.00

	Total Period		
	Total 40% Gen	Total Base Gen	Difference
	11,191,837	11,464,645	(272,808)
		Revenue:	$ (18,823,762)

	February -June		
	Total 40% Gen	Total Base Gen	Difference
	6,211,725	5,887,134	324,591
		Revenue:	$ 22,396,769

	July - September		
	Total 40% Gen	Total Base Gen	Difference
	3,576,928	3,919,235	(342,307)
		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1947	10	22.8416	25.6542	(2.8125)	15	(187.5026)	767.7	862.3	2,833	3,182	(349)	-	-	-	-	-	-
10/31/1947	10	24.2501	27.1778	(2.9277)	16	(182.9818)	764.1	856.4	3,008	3,371	(363)	-	-	-	-	-	-
11/15/1947	11	6.9719	7.6229	(0.6510)	15	(43.4000)	234.3	256.2	865	945	(81)	-	-	-	-	-	-
11/30/1947	11	6.9719	7.6229	(0.6510)	15	(43.4000)	234.3	256.2	865	945	(81)	-	-	-	-	-	-
12/15/1947	12	6.9649	7.6159	(0.6510)	15	(43.4000)	234.1	256.0	864	945	(81)	-	-	-	-	-	-
12/31/1947	12	7.3606	8.0116	(0.6510)	16	(40.6875)	231.9	252.4	913	994	(81)	-	-	-	-	-	-
1/15/1948	1	7.3488	8.1917	(0.8429)	15	(56.1966)	247.0	275.3	911	1,016	(105)	-	-	-	-	-	-
1/31/1948	1	7.7701	8.6259	(0.8557)	16	(53.4841)	244.8	271.8	964	1,070	(106)	-	-	-	-	-	-
2/15/1948	2	16.0633	16.7143	(0.6510)	15	(43.4000)	539.9	561.8	1,992	2,073	(81)	1,992	2,073	(81)	-	-	-
2/29/1948	2	15.0610	15.7120	(0.6510)	14	(46.5000)	542.4	565.8	1,868	1,949	(81)	1,868	1,949	(81)	-	-	-
3/15/1948	3	19.4562	40.9212	(21.4650)	15	(1,430.9997)	653.9	1,375.4	2,413	5,075	(2,662)	2,413	5,075	(2,662)	-	-	-
3/31/1948	3	20.7533	43.5807	(22.8274)	16	(1,426.7122)	653.9	1,373.2	2,574	5,405	(2,831)	2,574	5,405	(2,831)	-	-	-
4/14/1948	4	59.1150	49.9114	9.2036	14	657.4026	2,128.8	1,797.4	7,332	6,190	1,141	7,332	6,190	1,141	-	-	-
4/30/1948	4	67.5600	63.8754	3.6846	16	230.2880	2,128.8	2,012.7	8,379	7,922	457	8,379	7,922	457	-	-	-
5/15/1948	5	96.4241	64.6038	31.8204	15	2,121.3573	3,240.9	2,171.4	9,225	8,012	1,213	9,225	8,012	1,213	-	-	-
5/31/1948	5	102.8524	60.4563	42.3961	16	2,649.7559	3,240.9	1,905.0	9,840	7,498	2,342	9,840	7,498	2,342	-	-	-
6/15/1948	6	92.0577	57.5096	34.5481	15	2,303.2036	3,094.1	1,932.9	9,225	7,133	2,092	9,225	7,133	2,092	-	-	-
6/30/1948	6	92.0577	57.5096	34.5481	15	2,303.2036	3,094.1	1,932.9	9,225	7,133	2,092	9,225	7,133	2,092	-	-	-
7/15/1948	7	51.6416	54.8266	(3.1850)	15	(212.3333)	1,735.7	1,842.8	6,405	6,800	(395)	-	-	-	6,405	6,800	(395)
7/31/1948	7	55.0843	58.2693	(3.1850)	16	(199.0625)	1,735.7	1,836.1	6,832	7,227	(395)	-	-	-	6,832	7,227	(395)
8/15/1948	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/1948	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/1948	9	35.4015	38.2190	(2.8175)	15	(187.8333)	1,189.9	1,284.6	4,391	4,740	(349)	-	-	-	4,391	4,740	(349)
9/30/1948	9	35.4015	38.2190	(2.8175)	15	(187.8333)	1,189.9	1,284.6	4,391	4,740	(349)	-	-	-	4,391	4,740	(349)
10/15/1948	10	26.0690	29.5116	(3.4425)	15	(229.5026)	876.2	991.9	3,233	3,660	(427)	-	-	-	-	-	-
10/31/1948	10	27.8070	31.3647	(3.5577)	16	(222.3568)	876.2	988.3	3,449	3,890	(441)	-	-	-	-	-	-
11/15/1948	11	15.8742	16.9032	(1.0290)	15	(68.6000)	533.5	568.1	1,969	2,096	(128)	-	-	-	-	-	-
11/30/1948	11	15.8742	16.9032	(1.0290)	15	(68.6000)	533.5	568.1	1,969	2,096	(128)	-	-	-	-	-	-
12/15/1948	12	5.9286	6.9576	(1.0290)	15	(68.6000)	199.3	233.9	735	863	(128)	-	-	-	-	-	-
12/31/1948	12	6.3239	7.3529	(1.0290)	16	(64.3125)	199.3	231.7	784	912	(128)	-	-	-	-	-	-
1/15/1949	1	6.3053	7.5262	(1.2209)	15	(81.3966)	211.9	253.0	782	933	(151)	-	-	-	-	-	-
1/31/1949	1	6.7256	7.9594	(1.2337)	16	(77.1091)	211.9	250.8	834	987	(153)	-	-	-	-	-	-
2/15/1949	2	14.7973	16.0388	(1.2415)	15	(82.7677)	497.3	539.1	1,835	1,989	(154)	1,835	1,989	(154)	-	-	-
2/28/1949	2	12.8243	14.0375	(1.2132)	13	(93.3215)	497.3	544.4	1,591	1,741	(150)	1,591	1,741	(150)	-	-	-
3/15/1949	3	26.7836	21.9566	4.8270	15	321.8026	900.2	738.0	3,322	2,723	599	3,322	2,723	599	-	-	-
3/31/1949	3	28.5692	23.3518	5.2174	16	326.0901	900.2	735.8	3,543	2,896	647	3,543	2,896	647	-	-	-
4/14/1949	4	79.8664	74.2786	5.5877	14	399.1244	2,876.1	2,674.9	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1949	4	91.2759	74.2044	17.0715	16	1,066.9697	2,876.1	2,338.2	9,840	9,203	637	9,840	9,203	637	-	-	-
5/15/1949	5	94.5205	63.8791	30.6414	15	2,042.7570	3,176.9	2,147.0	9,225	7,922	1,303	9,225	7,922	1,303	-	-	-
5/31/1949	5	100.8219	71.2895	29.5324	16	1,845.7737	3,176.9	2,246.3	9,840	8,842	998	9,840	8,842	998	-	-	-
6/15/1949	6	65.8643	53.2818	12.5825	15	838.8333	2,213.7	1,790.8	8,169	6,608	1,561	8,169	6,608	1,561	-	-	-
6/30/1949	6	65.8643	53.2818	12.5825	15	838.8333	2,213.7	1,790.8	8,169	6,608	1,561	8,169	6,608	1,561	-	-	-
7/15/1949	7	51.6416	54.8266	(3.1850)	15	(212.3333)	1,735.7	1,842.8	6,405	6,800	(395)	-	-	-	6,405	6,800	(395)
7/31/1949	7	55.0843	58.2693	(3.1850)	16	(199.0625)	1,735.7	1,836.1	6,832	7,227	(395)	-	-	-	6,832	7,227	(395)
8/15/1949	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/1949	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/1949	9	35.4729	38.2904	(2.8175)	15	(187.8333)	1,192.3	1,287.0	4,399	4,749	(349)	-	-	-	4,399	4,749	(349)
9/30/1949	9	35.4729	38.2904	(2.8175)	15	(187.8333)	1,192.3	1,287.0	4,399	4,749	(349)	-	-	-	4,399	4,749	(349)
10/15/1949	10	34.6520	36.3670	(1.7150)	15	(114.3333)	1,164.7	1,222.3	4,298	4,510	(213)	-	-	-	-	-	-
10/31/1949	10	36.9621	38.6771	(1.7150)	16	(107.1875)	1,164.7	1,218.7	4,584	4,797	(213)	-	-	-	-	-	-
11/15/1949	11	15.9501	16.9791	(1.0290)	15	(68.6000)	536.1	570.7	1,978	2,106	(128)	-	-	-	-	-	-
11/30/1949	11	15.9501	16.9791	(1.0290)	15	(68.6000)	536.1	570.7	1,978	2,106	(128)	-	-	-	-	-	-
12/15/1949	12	5.9432	6.9722	(1.0290)	15	(68.6000)	199.8	234.3	737	865	(128)	-	-	-	-	-	-
12/31/1949	12	6.3394	7.3684	(1.0290)	16	(64.3125)	199.8	232.2	786	914	(128)	-	-	-	-	-	-
1/15/1950	1	6.0948	7.1238	(1.0290)	15	(68.6000)	204.8	239.4	756	884	(128)	-	-	-	-	-	-
1/31/1950	1	6.5011	7.5301	(1.0290)	16	(64.3125)	204.8	237.3	806	934	(128)	-	-	-	-	-	-
2/15/1950	2	15.3134	7.0750	8.2384	15	549.2276	514.7	237.8	1,899	877	1,022	1,899	877	1,022	-	-	-
2/28/1950	2	13.2716	6.2688	7.0028	13	538.6738	514.7	243.1	1,646	777	869	1,646	777	869	-	-	-
3/15/1950	3	30.5723	24.7997	5.7727	15	384.8443	1,027.6	833.5	3,792	3,076	716	3,792	3,076	716	-	-	-
3/31/1950	3	32.6105	26.3844	6.2261	16	389.1318	1,027.6	831.4	4,044	3,272	772	4,044	3,272	772	-	-	-
4/14/1950	4	85.6818	58.6283	27.0535	14	1,932.3909	3,085.5	2,111.3	8,610	7,271	1,339	8,610	7,271	1,339	-	-	-
4/30/1950	4	97.9221	61.5670	36.3550	16	2,272.1906	3,085.5	1,940.0	9,840	7,636	2,204	9,840	7,636	2,204	-	-	-
5/15/1950	5	108.2173	65.5759	42.6414	15	2,842.7570	3,637.2	2,204.0	9,225	8,133	1,092	9,225	8,133	1,092	-	-	-
5/31/1950	5	115.4317	76.1767	39.2551	16	2,453.4412	3,637.2	2,400.3	9,840	9,448	392	9,840	9,448	392	-	-	-
6/15/1950	6	81.6643	53.2818	28.3825	15	1,892.1667	2,744.8	1,790.8	9,225	6,608	2,617	9,225	6,608	2,617	-	-	-
6/30/1950	6	81.6643	53.2818	28.3825	15	1,892.1667	2,744.8	1,790.8	9,225	6,608	2,617	9,225	6,608	2,617	-	-	-
7/15/1950	7	51.6416	54.8266	(3.1850)	15	(212.3333)	1,735.7	1,842.8	6,405	6,800	(395)	-	-	-	6,405	6,800	(395)
7/31/1950	7	55.0843	58.2693	(3.1850)	16	(199.0625)	1,735.7	1,836.1	6,832	7,227	(395)	-	-	-	6,832	7,227	(395)
8/15/1950	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/1950	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/1950	9	30.6157	33.4332	(2.8175)	15	(187.8333)	1,029.0	1,123.7	3,797	4,146	(349)	-	-	-	3,797	4,146	(349)
9/30/1950	9	30.6157	33.4332	(2.8175)	15	(187.8333)	1,029.0	1,123.7	3,797	4,146	(349)	-	-	-	3,797	4,146	(349)
10/15/1950	10	21.6378	23.3528	(1.7150)	15	(114.3333)	727.3	784.9	2,684	2,896	(213)	-	-	-	-	-	-
10/31/1950	10	23.0803	24.7953	(1.7150)	16	(107.1875)	727.3	781.3	2,862	3,075	(213)	-	-	-	-	-	-
11/15/1950	11	6.2720	6.4994	(0.2274)	15	(15.1625)	210.8	218.4	778	806	(28)	-	-	-	-	-	-
11/30/1950	11	6.2720	6.4994	(0.2274)	15	(15.1625)	210.8	218.4	778	806	(28)	-	-	-	-	-	-
12/15/1950	12	8.0621	8.0621	-	15	-	271.0	271.0	1,000	1,000	-	-	-	-	-	-	-
12/31/1950	12	8.5996	8.5996	-	16	-	271.0	271.0	1,067	1,067	-	-	-	-	-	-	-

Avg Water Duty:	Total Period			February -June			July - September		
10.25	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$ 69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/1951	1	5.8916	6.9206	(1.0290)	15	(68.6000)	198.0	232.6	731	858	(128)	-	-	-	-	-	-
1/31/1951	1	6.2843	7.3133	(1.0290)	16	(64.3125)	198.0	230.4	779	907	(128)	-	-	-	-	-	-
2/15/1951	2	23.9652	7.1553	16.8098	15	1,120.6562	805.5	240.5	2,972	887	2,085	2,972	887	2,085	-	-	-
2/28/1951	2	20.7698	6.3385	14.4313	13	1,110.1024	805.5	245.8	2,576	786	1,790	2,576	786	1,790	-	-	-
3/15/1951	3	38.1965	59.5188	(21.3223)	15	(1,421.4857)	1,283.8	2,000.5	4,737	7,382	(2,644)	4,737	7,382	(2,644)	-	-	-
3/31/1951	3	40.6743	63.3747	(22.7004)	16	(1,418.7732)	1,281.6	1,996.9	5,045	7,860	(2,815)	5,045	7,860	(2,815)	-	-	-
4/14/1951	4	64.0150	83.5823	(19.5673)	14	(1,397.6627)	2,305.3	3,009.9	7,939	8,610	(671)	7,939	8,610	(671)	-	-	-
4/30/1951	4	72.7575	81.3110	(8.5535)	16	(534.5940)	2,292.6	2,562.1	9,024	9,840	(816)	9,024	9,840	(816)	-	-	-
5/15/1951	5	86.0775	110.5541	(24.4765)	15	(1,631.7697)	2,893.1	3,715.8	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1951	5	91.6282	119.3455	(27.7173)	16	(1,732.3311)	2,887.2	3,760.6	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1951	6	68.4743	81.0488	(12.5744)	15	(838.2961)	2,301.5	2,724.1	8,492	9,225	(733)	8,492	9,225	(733)	-	-	-
6/30/1951	6	68.4743	81.0488	(12.5744)	15	(838.2961)	2,301.5	2,724.1	8,492	9,225	(733)	8,492	9,225	(733)	-	-	-
7/15/1951	7	54.8193	65.3728	(10.5535)	15	(703.5682)	1,842.5	2,197.2	6,799	8,108	(1,309)	-	-	-	6,799	8,108	(1,309)
7/31/1951	7	58.2616	68.8843	(10.6228)	16	(663.9223)	1,835.8	2,170.5	7,226	8,543	(1,317)	-	-	-	7,226	8,543	(1,317)
8/15/1951	8	53.6512	63.6724	(10.0213)	15	(668.0843)	1,803.2	2,140.1	6,654	7,897	(1,243)	-	-	-	6,654	7,897	(1,243)
8/31/1951	8	57.0156	67.0706	(10.0550)	16	(628.4385)	1,796.6	2,113.4	7,071	8,318	(1,247)	-	-	-	7,071	8,318	(1,247)
9/15/1951	9	38.2904	47.2235	(8.9331)	15	(595.5413)	1,287.0	1,587.2	4,749	5,857	(1,108)	-	-	-	4,749	5,857	(1,108)
9/30/1951	9	38.2904	47.2235	(8.9331)	15	(595.5413)	1,287.0	1,587.2	4,749	5,857	(1,108)	-	-	-	4,749	5,857	(1,108)
10/15/1951	10	31.0784	36.9621	(5.8837)	15	(392.2480)	1,044.6	1,242.3	3,854	4,584	(730)	-	-	-	-	-	-
10/31/1951	10	33.0360	39.2396	(6.2036)	16	(387.7272)	1,041.0	1,236.4	4,097	4,867	(769)	-	-	-	-	-	-
11/15/1951	11	6.9569	7.6079	(0.6510)	15	(43.4000)	233.8	255.7	863	944	(81)	-	-	-	-	-	-
11/30/1951	11	6.9569	7.6079	(0.6510)	15	(43.4000)	233.8	255.7	863	944	(81)	-	-	-	-	-	-
12/15/1951	12	6.6963	7.3473	(0.6510)	15	(43.4000)	225.1	246.9	831	911	(81)	-	-	-	-	-	-
12/31/1951	12	7.0742	7.7252	(0.6510)	16	(40.6875)	222.9	243.4	877	958	(81)	-	-	-	-	-	-
1/15/1952	1	10.5817	10.5817	-	15	-	355.7	355.7	1,312	1,312	-	-	-	-	-	-	-
1/31/1952	1	11.2872	11.2872	-	16	-	355.7	355.7	1,400	1,400	-	-	-	-	-	-	-
2/15/1952	2	24.0017	8.3438	15.6579	15	1,043.8588	806.7	280.4	2,977	1,035	1,942	2,977	1,035	1,942	-	-	-
2/29/1952	2	22.4702	7.8996	14.5706	14	1,040.7588	809.2	284.5	2,787	980	1,807	2,787	980	1,807	-	-	-
3/15/1952	3	58.7527	62.5436	(3.7910)	15	(252.7326)	1,974.7	2,102.1	7,287	7,757	(470)	7,287	7,757	(470)	-	-	-
3/31/1952	3	62.5575	66.6012	(4.0437)	16	(252.7326)	1,971.2	2,098.6	7,759	8,260	(502)	7,759	8,260	(502)	-	-	-
4/14/1952	4	93.7093	99.1715	(5.4623)	14	(390.1614)	3,374.6	3,571.3	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1952	4	105.6356	63.7082	41.9274	16	2,620.4642	3,328.6	2,007.4	9,840	7,901	1,939	9,840	7,901	1,939	-	-	-
5/15/1952	5	167.3342	118.7935	48.5407	15	3,236.0439	5,624.2	3,992.7	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1952	5	177.8081	110.7455	67.0627	16	4,191.4158	5,602.7	3,489.6	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1952	6	126.5585	85.2858	41.2727	15	2,751.5152	4,253.7	2,866.5	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1952	6	126.5585	85.2858	41.2727	15	2,751.5152	4,253.7	2,866.5	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1952	7	63.3451	67.1840	(3.8390)	15	(255.9317)	2,129.1	2,258.1	7,856	8,332	(476)	-	-	-	7,856	8,332	(476)
7/31/1952	7	66.7214	70.8163	(4.0949)	16	(255.9317)	2,102.4	2,231.4	8,275	8,783	(508)	-	-	-	8,275	8,783	(508)
8/15/1952	8	63.6724	66.6477	(2.9752)	15	(198.3471)	2,140.1	2,240.1	7,897	8,266	(369)	-	-	-	7,897	8,266	(369)
8/31/1952	8	67.0706	70.2442	(3.1736)	16	(198.3471)	2,113.4	2,213.4	8,318	8,712	(394)	-	-	-	8,318	8,712	(394)
9/15/1952	9	47.0612	50.0364	(2.9752)	15	(198.3471)	1,581.8	1,681.8	5,837	6,206	(369)	-	-	-	5,837	6,206	(369)
9/30/1952	9	47.0612	50.0364	(2.9752)	15	(198.3471)	1,581.8	1,681.8	5,837	6,206	(369)	-	-	-	5,837	6,206	(369)
10/15/1952	10	43.9710	76.9905	(33.0195)	15	(2,201.3024)	1,477.9	2,587.7	5,453	9,225	(3,772)	-	-	-	-	-	-
10/31/1952	10	46.7157	48.1489	(1.4332)	16	(89.5761)	1,472.0	1,517.2	5,794	5,972	(178)	-	-	-	-	-	-
11/15/1952	11	7.6154	10.5906	(2.9752)	15	(198.3471)	256.0	356.0	944	1,313	(369)	-	-	-	-	-	-
11/30/1952	11	7.6154	10.5906	(2.9752)	15	(198.3471)	256.0	356.0	944	1,313	(369)	-	-	-	-	-	-
12/15/1952	12	7.5361	10.5113	(2.9752)	15	(198.3471)	253.3	353.3	935	1,304	(369)	-	-	-	-	-	-
12/31/1952	12	7.9265	11.1000	(3.1736)	16	(198.3471)	249.8	349.8	983	1,377	(394)	-	-	-	-	-	-
1/15/1953	1	8.3434	36.2001	(27.8567)	15	(1,857.1134)	280.4	1,216.7	1,035	4,490	(3,455)	-	-	-	-	-	-
1/31/1953	1	8.7876	42.4712	(33.6836)	16	(2,105.2240)	276.9	1,338.3	1,090	5,267	(4,178)	-	-	-	-	-	-
2/15/1953	2	10.4255	32.0524	(21.6268)	15	(1,441.7889)	350.4	1,077.3	1,293	3,975	(2,682)	1,293	3,975	(2,682)	-	-	-
2/28/1953	2	9.2595	27.7787	(18.5193)	13	(1,424.5581)	359.1	1,077.3	1,148	3,445	(2,297)	1,148	3,445	(2,297)	-	-	-
3/15/1953	3	36.4580	67.5809	(31.1229)	15	(2,074.8599)	1,225.4	2,271.4	4,522	8,382	(3,860)	4,522	8,382	(3,860)	-	-	-
3/31/1953	3	38.7765	71.9743	(33.1978)	16	(2,074.8599)	1,221.8	2,267.9	4,809	8,926	(4,117)	4,809	8,926	(4,117)	-	-	-
4/14/1953	4	82.6305	86.8267	(4.1962)	14	(299.7271)	2,975.6	3,126.7	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1953	4	92.9742	85.0189	7.9553	16	497.2032	2,929.6	2,678.9	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1953	5	89.6358	109.9952	(20.3594)	15	(1,357.2912)	3,012.7	3,697.0	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1953	5	94.9299	93.3738	1.5561	16	97.2542	2,991.2	2,942.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1953	6	96.9827	78.7496	18.2331	15	1,215.5373	3,259.6	2,646.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1953	6	96.9827	78.7496	18.2331	15	1,215.5373	3,259.6	2,646.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1953	7	64.3416	65.3801	(1.0385)	15	(69.2348)	2,162.6	2,197.5	7,980	8,109	(129)	-	-	-	7,980	8,109	(129)
7/31/1953	7	67.7843	68.8921	(1.1078)	16	(69.2348)	2,135.9	2,170.8	8,407	8,544	(137)	-	-	-	8,407	8,544	(137)
8/15/1953	8	61.8881	62.3944	(0.5063)	15	(33.7510)	2,080.1	2,097.1	7,676	7,738	(63)	-	-	-	7,676	7,738	(63)
8/31/1953	8	65.1673	65.7073	(0.5400)	16	(33.7510)	2,053.4	2,070.4	8,082	8,149	(67)	-	-	-	8,082	8,149	(67)
9/15/1953	9	45.5431	47.0687	(1.5256)	15	(101.7080)	1,530.7	1,582.0	5,648	5,838	(189)	-	-	-	5,648	5,838	(189)
9/30/1953	9	45.5431	47.0687	(1.5256)	15	(101.7080)	1,530.7	1,582.0	5,648	5,838	(189)	-	-	-	5,648	5,838	(189)
10/15/1953	10	35.8500	40.6488	(4.7987)	15	(319.9147)	1,204.9	1,366.2	4,446	5,041	(595)	-	-	-	-	-	-
10/31/1953	10	38.0534	43.1720	(5.1186)	16	(319.9147)	1,199.1	1,360.3	4,720	5,354	(635)	-	-	-	-	-	-
11/15/1953	11	16.3249	16.3249	-	15	-	548.7	548.7	2,025	2,025	-	-	-	-	-	-	-
11/30/1953	11	16.3249	16.3249	-	15	-	548.7	548.7	2,025	2,025	-	-	-	-	-	-	-
12/15/1953	12	7.6086	7.6086	-	15	-	255.7	255.7	944	944	-	-	-	-	-	-	-
12/31/1953	12	8.0039	8.0039	-	16	-	252.2	252.2	993	993	-	-	-	-	-	-	-
1/15/1954	1	8.1482	8.5321	(0.3839)	15	(25.5932)	273.9	286.8	1,011	1,058	(48)	-	-	-	-	-	-
1/31/1954	1	8.5794	8.9889	(0.4095)	16	(25.5932)	270.3	283.2	1,064	1,115	(51)	-	-	-	-	-	-
2/15/1954	2	19.9414	25.3702	(5.4288)	15	(361.9206)	670.2	852.7	2,473	3,146	(673)	2,473	3,146	(673)	-	-	-
2/28/1954	2	17.5065	22.2115	(4.7050)	13	(361.9206)	678.9	861.4	2,171	2,755	(584)	2,171	2,755	(584)	-	-	-
3/15/1954	3	48.3015	32.0429	16.2586	15	1,083.9065	1,623.4	1,077.0	5,991	3,974	2,016	5,991	3,974	2,016	-	-	-
3/31/1954	3	51.4096	34.0671	17.3425	16	1,083.9065	1,619.9	1,073.5	6,376	4,225	2,151	6,376	4,225	2,151	-	-	-

Avg Water Duty:	10.25
Price per MWh:	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/1954	4	105.8999	88.9943	16.9055	14	1,207.5370	3,813.6	3,204.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1954	4	119.5677	102.6898	16.8779	16	1,054.8664	3,767.6	3,235.8	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1954	5	103.9802	99.5321	4.4480	15	296.5354	3,494.8	3,345.3	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1954	5	110.2305	89.0739	21.1566	16	1,322.2875	3,473.4	2,806.7	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1954	6	69.8068	62.6167	7.1901	15	479.3389	2,346.3	2,104.6	8,658	7,766	892	8,658	7,766	892	-	-	-
6/30/1954	6	69.8068	62.6167	7.1901	15	479.3389	2,346.3	2,104.6	8,658	7,766	892	8,658	7,766	892	-	-	-
7/15/1954	7	64.3416	64.3416	-	15	-	2,162.6	2,162.6	7,980	7,980	-	-	-	-	7,980	7,980	-
7/31/1954	7	67.7843	67.7843	-	16	-	2,135.9	2,135.9	8,407	8,407	-	-	-	-	8,407	8,407	-
8/15/1954	8	63.1589	63.1589	-	15	-	2,122.8	2,122.8	7,833	7,833	-	-	-	-	7,833	7,833	-
8/31/1954	8	66.5228	66.5228	-	16	-	2,096.1	2,096.1	8,250	8,250	-	-	-	-	8,250	8,250	-
9/15/1954	9	45.6979	45.7359	(0.0380)	15	(2.5344)	1,535.9	1,537.2	5,668	5,672	(5)	-	-	-	5,668	5,672	(5)
9/30/1954	9	45.6979	45.7359	(0.0380)	15	(2.5344)	1,535.9	1,537.2	5,668	5,672	(5)	-	-	-	5,668	5,672	(5)
10/15/1954	10	39.1795	43.3064	(4.1269)	15	(275.1266)	1,316.8	1,455.6	4,859	5,371	(512)	-	-	-	-	-	-
10/31/1954	10	41.6048	46.0069	(4.4020)	16	(275.1266)	1,311.0	1,449.7	5,160	5,706	(546)	-	-	-	-	-	-
11/15/1954	11	7.6229	7.6229	-	15	-	256.2	256.2	945	945	-	-	-	-	-	-	-
11/30/1954	11	7.6229	7.6229	-	15	-	256.2	256.2	945	945	-	-	-	-	-	-	-
12/15/1954	12	7.5143	7.5143	-	15	-	252.6	252.6	932	932	-	-	-	-	-	-	-
12/31/1954	12	7.9032	7.9032	-	16	-	249.0	249.0	980	980	-	-	-	-	-	-	-
1/15/1955	1	7.9377	8.1297	(0.1919)	15	(12.7966)	266.8	273.2	984	1,008	(24)	-	-	-	-	-	-
1/31/1955	1	8.3549	8.5596	(0.2047)	16	(12.7966)	263.3	269.7	1,036	1,062	(25)	-	-	-	-	-	-
2/15/1955	2	9.4961	8.3680	1.1281	15	75.2066	319.2	281.3	1,178	1,038	140	1,178	1,038	140	-	-	-
2/28/1955	2	8.4539	7.4762	0.9777	13	75.2066	327.9	289.9	1,048	927	121	1,048	927	121	-	-	-
3/15/1955	3	27.1707	24.3495	2.8212	15	188.0800	913.2	818.4	3,370	3,020	350	3,370	3,020	350	-	-	-
3/31/1955	3	28.9821	25.8608	3.1213	16	195.0800	913.2	814.9	3,594	3,207	387	3,594	3,207	387	-	-	-
4/14/1955	4	40.8819	45.9512	(5.0693)	14	(362.0926)	1,472.2	1,654.8	5,070	5,699	(629)	5,070	5,699	(629)	-	-	-
4/30/1955	4	46.7222	66.9228	(20.2005)	16	(1,262.5335)	1,472.2	2,108.7	5,795	8,300	(2,505)	5,795	8,300	(2,505)	-	-	-
5/15/1955	5	85.5951	79.9685	5.6266	15	375.1050	2,876.9	2,687.8	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1955	5	91.3014	65.1628	26.1386	16	1,633.6619	2,876.9	2,053.3	9,840	8,082	1,758	9,840	8,082	1,758	-	-	-
6/15/1955	6	72.4643	61.0309	11.4334	15	762.2298	2,435.6	2,051.3	8,987	7,569	1,418	8,987	7,569	1,418	-	-	-
6/30/1955	6	72.4643	61.0309	11.4334	15	762.2298	2,435.6	2,051.3	8,987	7,569	1,418	8,987	7,569	1,418	-	-	-
7/15/1955	7	51.6416	64.3416	(12.7000)	15	(846.6667)	1,735.7	2,162.6	6,405	7,980	(1,575)	-	-	-	6,405	7,980	(1,575)
7/31/1955	7	55.0843	67.7843	(12.7000)	16	(793.7500)	1,735.7	2,135.9	6,832	8,407	(1,575)	-	-	-	6,832	8,407	(1,575)
8/15/1955	8	50.4662	63.1662	(12.7000)	15	(846.6667)	1,696.2	2,123.1	6,259	7,834	(1,575)	-	-	-	6,259	7,834	(1,575)
8/31/1955	8	53.8306	66.5306	(12.7000)	16	(793.7500)	1,696.2	2,096.4	6,676	8,251	(1,575)	-	-	-	6,676	8,251	(1,575)
9/15/1955	9	33.6753	43.9003	(10.2250)	15	(681.6667)	1,131.8	1,475.5	4,177	5,445	(1,268)	-	-	-	4,177	5,445	(1,268)
9/30/1955	9	33.6753	43.9003	(10.2250)	15	(681.6667)	1,131.8	1,475.5	4,177	5,445	(1,268)	-	-	-	4,177	5,445	(1,268)
10/15/1955	10	34.3755	38.9030	(4.5275)	15	(301.8360)	1,155.4	1,307.6	4,263	4,825	(562)	-	-	-	-	-	-
10/31/1955	10	36.6672	41.3099	(4.6427)	16	(290.1693)	1,155.4	1,301.7	4,548	5,123	(576)	-	-	-	-	-	-
11/15/1955	11	5.9504	7.6304	(1.6800)	15	(112.0000)	200.0	256.5	738	946	(208)	-	-	-	-	-	-
11/30/1955	11	5.9504	7.6304	(1.6800)	15	(112.0000)	200.0	256.5	738	946	(208)	-	-	-	-	-	-
12/15/1955	12	12.8063	12.8063	-	15	-	430.4	430.4	1,588	1,588	-	-	-	-	-	-	-
12/31/1955	12	13.6601	13.6601	-	16	-	430.4	430.4	1,694	1,694	-	-	-	-	-	-	-
1/15/1956	1	10.9640	10.9640	-	15	-	368.5	368.5	1,360	1,360	-	-	-	-	-	-	-
1/31/1956	1	11.6949	11.6949	-	16	-	368.5	368.5	1,450	1,450	-	-	-	-	-	-	-
2/15/1956	2	20.8862	8.0507	12.8355	15	855.6994	702.0	270.6	2,590	998	1,592	2,590	998	1,592	-	-	-
2/29/1956	2	19.4938	7.6260	11.8678	14	847.6994	702.0	274.6	2,418	946	1,472	2,418	946	1,472	-	-	-
3/15/1956	3	44.4765	66.3091	(21.8326)	15	(1,455.5051)	1,494.9	2,228.7	5,516	8,224	(2,708)	5,516	8,224	(2,708)	-	-	-
3/31/1956	3	47.3296	70.6177	(23.2881)	16	(1,455.5051)	1,491.4	2,225.2	5,870	8,758	(2,888)	5,870	8,758	(2,888)	-	-	-
4/14/1956	4	77.4153	81.3823	(3.9669)	14	(283.3530)	2,787.8	2,930.7	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1956	4	89.4567	78.7967	10.6600	16	666.2479	2,818.8	2,482.9	9,840	9,773	67	9,840	9,773	67	-	-	-
5/15/1956	5	125.3519	106.2274	19.1245	15	1,274.9668	4,213.2	3,570.4	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1956	5	133.0271	89.3549	43.6722	16	2,729.5122	4,191.7	2,815.6	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1956	6	109.6743	81.0413	28.6331	15	1,908.8706	3,686.2	2,723.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1956	6	109.6743	81.0413	28.6331	15	1,908.8706	3,686.2	2,723.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1956	7	64.3343	65.3728	(1.0385)	15	(69.2348)	2,162.3	2,197.2	7,979	8,108	(129)	-	-	-	7,979	8,108	(129)
7/31/1956	7	67.7766	68.8843	(1.1078)	16	(69.2348)	2,135.6	2,170.5	8,406	8,543	(137)	-	-	-	8,406	8,543	(137)
8/15/1956	8	63.1662	63.6724	(0.5063)	15	(33.7510)	2,123.1	2,140.1	7,834	7,897	(63)	-	-	-	7,834	7,897	(63)
8/31/1956	8	66.5306	67.0706	(0.5400)	16	(33.7510)	2,096.4	2,113.4	8,251	8,318	(67)	-	-	-	8,251	8,318	(67)
9/15/1956	9	43.4145	44.9021	(1.4876)	15	(99.1735)	1,459.2	1,509.2	5,384	5,569	(184)	-	-	-	5,384	5,569	(184)
9/30/1956	9	43.4145	44.9021	(1.4876)	15	(99.1735)	1,459.2	1,509.2	5,384	5,569	(184)	-	-	-	5,384	5,569	(184)
10/15/1956	10	38.8406	39.5125	(0.6718)	15	(44.7881)	1,305.5	1,328.0	4,817	4,900	(83)	-	-	-	-	-	-
10/31/1956	10	41.2434	41.9600	(0.7166)	16	(44.7881)	1,299.6	1,322.2	5,115	5,204	(89)	-	-	-	-	-	-
11/15/1956	11	17.8562	17.8562	-	15	-	600.2	600.2	2,215	2,215	-	-	-	-	-	-	-
11/30/1956	11	17.8562	17.8562	-	15	-	600.2	600.2	2,215	2,215	-	-	-	-	-	-	-
12/15/1956	12	7.6159	7.6159	-	15	-	256.0	256.0	945	945	-	-	-	-	-	-	-
12/31/1956	12	8.0116	8.0116	-	16	-	252.4	252.4	994	994	-	-	-	-	-	-	-
1/15/1957	1	8.3692	8.5611	(0.1919)	15	(12.7966)	281.3	287.7	1,038	1,062	(24)	-	-	-	-	-	-
1/31/1957	1	8.8151	9.0199	(0.2047)	16	(12.7966)	277.8	284.2	1,093	1,119	(25)	-	-	-	-	-	-
2/15/1957	2	14.6550	8.5966	6.0584	15	403.8961	492.6	288.9	1,818	1,066	751	1,818	1,066	751	-	-	-
2/28/1957	2	12.9250	7.6744	5.2506	13	403.8961	501.3	297.6	1,603	952	651	1,603	952	651	-	-	-
3/15/1957	3	43.7755	27.9253	15.8502	15	1,056.6800	1,471.3	938.6	5,429	3,463	1,966	5,429	3,463	1,966	-	-	-
3/31/1957	3	46.6253	29.6750	16.9503	16	1,059.3925	1,469.2	935.1	5,783	3,680	2,102	5,783	3,680	2,102	-	-	-
4/14/1957	4	65.8852	88.7656	(22.8803)	14	(1,634.3097)	2,372.6	3,196.6	8,171	8,610	(439)	8,171	8,610	(439)	-	-	-
4/30/1957	4	77.6171	102.4284	(24.8113)	16	(1,550.7042)	2,445.7	3,227.5	9,626	9,840	(214)	9,626	9,840	(214)	-	-	-
5/15/1957	5	91.6920	90.7805	0.9115	15	60.7666	3,081.8	3,051.2	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1957	5	97.6170	79.7389	17.8781	16	1,117.3832	3,075.9	2,512.6	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1957	6	83.0285	63.4459	19.5826	15	1,305.5055	2,790.6	2,132.5	9,225	7,869	1,356	9,225	7,869	1,356	-	-	-
6/30/1957	6	83.0285	63.4459	19.5826	15	1,305.5055	2,790.6	2,132.5	9,225	7,869	1,356	9,225	7,869	1,356	-	-	-

Avg Water Duty:	
	10.25
Price per MWh:	
$	69.00

Total Period			February -June			July - September		
Total 40% Gen	**Total Base Gen**	**Difference**	**Total 40% Gen**	**Total Base Gen**	**Difference**	**Total 40% Gen**	**Total Base Gen**	**Difference**
11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
	Revenue:	$ (18,823,762)		**Revenue:**	$ 22,396,769		**Revenue:**	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	**40% Gen MWh**	**Base Gen MWh**	**Difference**	**Feb-June 40% Gen**	**Feb-June Base Gen**	**Difference**	**July-Sept 40% Gen**	**July-Sept Base Gen**	**Difference**
7/15/1957	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1957	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1957	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1957	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1957	9	36.7904	44.2359	(7.4455)	15	(496.3678)	1,236.5	1,486.8	4,563	5,486	(923)	-	-	-	4,563	5,486	(923)
9/30/1957	9	36.7904	44.2359	(7.4455)	15	(496.3678)	1,236.5	1,486.8	4,563	5,486	(923)	-	-	-	4,563	5,486	(923)
10/15/1957	10	24.4309	29.6428	(5.2119)	15	(347.4600)	821.1	996.3	3,030	3,676	(646)	-	-	-	-	-	-
10/31/1957	10	25.9453	31.4324	(5.4870)	16	(342.9391)	817.5	990.4	3,218	3,898	(681)	-	-	-	-	-	-
11/15/1957	11	16.2172	16.8682	(0.6510)	15	(43.4000)	545.1	566.9	2,011	2,092	(81)	-	-	-	-	-	-
11/30/1957	11	16.2172	16.8682	(0.6510)	15	(43.4000)	545.1	566.9	2,011	2,092	(81)	-	-	-	-	-	-
12/15/1957	12	6.9504	7.6014	(0.6510)	15	(43.4000)	233.6	255.5	862	943	(81)	-	-	-	-	-	-
12/31/1957	12	7.3451	7.9961	(0.6510)	16	(40.6875)	231.4	252.0	911	992	(81)	-	-	-	-	-	-
1/15/1958	1	7.3956	8.2385	(0.8429)	15	(56.1966)	248.6	276.9	917	1,022	(105)	-	-	-	-	-	-
1/31/1958	1	7.8200	8.6758	(0.8557)	16	(53.4841)	246.4	273.4	970	1,076	(106)	-	-	-	-	-	-
2/15/1958	2	25.4978	7.9156	17.5822	15	1,172.1460	857.0	266.0	3,162	982	2,181	3,162	982	2,181	-	-	-
2/28/1958	2	22.2353	7.0514	15.1838	13	1,167.9868	862.3	273.5	2,758	875	1,883	2,758	875	1,883	-	-	-
3/15/1958	3	36.5985	52.3511	(15.7526)	15	(1,050.1732)	1,230.1	1,759.6	4,539	6,493	(1,954)	4,539	6,493	(1,954)	-	-	-
3/31/1958	3	38.9265	55.7292	(16.8028)	16	(1,050.1732)	1,226.6	1,756.0	4,828	6,912	(2,084)	4,828	6,912	(2,084)	-	-	-
4/14/1958	4	64.4563	79.6510	(15.1947)	14	(1,085.3363)	2,321.2	2,868.3	7,994	8,610	(616)	7,994	8,610	(616)	-	-	-
4/30/1958	4	72.2037	41.3990	30.8046	16	1,925.2893	2,275.1	1,304.5	8,955	5,134	3,820	8,955	5,134	3,820	-	-	-
5/15/1958	5	151.7447	107.4621	44.2826	15	2,952.1729	5,100.2	3,611.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1958	5	161.1793	98.6586	62.5207	16	3,907.5448	5,078.8	3,108.7	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1958	6	117.4843	85.2116	32.2727	15	2,151.5152	3,948.7	2,864.0	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1958	6	117.4843	85.2116	32.2727	15	2,151.5152	3,948.7	2,864.0	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1958	7	64.3343	69.2118	(4.8775)	15	(325.1666)	2,162.3	2,326.3	7,979	8,584	(605)	-	-	-	7,979	8,584	(605)
7/31/1958	7	67.7766	72.9792	(5.2027)	16	(325.1666)	2,135.6	2,299.6	8,406	9,051	(645)	-	-	-	8,406	9,051	(645)
8/15/1958	8	63.1662	66.6477	(3.4815)	15	(232.0981)	2,123.1	2,240.1	7,834	8,266	(432)	-	-	-	7,834	8,266	(432)
8/31/1958	8	66.5306	70.2442	(3.7136)	16	(232.0981)	2,096.4	2,213.4	8,251	8,712	(461)	-	-	-	8,251	8,712	(461)
9/15/1958	9	45.0573	49.5201	(4.4628)	15	(297.5207)	1,514.4	1,664.4	5,588	6,142	(553)	-	-	-	5,588	6,142	(553)
9/30/1958	9	45.0573	49.5201	(4.4628)	15	(297.5207)	1,514.4	1,664.4	5,588	6,142	(553)	-	-	-	5,588	6,142	(553)
10/15/1958	10	43.3064	45.3219	(2.0155)	15	(134.3642)	1,455.6	1,523.3	5,371	5,621	(250)	-	-	-	-	-	-
10/31/1958	10	46.0069	48.1567	(2.1498)	16	(134.3642)	1,449.7	1,517.4	5,706	5,973	(267)	-	-	-	-	-	-
11/15/1958	11	17.5467	20.5219	(2.9752)	15	(198.3471)	589.8	689.8	2,176	2,545	(369)	-	-	-	-	-	-
11/30/1958	11	17.5467	20.5219	(2.9752)	15	(198.3471)	589.8	689.8	2,176	2,545	(369)	-	-	-	-	-	-
12/15/1958	12	7.6159	10.5911	(2.9752)	15	(198.3471)	256.0	356.0	945	1,314	(369)	-	-	-	-	-	-
12/31/1958	12	8.0116	11.1852	(3.1736)	16	(198.3471)	252.4	352.4	994	1,387	(394)	-	-	-	-	-	-
1/15/1959	1	8.3474	12.2824	(3.9350)	15	(262.3300)	280.6	412.8	1,035	1,523	(488)	-	-	-	-	-	-
1/31/1959	1	8.7919	12.9892	(4.1973)	16	(262.3300)	277.0	409.3	1,090	1,611	(521)	-	-	-	-	-	-
2/15/1959	2	15.5095	12.2049	3.3046	15	220.3070	521.3	410.2	1,924	1,514	410	1,924	1,514	410	-	-	-
2/28/1959	2	13.6655	10.8015	2.8640	13	220.3070	530.0	418.9	1,695	1,340	355	1,695	1,340	355	-	-	-
3/15/1959	3	34.0513	23.8140	10.2373	15	682.4864	1,144.5	800.4	4,223	2,953	1,270	4,223	2,953	1,270	-	-	-
3/31/1959	3	36.2528	25.2896	10.9632	16	685.1989	1,142.3	796.9	4,496	3,137	1,360	4,496	3,137	1,360	-	-	-
4/14/1959	4	70.4281	91.0684	(20.6403)	14	(1,474.3097)	2,536.2	3,279.5	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1959	4	80.0868	105.0602	(24.9735)	16	(1,560.8419)	2,523.5	3,310.4	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1959	5	69.0227	100.2402	(31.2175)	15	(2,081.1689)	2,319.9	3,369.1	8,560	9,225	(665)	8,560	9,225	(665)	-	-	-
5/31/1959	5	73.4363	89.8292	(16.3928)	16	(1,024.5523)	2,314.0	2,830.5	9,108	9,840	(732)	9,108	9,840	(732)	-	-	-
6/15/1959	6	59.2893	63.9067	(4.6174)	15	(307.8278)	1,992.8	2,147.9	7,353	7,926	(573)	7,353	7,926	(573)	-	-	-
6/30/1959	6	59.2893	63.9067	(4.6174)	15	(307.8278)	1,992.8	2,147.9	7,353	7,926	(573)	7,353	7,926	(573)	-	-	-
7/15/1959	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1959	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1959	8	53.3694	62.8844	(9.5150)	15	(634.3333)	1,793.8	2,113.6	6,619	7,799	(1,180)	-	-	-	6,619	7,799	(1,180)
8/31/1959	8	56.7150	66.2300	(9.5150)	16	(594.6875)	1,787.1	2,086.9	7,034	8,214	(1,180)	-	-	-	7,034	8,214	(1,180)
9/15/1959	9	23.8737	31.3192	(7.4455)	15	(496.3678)	802.4	1,052.7	2,961	3,884	(923)	-	-	-	2,961	3,884	(923)
9/30/1959	9	23.8737	31.3192	(7.4455)	15	(496.3678)	802.4	1,052.7	2,961	3,884	(923)	-	-	-	2,961	3,884	(923)
10/15/1959	10	23.6026	30.5421	(6.9394)	15	(462.6292)	793.3	1,026.5	2,927	3,788	(861)	-	-	-	-	-	-
10/31/1959	10	25.0618	32.3915	(7.3297)	16	(458.1084)	789.7	1,020.7	3,108	4,017	(909)	-	-	-	-	-	-
11/15/1959	11	16.9127	17.5637	(0.6510)	15	(43.4000)	568.4	590.3	2,098	2,178	(81)	-	-	-	-	-	-
11/30/1959	11	16.9127	17.5637	(0.6510)	15	(43.4000)	568.4	590.3	2,098	2,178	(81)	-	-	-	-	-	-
12/15/1959	12	6.9722	7.6232	(0.6510)	15	(43.4000)	234.3	256.2	865	945	(81)	-	-	-	-	-	-
12/31/1959	12	7.3684	8.0194	(0.6510)	16	(40.6875)	232.2	252.7	914	995	(81)	-	-	-	-	-	-
1/15/1960	1	7.3415	8.3764	(1.0349)	15	(68.9932)	246.8	281.5	911	1,039	(128)	-	-	-	-	-	-
1/31/1960	1	7.7624	8.8229	(1.0605)	16	(66.2807)	244.6	278.0	963	1,094	(132)	-	-	-	-	-	-
2/15/1960	2	18.7246	13.5553	5.1692	15	344.6145	629.3	455.6	2,322	1,681	641	2,322	1,681	641	-	-	-
2/29/1960	2	17.5449	12.7637	4.7812	14	341.5145	631.8	459.6	2,176	1,583	593	2,176	1,583	593	-	-	-
3/15/1960	3	47.0199	36.5153	10.5046	15	700.3093	1,580.4	1,227.3	5,832	4,529	1,303	5,832	4,529	1,303	-	-	-
3/31/1960	3	50.1546	38.8810	11.2735	16	704.5968	1,580.4	1,225.1	6,220	4,822	1,398	6,220	4,822	1,398	-	-	-
4/14/1960	4	68.1413	54.7897	13.3515	14	953.6812	2,453.9	1,973.1	8,451	6,795	1,656	8,451	6,795	1,656	-	-	-
4/30/1960	4	77.8757	78.0821	(0.2064)	16	(12.8981)	2,453.9	2,460.4	9,658	9,684	(26)	9,658	9,684	(26)	-	-	-
5/15/1960	5	74.4326	76.6151	(2.1825)	15	(145.4979)	2,501.7	2,575.1	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1960	5	79.3948	58.8241	20.5706	16	1,285.6631	2,501.7	1,853.5	9,840	7,296	2,544	9,840	7,296	2,544	-	-	-
6/15/1960	6	56.5718	52.7893	3.7825	15	252.1667	1,901.4	1,774.3	7,016	6,547	469	7,016	6,547	469	-	-	-
6/30/1960	6	56.5718	52.7893	3.7825	15	252.1667	1,901.4	1,774.3	7,016	6,547	469	7,016	6,547	469	-	-	-
7/15/1960	7	51.1577	54.3427	(3.1850)	15	(212.3333)	1,719.4	1,826.5	6,345	6,740	(395)	-	-	-	6,345	6,740	(395)
7/31/1960	7	54.5682	57.7532	(3.1850)	16	(199.0625)	1,719.4	1,819.8	6,768	7,163	(395)	-	-	-	6,768	7,163	(395)
8/15/1960	8	49.8323	53.0173	(3.1850)	15	(212.3333)	1,674.9	1,781.9	6,180	6,575	(395)	-	-	-	6,180	6,575	(395)
8/31/1960	8	53.1545	56.3395	(3.1850)	16	(199.0625)	1,674.9	1,775.3	6,592	6,987	(395)	-	-	-	6,592	6,987	(395)
9/15/1960	9	34.3491	37.1666	(2.8175)	15	(187.8333)	1,154.5	1,249.2	4,260	4,610	(349)	-	-	-	4,260	4,610	(349)
9/30/1960	9	34.3491	37.1666	(2.8175)	15	(187.8333)	1,154.5	1,249.2	4,260	4,610	(349)	-	-	-	4,260	4,610	(349)

Avg Water Duty:	Total Period			February -June			July - September		
10.25	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$ 69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1960	10	19.1276	22.5701	(3.4425)	15	(229.5026)	642.9	758.6	2,372	2,799	(427)	-	-	-	-	-	-
10/31/1960	10	20.4028	23.9605	(3.5577)	16	(222.3568)	642.9	755.0	2,530	2,972	(441)	-	-	-	-	-	-
11/15/1960	11	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
11/30/1960	11	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
12/15/1960	12	5.9359	6.9649	(1.0290)	15	(68.6000)	199.5	234.1	736	864	(128)	-	-	-	-	-	-
12/31/1960	12	6.3316	7.3606	(1.0290)	16	(64.3125)	199.5	231.9	785	913	(128)	-	-	-	-	-	-
1/15/1961	1	6.3271	7.5480	(1.2209)	15	(81.3966)	212.7	253.7	785	936	(151)	-	-	-	-	-	-
1/31/1961	1	6.7489	7.9826	(1.2337)	16	(77.1091)	212.7	251.5	837	990	(153)	-	-	-	-	-	-
2/15/1961	2	6.3594	7.6009	(1.2415)	15	(82.7677)	213.7	255.5	789	943	(154)	789	943	(154)	-	-	-
2/28/1961	2	5.5115	6.7246	(1.2132)	13	(93.3215)	213.7	260.8	684	834	(150)	684	834	(150)	-	-	-
3/15/1961	3	20.5893	20.3682	0.2211	15	14.7399	692.0	684.6	2,554	2,526	27	2,554	2,526	27	-	-	-
3/31/1961	3	21.9619	21.7261	0.2358	16	14.7399	692.0	684.6	2,724	2,695	29	2,724	2,695	29	-	-	-
4/14/1961	4	54.1063	43.6034	10.5029	14	750.2100	1,948.4	1,570.2	6,710	5,408	1,303	6,710	5,408	1,303	-	-	-
4/30/1961	4	61.8358	60.2935	1.5423	16	96.3967	1,948.4	1,899.8	7,669	7,478	191	7,669	7,478	191	-	-	-
5/15/1961	5	63.6245	60.5528	3.0718	15	204.7838	2,138.5	2,035.2	7,891	7,510	381	7,891	7,510	381	-	-	-
5/31/1961	5	67.8662	53.4991	14.3671	16	897.9410	2,138.5	1,685.8	8,417	6,635	1,782	8,417	6,635	1,782	-	-	-
6/15/1961	6	53.7718	49.9718	3.8000	15	253.3333	1,807.3	1,679.6	6,669	6,198	471	6,669	6,198	471	-	-	-
6/30/1961	6	53.7718	49.9718	3.8000	15	253.3333	1,807.3	1,679.6	6,669	6,198	471	6,669	6,198	471	-	-	-
7/15/1961	7	51.1577	51.1577	-	15	-	1,719.4	1,719.4	6,345	6,345	-	-	-	-	6,345	6,345	-
7/31/1961	7	54.5682	54.5682	-	16	-	1,719.4	1,719.4	6,768	6,768	-	-	-	-	6,768	6,768	-
8/15/1961	8	49.1251	49.1251	-	15	-	1,651.1	1,651.1	6,093	6,093	-	-	-	-	6,093	6,093	-
8/31/1961	8	52.4001	52.4001	-	16	-	1,651.1	1,651.1	6,499	6,499	-	-	-	-	6,499	6,499	-
9/15/1961	9	34.6467	34.6467	-	15	-	1,164.5	1,164.5	4,297	4,297	-	-	-	-	4,297	4,297	-
9/30/1961	9	23.7539	34.6467	(10.8928)	15	(726.1864)	798.4	1,164.5	2,946	4,297	(1,351)	-	-	-	2,946	4,297	(1,351)
10/15/1961	10	17.1794	34.6520	(17.4726)	15	(1,164.8381)	577.4	1,164.7	2,131	4,298	(2,167)	-	-	-	-	-	-
10/31/1961	10	18.3247	36.9621	(18.6374)	16	(1,164.8381)	577.4	1,164.7	2,273	4,584	(2,311)	-	-	-	-	-	-
11/15/1961	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/1961	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/1961	12	5.9432	5.9432	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
12/31/1961	12	6.3394	6.3394	-	16	-	199.8	199.8	786	786	-	-	-	-	-	-	-
1/15/1962	1	6.3198	6.3198	-	15	-	212.4	212.4	784	784	-	-	-	-	-	-	-
1/31/1962	1	6.7411	6.7411	-	16	-	212.4	212.4	836	836	-	-	-	-	-	-	-
2/15/1962	2	19.7464	8.0370	11.7094	15	780.6282	663.7	270.1	2,449	997	1,452	2,449	997	1,452	-	-	-
2/28/1962	2	17.1136	6.9654	10.1482	13	780.6282	663.7	270.1	2,122	864	1,259	2,122	864	1,259	-	-	-
3/15/1962	3	14.4629	17.8179	(3.3550)	15	(223.6675)	486.1	598.9	1,794	2,210	(416)	1,794	2,210	(416)	-	-	-
3/31/1962	3	15.4271	19.0058	(3.5787)	16	(223.6675)	486.1	598.9	1,913	2,357	(444)	1,913	2,357	(444)	-	-	-
4/14/1962	4	60.5447	48.3642	12.1804	14	870.0298	2,180.3	1,741.7	7,509	5,998	1,511	7,509	5,998	1,511	-	-	-
4/30/1962	4	72.0653	57.2648	14.8005	16	925.0320	2,270.8	1,804.4	8,938	7,102	1,836	8,938	7,102	1,836	-	-	-
5/15/1962	5	93.2947	64.8681	28.4266	15	1,895.1064	3,135.7	2,180.3	9,225	8,045	1,180	9,225	8,045	1,180	-	-	-
5/31/1962	5	99.5143	66.2290	33.2854	16	2,080.3359	3,135.7	2,086.9	9,840	8,214	1,626	9,840	8,214	1,626	-	-	-
6/15/1962	6	84.0718	50.4718	33.6000	15	2,240.0000	2,825.7	1,696.4	9,225	6,260	2,965	9,225	6,260	2,965	-	-	-
6/30/1962	6	84.0718	50.4718	33.6000	15	2,240.0000	2,825.7	1,696.4	9,225	6,260	2,965	9,225	6,260	2,965	-	-	-
7/15/1962	7	51.6416	51.6416	-	15	-	1,735.7	1,735.7	6,405	6,405	-	-	-	-	6,405	6,405	-
7/31/1962	7	55.0843	55.0843	-	16	-	1,735.7	1,735.7	6,832	6,832	-	-	-	-	6,832	6,832	-
8/15/1962	8	50.4662	50.4662	-	15	-	1,696.2	1,696.2	6,259	6,259	-	-	-	-	6,259	6,259	-
8/31/1962	8	53.8306	53.8306	-	16	-	1,696.2	1,696.2	6,676	6,676	-	-	-	-	6,676	6,676	-
9/15/1962	9	13.8000	35.4729	(21.6729)	15	(1,444.8587)	463.8	1,192.3	1,712	4,399	(2,688)	-	-	-	1,712	4,399	(2,688)
9/30/1962	9	13.7000	35.4729	(21.7729)	15	(1,451.5254)	460.5	1,192.3	1,699	4,399	(2,700)	-	-	-	1,699	4,399	(2,700)
10/15/1962	10	17.1722	28.6194	(11.4472)	15	(763.1484)	577.2	961.9	2,130	3,549	(1,420)	-	-	-	-	-	-
10/31/1962	10	18.3170	30.5273	(12.2104)	16	(763.1484)	577.2	961.9	2,272	3,786	(1,514)	-	-	-	-	-	-
11/15/1962	11	5.9429	14.0572	(8.1143)	15	(540.9524)	199.7	472.5	737	1,743	(1,006)	-	-	-	-	-	-
11/30/1962	11	5.9429	14.0572	(8.1143)	15	(540.9524)	199.7	472.5	737	1,743	(1,006)	-	-	-	-	-	-
12/15/1962	12	5.9286	5.9286	-	15	-	199.3	199.3	735	735	-	-	-	-	-	-	-
12/31/1962	12	6.3239	6.3239	-	16	-	199.3	199.3	784	784	-	-	-	-	-	-	-
1/15/1963	1	6.2327	6.2327	-	15	-	209.5	209.5	773	773	-	-	-	-	-	-	-
1/31/1963	1	6.6482	6.6482	-	16	-	209.5	209.5	825	825	-	-	-	-	-	-	-
2/15/1963	2	45.9884	15.2658	30.7226	15	2,048.1756	1,545.7	513.1	5,704	1,893	3,810	5,704	1,893	3,810	-	-	-
2/28/1963	2	39.8566	13.2303	26.6263	13	2,048.1756	1,545.7	513.1	4,943	1,641	3,302	4,943	1,641	3,302	-	-	-
3/15/1963	3	15.0823	39.1677	(24.0854)	15	(1,605.6957)	506.9	1,316.5	1,871	4,858	(2,987)	1,871	4,858	(2,987)	-	-	-
3/31/1963	3	16.0877	41.7103	(25.6225)	16	(1,601.4082)	506.9	1,314.3	1,995	5,173	(3,178)	1,995	5,173	(3,178)	-	-	-
4/14/1963	4	45.9383	33.5201	12.4182	14	887.0145	1,654.3	1,207.1	5,697	4,157	1,540	5,697	4,157	1,540	-	-	-
4/30/1963	4	52.5009	53.7739	(1.2730)	16	(79.5648)	1,654.3	1,694.4	6,511	6,669	(158)	6,511	6,669	(158)	-	-	-
5/15/1963	5	120.8862	72.5513	48.3348	15	3,222.3228	4,063.1	2,438.5	9,225	8,998	227	9,225	8,998	227	-	-	-
5/31/1963	5	128.9453	84.1225	44.8227	16	2,801.4204	4,063.1	2,650.7	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1963	6	86.5793	79.4728	7.1065	15	473.7677	2,910.0	2,671.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1963	6	86.5793	79.4728	7.1065	15	473.7677	2,910.0	2,671.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1963	7	51.6270	54.8120	(3.1850)	15	(212.3333)	1,735.2	1,842.3	6,403	6,798	(395)	-	-	-	6,403	6,798	(395)
7/31/1963	7	55.0688	58.2538	(3.1850)	16	(199.0625)	1,735.2	1,835.6	6,830	7,225	(395)	-	-	-	6,830	7,225	(395)
8/15/1963	8	50.4589	53.6439	(3.1850)	15	(212.3333)	1,696.0	1,803.0	6,258	6,653	(395)	-	-	-	6,258	6,653	(395)
8/31/1963	8	53.8228	57.0078	(3.1850)	16	(199.0625)	1,696.0	1,796.3	6,675	7,070	(395)	-	-	-	6,675	7,070	(395)
9/15/1963	9	34.4178	37.2353	(2.8175)	15	(187.8333)	1,156.8	1,251.5	4,269	4,618	(349)	-	-	-	4,269	4,618	(349)
9/30/1963	9	34.4178	37.2353	(2.8175)	15	(187.8333)	1,156.8	1,251.5	4,269	4,618	(349)	-	-	-	4,269	4,618	(349)
10/15/1963	10	21.2576	24.7002	(3.4425)	15	(229.5026)	714.5	830.2	2,636	3,063	(427)	-	-	-	-	-	-
10/31/1963	10	22.6748	26.2325	(3.5577)	16	(222.3568)	714.5	826.6	2,812	3,253	(441)	-	-	-	-	-	-
11/15/1963	11	5.8829	6.9119	(1.0290)	15	(68.6000)	197.7	232.3	730	857	(128)	-	-	-	-	-	-
11/30/1963	11	5.8829	6.9119	(1.0290)	15	(68.6000)	197.7	232.3	730	857	(128)	-	-	-	-	-	-
12/15/1963	12	5.9214	6.9504	(1.0290)	15	(68.6000)	199.0	233.6	734	862	(128)	-	-	-	-	-	-
12/31/1963	12	6.3161	7.3451	(1.0290)	16	(64.3125)	199.0	231.4	783	911	(128)	-	-	-	-	-	-

Avg Water Duty:	Total Period			February -June			July - September		
10.25	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$ 69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/1964	1	6.1891	7.4101	(1.2209)	15	(81.3966)	208.0	249.1	768	919	(151)	-	-	-	-	-	-
1/31/1964	1	6.6018	7.8355	(1.2337)	16	(77.1091)	208.0	246.9	819	972	(153)	-	-	-	-	-	-
2/15/1964	2	6.3672	15.4916	(9.1243)	15	(608.2898)	214.0	520.7	790	1,921	(1,132)	790	1,921	(1,132)	-	-	-
2/29/1964	2	5.9428	14.5274	(8.5847)	14	(613.1898)	214.0	523.2	737	1,802	(1,065)	737	1,802	(1,065)	-	-	-
3/15/1964	3	9.6266	35.8176	(26.1910)	15	(1,746.0652)	323.6	1,203.9	1,194	4,442	(3,248)	1,194	4,442	(3,248)	-	-	-
3/31/1964	3	39.7924	38.1368	1.6556	16	103.4752	1,253.9	1,201.7	4,935	4,730	205	4,935	4,730	205	-	-	-
4/14/1964	4	65.3182	52.9078	12.4104	14	886.4539	2,352.2	1,905.3	8,101	6,562	1,539	8,101	6,562	1,539	-	-	-
4/30/1964	4	74.6493	72.9378	1.7115	16	106.9697	2,352.2	2,298.3	9,258	9,046	212	9,258	9,046	212	-	-	-
5/15/1964	5	79.8931	67.4453	12.4478	15	829.8537	2,685.3	2,266.9	9,225	8,365	860	9,225	8,365	860	-	-	-
5/31/1964	5	85.2193	58.1946	27.0247	16	1,689.0444	2,685.3	1,833.7	9,840	7,217	2,623	9,840	7,217	2,623	-	-	-
6/15/1964	6	61.5110	54.0412	7.4698	15	497.9864	2,067.4	1,816.4	7,629	6,702	926	7,629	6,702	926	-	-	-
6/30/1964	6	61.5110	54.0412	7.4698	15	497.9864	2,067.4	1,816.4	7,629	6,702	926	7,629	6,702	926	-	-	-
7/15/1964	7	51.5738	54.7588	(3.1850)	15	(212.3333)	1,733.4	1,840.5	6,396	6,791	(395)	-	-	-	6,396	6,791	(395)
7/31/1964	7	55.0121	58.1971	(3.1850)	16	(199.0625)	1,733.4	1,833.8	6,823	7,218	(395)	-	-	-	6,823	7,218	(395)
8/15/1964	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/1964	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/1964	9	35.4015	38.2190	(2.8175)	15	(187.8333)	1,189.9	1,284.6	4,391	4,740	(349)	-	-	-	4,391	4,740	(349)
9/30/1964	9	33.5945	38.2190	(4.6244)	15	(308.2938)	1,129.1	1,284.6	4,167	4,740	(574)	-	-	-	4,167	4,740	(574)
10/15/1964	10	17.1794	24.1550	(6.9756)	15	(465.0393)	577.4	811.9	2,131	2,996	(865)	-	-	-	-	-	-
10/31/1964	10	18.3247	25.6510	(7.3263)	16	(457.8935)	577.4	808.3	2,273	3,181	(909)	-	-	-	-	-	-
11/15/1964	11	5.9054	6.9344	(1.0290)	15	(68.6000)	198.5	233.1	732	860	(128)	-	-	-	-	-	-
11/30/1964	11	5.9054	6.9344	(1.0290)	15	(68.6000)	198.5	233.1	732	860	(128)	-	-	-	-	-	-
12/15/1964	12	9.9992	9.9992	-	15	-	336.1	336.1	1,240	1,240	-	-	-	-	-	-	-
12/31/1964	12	10.6658	10.6658	-	16	-	336.1	336.1	1,323	1,323	-	-	-	-	-	-	-
1/15/1965	1	7.7732	7.7732	-	15	-	261.3	261.3	964	964	-	-	-	-	-	-	-
1/31/1965	1	8.2914	8.2914	-	16	-	261.3	261.3	1,028	1,028	-	-	-	-	-	-	-
2/15/1965	2	21.9589	7.2919	14.6670	15	977.7991	738.1	245.1	2,723	904	1,819	2,723	904	1,819	-	-	-
2/28/1965	2	19.0311	6.4569	12.5742	13	967.2452	738.1	250.4	2,360	801	1,559	2,360	801	1,559	-	-	-
3/15/1965	3	34.9513	22.1979	12.7534	15	850.2284	1,174.7	746.1	4,335	2,753	1,582	4,335	2,753	1,582	-	-	-
3/31/1965	3	37.2128	23.5658	13.6471	16	852.9409	1,172.6	742.6	4,615	2,923	1,693	4,615	2,923	1,693	-	-	-
4/14/1965	4	74.6950	78.5353	(3.8403)	14	(274.3097)	2,689.9	2,828.2	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1965	4	84.9632	90.7367	(5.7735)	16	(360.8419)	2,677.2	2,859.1	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1965	5	106.0202	100.2700	5.7502	15	383.3473	3,563.4	3,370.1	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1965	5	112.9004	97.1941	15.7063	16	981.6447	3,557.5	3,062.6	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1965	6	94.6668	94.9285	(0.2617)	15	(17.4484)	3,181.8	3,190.6	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1965	6	94.6668	94.9285	(0.2617)	15	(17.4484)	3,181.8	3,190.6	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1965	7	54.6911	64.2061	(9.5150)	15	(634.3333)	1,838.2	2,158.0	6,783	7,963	(1,180)	-	-	-	6,783	7,963	(1,180)
7/31/1965	7	58.1248	67.6398	(9.5150)	16	(594.6875)	1,831.5	2,131.3	7,209	8,389	(1,180)	-	-	-	7,209	8,389	(1,180)
8/15/1965	8	48.4915	58.0065	(9.5150)	15	(634.3333)	1,629.8	1,949.6	6,014	7,194	(1,180)	-	-	-	6,014	7,194	(1,180)
8/31/1965	8	51.5119	61.0269	(9.5150)	16	(594.6875)	1,623.1	1,923.0	6,389	7,569	(1,180)	-	-	-	6,389	7,569	(1,180)
9/15/1965	9	38.0642	45.5097	(7.4455)	15	(496.3678)	1,279.4	1,529.6	4,721	5,644	(923)	-	-	-	4,721	5,644	(923)
9/30/1965	9	38.0642	45.5097	(7.4455)	15	(496.3678)	1,279.4	1,529.6	4,721	5,644	(923)	-	-	-	4,721	5,644	(923)
10/15/1965	10	35.7261	42.6655	(6.9394)	15	(462.6292)	1,200.8	1,434.0	4,431	5,292	(861)	-	-	-	-	-	-
10/31/1965	10	37.9935	45.3232	(7.3297)	16	(458.1084)	1,197.2	1,428.1	4,712	5,621	(909)	-	-	-	-	-	-
11/15/1965	11	6.9269	7.5779	(0.6510)	15	(43.4000)	232.8	254.7	859	940	(81)	-	-	-	-	-	-
11/30/1965	11	6.9269	7.5779	(0.6510)	15	(43.4000)	232.8	254.7	859	940	(81)	-	-	-	-	-	-
12/15/1965	12	6.8705	7.5215	(0.6510)	15	(43.4000)	230.9	252.8	852	933	(81)	-	-	-	-	-	-
12/31/1965	12	7.2600	7.9110	(0.6510)	16	(40.6875)	228.8	249.3	900	981	(81)	-	-	-	-	-	-
1/15/1966	1	7.2472	8.2821	(1.0349)	15	(68.9932)	243.6	278.4	899	1,027	(128)	-	-	-	-	-	-
1/31/1966	1	7.6617	8.7222	(1.0605)	16	(66.2807)	241.4	274.8	950	1,082	(132)	-	-	-	-	-	-
2/15/1966	2	9.2495	8.3439	0.9057	15	60.3781	310.9	280.4	1,147	1,035	112	1,147	1,035	112	-	-	-
2/28/1966	2	8.1535	7.4553	0.6981	13	53.7011	316.2	289.1	1,011	925	87	1,011	925	87	-	-	-
3/15/1966	3	36.0070	24.0890	11.9180	15	794.5316	1,210.2	809.6	4,466	2,988	1,478	4,466	2,988	1,478	-	-	-
3/31/1966	3	38.4075	25.5830	12.8245	16	801.5316	1,210.2	806.1	4,763	3,173	1,591	4,763	3,173	1,591	-	-	-
4/14/1966	4	73.3881	59.2307	14.1574	14	1,011.2407	2,642.8	2,133.0	8,610	7,346	1,264	8,610	7,346	1,264	-	-	-
4/30/1966	4	83.8721	82.0993	1.7728	16	110.7998	2,642.8	2,586.9	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1966	5	76.2052	83.8596	(7.6545)	15	(510.2990)	2,561.3	2,818.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1966	5	81.2855	87.3528	(6.0673)	16	(379.2035)	2,561.3	2,752.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1966	6	50.4343	62.5124	(12.0780)	15	(805.2030)	1,695.1	2,101.1	6,255	7,753	(1,498)	6,255	7,753	(1,498)	-	-	-
6/30/1966	6	50.4343	62.5124	(12.0780)	15	(805.2030)	1,695.1	2,101.1	6,255	7,753	(1,498)	6,255	7,753	(1,498)	-	-	-
7/15/1966	7	51.2009	63.9009	(12.7000)	15	(846.6667)	1,720.9	2,147.7	6,350	7,925	(1,575)	-	-	-	6,350	7,925	(1,575)
7/31/1966	7	54.6143	67.3143	(12.7000)	16	(793.7500)	1,720.9	2,121.1	6,773	8,349	(1,575)	-	-	-	6,773	8,349	(1,575)
8/15/1966	8	50.4662	63.1662	(12.7000)	15	(846.6667)	1,696.2	2,123.1	6,259	7,834	(1,575)	-	-	-	6,259	7,834	(1,575)
8/31/1966	8	53.8306	66.5306	(12.7000)	16	(793.7500)	1,696.2	2,096.4	6,676	8,251	(1,575)	-	-	-	6,676	8,251	(1,575)
9/15/1966	9	35.4729	45.6979	(10.2250)	15	(681.6667)	1,192.3	1,535.9	4,399	5,668	(1,268)	-	-	-	4,399	5,668	(1,268)
9/30/1966	9	35.4729	45.6979	(10.2250)	15	(681.6667)	1,192.3	1,535.9	4,399	5,668	(1,268)	-	-	-	4,399	5,668	(1,268)
10/15/1966	10	34.6520	39.1795	(4.5275)	15	(301.8360)	1,164.7	1,316.8	4,298	4,859	(562)	-	-	-	-	-	-
10/31/1966	10	36.9621	41.6048	(4.6427)	16	(290.1693)	1,164.7	1,311.0	4,584	5,160	(576)	-	-	-	-	-	-
11/15/1966	11	5.9354	7.6154	(1.6800)	15	(112.0000)	199.5	256.0	736	944	(208)	-	-	-	-	-	-
11/30/1966	11	5.9354	7.6154	(1.6800)	15	(112.0000)	199.5	256.0	736	944	(208)	-	-	-	-	-	-
12/15/1966	12	5.7472	7.4272	(1.6800)	15	(112.0000)	193.2	249.6	713	921	(208)	-	-	-	-	-	-
12/31/1966	12	6.1303	7.8103	(1.6800)	16	(105.0000)	193.2	246.1	760	969	(208)	-	-	-	-	-	-
1/15/1967	1	5.9355	7.7563	(1.8208)	15	(121.3867)	199.5	260.7	736	962	(226)	-	-	-	-	-	-
1/31/1967	1	6.3312	8.1613	(1.8302)	16	(114.3867)	199.5	257.2	785	1,012	(227)	-	-	-	-	-	-
2/15/1967	2	17.2125	32.6080	(15.3955)	15	(1,026.3691)	578.5	1,096.0	2,135	4,044	(1,909)	2,135	4,044	(1,909)	-	-	-
2/28/1967	2	14.9175	28.4843	(13.5668)	13	(1,043.5999)	578.5	1,104.7	1,850	3,533	(1,683)	1,850	3,533	(1,683)	-	-	-
3/15/1967	3	49.9628	57.2793	(7.3164)	15	(487.7632)	1,679.3	1,925.2	6,197	7,104	(907)	6,197	7,104	(907)	-	-	-
3/31/1967	3	53.1817	60.9859	(7.8042)	16	(487.7632)	1,675.8	1,921.7	6,596	7,564	(968)	6,596	7,564	(968)	-	-	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/1967	4	65.6832	69.6502	(3.9669)	14	(283.3530)	2,365.3	2,508.2	8,146	8,610	(464)	8,146	8,610	(464)	-	-	-
4/30/1967	4	76.0486	65.3886	10.6600	16	666.2479	2,396.3	2,060.4	9,432	8,110	1,322	9,432	8,110	1,322	-	-	-
5/15/1967	5	147.0893	107.3661	39.7231	15	2,648.2079	4,943.8	3,608.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1967	5	156.2135	90.5695	65.6441	16	4,102.7533	4,922.3	2,853.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1967	6	148.0610	77.8279	70.2331	15	4,682.2039	4,976.4	2,615.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1967	6	148.0610	77.8279	70.2331	15	4,682.2039	4,976.4	2,615.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1967	7	64.3270	65.3656	(1.0385)	15	(69.2348)	2,162.1	2,197.0	7,978	8,107	(129)	-	-	-	7,978	8,107	(129)
7/31/1967	7	67.7688	68.8766	(1.1078)	16	(69.2348)	2,135.4	2,170.3	8,405	8,542	(137)	-	-	-	8,405	8,542	(137)
8/15/1967	8	63.1589	63.6652	(0.5063)	15	(33.7510)	2,122.8	2,139.8	7,833	7,896	(63)	-	-	-	7,833	7,896	(63)
8/31/1967	8	66.5228	67.0629	(0.5400)	16	(33.7510)	2,096.1	2,113.1	8,250	8,317	(67)	-	-	-	8,250	8,317	(67)
9/15/1967	9	45.7359	47.2235	(1.4876)	15	(99.1735)	1,537.2	1,587.2	5,672	5,857	(184)	-	-	-	5,672	5,857	(184)
9/30/1967	9	45.7359	47.2235	(1.4876)	15	(99.1735)	1,537.2	1,587.2	5,672	5,857	(184)	-	-	-	5,672	5,857	(184)
10/15/1967	10	41.3176	41.9894	(0.6718)	15	(44.7881)	1,388.7	1,411.3	5,124	5,208	(83)	-	-	-	-	-	-
10/31/1967	10	43.8854	44.6021	(0.7166)	16	(44.7881)	1,382.8	1,405.4	5,443	5,532	(89)	-	-	-	-	-	-
11/15/1967	11	7.6154	7.6154	-	15	-	256.0	256.0	944	944	-	-	-	-	-	-	-
11/30/1967	11	7.6154	7.6154	-	15	-	256.0	256.0	944	944	-	-	-	-	-	-	-
12/15/1967	12	7.6086	7.6086	-	15	-	255.7	255.7	944	944	-	-	-	-	-	-	-
12/31/1967	12	8.0039	8.0039	-	16	-	252.2	252.2	993	993	-	-	-	-	-	-	-
1/15/1968	1	8.3401	8.5321	(0.1919)	15	(12.7966)	280.3	286.8	1,034	1,058	(24)	-	-	-	-	-	-
1/31/1968	1	8.7842	8.9889	(0.2047)	16	(12.7966)	276.8	283.2	1,089	1,115	(25)	-	-	-	-	-	-
2/15/1968	2	28.7901	16.1479	12.6422	15	842.8124	967.7	542.7	3,571	2,003	1,568	3,571	2,003	1,568	-	-	-
2/29/1968	2	26.9828	15.1834	11.7994	14	842.8124	971.7	546.8	3,346	1,883	1,463	3,346	1,883	1,463	-	-	-
3/15/1968	3	20.6064	9.7885	10.8179	15	721.1961	692.6	329.0	2,556	1,214	1,342	2,556	1,214	1,342	-	-	-
3/31/1968	3	21.9116	10.3290	11.5825	16	723.9086	690.4	325.5	2,718	1,281	1,437	2,718	1,281	1,437	-	-	-
4/14/1968	4	65.5563	86.9433	(21.3870)	14	(1,527.6430)	2,360.8	3,130.9	8,131	8,610	(479)	8,131	8,610	(479)	-	-	-
4/30/1968	4	74.5190	100.3458	(25.8268)	16	(1,614.1752)	2,348.1	3,161.9	9,242	9,840	(598)	9,242	9,840	(598)	-	-	-
5/15/1968	5	77.9186	100.2329	(22.3143)	15	(1,487.6205)	2,618.9	3,368.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1968	5	82.9254	89.8214	(6.8961)	16	(431.0039)	2,613.0	2,830.3	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1968	6	59.6818	63.8992	(4.2174)	15	(281.1611)	2,005.9	2,147.7	7,402	7,925	(523)	7,402	7,925	(523)	-	-	-
6/30/1968	6	59.6818	63.8992	(4.2174)	15	(281.1611)	2,005.9	2,147.7	7,402	7,925	(523)	7,402	7,925	(523)	-	-	-
7/15/1968	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/1968	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/1968	8	51.3913	60.9063	(9.5150)	15	(634.3333)	1,727.3	2,047.1	6,374	7,554	(1,180)	-	-	-	6,374	7,554	(1,180)
8/31/1968	8	54.6051	64.1201	(9.5150)	16	(594.6875)	1,720.6	2,020.4	6,772	7,952	(1,180)	-	-	-	6,772	7,952	(1,180)
9/15/1968	9	38.2904	45.7359	(7.4455)	15	(496.3678)	1,287.0	1,537.2	4,749	5,672	(923)	-	-	-	4,749	5,672	(923)
9/30/1968	9	38.2904	45.7359	(7.4455)	15	(496.3678)	1,287.0	1,537.2	4,749	5,672	(923)	-	-	-	4,749	5,672	(923)
10/15/1968	10	27.7840	34.7235	(6.9394)	15	(462.6292)	933.8	1,167.1	3,446	4,307	(861)	-	-	-	-	-	-
10/31/1968	10	29.5220	36.8517	(7.3297)	16	(458.1084)	930.2	1,161.2	3,661	4,570	(909)	-	-	-	-	-	-
11/15/1968	11	6.9644	7.6154	(0.6510)	15	(43.4000)	234.1	256.0	864	944	(81)	-	-	-	-	-	-
11/30/1968	11	6.9644	7.6154	(0.6510)	15	(43.4000)	234.1	256.0	864	944	(81)	-	-	-	-	-	-
12/15/1968	12	6.8633	7.5143	(0.6510)	15	(43.4000)	230.7	252.6	851	932	(81)	-	-	-	-	-	-
12/31/1968	12	7.2522	7.9032	(0.6510)	16	(40.6875)	228.5	249.0	899	980	(81)	-	-	-	-	-	-
1/15/1969	1	15.3229	15.3229	-	15	-	515.0	515.0	1,900	1,900	-	-	-	-	-	-	-
1/31/1969	1	16.3445	16.3445	-	16	-	515.0	515.0	2,027	2,027	-	-	-	-	-	-	-
2/15/1969	2	38.9067	12.0045	26.9022	15	1,793.4803	1,307.7	403.5	4,825	1,489	3,336	4,825	1,489	3,336	-	-	-
2/28/1969	2	33.8563	10.4039	23.4524	13	1,804.0341	1,313.0	403.5	4,199	1,290	2,909	4,199	1,290	2,909	-	-	-
3/15/1969	3	59.1527	62.9436	(3.7910)	15	(252.7326)	1,988.2	2,115.6	7,336	7,806	(470)	7,336	7,806	(470)	-	-	-
3/31/1969	3	62.9842	67.0279	(4.0437)	16	(252.7326)	1,984.6	2,112.0	7,811	8,313	(502)	7,811	8,313	(502)	-	-	-
4/14/1969	4	99.5564	102.8044	(3.2480)	14	(232.0030)	3,585.2	3,702.1	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1969	4	112.3180	67.8600	44.4580	16	2,778.6227	3,539.1	2,138.3	9,840	8,416	1,424	9,840	8,416	1,424	-	-	-
5/15/1969	5	179.7284	119.8403	59.8881	15	3,992.5371	6,040.8	4,027.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1969	5	191.0286	111.8621	79.1665	16	4,947.9090	6,019.3	3,524.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1969	6	120.2668	85.7941	34.4727	15	2,298.1819	4,042.2	2,883.6	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1969	6	120.2668	85.7941	34.4727	15	2,298.1819	4,042.2	2,883.6	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1969	7	65.3656	69.2045	(3.8390)	15	(255.9317)	2,197.0	2,326.0	8,107	8,583	(476)	-	-	-	8,107	8,583	(476)
7/31/1969	7	68.8766	72.9715	(4.0949)	16	(255.9317)	2,170.3	2,299.3	8,542	9,050	(508)	-	-	-	8,542	9,050	(508)
8/15/1969	8	63.6652	66.6404	(2.9752)	15	(198.3471)	2,139.8	2,239.8	7,896	8,265	(369)	-	-	-	7,896	8,265	(369)
8/31/1969	8	67.0629	70.2364	(3.1736)	16	(198.3471)	2,113.1	2,213.1	8,317	8,711	(394)	-	-	-	8,317	8,711	(394)
9/15/1969	9	44.0731	69.0525	(24.9794)	15	(1,665.2917)	1,481.3	2,320.9	5,466	8,564	(3,098)	-	-	-	5,466	8,564	(3,098)
9/30/1969	9	44.0731	83.0017	(38.9286)	15	(2,595.2390)	1,481.3	2,789.7	5,466	9,225	(3,759)	-	-	-	5,466	9,225	(3,759)
10/15/1969	10	36.1023	151.2992	(115.1969)	15	(7,679.7919)	1,213.4	5,085.3	4,478	9,225	(4,747)	-	-	-	-	-	-
10/31/1969	10	38.3225	39.7557	(1.4332)	16	(89.5761)	1,207.5	1,252.7	4,753	4,931	(178)	-	-	-	-	-	-
11/15/1969	11	7.6079	10.5831	(2.9752)	15	(198.3471)	255.7	355.7	944	1,313	(369)	-	-	-	-	-	-
11/30/1969	11	7.6079	10.5831	(2.9752)	15	(198.3471)	255.7	355.7	944	1,313	(369)	-	-	-	-	-	-
12/15/1969	12	7.5361	29.0540	(21.5179)	15	(1,434.5283)	253.3	976.5	935	3,603	(2,669)	-	-	-	-	-	-
12/31/1969	12	7.9265	39.3527	(31.4262)	16	(1,964.1388)	249.8	1,240.0	983	4,881	(3,898)	-	-	-	-	-	-
1/15/1970	1	9.4135	144.7209	(135.3074)	15	(9,020.4944)	316.4	4,864.2	1,167	9,225	(8,058)	-	-	-	-	-	-
1/31/1970	1	10.0411	154.3690	(144.3279)	16	(9,020.4944)	316.4	4,864.2	1,245	9,840	(8,595)	-	-	-	-	-	-
2/15/1970	2	26.7648	76.4928	(49.7280)	15	(3,315.1985)	899.6	2,571.0	3,319	9,225	(5,906)	3,319	9,225	(5,906)	-	-	-
2/28/1970	2	23.4202	66.2938	(42.8736)	13	(3,297.9677)	908.3	2,571.0	2,905	7,995	(5,090)	2,905	7,995	(5,090)	-	-	-
3/15/1970	3	59.6470	59.6470	-	15	-	2,004.8	2,004.8	7,398	7,398	-	7,398	7,398	-	-	-	-
3/31/1970	3	63.5115	63.5115	-	16	-	2,001.2	2,001.2	7,877	7,877	-	7,877	7,877	-	-	-	-
4/14/1970	4	87.5934	87.5934	-	14	-	3,154.4	3,154.4	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1970	4	85.8951	85.8951	-	16	-	2,706.6	2,706.6	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1970	5	112.7121	112.7121	-	15	-	3,788.3	3,788.3	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1970	5	110.8344	120.3479	(9.5136)	16	(594.5979)	3,492.4	3,792.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1970	6	87.0285	80.5954	6.4331	15	428.8706	2,925.1	2,708.9	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1970	6	87.0285	80.5954	6.4331	15	428.8706	2,925.1	2,708.9	9,225	9,225	-	9,225	9,225	-	-	-	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total Period			February -June			July - September		
	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
Revenue:			$ (18,823,762)			$ 22,396,769			$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
7/15/1970	7	65.3656	65.3656	-	15	-	2,197.0	2,197.0	8,107	8,107	-	-	-	-	8,107	8,107	-
7/31/1970	7	68.8766	68.8766	-	16	-	2,170.3	2,170.3	8,542	8,542	-	-	-	-	8,542	8,542	-
8/15/1970	8	63.6652	63.6652	-	15	-	2,139.8	2,139.8	7,896	7,896	-	-	-	-	7,896	7,896	-
8/31/1970	8	67.0629	67.0629	-	16	-	2,113.1	2,113.1	8,317	8,317	-	-	-	-	8,317	8,317	-
9/15/1970	9	47.2160	47.2160	-	15	-	1,587.0	1,587.0	5,856	5,856	-	-	-	-	5,856	5,856	-
9/30/1970	9	47.2160	47.2160	-	15	-	1,587.0	1,587.0	5,856	5,856	-	-	-	-	5,856	5,856	-
10/15/1970	10	39.6507	39.6507	-	15	-	1,332.7	1,332.7	4,918	4,918	-	-	-	-	-	-	-
10/31/1970	10	42.1074	42.1074	-	16	-	1,326.8	1,326.8	5,222	5,222	-	-	-	-	-	-	-
11/15/1970	11	7.5404	7.5404	-	15	-	253.4	253.4	935	935	-	-	-	-	-	-	-
11/30/1970	11	7.5404	7.5404	-	15	-	253.4	253.4	935	935	-	-	-	-	-	-	-
12/15/1970	12	7.2530	7.2530	-	15	-	243.8	243.8	900	900	-	-	-	-	-	-	-
12/31/1970	12	7.6245	7.6245	-	16	-	240.2	240.2	946	946	-	-	-	-	-	-	-
1/15/1971	1	8.4160	8.4160	-	15	-	282.9	282.9	1,044	1,044	-	-	-	-	-	-	-
1/31/1971	1	8.8650	8.8650	-	16	-	279.3	279.3	1,099	1,099	-	-	-	-	-	-	-
2/15/1971	2	16.8380	8.6367	8.2013	15	546.7533	565.9	290.3	2,088	1,071	1,017	2,088	1,071	1,017	-	-	-
2/28/1971	2	14.8170	7.7092	7.1078	13	546.7533	574.6	299.0	1,838	956	882	1,838	956	882	-	-	-
3/15/1971	3	37.6967	61.8519	(24.1552)	15	(1,610.3438)	1,267.0	2,078.9	4,675	7,671	(2,996)	4,675	7,671	(2,996)	-	-	-
3/31/1971	3	40.0978	65.8633	(25.7655)	16	(1,610.3438)	1,263.5	2,075.4	4,973	8,169	(3,196)	4,973	8,169	(3,196)	-	-	-
4/14/1971	4	81.4668	85.4337	(3.9669)	14	(283.3530)	2,933.7	3,076.6	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1971	4	94.0869	83.4269	10.6600	16	666.2479	2,964.7	2,628.8	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1971	5	98.0052	109.2678	(11.2626)	15	(750.8396)	3,294.0	3,672.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1971	5	103.8572	92.5979	11.2593	16	703.7058	3,272.5	2,917.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1971	6	94.8743	81.0413	13.8331	15	922.2039	3,188.8	2,723.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1971	6	94.8743	81.0413	13.8331	15	922.2039	3,188.8	2,723.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1971	7	64.3270	65.3656	(1.0385)	15	(69.2348)	2,162.1	2,197.0	7,978	8,107	(129)	-	-	-	7,978	8,107	(129)
7/31/1971	7	67.7688	68.8766	(1.1078)	16	(69.2348)	2,135.4	2,170.3	8,405	8,542	(137)	-	-	-	8,405	8,542	(137)
8/15/1971	8	63.1589	63.6652	(0.5063)	15	(33.7510)	2,122.8	2,139.8	7,833	7,896	(63)	-	-	-	7,833	7,896	(63)
8/31/1971	8	66.5228	67.0629	(0.5400)	16	(33.7510)	2,096.1	2,113.1	8,250	8,317	(67)	-	-	-	8,250	8,317	(67)
9/15/1971	9	45.5022	46.9898	(1.4876)	15	(99.1736)	1,529.4	1,579.4	5,643	5,828	(184)	-	-	-	5,643	5,828	(184)
9/30/1971	9	45.5022	46.9898	(1.4876)	15	(99.1736)	1,529.4	1,579.4	5,643	5,828	(184)	-	-	-	5,643	5,828	(184)
10/15/1971	10	28.2127	28.8845	(0.6718)	15	(44.7881)	948.2	970.8	3,499	3,582	(83)	-	-	-	-	-	-
10/31/1971	10	29.9068	30.6234	(0.7166)	16	(44.7881)	942.4	964.9	3,709	3,798	(89)	-	-	-	-	-	-
11/15/1971	11	14.5154	14.5154	-	15	-	487.9	487.9	1,800	1,800	-	-	-	-	-	-	-
11/30/1971	11	14.5154	14.5154	-	15	-	487.9	487.9	1,800	1,800	-	-	-	-	-	-	-
12/15/1971	12	7.4490	7.4490	-	15	-	250.4	250.4	924	924	-	-	-	-	-	-	-
12/31/1971	12	7.8336	7.8336	-	16	-	246.8	246.8	972	972	-	-	-	-	-	-	-
1/15/1972	1	8.3474	8.5394	(0.1919)	15	(12.7966)	280.6	287.0	1,035	1,059	(24)	-	-	-	-	-	-
1/31/1972	1	8.7919	8.9966	(0.2047)	16	(12.7966)	277.0	283.5	1,090	1,116	(25)	-	-	-	-	-	-
2/15/1972	2	17.4636	18.6832	(1.2195)	15	(81.3021)	587.0	628.0	2,166	2,317	(151)	2,166	2,317	(151)	-	-	-
2/29/1972	2	16.4114	17.5496	(1.1382)	14	(81.3021)	591.0	632.0	2,035	2,177	(141)	2,035	2,177	(141)	-	-	-
3/15/1972	3	65.1193	65.0155	0.1038	15	6.9219	2,188.7	2,185.2	8,076	8,063	13	8,076	8,063	13	-	-	-
3/31/1972	3	69.3486	69.2378	0.1108	16	6.9219	2,185.2	2,181.7	8,601	8,587	14	8,601	8,587	14	-	-	-
4/14/1972	4	74.6638	79.7681	(5.1043)	14	(364.5900)	2,688.7	2,872.6	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1972	4	89.1516	89.1516	-	16	-	2,809.2	2,809.2	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1972	5	100.8834	85.1516	15.7318	15	1,048.7871	3,390.8	2,862.0	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1972	5	106.9273	89.9152	17.0121	16	1,063.2556	3,369.3	2,833.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1972	6	67.6518	62.6222	5.0296	15	335.3053	2,273.8	2,104.8	8,390	7,767	624	8,390	7,767	624	-	-	-
6/30/1972	6	67.6518	62.6222	5.0296	15	335.3053	2,273.8	2,104.8	8,390	7,767	624	8,390	7,767	624	-	-	-
7/15/1972	7	64.3416	64.3416	-	15	-	2,162.6	2,162.6	7,980	7,980	-	-	-	-	7,980	7,980	-
7/31/1972	7	67.7843	67.7843	-	16	-	2,135.9	2,135.9	8,407	8,407	-	-	-	-	8,407	8,407	-
8/15/1972	8	63.1662	63.1662	-	15	-	2,123.1	2,123.1	7,834	7,834	-	-	-	-	7,834	7,834	-
8/31/1972	8	66.5306	66.5306	-	16	-	2,096.4	2,096.4	8,251	8,251	-	-	-	-	8,251	8,251	-
9/15/1972	9	44.1904	44.1904	-	15	-	1,485.3	1,485.3	5,481	5,481	-	-	-	-	5,481	5,481	-
9/30/1972	9	44.1904	44.1904	-	15	-	1,485.3	1,485.3	5,481	5,481	-	-	-	-	5,481	5,481	-
10/15/1972	10	31.3109	31.3109	-	15	-	1,052.4	1,052.4	3,883	3,883	-	-	-	-	-	-	-
10/31/1972	10	33.2116	33.2116	-	16	-	1,046.5	1,046.5	4,119	4,119	-	-	-	-	-	-	-
11/15/1972	11	7.6154	7.6154	-	15	-	256.0	256.0	944	944	-	-	-	-	-	-	-
11/30/1972	11	7.6154	7.6154	-	15	-	256.0	256.0	944	944	-	-	-	-	-	-	-
12/15/1972	12	7.5796	7.5796	-	15	-	254.8	254.8	940	940	-	-	-	-	-	-	-
12/31/1972	12	7.9729	7.9729	-	16	-	251.2	251.2	989	989	-	-	-	-	-	-	-
1/15/1973	1	7.6619	7.6619	-	15	-	257.5	257.5	950	950	-	-	-	-	-	-	-
1/31/1973	1	8.0607	8.0607	-	16	-	254.0	254.0	1,000	1,000	-	-	-	-	-	-	-
2/15/1973	2	28.3773	9.6347	18.7426	15	1,249.5081	953.8	323.8	3,519	1,195	2,325	3,519	1,195	2,325	-	-	-
2/28/1973	2	24.8177	8.3501	16.4676	13	1,266.7388	962.5	323.8	3,078	1,036	2,042	3,078	1,036	2,042	-	-	-
3/15/1973	3	27.9348	9.4982	18.4367	15	1,229.1123	938.9	319.2	3,465	1,178	2,287	3,465	1,178	2,287	-	-	-
3/31/1973	3	29.6852	10.0194	19.6658	16	1,229.1123	935.4	315.7	3,682	1,243	2,439	3,682	1,243	2,439	-	-	-
4/14/1973	4	75.0602	76.5330	(1.4728)	14	(105.2026)	2,703.0	2,756.1	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1973	4	84.3223	88.4483	(4.1260)	16	(257.8732)	2,657.0	2,787.0	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1973	5	135.1431	100.5015	34.6416	15	2,309.4387	4,542.2	3,377.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1973	5	143.4709	90.1079	53.3631	16	3,335.1907	4,520.8	2,839.3	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1973	6	86.4827	86.8427	(0.3601)	15	(24.0058)	2,906.7	2,918.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1973	6	86.4827	86.8427	(0.3601)	15	(24.0058)	2,906.7	2,918.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1973	7	64.3198	64.3198	-	15	-	2,161.8	2,161.8	7,977	7,977	-	-	-	-	7,977	7,977	-
7/31/1973	7	67.7611	67.7611	-	16	-	2,135.1	2,135.1	8,404	8,404	-	-	-	-	8,404	8,404	-
8/15/1973	8	63.1517	63.1517	-	15	-	2,122.6	2,122.6	7,832	7,832	-	-	-	-	7,832	7,832	-
8/31/1973	8	66.5151	66.5151	-	16	-	2,095.9	2,095.9	8,249	8,249	-	-	-	-	8,249	8,249	-
9/15/1973	9	45.6904	45.7284	(0.0380)	15	(2.5344)	1,535.7	1,537.0	5,667	5,671	(5)	-	-	-	5,667	5,671	(5)
9/30/1973	9	45.6904	45.7284	(0.0380)	15	(2.5344)	1,535.7	1,537.0	5,667	5,671	(5)	-	-	-	5,667	5,671	(5)

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1973	10	16.7158	20.8427	(4.1269)	15	(275.1266)	561.8	700.5	2,073	2,585	(512)	-	-	-	-	-	-
10/31/1973	10	17.6436	22.0456	(4.4020)	16	(275.1266)	555.9	694.7	2,188	2,734	(546)	-	-	-	-	-	-
11/15/1973	11	7.5704	7.5704	-	15	-	254.4	254.4	939	939	-	-	-	-	-	-	-
11/30/1973	11	7.5704	7.5704	-	15	-	254.4	254.4	939	939	-	-	-	-	-	-	-
12/15/1973	12	7.3619	7.3619	-	15	-	247.4	247.4	913	913	-	-	-	-	-	-	-
12/31/1973	12	7.7407	7.7407	-	16	-	243.9	243.9	960	960	-	-	-	-	-	-	-
1/15/1974	1	7.9159	8.1079	(0.1919)	15	(12.7966)	266.1	272.5	982	1,006	(24)	-	-	-	-	-	-
1/31/1974	1	8.3317	8.5364	(0.2047)	16	(12.7966)	262.5	269.0	1,033	1,059	(25)	-	-	-	-	-	-
2/15/1974	2	15.3220	8.4082	6.9138	15	460.9209	515.0	282.6	1,900	1,043	857	1,900	1,043	857	-	-	-
2/28/1974	2	13.5030	7.5111	5.9920	13	460.9209	523.7	291.3	1,675	932	743	1,675	932	743	-	-	-
3/15/1974	3	44.8361	51.3784	(6.5423)	15	(436.1502)	1,507.0	1,726.9	5,561	6,372	(811)	5,561	6,372	(811)	-	-	-
3/31/1974	3	47.7132	54.6916	(6.9784)	16	(436.1502)	1,503.4	1,723.3	5,918	6,783	(865)	5,918	6,783	(865)	-	-	-
4/14/1974	4	76.9829	75.7027	1.2802	14	91.4444	2,772.3	2,726.2	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1974	4	86.5198	72.3058	14.2140	16	888.3747	2,726.2	2,278.4	9,840	8,968	872	9,840	8,968	872	-	-	-
5/15/1974	5	124.4834	110.0041	14.4793	15	965.2894	4,184.0	3,697.3	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1974	5	132.1006	93.3833	38.7174	16	2,419.8348	4,162.5	2,942.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1974	6	93.0285	79.1954	13.8331	15	922.2039	3,126.7	2,661.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1974	6	93.0285	79.1954	13.8331	15	922.2039	3,126.7	2,661.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1974	7	60.0427	61.0812	(1.0385)	15	(69.2348)	2,018.1	2,053.0	7,447	7,575	(129)	-	-	-	7,447	7,575	(129)
7/31/1974	7	63.1989	64.3066	(1.1078)	16	(69.2348)	1,991.4	2,026.3	7,838	7,976	(137)	-	-	-	7,838	7,976	(137)
8/15/1974	8	63.1589	63.6652	(0.5063)	15	(33.7510)	2,122.8	2,139.8	7,833	7,896	(63)	-	-	-	7,833	7,896	(63)
8/31/1974	8	66.5228	67.0629	(0.5400)	16	(33.7510)	2,096.1	2,113.1	8,250	8,317	(67)	-	-	-	8,250	8,317	(67)
9/15/1974	9	45.7284	47.2160	(1.4876)	15	(99.1735)	1,537.0	1,587.0	5,671	5,856	(184)	-	-	-	5,671	5,856	(184)
9/30/1974	9	45.7284	47.2160	(1.4876)	15	(99.1735)	1,537.0	1,587.0	5,671	5,856	(184)	-	-	-	5,671	5,856	(184)
10/15/1974	10	31.8821	32.5539	(0.6718)	15	(44.7881)	1,071.6	1,094.2	3,954	4,037	(83)	-	-	-	-	-	-
10/31/1974	10	33.8209	34.5375	(0.7166)	16	(44.7881)	1,065.7	1,088.3	4,195	4,283	(89)	-	-	-	-	-	-
11/15/1974	11	15.2015	15.2015	-	15	-	510.9	510.9	1,885	1,885	-	-	-	-	-	-	-
11/30/1974	11	15.2015	15.2015	-	15	-	510.9	510.9	1,885	1,885	-	-	-	-	-	-	-
12/15/1974	12	7.6086	7.6086	-	15	-	255.7	255.7	944	944	-	-	-	-	-	-	-
12/31/1974	12	8.0039	8.0039	-	16	-	252.2	252.2	993	993	-	-	-	-	-	-	-
1/15/1975	1	8.3547	8.5466	(0.1919)	15	(12.7966)	280.8	287.3	1,036	1,060	(24)	-	-	-	-	-	-
1/31/1975	1	8.7996	9.0044	(0.2047)	16	(12.7966)	277.3	283.7	1,091	1,117	(25)	-	-	-	-	-	-
2/15/1975	2	17.7206	8.4037	9.3169	15	621.1262	595.6	282.5	2,198	1,042	1,156	2,198	1,042	1,156	-	-	-
2/28/1975	2	15.5818	7.5072	8.0746	13	621.1262	604.3	291.1	1,933	931	1,001	1,933	931	1,001	-	-	-
3/15/1975	3	31.1018	48.6763	(17.5745)	15	(1,171.6341)	1,045.3	1,636.0	3,857	6,037	(2,180)	3,857	6,037	(2,180)	-	-	-
3/31/1975	3	33.0632	51.8094	(18.7461)	16	(1,171.6341)	1,041.8	1,632.5	4,101	6,426	(2,325)	4,101	6,426	(2,325)	-	-	-
4/14/1975	4	78.6326	82.5995	(3.9669)	14	(283.3530)	2,831.7	2,974.5	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1975	4	90.8478	80.1878	10.6600	16	666.2479	2,862.6	2,526.7	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1975	5	131.4689	111.3766	20.0922	15	1,339.4829	4,418.8	3,743.4	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1975	5	139.5518	114.8452	24.7066	16	1,544.1631	4,397.3	3,618.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1975	6	119.4893	81.0563	38.4331	15	2,562.2039	4,016.1	2,724.4	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1975	6	119.4893	81.0563	38.4331	15	2,562.2039	4,016.1	2,724.4	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1975	7	64.3343	65.3728	(1.0385)	15	(69.2348)	2,162.3	2,197.2	7,979	8,108	(129)	-	-	-	7,979	8,108	(129)
7/31/1975	7	67.7766	68.8843	(1.1078)	16	(69.2348)	2,135.6	2,170.5	8,406	8,543	(137)	-	-	-	8,406	8,543	(137)
8/15/1975	8	58.5083	59.0145	(0.5063)	15	(33.7510)	1,966.5	1,983.5	7,256	7,319	(63)	-	-	-	7,256	7,319	(63)
8/31/1975	8	61.5621	62.1022	(0.5400)	16	(33.7510)	1,939.8	1,956.8	7,635	7,702	(67)	-	-	-	7,635	7,702	(67)
9/15/1975	9	45.7284	47.2160	(1.4876)	15	(99.1735)	1,537.0	1,587.0	5,671	5,856	(184)	-	-	-	5,671	5,856	(184)
9/30/1975	9	45.7284	47.2160	(1.4876)	15	(99.1735)	1,537.0	1,587.0	5,671	5,856	(184)	-	-	-	5,671	5,856	(184)
10/15/1975	10	27.7748	28.4466	(0.6718)	15	(44.7881)	933.5	956.1	3,445	3,528	(83)	-	-	-	-	-	-
10/31/1975	10	29.4397	30.1564	(0.7166)	16	(44.7881)	927.6	950.2	3,651	3,740	(89)	-	-	-	-	-	-
11/15/1975	11	14.2154	14.2154	-	15	-	477.8	477.8	1,763	1,763	-	-	-	-	-	-	-
11/30/1975	11	14.2154	14.2154	-	15	-	477.8	477.8	1,763	1,763	-	-	-	-	-	-	-
12/15/1975	12	7.6232	7.6232	-	15	-	256.2	256.2	945	945	-	-	-	-	-	-	-
12/31/1975	12	8.0194	8.0194	-	16	-	252.7	252.7	995	995	-	-	-	-	-	-	-
1/15/1976	1	8.3837	8.5756	(0.1919)	15	(12.7966)	281.8	288.2	1,040	1,064	(24)	-	-	-	-	-	-
1/31/1976	1	8.8306	9.0354	(0.2047)	16	(12.7966)	278.3	284.7	1,095	1,121	(25)	-	-	-	-	-	-
2/15/1976	2	15.1891	15.4016	(0.2125)	15	(14.1677)	510.5	517.7	1,884	1,910	(26)	1,884	1,910	(26)	-	-	-
2/29/1976	2	14.2885	14.4868	(0.1983)	14	(14.1677)	514.5	521.7	1,772	1,797	(25)	1,772	1,797	(25)	-	-	-
3/15/1976	3	21.0449	20.9878	0.0571	15	3.8038	707.3	705.4	2,610	2,603	7	2,610	2,603	7	-	-	-
3/31/1976	3	22.3793	22.2750	0.1043	16	6.5163	705.2	701.9	2,776	2,763	13	2,776	2,763	13	-	-	-
4/14/1976	4	47.3730	54.6648	(7.2918)	14	(520.8426)	1,706.0	1,968.6	5,875	6,780	(904)	5,875	6,780	(904)	-	-	-
4/30/1976	4	59.2357	76.8811	(17.6454)	16	(1,102.8365)	1,866.5	2,422.5	7,347	9,535	(2,188)	7,347	9,535	(2,188)	-	-	-
5/15/1976	5	67.7090	84.7145	(17.0055)	15	(1,133.7011)	2,275.7	2,847.3	8,397	9,225	(828)	8,397	9,225	(828)	-	-	-
5/31/1976	5	70.9761	67.2556	3.7205	16	232.5318	2,236.5	2,119.2	8,803	8,341	461	8,803	8,341	461	-	-	-
6/15/1976	6	52.5902	59.9977	(7.4075)	15	(493.8333)	1,767.6	2,016.6	6,522	7,441	(919)	6,522	7,441	(919)	-	-	-
6/30/1976	6	52.5902	59.9977	(7.4075)	15	(493.8333)	1,767.6	2,016.6	6,522	7,441	(919)	6,522	7,441	(919)	-	-	-
7/15/1976	7	54.2822	63.7972	(9.5150)	15	(634.3333)	1,824.5	2,144.3	6,732	7,912	(1,180)	-	-	-	6,732	7,912	(1,180)
7/31/1976	7	57.6887	67.2037	(9.5150)	16	(594.6875)	1,817.8	2,117.6	7,155	8,335	(1,180)	-	-	-	7,155	8,335	(1,180)
8/15/1976	8	47.7885	57.3035	(9.5150)	15	(634.3333)	1,606.2	1,926.0	5,927	7,107	(1,180)	-	-	-	5,927	7,107	(1,180)
8/31/1976	8	50.7621	60.2771	(9.5150)	16	(594.6875)	1,599.5	1,899.3	6,296	7,476	(1,180)	-	-	-	6,296	7,476	(1,180)
9/15/1976	9	35.4404	42.8479	(7.4075)	15	(493.8333)	1,191.2	1,440.1	4,395	5,314	(919)	-	-	-	4,395	5,314	(919)
9/30/1976	9	35.4404	42.8479	(7.4075)	15	(493.8333)	1,191.2	1,440.1	4,395	5,314	(919)	-	-	-	4,395	5,314	(919)
10/15/1976	10	20.8426	23.6551	(2.8125)	15	(187.5026)	700.5	795.1	2,585	2,934	(349)	-	-	-	-	-	-
10/31/1976	10	22.1178	25.0455	(2.9277)	16	(182.9818)	696.9	789.2	2,743	3,106	(363)	-	-	-	-	-	-
11/15/1976	11	13.5794	14.2304	(0.6510)	15	(43.4000)	456.4	478.3	1,684	1,765	(81)	-	-	-	-	-	-
11/30/1976	11	13.5794	14.2304	(0.6510)	15	(43.4000)	456.4	478.3	1,684	1,765	(81)	-	-	-	-	-	-
12/15/1976	12	6.9794	7.6304	(0.6510)	15	(43.4000)	234.6	256.5	866	946	(81)	-	-	-	-	-	-
12/31/1976	12	7.3761	8.0271	(0.6510)	16	(40.6875)	232.4	252.9	915	996	(81)	-	-	-	-	-	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/1977	1	7.3561	8.1990	(0.8429)	15	(56.1966)	247.2	275.6	912	1,017	(105)	-	-	-	-	-	-
1/31/1977	1	7.7779	8.6336	(0.8557)	16	(53.4841)	245.1	272.0	965	1,071	(106)	-	-	-	-	-	-
2/15/1977	2	17.9811	18.6321	(0.6510)	15	(43.4000)	604.4	626.2	2,230	2,311	(81)	2,230	2,311	(81)	-	-	-
2/28/1977	2	15.7209	16.3719	(0.6510)	13	(50.0769)	609.7	634.9	1,950	2,030	(81)	1,950	2,030	(81)	-	-	-
3/15/1977	3	21.9842	21.9842	-	15	-	738.9	738.9	2,727	2,727	-	2,727	2,727	-	-	-	-
3/31/1977	3	23.4498	23.4498	-	16	-	738.9	738.9	2,908	2,908	-	2,908	2,908	-	-	-	-
4/14/1977	4	22.2734	22.2734	-	14	-	802.1	802.1	2,762	2,762	-	2,762	2,762	-	-	-	-
4/30/1977	4	35.1404	35.1404	-	16	-	1,107.3	1,107.3	4,358	4,358	-	4,358	4,358	-	-	-	-
5/15/1977	5	38.1703	38.1703	-	15	-	1,282.9	1,282.9	4,734	4,734	-	4,734	4,734	-	-	-	-
5/31/1977	5	30.2004	30.2004	-	16	-	951.6	951.6	3,746	3,746	-	3,746	3,746	-	-	-	-
6/15/1977	6	28.3116	28.7851	(0.4735)	15	(31.5672)	951.6	967.5	3,511	3,570	(59)	3,511	3,570	(59)	-	-	-
6/30/1977	6	28.3116	28.7851	(0.4735)	15	(31.5672)	951.6	967.5	3,511	3,570	(59)	3,511	3,570	(59)	-	-	-
7/15/1977	7	51.1378	51.1378	-	15	-	1,718.8	1,718.8	6,342	6,342	-	-	-	-	6,342	6,342	-
7/31/1977	7	54.5470	54.5470	-	16	-	1,718.8	1,718.8	6,765	6,765	-	-	-	-	6,765	6,765	-
8/15/1977	8	49.8250	49.8250	-	15	-	1,674.7	1,674.7	6,179	6,179	-	-	-	-	6,179	6,179	-
8/31/1977	8	53.1467	53.1467	-	16	-	1,674.7	1,674.7	6,591	6,591	-	-	-	-	6,591	6,591	-
9/15/1977	9	33.3729	33.3729	-	15	-	1,121.7	1,121.7	4,139	4,139	-	-	-	-	4,139	4,139	-
9/30/1977	9	33.3729	33.3729	-	15	-	1,121.7	1,121.7	4,139	4,139	-	-	-	-	4,139	4,139	-
10/15/1977	10	30.8271	30.8271	-	15	-	1,036.1	1,036.1	3,823	3,823	-	-	-	-	-	-	-
10/31/1977	10	32.8822	32.8822	-	16	-	1,036.1	1,036.1	4,078	4,078	-	-	-	-	-	-	-
11/15/1977	11	8.0337	8.0337	-	15	-	270.0	270.0	996	996	-	-	-	-	-	-	-
11/30/1977	11	8.0337	8.0337	-	15	-	270.0	270.0	996	996	-	-	-	-	-	-	-
12/15/1977	12	5.9214	5.9214	-	15	-	199.0	199.0	734	734	-	-	-	-	-	-	-
12/31/1977	12	6.3161	6.3161	-	16	-	199.0	199.0	783	783	-	-	-	-	-	-	-
1/15/1978	1	6.2189	6.2189	-	15	-	209.0	209.0	771	771	-	-	-	-	-	-	-
1/31/1978	1	6.6335	6.6335	-	16	-	209.0	209.0	823	823	-	-	-	-	-	-	-
2/15/1978	2	22.7491	5.9817	16.7674	15	1,117.8276	764.6	201.0	2,821	742	2,080	2,821	742	2,080	-	-	-
2/28/1978	2	19.7159	5.1841	14.5318	13	1,117.8276	764.6	201.0	2,445	643	1,802	2,445	643	1,802	-	-	-
3/15/1978	3	50.2719	9.4982	40.7738	15	2,718.2501	1,689.7	319.2	6,235	1,178	5,057	6,235	1,178	5,057	-	-	-
3/31/1978	3	53.5548	10.0194	43.5354	16	2,720.9626	1,687.5	315.7	6,642	1,243	5,399	6,642	1,243	5,399	-	-	-
4/14/1978	4	63.9966	36.5683	27.4282	14	1,959.1574	2,304.6	1,316.9	7,937	4,535	3,402	7,937	4,535	3,402	-	-	-
4/30/1978	4	72.7364	56.1995	16.5370	16	1,033.5603	2,291.9	1,770.8	9,021	6,970	2,051	9,021	6,970	2,051	-	-	-
5/15/1978	5	118.7561	79.6669	39.0892	15	2,605.9461	3,991.5	2,677.7	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1978	5	126.4853	61.5856	64.8997	16	4,056.2321	3,985.5	1,940.6	9,840	7,638	2,202	9,840	7,638	2,202	-	-	-
6/15/1978	6	106.0668	60.6743	45.3925	15	3,026.1667	3,565.0	2,039.3	9,225	7,525	1,700	9,225	7,525	1,700	-	-	-
6/30/1978	6	106.0668	60.6743	45.3925	15	3,026.1667	3,565.0	2,039.3	9,225	7,525	1,700	9,225	7,525	1,700	-	-	-
7/15/1978	7	54.8193	64.3343	(9.5150)	15	(634.3333)	1,842.5	2,162.3	6,799	7,979	(1,180)	-	-	-	6,799	7,979	(1,180)
7/31/1978	7	58.2616	67.7766	(9.5150)	16	(594.6875)	1,835.8	2,135.6	7,226	8,406	(1,180)	-	-	-	7,226	8,406	(1,180)
8/15/1978	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1978	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1978	9	32.5210	39.9285	(7.4075)	15	(493.8333)	1,093.1	1,342.0	4,033	4,952	(919)	-	-	-	4,033	4,952	(919)
9/30/1978	9	32.5210	39.9285	(7.4075)	15	(493.8333)	1,093.1	1,342.0	4,033	4,952	(919)	-	-	-	4,033	4,952	(919)
10/15/1978	10	36.3670	39.1795	(2.8125)	15	(187.5026)	1,222.3	1,316.8	4,510	4,859	(349)	-	-	-	-	-	-
10/31/1978	10	38.6771	41.6048	(2.9277)	16	(182.9818)	1,218.7	1,311.0	4,797	5,160	(363)	-	-	-	-	-	-
11/15/1978	11	6.9719	7.6229	(0.6510)	15	(43.4000)	234.3	256.2	865	945	(81)	-	-	-	-	-	-
11/30/1978	11	6.9719	7.6229	(0.6510)	15	(43.4000)	234.3	256.2	865	945	(81)	-	-	-	-	-	-
12/15/1978	12	6.9576	7.6086	(0.6510)	15	(43.4000)	233.9	255.7	863	944	(81)	-	-	-	-	-	-
12/31/1978	12	7.3529	8.0039	(0.6510)	16	(40.6875)	231.7	252.2	912	993	(81)	-	-	-	-	-	-
1/15/1979	1	7.1383	7.9813	(0.8429)	15	(56.1966)	239.9	268.3	885	990	(105)	-	-	-	-	-	-
1/31/1979	1	7.5456	8.4013	(0.8557)	16	(53.4841)	237.8	264.7	936	1,042	(106)	-	-	-	-	-	-
2/15/1979	2	23.6415	7.7376	15.9039	15	1,060.2600	794.6	260.1	2,932	960	1,972	2,932	960	1,972	-	-	-
2/28/1979	2	20.6265	6.9299	13.6966	13	1,053.5831	799.9	268.8	2,558	859	1,699	2,558	859	1,699	-	-	-
3/15/1979	3	42.2352	17.8689	24.3663	15	1,624.4219	1,419.6	600.6	5,238	2,216	3,022	5,238	2,216	3,022	-	-	-
3/31/1979	3	44.9823	18.9481	26.0342	16	1,627.1344	1,417.4	597.1	5,579	2,350	3,229	5,579	2,350	3,229	-	-	-
4/14/1979	4	70.4346	80.2482	(9.8137)	14	(700.9764)	2,536.4	2,889.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1979	4	80.0941	92.6943	(12.6001)	16	(787.5086)	2,523.8	2,920.8	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1979	5	124.2796	100.0031	24.2765	15	1,618.4336	4,177.1	3,361.2	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1979	5	132.3771	89.5763	42.8008	16	2,675.0502	4,171.2	2,822.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1979	6	74.0743	106.7074	(32.6331)	15	(2,175.5393)	2,489.7	3,586.5	9,187	9,225	(38)	9,187	9,225	(38)	-	-	-
6/30/1979	6	74.0743	106.7074	(32.6331)	15	(2,175.5393)	2,489.7	3,586.5	9,187	9,225	(38)	9,187	9,225	(38)	-	-	-
7/15/1979	7	54.0071	63.5221	(9.5150)	15	(634.3333)	1,815.2	2,135.0	6,698	7,878	(1,180)	-	-	-	6,698	7,878	(1,180)
7/31/1979	7	57.3952	66.9102	(9.5150)	16	(594.6875)	1,808.5	2,108.3	7,118	8,298	(1,180)	-	-	-	7,118	8,298	(1,180)
8/15/1979	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/1979	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/1979	9	38.2904	45.7359	(7.4455)	15	(496.3678)	1,287.0	1,537.2	4,749	5,672	(923)	-	-	-	4,749	5,672	(923)
9/30/1979	9	38.2904	45.7359	(7.4455)	15	(496.3678)	1,287.0	1,537.2	4,749	5,672	(923)	-	-	-	4,749	5,672	(923)
10/15/1979	10	26.1596	33.0991	(6.9394)	15	(462.6292)	879.2	1,112.5	3,244	4,105	(861)	-	-	-	-	-	-
10/31/1979	10	27.7893	35.1190	(7.3297)	16	(458.1084)	875.6	1,106.6	3,447	4,356	(909)	-	-	-	-	-	-
11/15/1979	11	6.9644	7.6154	(0.6510)	15	(43.4000)	234.1	256.0	864	944	(81)	-	-	-	-	-	-
11/30/1979	11	6.9644	7.6154	(0.6510)	15	(43.4000)	234.1	256.0	864	944	(81)	-	-	-	-	-	-
12/15/1979	12	6.9213	7.5723	(0.6510)	15	(43.4000)	232.6	254.5	858	939	(81)	-	-	-	-	-	-
12/31/1979	12	7.3142	7.9652	(0.6510)	16	(40.6875)	230.5	251.0	907	988	(81)	-	-	-	-	-	-
1/15/1980	1	8.8340	8.8340	-	15	-	296.9	296.9	1,096	1,096	-	-	-	-	-	-	-
1/31/1980	1	9.4229	9.4229	-	16	-	296.9	296.9	1,169	1,169	-	-	-	-	-	-	-
2/15/1980	2	53.5652	8.3670	45.1982	15	3,013.2138	1,800.4	281.2	6,643	1,038	5,606	6,643	1,038	5,606	-	-	-
2/29/1980	2	50.0628	7.8092	42.2536	14	3,018.1138	1,802.8	281.2	6,209	969	5,240	6,209	969	5,240	-	-	-
3/15/1980	3	32.6958	55.4161	(22.7203)	15	(1,514.6893)	1,098.9	1,862.6	4,055	6,873	(2,818)	4,055	6,873	(2,818)	-	-	-
3/31/1980	3	34.7635	58.9985	(24.2350)	16	(1,514.6893)	1,095.4	1,859.0	4,311	7,317	(3,006)	4,311	7,317	(3,006)	-	-	-

Avg Water Duty:	10.25
Price per MWh:	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/1980	4	74.7748	104.9029	(30.1280)	14	(2,152.0030)	2,692.7	3,777.7	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1980	4	83.9962	70.2583	13.7380	16	858.6227	2,646.7	2,213.8	9,840	8,714	1,126	9,840	8,714	1,126	-	-	-
5/15/1980	5	114.1431	117.6669	(3.5239)	15	(234.9239)	3,836.4	3,954.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1980	5	121.0709	109.5438	11.5272	16	720.4480	3,814.9	3,451.7	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1980	6	106.6743	85.8016	20.8727	15	1,391.5152	3,585.4	2,883.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1980	6	106.6743	85.8016	20.8727	15	1,391.5152	3,585.4	2,883.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1980	7	60.8636	65.7411	(4.8775)	15	(325.1666)	2,045.7	2,209.6	7,548	8,153	(605)	-	-	-	7,548	8,153	(605)
7/31/1980	7	64.0745	69.2771	(5.2027)	16	(325.1666)	2,019.0	2,182.9	7,947	8,592	(645)	-	-	-	7,947	8,592	(645)
8/15/1980	8	63.1589	66.6404	(3.4815)	15	(232.0981)	2,122.8	2,239.8	7,833	8,265	(432)	-	-	-	7,833	8,265	(432)
8/31/1980	8	66.5228	70.2364	(3.7136)	16	(232.0981)	2,096.1	2,213.1	8,250	8,711	(461)	-	-	-	8,250	8,711	(461)
9/15/1980	9	45.6829	50.1837	(4.5008)	15	(300.0551)	1,535.4	1,686.7	5,666	6,224	(558)	-	-	-	5,666	6,224	(558)
9/30/1980	9	45.6829	50.1837	(4.5008)	15	(300.0551)	1,535.4	1,686.7	5,666	6,224	(558)	-	-	-	5,666	6,224	(558)
10/15/1980	10	38.9030	45.0454	(6.1424)	15	(409.4908)	1,307.6	1,514.0	4,825	5,587	(762)	-	-	-	-	-	-
10/31/1980	10	41.3099	47.8618	(6.5519)	16	(409.4908)	1,301.7	1,508.1	5,123	5,936	(813)	-	-	-	-	-	-
11/15/1980	11	17.8562	20.8315	(2.9752)	15	(198.3471)	600.2	700.2	2,215	2,584	(369)	-	-	-	-	-	-
11/30/1980	11	17.8562	20.8315	(2.9752)	15	(198.3471)	600.2	700.2	2,215	2,584	(369)	-	-	-	-	-	-
12/15/1980	12	7.6159	10.5911	(2.9752)	15	(198.3471)	256.0	356.0	945	1,314	(369)	-	-	-	-	-	-
12/31/1980	12	8.0116	11.1852	(3.1736)	16	(198.3471)	252.4	352.4	994	1,387	(394)	-	-	-	-	-	-
1/15/1981	1	8.0611	12.1880	(4.1269)	15	(275.1266)	270.9	409.6	1,000	1,512	(512)	-	-	-	-	-	-
1/31/1981	1	8.4865	12.8885	(4.4020)	16	(275.1266)	267.4	406.1	1,053	1,598	(546)	-	-	-	-	-	-
2/15/1981	2	10.2032	12.4700	(2.2668)	15	(151.1216)	342.9	419.1	1,265	1,547	(281)	1,265	1,547	(281)	-	-	-
2/28/1981	2	9.0668	11.0314	(1.9646)	13	(151.1216)	351.6	427.8	1,124	1,368	(244)	1,124	1,368	(244)	-	-	-
3/15/1981	3	18.9782	9.7086	9.2696	15	617.9703	637.9	326.3	2,354	1,204	1,150	2,354	1,204	1,150	-	-	-
3/31/1981	3	20.1748	10.2439	9.9309	16	620.6828	635.7	322.8	2,502	1,270	1,232	2,502	1,270	1,232	-	-	-
4/14/1981	4	65.2979	55.9763	9.3215	14	665.8240	2,351.5	2,015.8	8,098	6,942	1,156	8,098	6,942	1,156	-	-	-
4/30/1981	4	74.2237	78.3800	(4.1564)	16	(259.7731)	2,338.8	2,469.8	9,205	9,721	(515)	9,205	9,721	(515)	-	-	-
5/15/1981	5	79.1194	84.3435	(5.2241)	15	(348.2721)	2,659.3	2,834.8	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1981	5	84.2062	78.0644	6.1418	16	383.8643	2,653.3	2,459.8	9,840	9,682	158	9,840	9,682	158	-	-	-
6/15/1981	6	57.0818	60.6893	(3.6075)	15	(240.5000)	1,918.6	2,039.8	7,079	7,527	(447)	7,079	7,527	(447)	-	-	-
6/30/1981	6	57.0818	60.6893	(3.6075)	15	(240.5000)	1,918.6	2,039.8	7,079	7,527	(447)	7,079	7,527	(447)	-	-	-
7/15/1981	7	54.8193	64.3343	(9.5150)	15	(634.3333)	1,842.5	2,162.3	6,799	7,979	(1,180)	-	-	-	6,799	7,979	(1,180)
7/31/1981	7	58.2616	67.7766	(9.5150)	16	(594.6875)	1,835.8	2,135.6	7,226	8,406	(1,180)	-	-	-	7,226	8,406	(1,180)
8/15/1981	8	53.6439	63.1589	(9.5150)	15	(634.3333)	1,803.0	2,122.8	6,653	7,833	(1,180)	-	-	-	6,653	7,833	(1,180)
8/31/1981	8	57.0078	66.5228	(9.5150)	16	(594.6875)	1,796.3	2,096.1	7,070	8,250	(1,180)	-	-	-	7,070	8,250	(1,180)
9/15/1981	9	38.2904	45.6979	(7.4075)	15	(493.8333)	1,287.0	1,535.9	4,749	5,668	(919)	-	-	-	4,749	5,668	(919)
9/30/1981	9	38.2904	45.6979	(7.4075)	15	(493.8333)	1,287.0	1,535.9	4,749	5,668	(919)	-	-	-	4,749	5,668	(919)
10/15/1981	10	24.7310	27.5436	(2.8125)	15	(187.5026)	831.2	925.8	3,067	3,416	(349)	-	-	-	-	-	-
10/31/1981	10	26.2654	29.1932	(2.9277)	16	(182.9818)	827.6	919.9	3,258	3,621	(363)	-	-	-	-	-	-
11/15/1981	11	6.8969	7.5479	(0.6510)	15	(43.4000)	231.8	253.7	855	936	(81)	-	-	-	-	-	-
11/30/1981	11	6.8969	7.5479	(0.6510)	15	(43.4000)	231.8	253.7	855	936	(81)	-	-	-	-	-	-
12/15/1981	12	6.7762	7.4272	(0.6510)	15	(43.4000)	227.8	249.6	840	921	(81)	-	-	-	-	-	-
12/31/1981	12	7.1593	7.8103	(0.6510)	16	(40.6875)	225.6	246.1	888	969	(81)	-	-	-	-	-	-
1/15/1982	1	9.4234	9.4234	-	15	-	316.7	316.7	1,169	1,169	-	-	-	-	-	-	-
1/31/1982	1	10.0517	10.0517	-	16	-	316.7	316.7	1,247	1,247	-	-	-	-	-	-	-
2/15/1982	2	70.8701	8.6695	62.2006	15	4,146.7064	2,382.0	291.4	8,790	1,075	7,714	8,790	1,075	7,714	-	-	-
2/28/1982	2	61.5579	39.0649	22.4930	13	1,730.2312	2,387.3	1,515.0	7,635	4,845	2,790	7,635	4,845	2,790	-	-	-
3/15/1982	3	52.2495	102.3377	(50.0882)	15	(3,339.2125)	1,756.1	3,439.6	6,480	9,225	(2,745)	6,480	9,225	(2,745)	-	-	-
3/31/1982	3	55.6208	111.1931	(55.5723)	16	(3,473.2665)	1,752.6	3,503.7	6,898	9,840	(2,942)	6,898	9,840	(2,942)	-	-	-
4/14/1982	4	105.8656	92.8736	12.9920	14	927.9970	3,812.4	3,344.5	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1982	4	119.5286	91.2158	28.3127	16	1,769.5459	3,766.3	2,874.2	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1982	5	137.7786	118.0766	19.7019	15	1,313.4632	4,630.8	3,968.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1982	5	146.2821	109.9808	36.3014	16	2,268.8351	4,609.3	3,465.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1982	6	101.6677	84.1949	17.4727	15	1,164.8486	3,417.1	2,829.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1982	6	101.6677	84.1949	17.4727	15	1,164.8486	3,417.1	2,829.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1982	7	69.1973	69.1973	-	15	-	2,325.8	2,325.8	8,582	8,582	-	-	-	-	8,582	8,582	-
7/31/1982	7	72.9638	72.9638	-	16	-	2,299.1	2,299.1	9,049	9,049	-	-	-	-	9,049	9,049	-
8/15/1982	8	66.6404	66.6404	-	15	-	2,239.8	2,239.8	8,265	8,265	-	-	-	-	8,265	8,265	-
8/31/1982	8	70.2364	77.2285	(6.9921)	16	(437.0032)	2,213.1	2,433.5	8,711	9,578	(867)	-	-	-	8,711	9,578	(867)
9/15/1982	9	37.6361	106.1975	(68.5614)	15	(4,570.7623)	1,265.0	3,569.4	4,668	9,225	(4,557)	-	-	-	4,668	9,225	(4,557)
9/30/1982	9	37.6361	106.3020	(68.6659)	15	(4,577.7275)	1,265.0	3,572.9	4,668	9,225	(4,557)	-	-	-	4,668	9,225	(4,557)
10/15/1982	10	30.9653	175.8197	(144.8544)	15	(9,656.9604)	1,040.8	5,909.4	3,840	9,225	(5,385)	-	-	-	-	-	-
10/31/1982	10	32.8430	42.0837	(9.2407)	16	(577.5425)	1,034.9	1,326.1	4,073	5,219	(1,146)	-	-	-	-	-	-
11/15/1982	11	10.3206	78.9063	(68.5857)	15	(4,572.3812)	346.9	2,652.1	1,280	9,225	(7,945)	-	-	-	-	-	-
11/30/1982	11	10.3206	78.9063	(68.5857)	15	(4,572.3812)	346.9	2,652.1	1,280	9,225	(7,945)	-	-	-	-	-	-
12/15/1982	12	10.1266	89.7470	(79.6204)	15	(5,308.0296)	340.4	3,016.5	1,256	9,225	(7,969)	-	-	-	-	-	-
12/31/1982	12	10.6897	95.7302	(85.0405)	16	(5,315.0296)	336.8	3,016.5	1,326	9,840	(8,514)	-	-	-	-	-	-
1/15/1983	1	65.9695	122.8389	(56.8694)	15	(3,791.2908)	2,217.3	4,128.7	8,182	9,225	(1,043)	-	-	-	-	-	-
1/31/1983	1	131.0282	131.0282	-	16	-	4,128.7	4,128.7	9,840	9,840	-	-	-	-	-	-	-
2/15/1983	2	148.0939	148.0939	-	15	-	4,977.5	4,977.5	9,225	9,225	-	9,225	9,225	-	-	-	-
2/28/1983	2	128.3481	128.3481	-	13	-	4,977.5	4,977.5	7,995	7,995	-	7,995	7,995	-	-	-	-
3/15/1983	3	177.5232	177.5232	-	15	-	5,966.7	5,966.7	9,225	9,225	-	9,225	9,225	-	-	-	-
3/31/1983	3	191.3899	191.3899	-	16	-	6,030.7	6,030.7	9,840	9,840	-	9,840	9,840	-	-	-	-
4/14/1983	4	91.4661	91.4661	-	14	-	3,293.8	3,293.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1983	4	70.9866	54.9020	16.0846	16	1,005.2893	2,236.8	1,730.0	8,804	6,809	1,995	8,804	6,809	1,995	-	-	-
5/15/1983	5	147.6173	115.7218	31.8955	15	2,126.3665	4,961.5	3,889.5	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1983	5	156.7767	107.4689	49.3078	16	3,081.7383	4,940.0	3,386.3	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1983	6	179.4368	85.7641	93.6727	15	6,244.8486	6,031.0	2,882.6	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1983	6	179.4368	285.1869	(105.7501)	15	(7,050.0066)	6,031.0	9,585.3	9,225	9,225	-	9,225	9,225	-	-	-	-

Avg Water Duty:	
	10.25
Price per MWh:	
$	69.00

Total Period		
Total 40% Gen	Total Base Gen	Difference
11,191,837	11,464,645	(272,808)
	Revenue:	$ (18,823,762)

February -June		
Total 40% Gen	Total Base Gen	Difference
6,211,725	5,887,134	324,591
	Revenue:	$ 22,396,769

July - September		
Total 40% Gen	Total Base Gen	Difference
3,576,928	3,919,235	(342,307)
	Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
7/15/1983	7	69.1828	153.1106	(83.9278)	15	(5,595.1884)	2,325.3	5,146.1	8,580	9,225	(645)	-	-	-	8,580	9,225	(645)
7/31/1983	7	162.2638	162.8911	(0.6274)	16	(39.2103)	5,112.9	5,132.7	9,840	9,840	-	-	-	-	9,840	9,840	-
8/15/1983	8	100.9110	100.9110	-	15	-	3,391.7	3,391.7	9,225	9,225	-	-	-	-	9,225	9,225	-
8/31/1983	8	108.7417	108.7417	-	16	-	3,426.4	3,426.4	9,840	9,840	-	-	-	-	9,840	9,840	-
9/15/1983	9	106.6432	106.6432	-	15	-	3,584.3	3,584.3	9,225	9,225	-	-	-	-	9,225	9,225	-
9/30/1983	9	106.7488	106.7488	-	15	-	3,587.9	3,587.9	9,225	9,225	-	-	-	-	9,225	9,225	-
10/15/1983	10	162.8645	162.8645	-	15	-	5,474.0	5,474.0	9,225	9,225	-	-	-	-	-	-	-
10/31/1983	10	42.6158	42.6158	-	16	-	1,342.8	1,342.8	5,285	5,285	-	-	-	-	-	-	-
11/15/1983	11	88.4381	88.4381	-	15	-	2,972.5	2,972.5	9,225	9,225	-	-	-	-	-	-	-
11/30/1983	11	102.7826	102.7826	-	15	-	3,454.6	3,454.6	9,225	9,225	-	-	-	-	-	-	-
12/15/1983	12	146.0632	146.0632	-	15	-	4,909.3	4,909.3	9,225	9,225	-	-	-	-	-	-	-
12/31/1983	12	155.8008	155.8008	-	16	-	4,909.3	4,909.3	9,840	9,840	-	-	-	-	-	-	-
1/15/1984	1	74.4366	74.4366	-	15	-	2,501.9	2,501.9	9,225	9,225	-	-	-	-	-	-	-
1/31/1984	1	79.3991	79.3991	-	16	-	2,501.9	2,501.9	9,840	9,840	-	-	-	-	-	-	-
2/15/1984	2	69.1576	69.1576	-	15	-	2,324.4	2,324.4	8,577	8,577	-	8,577	8,577	-	-	-	-
2/29/1984	2	64.5471	64.5471	-	14	-	2,324.4	2,324.4	8,005	8,005	-	8,005	8,005	-	-	-	-
3/15/1984	3	67.2670	67.2670	-	15	-	2,260.9	2,260.9	8,343	8,343	-	8,343	8,343	-	-	-	-
3/31/1984	3	71.6395	71.6395	-	16	-	2,257.4	2,257.4	8,885	8,885	-	8,885	8,885	-	-	-	-
4/14/1984	4	113.8391	113.8391	-	14	-	4,099.5	4,099.5	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1984	4	84.6091	80.4711	4.1380	16	258.6227	2,666.0	2,535.6	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1984	5	121.0952	121.0952	-	15	-	4,070.1	4,070.1	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1984	5	119.7729	113.2005	6.5723	16	410.7706	3,774.0	3,566.9	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1984	6	85.8016	85.8016	-	15	-	2,883.8	2,883.8	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1984	6	85.8016	85.8016	-	15	-	2,883.8	2,883.8	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1984	7	69.2118	69.2118	-	15	-	2,326.3	2,326.3	8,584	8,584	-	-	-	-	8,584	8,584	-
7/31/1984	7	72.9792	72.9792	-	16	-	2,299.6	2,299.6	9,051	9,051	-	-	-	-	9,051	9,051	-
8/15/1984	8	66.6477	66.6477	-	15	-	2,240.1	2,240.1	8,266	8,266	-	-	-	-	8,266	8,266	-
8/31/1984	8	70.2442	70.2442	-	16	-	2,213.4	2,213.4	8,712	8,712	-	-	-	-	8,712	8,712	-
9/15/1984	9	50.1273	50.1273	-	15	-	1,684.8	1,684.8	6,217	6,217	-	-	-	-	6,217	6,217	-
9/30/1984	9	50.1273	50.1273	-	15	-	1,684.8	1,684.8	6,217	6,217	-	-	-	-	6,217	6,217	-
10/15/1984	10	30.9871	30.9871	-	15	-	1,041.5	1,041.5	3,843	3,843	-	-	-	-	-	-	-
10/31/1984	10	32.8662	32.8662	-	16	-	1,035.6	1,035.6	4,076	4,076	-	-	-	-	-	-	-
11/15/1984	11	10.5381	10.5381	-	15	-	354.2	354.2	1,307	1,307	-	-	-	-	-	-	-
11/30/1984	11	10.5381	10.5381	-	15	-	354.2	354.2	1,307	1,307	-	-	-	-	-	-	-
12/15/1984	12	10.5476	10.5476	-	15	-	354.5	354.5	1,308	1,308	-	-	-	-	-	-	-
12/31/1984	12	11.1387	11.1387	-	16	-	351.0	351.0	1,381	1,381	-	-	-	-	-	-	-
1/15/1985	1	12.2969	12.2969	-	15	-	413.3	413.3	1,525	1,525	-	-	-	-	-	-	-
1/31/1985	1	13.0047	13.0047	-	16	-	409.8	409.8	1,613	1,613	-	-	-	-	-	-	-
2/15/1985	2	12.3736	12.3736	-	15	-	415.9	415.9	1,535	1,535	-	1,535	1,535	-	-	-	-
2/28/1985	2	10.9478	10.9478	-	13	-	424.6	424.6	1,358	1,358	-	1,358	1,358	-	-	-	-
3/15/1985	3	28.7894	19.4495	9.3399	15	622.6606	967.6	653.7	3,571	2,412	1,158	3,571	2,412	1,158	-	-	-
3/31/1985	3	30.5967	20.6342	9.9626	16	622.6606	964.1	650.2	3,795	2,559	1,236	3,795	2,559	1,236	-	-	-
4/14/1985	4	81.2051	83.6112	(2.4062)	14	(171.8692)	2,924.3	3,011.0	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1985	4	91.3451	96.5377	(5.1926)	16	(324.5398)	2,878.3	3,041.9	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1985	5	88.1003	101.0717	(12.9713)	15	(864.7549)	2,961.1	3,397.1	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1985	5	93.2920	90.7161	2.5760	16	160.9971	2,939.6	2,858.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1985	6	62.5435	62.7534	(0.2099)	15	(13.9945)	2,102.1	2,109.2	7,757	7,783	(26)	7,757	7,783	(26)	-	-	-
6/30/1985	6	62.5435	62.7534	(0.2099)	15	(13.9945)	2,102.1	2,109.2	7,757	7,783	(26)	7,757	7,783	(26)	-	-	-
7/15/1985	7	64.3343	64.3343	-	15	-	2,162.3	2,162.3	7,979	7,979	-	-	-	-	7,979	7,979	-
7/31/1985	7	67.7766	67.7766	-	16	-	2,135.6	2,135.6	8,406	8,406	-	-	-	-	8,406	8,406	-
8/15/1985	8	63.1589	63.1589	-	15	-	2,122.8	2,122.8	7,833	7,833	-	-	-	-	7,833	7,833	-
8/31/1985	8	66.5228	66.5228	-	16	-	2,096.1	2,096.1	8,250	8,250	-	-	-	-	8,250	8,250	-
9/15/1985	9	45.1666	45.2046	(0.0380)	15	(2.5344)	1,518.1	1,519.4	5,602	5,606	(5)	-	-	-	5,602	5,606	(5)
9/30/1985	9	45.1666	45.2046	(0.0380)	15	(2.5344)	1,518.1	1,519.4	5,602	5,606	(5)	-	-	-	5,602	5,606	(5)
10/15/1985	10	31.0847	35.2116	(4.1269)	15	(275.1266)	1,044.8	1,183.5	3,855	4,367	(512)	-	-	-	-	-	-
10/31/1985	10	32.9704	37.3724	(4.4020)	16	(275.1266)	1,038.9	1,177.6	4,089	4,635	(546)	-	-	-	-	-	-
11/15/1985	11	7.5929	7.5929	-	15	-	255.2	255.2	942	942	-	-	-	-	-	-	-
11/30/1985	11	7.5929	7.5929	-	15	-	255.2	255.2	942	942	-	-	-	-	-	-	-
12/15/1985	12	7.5869	7.5869	-	15	-	255.0	255.0	941	941	-	-	-	-	-	-	-
12/31/1985	12	7.9807	7.9807	-	16	-	251.5	251.5	990	990	-	-	-	-	-	-	-
1/15/1986	1	8.1119	8.3039	(0.1919)	15	(12.7966)	272.6	279.1	1,006	1,030	(24)	-	-	-	-	-	-
1/31/1986	1	8.5407	8.7454	(0.2047)	16	(12.7966)	269.1	275.6	1,059	1,085	(25)	-	-	-	-	-	-
2/15/1986	2	114.1693	20.0199	94.1493	15	6,276.6232	3,837.3	672.9	9,225	2,483	6,742	9,225	2,483	6,742	-	-	-
2/28/1986	2	99.1707	17.3506	81.8201	13	6,293.8540	3,846.0	672.9	7,995	2,152	5,843	7,995	2,152	5,843	-	-	-
3/15/1986	3	72.3410	52.3947	19.9463	15	1,329.7559	2,431.4	1,761.0	8,972	6,498	2,474	8,972	6,498	2,474	-	-	-
3/31/1986	3	77.0518	107.8433	(30.7916)	16	(1,924.4738)	2,427.9	3,398.1	9,556	9,840	(284)	9,556	9,840	(284)	-	-	-
4/14/1986	4	99.9070	99.9070	-	14	-	3,597.8	3,597.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1986	4	89.1666	64.5487	24.6180	16	1,538.6227	2,809.6	2,033.9	9,840	8,006	1,834	9,840	8,006	1,834	-	-	-
5/15/1986	5	117.1113	117.1113	-	15	-	3,936.2	3,936.2	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1986	5	116.1428	108.9511	7.1917	16	449.4803	3,659.7	3,433.0	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1986	6	96.0818	85.8091	10.2727	15	684.8486	3,229.4	2,884.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1986	6	96.0818	85.8091	10.2727	15	684.8486	3,229.4	2,884.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1986	7	69.2191	69.2191	-	15	-	2,326.5	2,326.5	8,585	8,585	-	-	-	-	8,585	8,585	-
7/31/1986	7	72.9870	72.9870	-	16	-	2,299.8	2,299.8	9,052	9,052	-	-	-	-	9,052	9,052	-
8/15/1986	8	66.6477	66.6477	-	15	-	2,240.1	2,240.1	8,266	8,266	-	-	-	-	8,266	8,266	-
8/31/1986	8	70.2442	70.2442	-	16	-	2,213.4	2,213.4	8,712	8,712	-	-	-	-	8,712	8,712	-
9/15/1986	9	49.8222	49.8222	-	15	-	1,674.6	1,674.6	6,179	6,179	-	-	-	-	6,179	6,179	-
9/30/1986	9	49.8222	49.8222	-	15	-	1,674.6	1,674.6	6,179	6,179	-	-	-	-	6,179	6,179	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue:
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1986	10	38.1444	38.1444	-	15	-	1,282.1	1,282.1	4,731	4,731	-	-	-	-	-	-	-
10/31/1986	10	40.5006	40.5006	-	16	-	1,276.2	1,276.2	5,023	5,023	-	-	-	-	-	-	-
11/15/1986	11	20.4481	20.4481	-	15	-	687.3	687.3	2,536	2,536	-	-	-	-	-	-	-
11/30/1986	11	20.4481	20.4481	-	15	-	687.3	687.3	2,536	2,536	-	-	-	-	-	-	-
12/15/1986	12	10.5911	10.5911	-	15	-	356.0	356.0	1,314	1,314	-	-	-	-	-	-	-
12/31/1986	12	11.1852	11.1852	-	16	-	352.4	352.4	1,387	1,387	-	-	-	-	-	-	-
1/15/1987	1	12.3114	12.3114	-	15	-	413.8	413.8	1,527	1,527	-	-	-	-	-	-	-
1/31/1987	1	13.0201	13.0201	-	16	-	410.3	410.3	1,615	1,615	-	-	-	-	-	-	-
2/15/1987	2	12.4540	12.4540	-	15	-	418.6	418.6	1,545	1,545	-	1,545	1,545	-	-	-	-
2/28/1987	2	11.0174	11.0174	-	13	-	427.3	427.3	1,366	1,366	-	1,366	1,366	-	-	-	-
3/15/1987	3	15.2429	9.7740	5.4689	15	364.5961	512.3	328.5	1,890	1,212	678	1,890	1,212	678	-	-	-
3/31/1987	3	16.1471	10.3136	5.8335	16	364.5961	508.8	325.0	2,003	1,279	723	2,003	1,279	723	-	-	-
4/14/1987	4	66.2181	60.6890	5.5290	14	394.9312	2,384.6	2,185.5	8,213	7,527	686	8,213	7,527	686	-	-	-
4/30/1987	4	83.7659	83.7659	-	16	-	2,639.5	2,639.5	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1987	5	84.6572	84.6572	-	15	-	2,845.4	2,845.4	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1987	5	77.2903	68.4042	8.8861	16	555.3801	2,435.4	2,155.4	9,586	8,484	1,102	9,586	8,484	1,102	-	-	-
6/15/1987	6	60.1968	60.1968	-	15	-	2,023.3	2,023.3	7,466	7,466	-	7,466	7,466	-	-	-	-
6/30/1987	6	60.1968	60.1968	-	15	-	2,023.3	2,023.3	7,466	7,466	-	7,466	7,466	-	-	-	-
7/15/1987	7	63.8577	63.8577	-	15	-	2,146.3	2,146.3	7,920	7,920	-	-	-	-	7,920	7,920	-
7/31/1987	7	67.2682	67.2682	-	16	-	2,119.6	2,119.6	8,343	8,343	-	-	-	-	8,343	8,343	-
8/15/1987	8	62.5323	62.5323	-	15	-	2,101.7	2,101.7	7,755	7,755	-	-	-	-	7,755	7,755	-
8/31/1987	8	65.8545	65.8545	-	16	-	2,075.1	2,075.1	8,167	8,167	-	-	-	-	8,167	8,167	-
9/15/1987	9	45.0979	45.0979	-	15	-	1,515.8	1,515.8	5,593	5,593	-	-	-	-	5,593	5,593	-
9/30/1987	9	45.0979	45.0979	-	15	-	1,515.8	1,515.8	5,593	5,593	-	-	-	-	5,593	5,593	-
10/15/1987	10	23.6551	23.6551	-	15	-	795.1	795.1	2,934	2,934	-	-	-	-	-	-	-
10/31/1987	10	25.0455	25.0455	-	16	-	789.2	789.2	3,106	3,106	-	-	-	-	-	-	-
11/15/1987	11	14.2304	14.2304	-	15	-	478.3	478.3	1,765	1,765	-	-	-	-	-	-	-
11/30/1987	11	14.2304	14.2304	-	15	-	478.3	478.3	1,765	1,765	-	-	-	-	-	-	-
12/15/1987	12	7.6232	7.6232	-	15	-	256.2	256.2	945	945	-	-	-	-	-	-	-
12/31/1987	12	8.0194	8.0194	-	16	-	252.7	252.7	995	995	-	-	-	-	-	-	-
1/15/1988	1	8.1700	8.1700	-	15	-	274.6	274.6	1,013	1,013	-	-	-	-	-	-	-
1/31/1988	1	8.6026	8.6026	-	16	-	271.1	271.1	1,067	1,067	-	-	-	-	-	-	-
2/15/1988	2	11.2868	11.2868	-	15	-	379.4	379.4	1,400	1,400	-	1,400	1,400	-	-	-	-
2/29/1988	2	10.6463	10.6463	-	14	-	383.4	383.4	1,320	1,320	-	1,320	1,320	-	-	-	-
3/15/1988	3	26.3076	27.3366	(1.0290)	15	(68.6000)	884.2	918.8	3,263	3,390	(128)	3,263	3,390	(128)	-	-	-
3/31/1988	3	28.0614	29.0904	(1.0290)	16	(64.3125)	884.2	916.6	3,480	3,608	(128)	3,480	3,608	(128)	-	-	-
4/14/1988	4	34.9767	30.1437	4.8330	14	345.2150	1,259.6	1,085.5	4,338	3,739	599	4,338	3,739	599	-	-	-
4/30/1988	4	43.1244	45.9419	(2.8175)	16	(176.0938)	1,358.8	1,447.6	5,348	5,698	(349)	5,348	5,698	(349)	-	-	-
5/15/1988	5	52.0704	54.8879	(2.8175)	15	(187.8333)	1,750.1	1,844.8	6,458	6,807	(349)	6,458	6,807	(349)	-	-	-
5/31/1988	5	51.1796	47.7657	3.4138	16	213.3645	1,612.7	1,505.1	6,347	5,924	423	6,347	5,924	423	-	-	-
6/15/1988	6	48.8427	51.2602	(2.4175)	15	(161.1667)	1,641.6	1,722.9	6,058	6,357	(300)	6,058	6,357	(300)	-	-	-
6/30/1988	6	48.8427	51.2602	(2.4175)	15	(161.1667)	1,641.6	1,722.9	6,058	6,357	(300)	6,058	6,357	(300)	-	-	-
7/15/1988	7	51.1504	54.3354	(3.1850)	15	(212.3333)	1,719.2	1,826.2	6,344	6,739	(395)	-	-	-	6,344	6,739	(395)
7/31/1988	7	54.5605	57.7455	(3.1850)	16	(199.0625)	1,719.2	1,819.6	6,767	7,162	(395)	-	-	-	6,767	7,162	(395)
8/15/1988	8	49.8250	53.0100	(3.1850)	15	(212.3333)	1,674.7	1,781.7	6,179	6,574	(395)	-	-	-	6,179	6,574	(395)
8/31/1988	8	53.1467	56.3317	(3.1850)	16	(199.0625)	1,674.7	1,775.0	6,591	6,986	(395)	-	-	-	6,591	6,986	(395)
9/15/1988	9	34.8729	37.6904	(2.8175)	15	(187.8333)	1,172.1	1,266.8	4,325	4,674	(349)	-	-	-	4,325	4,674	(349)
9/30/1988	9	34.8729	37.6904	(2.8175)	15	(187.8333)	1,172.1	1,266.8	4,325	4,674	(349)	-	-	-	4,325	4,674	(349)
10/15/1988	10	34.2213	35.9363	(1.7150)	15	(114.3333)	1,150.2	1,207.8	4,244	4,457	(213)	-	-	-	-	-	-
10/31/1988	10	36.5028	38.2178	(1.7150)	16	(107.1875)	1,150.2	1,204.2	4,527	4,740	(213)	-	-	-	-	-	-
11/15/1988	11	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
11/30/1988	11	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
12/15/1988	12	5.9359	6.9649	(1.0290)	15	(68.6000)	199.5	234.1	736	864	(128)	-	-	-	-	-	-
12/31/1988	12	6.3316	7.3606	(1.0290)	16	(64.3125)	199.5	231.9	785	913	(128)	-	-	-	-	-	-
1/15/1989	1	6.3125	7.3415	(1.0290)	15	(68.6000)	212.2	246.8	783	911	(128)	-	-	-	-	-	-
1/31/1989	1	6.7334	7.7624	(1.0290)	16	(64.3125)	212.2	244.6	835	963	(128)	-	-	-	-	-	-
2/15/1989	2	15.2534	16.2824	(1.0290)	15	(68.6000)	512.7	547.3	1,892	2,019	(128)	1,892	2,019	(128)	-	-	-
2/28/1989	2	13.2196	14.2486	(1.0290)	13	(79.1538)	512.7	552.6	1,640	1,767	(128)	1,640	1,767	(128)	-	-	-
3/15/1989	3	48.4731	23.7516	24.7215	15	1,648.1001	1,629.2	798.3	6,012	2,946	3,066	6,012	2,946	3,066	-	-	-
3/31/1989	3	51.7047	25.3351	26.3696	16	1,648.1001	1,629.2	798.3	6,413	3,142	3,270	6,413	3,142	3,270	-	-	-
4/14/1989	4	84.3042	50.4053	33.8988	14	2,421.3455	3,035.9	1,815.2	8,610	6,251	2,359	8,610	6,251	2,359	-	-	-
4/30/1989	4	96.3476	67.9253	28.4223	16	1,776.3967	3,035.9	2,140.3	9,840	8,424	1,416	9,840	8,424	1,416	-	-	-
5/15/1989	5	75.7536	64.5528	11.2008	15	746.7193	2,546.1	2,169.7	9,225	8,006	1,219	9,225	8,006	1,219	-	-	-
5/31/1989	5	80.8038	61.9296	18.8742	16	1,179.6357	2,546.1	1,951.4	9,840	7,681	2,159	9,840	7,681	2,159	-	-	-
6/15/1989	6	61.1718	49.9718	11.2000	15	746.6667	2,056.0	1,679.6	7,587	6,198	1,389	7,587	6,198	1,389	-	-	-
6/30/1989	6	61.1718	49.9718	11.2000	15	746.6667	2,056.0	1,679.6	7,587	6,198	1,389	7,587	6,198	1,389	-	-	-
7/15/1989	7	51.1577	51.1577	-	15	-	1,719.4	1,719.4	6,345	6,345	-	-	-	-	6,345	6,345	-
7/31/1989	7	54.5682	54.5682	-	16	-	1,719.4	1,719.4	6,768	6,768	-	-	-	-	6,768	6,768	-
8/15/1989	8	49.2687	49.2687	-	15	-	1,656.0	1,656.0	6,110	6,110	-	-	-	-	6,110	6,110	-
8/31/1989	8	52.5533	52.5533	-	16	-	1,656.0	1,656.0	6,518	6,518	-	-	-	-	6,518	6,518	-
9/15/1989	9	24.1110	24.1110	-	15	-	810.4	810.4	2,990	2,990	-	-	-	-	2,990	2,990	-
9/30/1989	9	24.1110	24.1110	-	15	-	810.4	810.4	2,990	2,990	-	-	-	-	2,990	2,990	-
10/15/1989	10	19.1203	19.1203	-	15	-	642.6	642.6	2,371	2,371	-	-	-	-	-	-	-
10/31/1989	10	20.3950	20.3950	-	16	-	642.6	642.6	2,529	2,529	-	-	-	-	-	-	-
11/15/1989	11	12.5429	12.5429	-	15	-	421.6	421.6	1,556	1,556	-	-	-	-	-	-	-
11/30/1989	11	12.5429	12.5429	-	15	-	421.6	421.6	1,556	1,556	-	-	-	-	-	-	-
12/15/1989	12	5.9432	5.9432	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
12/31/1989	12	6.3394	6.3394	-	16	-	199.8	199.8	786	786	-	-	-	-	-	-	-

Avg Water Duty:	Total Period			February -June			July - September		
10.25	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$ 69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/1990	1	6.3053	6.3053	-	15	-	211.9	211.9	782	782	-	-	-	-	-	-	-
1/31/1990	1	6.7256	6.7256	-	16	-	211.9	211.9	834	834	-	-	-	-	-	-	-
2/15/1990	2	7.0612	12.2041	(5.1429)	15	(342.8571)	237.3	410.2	876	1,514	(638)	876	1,514	(638)	-	-	-
2/28/1990	2	6.1197	10.5769	(4.4571)	13	(342.8571)	237.3	410.2	759	1,312	(553)	759	1,312	(553)	-	-	-
3/15/1990	3	15.9847	27.7874	(11.8027)	15	(786.8468)	537.3	934.0	1,982	3,446	(1,464)	1,982	3,446	(1,464)	-	-	-
3/31/1990	3	17.0503	29.6399	(12.5895)	16	(786.8468)	537.3	934.0	2,115	3,676	(1,561)	2,115	3,676	(1,561)	-	-	-
4/14/1990	4	56.1886	51.9293	4.2593	14	304.2365	2,023.4	1,870.0	6,969	6,440	528	6,969	6,440	528	-	-	-
4/30/1990	4	64.2156	69.6649	(5.4494)	16	(340.5849)	2,023.4	2,195.1	7,964	8,640	(676)	7,964	8,640	(676)	-	-	-
5/15/1990	5	42.4203	51.8592	(9.4389)	15	(629.2633)	1,425.8	1,743.0	5,261	6,432	(1,171)	5,261	6,432	(1,171)	-	-	-
5/31/1990	5	51.7801	43.3087	8.4714	16	529.4653	1,631.6	1,364.7	6,422	5,371	1,051	6,422	5,371	1,051	-	-	-
6/15/1990	6	52.5643	49.9643	2.6000	15	173.3333	1,766.7	1,679.3	6,519	6,197	322	6,519	6,197	322	-	-	-
6/30/1990	6	52.5643	49.9643	2.6000	15	173.3333	1,766.7	1,679.3	6,519	6,197	322	6,519	6,197	322	-	-	-
7/15/1990	7	51.1577	51.1577	-	15	-	1,719.4	1,719.4	6,345	6,345	-	-	-	-	6,345	6,345	-
7/31/1990	7	54.5682	54.5682	-	16	-	1,719.4	1,719.4	6,768	6,768	-	-	-	-	6,768	6,768	-
8/15/1990	8	49.8323	49.8323	-	15	-	1,674.9	1,674.9	6,180	6,180	-	-	-	-	6,180	6,180	-
8/31/1990	8	53.1545	53.1545	-	16	-	1,674.9	1,674.9	6,592	6,592	-	-	-	-	6,592	6,592	-
9/15/1990	9	25.0926	34.5038	(9.4112)	15	(627.4141)	843.4	1,159.7	3,112	4,279	(1,167)	-	-	-	3,112	4,279	(1,167)
9/30/1990	9	17.3000	34.5038	(17.2038)	15	(1,146.9222)	581.5	1,159.7	2,146	4,279	(2,134)	-	-	-	2,146	4,279	(2,134)
10/15/1990	10	17.1794	24.0140	(6.8346)	15	(455.6369)	577.4	807.1	2,131	2,978	(848)	-	-	-	-	-	-
10/31/1990	10	18.3247	25.6149	(7.2902)	16	(455.6369)	577.4	807.1	2,273	3,177	(904)	-	-	-	-	-	-
11/15/1990	11	5.9504	15.3480	(9.3976)	15	(626.5079)	200.0	515.9	738	1,904	(1,166)	-	-	-	-	-	-
11/30/1990	11	5.9504	15.3480	(9.3976)	15	(626.5079)	200.0	515.9	738	1,904	(1,166)	-	-	-	-	-	-
12/15/1990	12	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/31/1990	12	6.3471	6.3471	-	16	-	200.0	200.0	787	787	-	-	-	-	-	-	-
1/15/1991	1	6.3343	6.3343	-	15	-	212.9	212.9	786	786	-	-	-	-	-	-	-
1/31/1991	1	6.7566	6.7566	-	16	-	212.9	212.9	838	838	-	-	-	-	-	-	-
2/15/1991	2	9.9960	17.8787	(7.8827)	15	(525.5102)	336.0	600.9	1,240	2,217	(978)	1,240	2,217	(978)	-	-	-
2/28/1991	2	8.6632	15.4948	(6.8316)	13	(525.5102)	336.0	600.9	1,074	1,922	(847)	1,074	1,922	(847)	-	-	-
3/15/1991	3	15.3871	7.9343	7.4528	15	496.8542	517.2	266.7	1,908	984	924	1,908	984	924	-	-	-
3/31/1991	3	16.4129	8.4632	7.9497	16	496.8542	517.2	266.7	2,036	1,050	986	2,036	1,050	986	-	-	-
4/14/1991	4	20.0717	47.9961	(27.9244)	14	(1,994.5992)	722.8	1,728.4	2,489	5,953	(3,463)	2,489	5,953	(3,463)	-	-	-
4/30/1991	4	24.4577	61.5855	(37.1278)	16	(2,320.4878)	770.7	1,940.6	3,033	7,638	(4,605)	3,033	7,638	(4,605)	-	-	-
5/15/1991	5	45.4121	64.3431	(18.9310)	15	(1,262.0659)	1,526.3	2,162.6	5,632	7,980	(2,348)	5,632	7,980	(2,348)	-	-	-
5/31/1991	5	47.7729	59.5621	(11.7892)	16	(736.8278)	1,505.3	1,876.8	5,925	7,387	(1,462)	5,925	7,387	(1,462)	-	-	-
6/15/1991	6	36.2000	47.4885	(11.2885)	15	(752.5657)	1,216.7	1,596.1	4,490	5,890	(1,400)	4,490	5,890	(1,400)	-	-	-
6/30/1991	6	41.2000	47.4885	(6.2885)	15	(419.2323)	1,384.8	1,596.1	5,110	5,890	(780)	5,110	5,890	(780)	-	-	-
7/15/1991	7	27.8871	51.1577	(23.2706)	15	(1,551.3725)	937.3	1,719.4	3,459	6,345	(2,886)	-	-	-	3,459	6,345	(2,886)
7/31/1991	7	29.1129	54.5682	(25.4553)	16	(1,590.9558)	917.3	1,719.4	3,611	6,768	(3,157)	-	-	-	3,611	6,768	(3,157)
8/15/1991	8	28.4194	48.7742	(20.3548)	15	(1,356.9879)	955.2	1,639.3	3,525	6,049	(2,524)	-	-	-	3,525	6,049	(2,524)
8/31/1991	8	28.9806	52.0258	(23.0451)	16	(1,440.3212)	913.2	1,639.3	3,594	6,452	(2,858)	-	-	-	3,594	6,452	(2,858)
9/15/1991	9	24.2000	34.8729	(10.6729)	15	(711.5254)	813.4	1,172.1	3,001	4,325	(1,324)	-	-	-	3,001	4,325	(1,324)
9/30/1991	9	24.2000	34.8729	(10.6729)	15	(711.5254)	813.4	1,172.1	3,001	4,325	(1,324)	-	-	-	3,001	4,325	(1,324)
10/15/1991	10	17.1722	26.5110	(9.3388)	15	(622.5891)	577.2	891.1	2,130	3,288	(1,158)	-	-	-	-	-	-
10/31/1991	10	18.3170	24.3170	(6.0000)	16	(375.0000)	577.2	766.2	2,272	3,016	(744)	-	-	-	-	-	-
11/15/1991	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/1991	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/1991	12	5.9432	5.9432	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
12/31/1991	12	6.3394	6.3394	-	16	-	199.8	199.8	786	786	-	-	-	-	-	-	-
1/15/1992	1	6.3053	6.3053	-	15	-	211.9	211.9	782	782	-	-	-	-	-	-	-
1/31/1992	1	6.7256	6.7256	-	16	-	211.9	211.9	834	834	-	-	-	-	-	-	-
2/15/1992	2	14.6017	6.0806	8.5211	15	568.0739	490.8	204.4	1,811	754	1,057	1,811	754	1,057	-	-	-
2/29/1992	2	13.6283	5.6752	7.9530	14	568.0739	490.8	204.4	1,690	704	986	1,690	704	986	-	-	-
3/15/1992	3	14.9879	7.7499	7.2380	15	482.5345	503.8	260.5	1,859	961	898	1,859	961	898	-	-	-
3/31/1992	3	15.9871	8.2665	7.7206	16	482.5345	503.8	260.5	1,983	1,025	958	1,983	1,025	958	-	-	-
4/14/1992	4	30.3657	20.9619	9.4037	14	671.6955	1,093.5	754.9	3,766	2,600	1,166	3,766	2,600	1,166	-	-	-
4/30/1992	4	33.9893	25.4737	8.5157	16	532.2301	1,071.0	802.7	4,215	3,159	1,056	4,215	3,159	1,056	-	-	-
5/15/1992	5	30.1468	35.1468	(5.0000)	15	(333.3333)	1,013.3	1,181.3	3,739	4,359	(620)	3,739	4,359	(620)	-	-	-
5/31/1992	5	29.6052	27.9107	1.6944	16	105.9016	932.9	879.5	3,672	3,462	210	3,672	3,462	210	-	-	-
6/15/1992	6	22.6000	31.1655	(8.5655)	15	(571.0319)	759.6	1,047.5	2,803	3,865	(1,062)	2,803	3,865	(1,062)	-	-	-
6/30/1992	6	22.6000	31.1655	(8.5655)	15	(571.0319)	759.6	1,047.5	2,803	3,865	(1,062)	2,803	3,865	(1,062)	-	-	-
7/15/1992	7	27.8871	35.8871	(8.0000)	15	(533.3333)	937.3	1,206.2	3,459	4,451	(992)	-	-	-	3,459	4,451	(992)
7/31/1992	7	28.4129	36.4129	(8.0000)	16	(500.0000)	895.3	1,147.4	3,524	4,516	(992)	-	-	-	3,524	4,516	(992)
8/15/1992	8	28.4121	33.6121	(5.2000)	15	(346.6667)	954.9	1,129.7	3,524	4,169	(645)	-	-	-	3,524	4,169	(645)
8/31/1992	8	28.3729	33.9729	(5.6000)	16	(350.0000)	894.0	1,070.5	3,519	4,213	(695)	-	-	-	3,519	4,213	(695)
9/15/1992	9	18.0000	12.9000	5.1000	15	340.0000	605.0	433.6	2,232	1,600	633	-	-	-	2,232	1,600	633
9/30/1992	9	7.4000	12.4000	(5.0000)	15	(333.3333)	248.7	416.8	918	1,538	(620)	-	-	-	918	1,538	(620)
10/15/1992	10	17.1794	17.1794	-	15	-	577.4	577.4	2,131	2,131	-	-	-	-	-	-	-
10/31/1992	10	18.3247	18.3247	-	16	-	577.4	577.4	2,273	2,273	-	-	-	-	-	-	-
11/15/1992	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/1992	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/1992	12	5.8851	5.8851	-	15	-	197.8	197.8	730	730	-	-	-	-	-	-	-
12/31/1992	12	6.2774	6.2774	-	16	-	197.8	197.8	779	779	-	-	-	-	-	-	-
1/15/1993	1	8.9334	8.9334	-	15	-	300.3	300.3	1,108	1,108	-	-	-	-	-	-	-
1/31/1993	1	9.5290	9.5290	-	16	-	300.3	300.3	1,182	1,182	-	-	-	-	-	-	-
2/15/1993	2	22.7732	6.0058	16.7674	15	1,117.8276	765.4	201.9	2,824	745	2,080	2,824	745	2,080	-	-	-
2/28/1993	2	19.7368	5.2050	14.5318	13	1,117.8276	765.4	201.9	2,448	646	1,802	2,448	646	1,802	-	-	-
3/15/1993	3	47.2742	17.9397	29.3344	15	1,955.6299	1,588.9	603.0	5,863	2,225	3,638	5,863	2,225	3,638	-	-	-
3/31/1993	3	50.4258	19.1357	31.2901	16	1,955.6299	1,588.9	603.0	6,254	2,373	3,881	6,254	2,373	3,881	-	-	-

Avg Water Duty:	Total Period			February -June			July - September		
10.25	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference	Total 40% Gen	Total Base Gen	Difference
Price per MWh:	11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
$ 69.00		Revenue:	$ (18,823,762)		Revenue:	$ 22,396,769		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/1993	4	71.6848	88.1615	(16.4767)	14	(1,176.9069)	2,581.5	3,174.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1993	4	81.9255	54.3668	27.5587	16	1,722.4192	2,581.5	1,713.1	9,840	6,743	3,097	9,840	6,743	3,097	-	-	-
5/15/1993	5	114.5632	58.0900	56.4732	15	3,764.8812	3,850.5	1,952.4	9,225	7,205	2,020	9,225	7,205	2,020	-	-	-
5/31/1993	5	122.2008	108.3519	13.8489	16	865.5555	3,850.5	3,414.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1993	6	88.5660	57.7761	30.7898	15	2,052.6560	2,976.8	1,941.9	9,225	7,166	2,059	9,225	7,166	2,059	-	-	-
6/30/1993	6	88.5660	57.7761	30.7898	15	2,052.6560	2,976.8	1,941.9	9,225	7,166	2,059	9,225	7,166	2,059	-	-	-
7/15/1993	7	51.6416	51.6416	-	15	-	1,735.7	1,735.7	6,405	6,405	-	-	-	-	6,405	6,405	-
7/31/1993	7	55.0843	55.0843	-	16	-	1,735.7	1,735.7	6,832	6,832	-	-	-	-	6,832	6,832	-
8/15/1993	8	50.4662	50.4662	-	15	-	1,696.2	1,696.2	6,259	6,259	-	-	-	-	6,259	6,259	-
8/31/1993	8	53.8306	53.8306	-	16	-	1,696.2	1,696.2	6,676	6,676	-	-	-	-	6,676	6,676	-
9/15/1993	9	35.4654	35.4654	-	15	-	1,192.0	1,192.0	4,399	4,399	-	-	-	-	4,399	4,399	-
9/30/1993	9	35.4654	35.4654	-	15	-	1,192.0	1,192.0	4,399	4,399	-	-	-	-	4,399	4,399	-
10/15/1993	10	31.3800	31.3800	-	15	-	1,054.7	1,054.7	3,892	3,892	-	-	-	-	-	-	-
10/31/1993	10	33.4720	33.4720	-	16	-	1,054.7	1,054.7	4,151	4,151	-	-	-	-	-	-	-
11/15/1993	11	5.9429	5.9429	-	15	-	199.7	199.7	737	737	-	-	-	-	-	-	-
11/30/1993	11	5.9429	5.9429	-	15	-	199.7	199.7	737	737	-	-	-	-	-	-	-
12/15/1993	12	5.9359	5.9359	-	15	-	199.5	199.5	736	736	-	-	-	-	-	-	-
12/31/1993	12	6.3316	6.3316	-	16	-	199.5	199.5	785	785	-	-	-	-	-	-	-
1/15/1994	1	6.3125	6.3125	-	15	-	212.2	212.2	783	783	-	-	-	-	-	-	-
1/31/1994	1	6.7334	6.7334	-	16	-	212.2	212.2	835	835	-	-	-	-	-	-	-
2/15/1994	2	6.2790	6.2790	-	15	-	211.0	211.0	779	779	-	779	779	-	-	-	-
2/28/1994	2	5.4418	5.4418	-	13	-	211.0	211.0	675	675	-	675	675	-	-	-	-
3/15/1994	3	17.0126	42.9301	(25.9175)	15	(1,727.8335)	571.8	1,442.9	2,110	5,324	(3,214)	2,110	5,324	(3,214)	-	-	-
3/31/1994	3	18.1467	45.7921	(27.6453)	16	(1,727.8335)	571.8	1,442.9	2,251	5,679	(3,429)	2,251	5,679	(3,429)	-	-	-
4/14/1994	4	39.7657	41.0997	(1.3340)	14	(95.2870)	1,432.0	1,480.1	4,932	5,097	(165)	4,932	5,097	(165)	-	-	-
4/30/1994	4	45.9893	57.5634	(11.5740)	16	(723.3768)	1,449.1	1,813.8	5,704	7,139	(1,435)	5,704	7,139	(1,435)	-	-	-
5/15/1994	5	61.7213	51.1011	10.6201	15	708.0096	2,074.5	1,717.5	7,655	6,338	1,317	7,655	6,338	1,317	-	-	-
5/31/1994	5	65.8360	41.7074	24.1287	16	1,508.0412	2,074.5	1,314.2	8,165	5,173	2,993	8,165	5,173	2,993	-	-	-
6/15/1994	6	50.5718	49.9718	0.6000	15	40.0000	1,699.8	1,679.6	6,272	6,198	74	6,272	6,198	74	-	-	-
6/30/1994	6	50.5718	49.9718	0.6000	15	40.0000	1,699.8	1,679.6	6,272	6,198	74	6,272	6,198	74	-	-	-
7/15/1994	7	51.4588	51.4588	-	15	-	1,729.6	1,729.6	6,382	6,382	-	-	-	-	6,382	6,382	-
7/31/1994	7	54.8894	54.8894	-	16	-	1,729.6	1,729.6	6,808	6,808	-	-	-	-	6,808	6,808	-
8/15/1994	8	49.8323	49.8323	-	15	-	1,674.9	1,674.9	6,180	6,180	-	-	-	-	6,180	6,180	-
8/31/1994	8	53.1545	53.1545	-	16	-	1,674.9	1,674.9	6,592	6,592	-	-	-	-	6,592	6,592	-
9/15/1994	9	17.3925	34.6392	(17.2467)	15	(1,149.7794)	584.6	1,164.2	2,157	4,296	(2,139)	-	-	-	2,157	4,296	(2,139)
9/30/1994	9	17.3925	34.6392	(17.2467)	15	(1,149.7794)	584.6	1,164.2	2,157	4,296	(2,139)	-	-	-	2,157	4,296	(2,139)
10/15/1994	10	17.1794	30.1935	(13.0140)	15	(867.6031)	577.4	1,014.8	2,131	3,745	(1,614)	-	-	-	-	-	-
10/31/1994	10	18.3247	32.2064	(13.8816)	16	(867.6031)	577.4	1,014.8	2,273	3,994	(1,722)	-	-	-	-	-	-
11/15/1994	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/1994	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/1994	12	5.9286	5.9286	-	15	-	199.3	199.3	735	735	-	-	-	-	-	-	-
12/31/1994	12	6.3239	6.3239	-	16	-	199.3	199.3	784	784	-	-	-	-	-	-	-
1/15/1995	1	12.1299	12.1299	-	15	-	407.7	407.7	1,504	1,504	-	-	-	-	-	-	-
1/31/1995	1	12.9386	12.9386	-	16	-	407.7	407.7	1,605	1,605	-	-	-	-	-	-	-
2/15/1995	2	21.3241	6.2710	15.0531	15	1,003.5419	716.7	210.8	2,645	778	1,867	2,645	778	1,867	-	-	-
2/28/1995	2	18.4809	5.4348	13.0460	13	1,003.5419	716.7	210.8	2,292	674	1,618	2,292	674	1,618	-	-	-
3/15/1995	3	83.2244	13.1169	70.1075	15	4,673.8319	2,797.2	440.9	9,225	1,627	7,598	9,225	1,627	7,598	-	-	-
3/31/1995	3	88.6606	14.0391	74.6216	16	4,663.8471	2,793.7	442.4	9,840	1,741	8,099	9,840	1,741	8,099	-	-	-
4/14/1995	4	80.0832	69.4227	10.6605	14	761.4641	2,883.9	2,500.0	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1995	4	90.0629	80.3222	9.7407	16	608.7935	2,837.9	2,530.9	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1995	5	136.0519	88.4426	47.6093	15	3,173.9548	4,572.8	2,972.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1995	5	144.4404	77.2451	67.1953	16	4,199.7068	4,551.3	2,434.0	9,840	9,580	260	9,840	9,580	260	-	-	-
6/15/1995	6	142.0927	60.9026	81.1901	15	5,412.6722	4,775.8	2,047.0	9,225	7,553	1,672	9,225	7,553	1,672	-	-	-
6/30/1995	6	142.0927	60.9026	81.1901	15	5,412.6722	4,775.8	2,047.0	9,225	7,553	1,672	9,225	7,553	1,672	-	-	-
7/15/1995	7	64.3198	64.3198	-	15	-	2,161.8	2,161.8	7,977	7,977	-	-	-	-	7,977	7,977	-
7/31/1995	7	67.7611	67.7611	-	16	-	2,135.1	2,135.1	8,404	8,404	-	-	-	-	8,404	8,404	-
8/15/1995	8	63.1662	63.1662	-	15	-	2,123.1	2,123.1	7,834	7,834	-	-	-	-	7,834	7,834	-
8/31/1995	8	66.5306	66.5306	-	16	-	2,096.4	2,096.4	8,251	8,251	-	-	-	-	8,251	8,251	-
9/15/1995	9	45.6979	45.7359	(0.0380)	15	(2.5344)	1,535.9	1,537.2	5,668	5,672	(5)	-	-	-	5,668	5,672	(5)
9/30/1995	9	45.6979	45.7359	(0.0380)	15	(2.5344)	1,535.9	1,537.2	5,668	5,672	(5)	-	-	-	5,668	5,672	(5)
10/15/1995	10	39.1650	43.2919	(4.1269)	15	(275.1266)	1,316.4	1,455.1	4,857	5,369	(512)	-	-	-	-	-	-
10/31/1995	10	41.5893	45.9914	(4.4020)	16	(275.1266)	1,310.5	1,449.2	5,158	5,704	(546)	-	-	-	-	-	-
11/15/1995	11	17.8412	17.8412	-	15	-	599.7	599.7	2,213	2,213	-	-	-	-	-	-	-
11/30/1995	11	17.8412	17.8412	-	15	-	599.7	599.7	2,213	2,213	-	-	-	-	-	-	-
12/15/1995	12	7.5869	7.5869	-	15	-	255.0	255.0	941	941	-	-	-	-	-	-	-
12/31/1995	12	7.9807	7.9807	-	16	-	251.5	251.5	990	990	-	-	-	-	-	-	-
1/15/1996	1	7.9087	8.1006	(0.1919)	15	(12.7966)	265.8	272.3	981	1,005	(24)	-	-	-	-	-	-
1/31/1996	1	8.3239	8.5287	(0.2047)	16	(12.7966)	262.3	268.7	1,032	1,058	(25)	-	-	-	-	-	-
2/15/1996	2	60.0654	7.8831	52.1823	15	3,478.8205	2,018.8	265.0	7,449	978	6,472	7,449	978	6,472	-	-	-
2/29/1996	2	56.1730	7.4695	48.7035	14	3,478.8205	2,022.9	269.0	6,967	926	6,040	6,967	926	6,040	-	-	-
3/15/1996	3	53.5919	61.0219	(7.4300)	15	(495.3345)	1,801.3	2,051.0	6,647	7,568	(921)	6,647	7,568	(921)	-	-	-
3/31/1996	3	57.0526	64.9780	(7.9254)	16	(495.3345)	1,797.7	2,047.5	7,076	8,059	(983)	7,076	8,059	(983)	-	-	-
4/14/1996	4	84.6151	104.8498	(20.2347)	14	(1,445.3363)	3,047.1	3,775.8	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1996	4	95.2422	70.1976	25.0446	16	1,565.2893	3,001.1	2,211.9	9,840	8,706	1,134	9,840	8,706	1,134	-	-	-
5/15/1996	5	112.9527	105.6379	7.3149	15	487.6568	3,796.4	3,550.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1996	5	119.8013	96.7128	23.0885	16	1,443.0287	3,774.9	3,047.4	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1996	6	88.0043	85.7316	2.2727	15	151.5152	2,957.9	2,881.5	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1996	6	88.0043	85.7316	2.2727	15	151.5152	2,957.9	2,881.5	9,225	9,225	-	9,225	9,225	-	-	-	-

Avg Water Duty:	10.25	Price per MWh:	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue:
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
7/15/1996	7	64.3270	69.2045	(4.8775)	15	(325.1666)	2,162.1	2,326.0	7,978	8,583	(605)	-	-	-	7,978	8,583	(605)
7/31/1996	7	67.7688	72.9715	(5.2027)	16	(325.1666)	2,135.4	2,299.3	8,405	9,050	(645)	-	-	-	8,405	9,050	(645)
8/15/1996	8	63.1589	66.6404	(3.4815)	15	(232.0981)	2,122.8	2,239.8	7,833	8,265	(432)	-	-	-	7,833	8,265	(432)
8/31/1996	8	66.5228	70.2364	(3.7136)	16	(232.0981)	2,096.1	2,213.1	8,250	8,711	(461)	-	-	-	8,250	8,711	(461)
9/15/1996	9	45.6904	50.1912	(4.5008)	15	(300.0551)	1,535.7	1,687.0	5,667	6,225	(558)	-	-	-	5,667	6,225	(558)
9/30/1996	9	45.6904	50.1912	(4.5008)	15	(300.0551)	1,535.7	1,687.0	5,667	6,225	(558)	-	-	-	5,667	6,225	(558)
10/15/1996	10	27.5436	33.6859	(6.1424)	15	(409.4908)	925.8	1,132.2	3,416	4,178	(762)	-	-	-	-	-	-
10/31/1996	10	29.1932	35.7450	(6.5519)	16	(409.4908)	919.9	1,126.3	3,621	4,433	(813)	-	-	-	-	-	-
11/15/1996	11	7.5779	10.5531	(2.9752)	15	(198.3471)	254.7	354.7	940	1,309	(369)	-	-	-	-	-	-
11/30/1996	11	7.5779	10.5531	(2.9752)	15	(198.3471)	254.7	354.7	940	1,309	(369)	-	-	-	-	-	-
12/15/1996	12	10.1999	10.1999	-	15	-	342.8	342.8	1,265	1,265	-	-	-	-	-	-	-
12/31/1996	12	10.8799	15.6755	(4.7955)	16	(299.7201)	342.8	493.9	1,349	1,944	(595)	-	-	-	-	-	-
1/15/1997	1	18.3235	308.5808	(290.2574)	15	##########	615.9	10,371.6	2,273	9,225	(6,952)	-	-	-	-	-	-
1/31/1997	1	19.5450	329.1529	(309.6079)	16	##########	615.9	10,371.6	2,424	9,840	(7,416)	-	-	-	-	-	-
2/15/1997	2	65.2313	101.4198	(36.1885)	15	(2,412.5648)	2,192.5	3,408.8	8,090	9,225	(1,135)	8,090	9,225	(1,135)	-	-	-
2/28/1997	2	87.8971	87.8971	-	13	-	3,408.8	3,408.8	7,995	7,995	-	7,995	7,995	-	-	-	-
3/15/1997	3	69.6664	69.6664	-	15	-	2,341.5	2,341.5	8,640	8,640	-	8,640	8,640	-	-	-	-
3/31/1997	3	74.1988	74.1988	-	16	-	2,338.0	2,338.0	9,202	9,202	-	9,202	9,202	-	-	-	-
4/14/1997	4	96.1992	96.1992	-	14	-	3,464.3	3,464.3	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1997	4	95.7303	95.7303	-	16	-	3,016.5	3,016.5	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/1997	5	111.8073	111.8073	-	15	-	3,757.9	3,757.9	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1997	5	104.9144	95.3067	9.6077	16	600.4800	3,305.8	3,003.1	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1997	6	80.3638	80.3638	-	15	-	2,701.1	2,701.1	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1997	6	80.3638	80.3638	-	15	-	2,701.1	2,701.1	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1997	7	65.3801	65.3801	-	15	-	2,197.5	2,197.5	8,109	8,109	-	-	-	-	8,109	8,109	-
7/31/1997	7	68.8921	68.8921	-	16	-	2,170.8	2,170.8	8,544	8,544	-	-	-	-	8,544	8,544	-
8/15/1997	8	63.6724	63.6724	-	15	-	2,140.1	2,140.1	7,897	7,897	-	-	-	-	7,897	7,897	-
8/31/1997	8	67.0706	67.0706	-	16	-	2,113.4	2,113.4	8,318	8,318	-	-	-	-	8,318	8,318	-
9/15/1997	9	47.2235	47.2235	-	15	-	1,587.2	1,587.2	5,857	5,857	-	-	-	-	5,857	5,857	-
9/30/1997	9	47.2235	47.2235	-	15	-	1,587.2	1,587.2	5,857	5,857	-	-	-	-	5,857	5,857	-
10/15/1997	10	42.7110	42.7110	-	15	-	1,435.5	1,435.5	5,297	5,297	-	-	-	-	-	-	-
10/31/1997	10	45.3717	45.3717	-	16	-	1,429.7	1,429.7	5,627	5,627	-	-	-	-	-	-	-
11/15/1997	11	7.6154	7.6154	-	15	-	256.0	256.0	944	944	-	-	-	-	-	-	-
11/30/1997	11	7.6154	7.6154	-	15	-	256.0	256.0	944	944	-	-	-	-	-	-	-
12/15/1997	12	7.6014	7.6014	-	15	-	255.5	255.5	943	943	-	-	-	-	-	-	-
12/31/1997	12	7.9961	7.9961	-	16	-	252.0	252.0	992	992	-	-	-	-	-	-	-
1/15/1998	1	8.1184	8.1184	-	15	-	272.9	272.9	1,007	1,007	-	-	-	-	-	-	-
1/31/1998	1	8.5476	8.5476	-	16	-	269.3	269.3	1,060	1,060	-	-	-	-	-	-	-
2/15/1998	2	53.8371	18.7446	35.0926	15	2,339.5057	1,809.5	630.0	6,677	2,325	4,352	6,677	2,325	4,352	-	-	-
2/28/1998	2	46.8829	16.2453	30.6376	13	2,356.7365	1,818.2	630.0	5,815	2,015	3,800	5,815	2,015	3,800	-	-	-
3/15/1998	3	55.0145	60.7378	(5.7233)	15	(381.5502)	1,849.1	2,041.4	6,823	7,533	(710)	6,823	7,533	(710)	-	-	-
3/31/1998	3	58.5702	67.8897	(9.3196)	16	(582.4719)	1,845.5	2,139.2	7,264	8,420	(1,156)	7,264	8,420	(1,156)	-	-	-
4/14/1998	4	101.0405	101.0405	-	14	-	3,638.6	3,638.6	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1998	4	88.7555	65.8442	22.9113	16	1,431.9560	2,796.7	2,074.7	9,840	8,166	1,674	9,840	8,166	1,674	-	-	-
5/15/1998	5	94.0189	93.6718	0.3471	15	23.1407	3,160.0	3,148.4	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1998	5	99.6051	83.9489	15.6562	16	978.5125	3,138.6	2,645.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1998	6	152.2143	82.7416	69.4727	15	4,631.5152	5,116.0	2,781.0	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1998	6	152.2143	82.7416	69.4727	15	4,631.5152	5,116.0	2,781.0	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1998	7	69.1900	69.1900	-	15	-	2,325.5	2,325.5	8,581	8,581	-	-	-	-	8,581	8,581	-
7/31/1998	7	72.9560	106.9693	(34.0133)	16	(2,125.8305)	2,298.8	3,370.6	9,048	9,840	(792)	-	-	-	9,048	9,840	(792)
8/15/1998	8	66.6331	97.5239	(30.8908)	15	(2,059.3844)	2,239.6	3,277.8	8,264	9,225	(961)	-	-	-	8,264	9,225	(961)
8/31/1998	8	70.2287	105.1288	(34.9002)	16	(2,181.2602)	2,212.9	3,312.6	8,710	9,840	(1,130)	-	-	-	8,710	9,840	(1,130)
9/15/1998	9	50.1123	107.7736	(57.6613)	15	(3,844.0872)	1,684.3	3,622.3	6,215	9,225	(3,010)	-	-	-	6,215	9,225	(3,010)
9/30/1998	9	50.1123	107.8775	(57.7652)	15	(3,851.0146)	1,684.3	3,625.8	6,215	9,225	(3,010)	-	-	-	6,215	9,225	(3,010)
10/15/1998	10	142.5890	162.8033	(20.2142)	15	(1,347.6155)	4,792.5	5,471.9	9,225	9,225	-	-	-	-	-	-	-
10/31/1998	10	35.2703	35.2703	-	16	-	1,111.4	1,111.4	4,374	4,374	-	-	-	-	-	-	-
11/15/1998	11	11.7020	11.7020	-	15	-	393.3	393.3	1,451	1,451	-	-	-	-	-	-	-
11/30/1998	11	18.7643	18.7643	-	15	-	630.7	630.7	2,327	2,327	-	-	-	-	-	-	-
12/15/1998	12	26.7155	26.7155	-	15	-	897.9	897.9	3,313	3,313	-	-	-	-	-	-	-
12/31/1998	12	28.4966	28.4966	-	16	-	897.9	897.9	3,534	3,534	-	-	-	-	-	-	-
1/15/1999	1	50.3776	50.3776	-	15	-	1,693.2	1,693.2	6,248	6,248	-	-	-	-	-	-	-
1/31/1999	1	53.7361	53.7361	-	16	-	1,693.2	1,693.2	6,665	6,665	-	-	-	-	-	-	-
2/15/1999	2	105.6342	105.6342	-	15	-	3,550.4	3,550.4	9,225	9,225	-	9,225	9,225	-	-	-	-
2/28/1999	2	91.5497	91.5497	-	13	-	3,550.4	3,550.4	7,995	7,995	-	7,995	7,995	-	-	-	-
3/15/1999	3	62.4211	62.4211	-	15	-	2,098.0	2,098.0	7,742	7,742	-	7,742	7,742	-	-	-	-
3/31/1999	3	66.4705	66.4705	-	16	-	2,094.5	2,094.5	8,244	8,244	-	8,244	8,244	-	-	-	-
4/14/1999	4	108.6802	108.6802	-	14	-	3,913.7	3,913.7	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/1999	4	82.1265	74.5752	7.5513	16	471.9560	2,587.8	2,349.9	9,840	9,249	591	9,840	9,249	591	-	-	-
5/15/1999	5	124.2415	118.2814	5.9600	15	397.3342	4,175.8	3,975.5	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/1999	5	131.8426	110.1993	21.6433	16	1,352.7061	4,154.4	3,472.4	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/1999	6	96.0118	85.7391	10.2727	15	684.8486	3,227.0	2,881.7	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/1999	6	96.0118	85.7391	10.2727	15	684.8486	3,227.0	2,881.7	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/1999	7	69.2118	69.2118	-	15	-	2,326.3	2,326.3	8,584	8,584	-	-	-	-	8,584	8,584	-
7/31/1999	7	72.9792	72.9792	-	16	-	2,299.6	2,299.6	9,051	9,051	-	-	-	-	9,051	9,051	-
8/15/1999	8	66.6477	66.6477	-	15	-	2,240.1	2,240.1	8,266	8,266	-	-	-	-	8,266	8,266	-
8/31/1999	8	70.2442	70.2442	-	16	-	2,213.4	2,213.4	8,712	8,712	-	-	-	-	8,712	8,712	-
9/15/1999	9	50.0439	50.0439	-	15	-	1,682.0	1,682.0	6,207	6,207	-	-	-	-	6,207	6,207	-
9/30/1999	9	50.0439	50.0439	-	15	-	1,682.0	1,682.0	6,207	6,207	-	-	-	-	6,207	6,207	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/1999	10	45.0454	45.0454	-	15	-	1,514.0	1,514.0	5,587	5,587	-	-	-	-	-	-	-
10/31/1999	10	47.8618	47.8618	-	16	-	1,508.1	1,508.1	5,936	5,936	-	-	-	-	-	-	-
11/15/1999	11	19.8359	19.8359	-	15	-	666.7	666.7	2,460	2,460	-	-	-	-	-	-	-
11/30/1999	11	19.8359	19.8359	-	15	-	666.7	666.7	2,460	2,460	-	-	-	-	-	-	-
12/15/1999	12	10.5984	10.5984	-	15	-	356.2	356.2	1,314	1,314	-	-	-	-	-	-	-
12/31/1999	12	11.1929	11.1929	-	16	-	352.7	352.7	1,388	1,388	-	-	-	-	-	-	-
1/15/2000	1	12.0936	12.0936	-	15	-	406.5	406.5	1,500	1,500	-	-	-	-	-	-	-
1/31/2000	1	12.7879	12.7879	-	16	-	402.9	402.9	1,586	1,586	-	-	-	-	-	-	-
2/15/2000	2	40.0153	11.7501	28.2652	15	1,884.3464	1,344.9	394.9	4,963	1,457	3,506	4,963	1,457	3,506	-	-	-
2/29/2000	2	37.4597	11.0788	26.3808	14	1,884.3464	1,349.0	399.0	4,646	1,374	3,272	4,646	1,374	3,272	-	-	-
3/15/2000	3	57.8720	57.8720	-	15	-	1,945.1	1,945.1	7,177	7,177	-	7,177	7,177	-	-	-	-
3/31/2000	3	61.6181	61.6181	-	16	-	1,941.6	1,941.6	7,642	7,642	-	7,642	7,642	-	-	-	-
4/14/2000	4	77.4197	77.4197	-	14	-	2,788.0	2,788.0	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2000	4	83.1487	74.2681	8.8807	16	555.0414	2,620.0	2,340.2	9,840	9,211	629	9,840	9,211	629	-	-	-
5/15/2000	5	96.2226	96.2226	-	15	-	3,234.1	3,234.1	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2000	5	100.8843	78.6830	22.2012	16	1,387.5767	3,178.9	2,479.3	9,840	9,759	81	9,840	9,759	81	-	-	-
6/15/2000	6	73.5363	73.5363	-	15	-	2,471.6	2,471.6	9,120	9,120	-	9,120	9,120	-	-	-	-
6/30/2000	6	73.5363	73.5363	-	15	-	2,471.6	2,471.6	9,120	9,120	-	9,120	9,120	-	-	-	-
7/15/2000	7	65.3801	65.3801	-	15	-	2,197.5	2,197.5	8,109	8,109	-	-	-	-	8,109	8,109	-
7/31/2000	7	68.8921	68.8921	-	16	-	2,170.8	2,170.8	8,544	8,544	-	-	-	-	8,544	8,544	-
8/15/2000	8	63.6434	63.6434	-	15	-	2,139.1	2,139.1	7,893	7,893	-	-	-	-	7,893	7,893	-
8/31/2000	8	67.0396	67.0396	-	16	-	2,112.4	2,112.4	8,314	8,314	-	-	-	-	8,314	8,314	-
9/15/2000	9	46.9898	46.9898	-	15	-	1,579.4	1,579.4	5,828	5,828	-	-	-	-	5,828	5,828	-
9/30/2000	9	46.9898	46.9898	-	15	-	1,579.4	1,579.4	5,828	5,828	-	-	-	-	5,828	5,828	-
10/15/2000	10	21.5155	21.5155	-	15	-	723.1	723.1	2,668	2,668	-	-	-	-	-	-	-
10/31/2000	10	22.7632	22.7632	-	16	-	717.3	717.3	2,823	2,823	-	-	-	-	-	-	-
11/15/2000	11	15.6454	15.6454	-	15	-	525.9	525.9	1,940	1,940	-	-	-	-	-	-	-
11/30/2000	11	15.6454	15.6454	-	15	-	525.9	525.9	1,940	1,940	-	-	-	-	-	-	-
12/15/2000	12	7.6188	7.6188	-	15	-	256.1	256.1	945	945	-	-	-	-	-	-	-
12/31/2000	12	8.0147	8.0147	-	16	-	252.5	252.5	994	994	-	-	-	-	-	-	-
1/15/2001	1	8.3482	8.3482	-	15	-	280.6	280.6	1,035	1,035	-	-	-	-	-	-	-
1/31/2001	1	8.7928	8.7928	-	16	-	277.1	277.1	1,091	1,091	-	-	-	-	-	-	-
2/15/2001	2	10.1292	10.1292	-	15	-	340.4	340.4	1,256	1,256	-	1,256	1,256	-	-	-	-
2/28/2001	2	8.7786	8.7786	-	13	-	340.4	340.4	1,089	1,089	-	1,089	1,089	-	-	-	-
3/15/2001	3	22.2552	9.6249	12.6302	15	842.0155	748.0	323.5	2,760	1,194	1,566	2,760	1,194	1,566	-	-	-
3/31/2001	3	23.6268	10.1546	13.4722	16	842.0155	744.5	320.0	2,930	1,259	1,671	2,930	1,259	1,671	-	-	-
4/14/2001	4	59.3728	48.2438	11.1290	14	794.9312	2,138.1	1,737.3	7,364	5,983	1,380	7,364	5,983	1,380	-	-	-
4/30/2001	4	69.5428	69.5428	-	16	-	2,191.3	2,191.3	8,625	8,625	-	8,625	8,625	-	-	-	-
5/15/2001	5	92.2127	83.2551	8.9576	15	597.1742	3,099.3	2,798.3	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2001	5	97.6786	65.4131	32.2655	16	2,016.5956	3,077.8	2,061.2	9,840	8,113	1,727	9,840	8,113	1,727	-	-	-
6/15/2001	6	60.4232	63.2043	(2.7811)	15	(185.4079)	2,030.9	2,124.3	7,494	7,839	(345)	7,494	7,839	(345)	-	-	-
6/30/2001	6	60.4232	63.2043	(2.7811)	15	(185.4079)	2,030.9	2,124.3	7,494	7,839	(345)	7,494	7,839	(345)	-	-	-
7/15/2001	7	64.3353	64.3353	-	15	-	2,162.3	2,162.3	7,979	7,979	-	-	-	-	7,979	7,979	-
7/31/2001	7	67.7776	67.7776	-	16	-	2,135.7	2,135.7	8,406	8,406	-	-	-	-	8,406	8,406	-
8/15/2001	8	63.1623	63.1623	-	15	-	2,122.9	2,122.9	7,834	7,834	-	-	-	-	7,834	7,834	-
8/31/2001	8	66.5265	66.5265	-	16	-	2,096.2	2,096.2	8,251	8,251	-	-	-	-	8,251	8,251	-
9/15/2001	9	44.7122	44.7122	-	15	-	1,502.8	1,502.8	5,545	5,545	-	-	-	-	5,545	5,545	-
9/30/2001	9	44.7122	44.7122	-	15	-	1,502.8	1,502.8	5,545	5,545	-	-	-	-	5,545	5,545	-
10/15/2001	10	37.5382	37.5382	-	15	-	1,261.7	1,261.7	4,656	4,656	-	-	-	-	-	-	-
10/31/2001	10	39.8540	39.8540	-	16	-	1,255.8	1,255.8	4,943	4,943	-	-	-	-	-	-	-
11/15/2001	11	7.6194	7.6194	-	15	-	256.1	256.1	945	945	-	-	-	-	-	-	-
11/30/2001	11	7.6194	7.6194	-	15	-	256.1	256.1	945	945	-	-	-	-	-	-	-
12/15/2001	12	7.6164	7.6164	-	15	-	256.0	256.0	945	945	-	-	-	-	-	-	-
12/31/2001	12	8.0121	8.0121	-	16	-	252.5	252.5	994	994	-	-	-	-	-	-	-
1/15/2002	1	8.1622	8.1622	-	15	-	274.3	274.3	1,012	1,012	-	-	-	-	-	-	-
1/31/2002	1	8.5944	8.5944	-	16	-	270.8	270.8	1,066	1,066	-	-	-	-	-	-	-
2/15/2002	2	13.5052	23.5166	(10.0114)	15	(667.4249)	453.9	790.4	1,675	2,917	(1,242)	1,675	2,917	(1,242)	-	-	-
2/28/2002	2	11.9285	20.6051	(8.6765)	13	(667.4249)	462.6	799.1	1,479	2,556	(1,076)	1,479	2,556	(1,076)	-	-	-
3/15/2002	3	34.6920	34.0593	0.6327	15	42.1813	1,166.0	1,144.8	4,303	4,224	78	4,303	4,224	78	-	-	-
3/31/2002	3	36.9362	36.2179	0.7183	16	44.8938	1,163.9	1,141.2	4,581	4,492	89	4,581	4,492	89	-	-	-
4/14/2002	4	77.7894	90.5612	(12.7718)	14	(912.2746)	2,801.3	3,261.2	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2002	4	88.4996	82.2027	6.2970	16	393.5603	2,788.6	2,590.2	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/2002	5	89.0428	84.3959	4.6469	15	309.7924	2,992.8	2,836.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2002	5	94.7912	92.5482	2.2430	16	140.1852	2,986.9	2,916.2	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/2002	6	65.0818	69.6171	(4.5352)	15	(302.3489)	2,187.4	2,339.9	8,072	8,634	(562)	8,072	8,634	(562)	-	-	-
6/30/2002	6	65.0818	69.6171	(4.5352)	15	(302.3489)	2,187.4	2,339.9	8,072	8,634	(562)	8,072	8,634	(562)	-	-	-
7/15/2002	7	54.8227	64.3377	(9.5150)	15	(634.3333)	1,842.6	2,162.4	6,799	7,979	(1,180)	-	-	-	6,799	7,979	(1,180)
7/31/2002	7	58.2652	67.7802	(9.5150)	16	(594.6875)	1,835.9	2,135.8	7,226	8,406	(1,180)	-	-	-	7,226	8,406	(1,180)
8/15/2002	8	53.6473	63.1623	(9.5150)	15	(634.3333)	1,803.1	2,122.9	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/2002	8	57.0115	66.5265	(9.5150)	16	(594.6875)	1,796.4	2,096.2	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/2002	9	38.2854	45.6929	(7.4075)	15	(493.8333)	1,286.8	1,535.8	4,748	5,667	(919)	-	-	-	4,748	5,667	(919)
9/30/2002	9	38.2854	45.6929	(7.4075)	15	(493.8333)	1,286.8	1,535.8	4,748	5,667	(919)	-	-	-	4,748	5,667	(919)
10/15/2002	10	36.3651	39.1776	(2.8125)	15	(187.5026)	1,222.3	1,316.8	4,510	4,859	(349)	-	-	-	-	-	-
10/31/2002	10	38.6751	41.6028	(2.9277)	16	(182.9818)	1,218.6	1,310.9	4,797	5,160	(363)	-	-	-	-	-	-
11/15/2002	11	6.9694	7.6204	(0.6510)	15	(43.4000)	234.2	256.1	864	945	(81)	-	-	-	-	-	-
11/30/2002	11	6.9694	7.6204	(0.6510)	15	(43.4000)	234.2	256.1	864	945	(81)	-	-	-	-	-	-
12/15/2002	12	6.8672	7.5182	(0.6510)	15	(43.4000)	230.8	252.7	852	932	(81)	-	-	-	-	-	-
12/31/2002	12	7.2564	7.9074	(0.6510)	16	(40.6875)	228.6	249.2	900	981	(81)	-	-	-	-	-	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
1/15/2003	1	7.2191	8.0621	(0.8429)	15	(56.1966)	242.6	271.0	895	1,000	(105)	-	-	-	-	-	-
1/31/2003	1	7.6318	8.4875	(0.8557)	16	(53.4841)	240.5	267.4	947	1,053	(106)	-	-	-	-	-	-
2/15/2003	2	12.8743	26.3929	(13.5187)	15	(901.2439)	432.7	887.1	1,597	3,273	(1,677)	1,597	3,273	(1,677)	-	-	-
2/28/2003	2	11.2949	23.0979	(11.8030)	13	(907.9208)	438.0	895.8	1,401	2,865	(1,464)	1,401	2,865	(1,464)	-	-	-
3/15/2003	3	34.2081	40.9090	(6.7008)	15	(446.7229)	1,149.8	1,375.0	4,243	5,074	(831)	4,243	5,074	(831)	-	-	-
3/31/2003	3	36.4201	43.5676	(7.1476)	16	(446.7229)	1,147.6	1,372.8	4,517	5,403	(886)	4,517	5,403	(886)	-	-	-
4/14/2003	4	59.0714	67.0420	(7.9706)	14	(569.3295)	2,127.2	2,414.3	7,326	8,315	(989)	7,326	8,315	(989)	-	-	-
4/30/2003	4	67.1077	55.4485	11.6592	16	728.6991	2,114.6	1,747.2	8,323	6,877	1,446	8,323	6,877	1,446	-	-	-
5/15/2003	5	108.4222	65.6730	42.7492	15	2,849.9451	3,644.1	2,207.3	9,225	8,145	1,080	9,225	8,145	1,080	-	-	-
5/31/2003	5	115.4625	76.8509	38.6116	16	2,413.2270	3,638.2	2,421.6	9,840	9,531	309	9,840	9,531	309	-	-	-
6/15/2003	6	81.8803	85.9753	(4.0950)	15	(272.9991)	2,752.0	2,889.7	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/2003	6	81.8803	85.9753	(4.0950)	15	(272.9991)	2,752.0	2,889.7	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/2003	7	54.8251	54.8251	-	15	-	1,842.7	1,842.7	6,800	6,800	-	-	-	-	6,800	6,800	-
7/31/2003	7	58.2678	58.2678	-	16	-	1,836.0	1,836.0	7,227	7,227	-	-	-	-	7,227	7,227	-
8/15/2003	8	52.4471	52.4471	-	15	-	1,762.8	1,762.8	6,505	6,505	-	-	-	-	6,505	6,505	-
8/31/2003	8	55.7312	55.7312	-	16	-	1,756.1	1,756.1	6,912	6,912	-	-	-	-	6,912	6,912	-
9/15/2003	9	38.2884	38.2884	-	15	-	1,286.9	1,286.9	4,749	4,749	-	-	-	-	4,749	4,749	-
9/30/2003	9	38.2884	38.2884	-	15	-	1,286.9	1,286.9	4,749	4,749	-	-	-	-	4,749	4,749	-
10/15/2003	10	21.1372	21.1372	-	15	-	710.4	710.4	2,622	2,622	-	-	-	-	-	-	-
10/31/2003	10	22.4320	22.4320	-	16	-	706.8	706.8	2,782	2,782	-	-	-	-	-	-	-
11/15/2003	11	13.8788	13.8788	-	15	-	466.5	466.5	1,721	1,721	-	-	-	-	-	-	-
11/30/2003	11	13.8788	13.8788	-	15	-	466.5	466.5	1,721	1,721	-	-	-	-	-	-	-
12/15/2003	12	6.7857	6.7857	-	15	-	228.1	228.1	842	842	-	-	-	-	-	-	-
12/31/2003	12	7.1695	7.1695	-	16	-	225.9	225.9	889	889	-	-	-	-	-	-	-
1/15/2004	1	7.1956	7.1956	-	15	-	241.8	241.8	892	892	-	-	-	-	-	-	-
1/31/2004	1	7.6067	7.6067	-	16	-	239.7	239.7	943	943	-	-	-	-	-	-	-
2/15/2004	2	23.4272	27.8485	(4.4213)	15	(294.7548)	787.4	936.0	2,906	3,454	(548)	2,906	3,454	(548)	-	-	-
2/29/2004	2	21.9340	26.0605	(4.1266)	14	(294.7548)	789.9	938.5	2,720	3,232	(512)	2,720	3,232	(512)	-	-	-
3/15/2004	3	60.3389	34.5143	25.8246	15	1,721.6413	2,028.0	1,160.0	7,483	4,281	3,203	7,483	4,281	3,203	-	-	-
3/31/2004	3	64.3615	36.8152	27.5463	16	1,721.6413	2,028.0	1,160.0	7,982	4,566	3,416	7,982	4,566	3,416	-	-	-
4/14/2004	4	77.4649	62.2150	15.2499	14	1,089.2762	2,789.6	2,240.4	8,610	7,716	894	8,610	7,716	894	-	-	-
4/30/2004	4	88.5313	72.6875	15.8438	16	990.2367	2,789.6	2,290.4	9,840	9,015	825	9,840	9,015	825	-	-	-
5/15/2004	5	74.5878	65.1432	9.4445	15	629.6355	2,506.9	2,189.5	9,225	8,079	1,146	9,225	8,079	1,146	-	-	-
5/31/2004	5	79.5603	52.7488	26.8115	16	1,675.7181	2,506.9	1,662.1	9,840	6,542	3,298	9,840	6,542	3,298	-	-	-
6/15/2004	6	54.7432	50.1010	4.6422	15	309.4800	1,840.0	1,683.9	6,789	6,214	576	6,789	6,214	576	-	-	-
6/30/2004	6	54.7432	50.1010	4.6422	15	309.4800	1,840.0	1,683.9	6,789	6,214	576	6,789	6,214	576	-	-	-
7/15/2004	7	51.2076	51.2076	-	15	-	1,721.1	1,721.1	6,351	6,351	-	-	-	-	6,351	6,351	-
7/31/2004	7	54.6214	54.6214	-	16	-	1,721.1	1,721.1	6,774	6,774	-	-	-	-	6,774	6,774	-
8/15/2004	8	50.2686	50.2686	-	15	-	1,689.6	1,689.6	6,234	6,234	-	-	-	-	6,234	6,234	-
8/31/2004	8	53.6198	53.6198	-	16	-	1,689.6	1,689.6	6,650	6,650	-	-	-	-	6,650	6,650	-
9/15/2004	9	35.2467	35.2467	-	15	-	1,184.7	1,184.7	4,371	4,371	-	-	-	-	4,371	4,371	-
9/30/2004	9	35.2467	35.2467	-	15	-	1,184.7	1,184.7	4,371	4,371	-	-	-	-	4,371	4,371	-
10/15/2004	10	22.0022	22.0022	-	15	-	739.5	739.5	2,729	2,729	-	-	-	-	-	-	-
10/31/2004	10	23.4690	23.4690	-	16	-	739.5	739.5	2,911	2,911	-	-	-	-	-	-	-
11/15/2004	11	5.9222	5.9222	-	15	-	199.0	199.0	734	734	-	-	-	-	-	-	-
11/30/2004	11	5.9222	5.9222	-	15	-	199.0	199.0	734	734	-	-	-	-	-	-	-
12/15/2004	12	5.7516	5.7516	-	15	-	193.3	193.3	713	713	-	-	-	-	-	-	-
12/31/2004	12	6.1350	6.1350	-	16	-	193.3	193.3	761	761	-	-	-	-	-	-	-
1/15/2005	1	11.2707	11.2707	-	15	-	378.8	378.8	1,398	1,398	-	-	-	-	-	-	-
1/31/2005	1	12.0221	12.0221	-	16	-	378.8	378.8	1,491	1,491	-	-	-	-	-	-	-
2/15/2005	2	23.3968	5.9998	17.3970	15	1,159.7991	786.4	201.7	2,902	744	2,158	2,902	744	2,158	-	-	-
2/28/2005	2	20.2772	5.1998	15.0774	13	1,159.7991	786.4	201.7	2,515	645	1,870	2,515	645	1,870	-	-	-
3/15/2005	3	52.3382	21.3093	31.0288	15	2,068.5897	1,759.1	716.2	6,491	2,643	3,848	6,491	2,643	3,848	-	-	-
3/31/2005	3	55.7588	22.6179	33.1408	16	2,071.3022	1,757.0	712.7	6,915	2,805	4,110	6,915	2,805	4,110	-	-	-
4/14/2005	4	77.5218	59.3528	18.1690	14	1,297.7840	2,791.7	2,137.4	8,610	7,361	1,249	8,610	7,361	1,249	-	-	-
4/30/2005	4	88.1938	82.2388	5.9550	16	372.1869	2,779.0	2,591.3	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/2005	5	150.8086	84.7540	66.0546	15	4,403.6376	5,068.8	2,848.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2005	5	160.6746	67.0119	93.6628	16	5,853.9236	5,062.9	2,111.5	9,840	8,311	1,529	9,840	8,311	1,529	-	-	-
6/15/2005	6	104.0138	60.6343	43.3795	15	2,891.9667	3,496.0	2,038.0	9,225	7,520	1,705	9,225	7,520	1,705	-	-	-
6/30/2005	6	104.0138	60.6343	43.3795	15	2,891.9667	3,496.0	2,038.0	9,225	7,520	1,705	9,225	7,520	1,705	-	-	-
7/15/2005	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/2005	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/2005	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/2005	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/2005	9	36.9451	44.3526	(7.4075)	15	(493.8333)	1,241.7	1,490.7	4,582	5,501	(919)	-	-	-	4,582	5,501	(919)
9/30/2005	9	36.9451	44.3526	(7.4075)	15	(493.8333)	1,241.7	1,490.7	4,582	5,501	(919)	-	-	-	4,582	5,501	(919)
10/15/2005	10	37.6798	38.7648	(1.0850)	15	(72.3333)	1,266.4	1,302.9	4,673	4,808	(135)	-	-	-	-	-	-
10/31/2005	10	40.0774	41.1624	(1.0850)	16	(67.8125)	1,262.8	1,297.0	4,971	5,105	(135)	-	-	-	-	-	-
11/15/2005	11	15.6889	16.3399	(0.6510)	15	(43.4000)	527.3	549.2	1,946	2,027	(81)	-	-	-	-	-	-
11/30/2005	11	15.6889	16.3399	(0.6510)	15	(43.4000)	527.3	549.2	1,946	2,027	(81)	-	-	-	-	-	-
12/15/2005	12	6.8876	7.5386	(0.6510)	15	(43.4000)	231.5	253.4	854	935	(81)	-	-	-	-	-	-
12/31/2005	12	7.2782	7.9292	(0.6510)	16	(40.6875)	229.3	249.8	903	983	(81)	-	-	-	-	-	-
1/15/2006	1	7.0377	7.6887	(0.6510)	15	(43.4000)	236.5	258.4	873	954	(81)	-	-	-	-	-	-
1/31/2006	1	7.4383	8.0893	(0.6510)	16	(40.6875)	234.4	254.9	923	1,003	(81)	-	-	-	-	-	-
2/15/2006	2	30.5944	39.9516	(9.3571)	15	(623.8082)	1,028.3	1,342.8	3,794	4,955	(1,161)	3,794	4,955	(1,161)	-	-	-
2/28/2006	2	26.6524	34.8487	(8.1963)	13	(630.4852)	1,033.6	1,351.5	3,306	4,322	(1,017)	3,306	4,322	(1,017)	-	-	-
3/15/2006	3	48.4716	52.2626	(3.7910)	15	(252.7326)	1,629.2	1,756.6	6,012	6,482	(470)	6,012	6,482	(470)	-	-	-
3/31/2006	3	51.5910	55.6347	(4.0437)	16	(252.7326)	1,625.6	1,753.0	6,398	6,900	(502)	6,398	6,900	(502)	-	-	-

Avg Water Duty: 10.25	Total Period		
	Total 40% Gen	Total Base Gen	Difference
Price per MWh: $ 69.00	11,191,837	11,464,645	(272,808)
		Revenue:	$ (18,823,762)

February -June		
Total 40% Gen	Total Base Gen	Difference
6,211,725	5,887,134	324,591
	Revenue:	$ 22,396,769

July - September		
Total 40% Gen	Total Base Gen	Difference
3,576,928	3,919,235	(342,307)
	Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
4/14/2006	4	113.2005	93.2831	19.9175	14	1,422.6770	4,076.5	3,359.3	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2006	4	127.9113	56.9785	70.9328	16	4,433.3027	4,030.5	1,795.4	9,840	7,067	2,773	9,840	7,067	2,773	-	-	-
5/15/2006	5	155.6097	117.1548	38.4549	15	2,563.6568	5,230.1	3,937.6	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2006	5	165.3020	108.9975	56.3045	16	3,519.0287	5,208.7	3,434.5	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/2006	6	108.3642	85.6535	22.7107	15	1,514.0486	3,642.2	2,878.9	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/2006	6	108.3642	85.6535	22.7107	15	1,514.0486	3,642.2	2,878.9	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/2006	7	65.2800	69.1190	(3.8390)	15	(255.9317)	2,194.1	2,323.1	8,096	8,572	(476)	-	-	-	8,096	8,572	(476)
7/31/2006	7	68.7853	72.8802	(4.0949)	16	(255.9317)	2,167.4	2,296.5	8,531	9,039	(508)	-	-	-	8,531	9,039	(508)
8/15/2006	8	63.5048	66.4800	(2.9752)	15	(198.3471)	2,134.4	2,234.4	7,876	8,245	(369)	-	-	-	7,876	8,245	(369)
8/31/2006	8	66.8917	70.0653	(3.1736)	16	(198.3471)	2,107.8	2,207.8	8,296	8,690	(394)	-	-	-	8,296	8,690	(394)
9/15/2006	9	46.9927	49.9679	(2.9752)	15	(198.3471)	1,579.5	1,679.5	5,828	6,197	(369)	-	-	-	5,828	6,197	(369)
9/30/2006	9	46.9927	49.9679	(2.9752)	15	(198.3471)	1,579.5	1,679.5	5,828	6,197	(369)	-	-	-	5,828	6,197	(369)
10/15/2006	10	39.7108	60.6692	(20.9584)	15	(1,397.2262)	1,334.7	2,039.1	4,925	7,524	(2,599)	-	-	-	-	-	-
10/31/2006	10	42.1715	43.6048	(1.4332)	16	(89.5761)	1,328.8	1,374.0	5,230	5,408	(178)	-	-	-	-	-	-
11/15/2006	11	7.6211	10.5963	(2.9752)	15	(198.3471)	256.1	356.1	945	1,314	(369)	-	-	-	-	-	-
11/30/2006	11	7.6211	10.5963	(2.9752)	15	(198.3471)	256.1	356.1	945	1,314	(369)	-	-	-	-	-	-
12/15/2006	12	7.4904	26.0834	(18.5930)	15	(1,239.5367)	251.8	876.7	929	3,235	(2,306)	-	-	-	-	-	-
12/31/2006	12	7.8777	30.0912	(22.2135)	16	(1,388.3427)	248.2	948.2	977	3,732	(2,755)	-	-	-	-	-	-
1/15/2007	1	8.5677	25.0206	(16.4529)	15	(1,096.8619)	288.0	841.0	1,063	3,103	(2,041)	-	-	-	-	-	-
1/31/2007	1	9.0268	26.6886	(17.6618)	16	(1,103.8619)	284.4	841.0	1,120	3,310	(2,190)	-	-	-	-	-	-
2/15/2007	2	23.5776	37.1860	(13.6084)	15	(907.2294)	792.5	1,249.8	2,924	4,612	(1,688)	2,924	4,612	(1,688)	-	-	-
2/28/2007	2	20.6579	32.2279	(11.5700)	13	(889.9987)	801.1	1,249.8	2,562	3,997	(1,435)	2,562	3,997	(1,435)	-	-	-
3/15/2007	3	52.7392	46.4284	6.3108	15	420.7203	1,772.6	1,560.5	6,541	5,758	783	6,541	5,758	783	-	-	-
3/31/2007	3	56.1866	49.4116	6.7749	16	423.4328	1,770.4	1,557.0	6,968	6,128	840	6,968	6,128	840	-	-	-
4/14/2007	4	65.0672	90.2041	(25.1369)	14	(1,795.4964)	2,343.2	3,248.4	8,070	8,610	(540)	8,070	8,610	(540)	-	-	-
4/30/2007	4	73.9600	104.0725	(30.1125)	16	(1,882.0286)	2,330.5	3,279.3	9,173	9,840	(667)	9,173	9,840	(667)	-	-	-
5/15/2007	5	71.1937	100.5762	(29.3825)	15	(1,958.8334)	2,392.9	3,380.4	8,830	9,225	(395)	8,830	9,225	(395)	-	-	-
5/31/2007	5	75.7521	90.1876	(14.4355)	16	(902.2168)	2,386.9	2,841.8	9,395	9,840	(445)	9,395	9,840	(445)	-	-	-
6/15/2007	6	52.7811	66.7601	(13.9790)	15	(931.9338)	1,774.0	2,243.8	6,546	8,280	(1,734)	6,546	8,280	(1,734)	-	-	-
6/30/2007	6	52.7811	66.7601	(13.9790)	15	(931.9338)	1,774.0	2,243.8	6,546	8,280	(1,734)	6,546	8,280	(1,734)	-	-	-
7/15/2007	7	54.2295	63.7445	(9.5150)	15	(634.3333)	1,822.7	2,142.5	6,726	7,906	(1,180)	-	-	-	6,726	7,906	(1,180)
7/31/2007	7	57.6324	67.1474	(9.5150)	16	(594.6875)	1,816.0	2,115.8	7,148	8,328	(1,180)	-	-	-	7,148	8,328	(1,180)
8/15/2007	8	53.0173	62.5323	(9.5150)	15	(634.3333)	1,781.9	2,101.7	6,575	7,755	(1,180)	-	-	-	6,575	7,755	(1,180)
8/31/2007	8	56.3395	65.8545	(9.5150)	16	(594.6875)	1,775.3	2,075.1	6,987	8,167	(1,180)	-	-	-	6,987	8,167	(1,180)
9/15/2007	9	36.3451	43.7907	(7.4455)	15	(496.3678)	1,221.6	1,471.8	4,508	5,431	(923)	-	-	-	4,508	5,431	(923)
9/30/2007	9	36.3451	43.7907	(7.4455)	15	(496.3678)	1,221.6	1,471.8	4,508	5,431	(923)	-	-	-	4,508	5,431	(923)
10/15/2007	10	27.5723	34.5117	(6.9394)	15	(462.6292)	926.7	1,160.0	3,420	4,280	(861)	-	-	-	-	-	-
10/31/2007	10	29.2961	36.6258	(7.3297)	16	(458.1084)	923.1	1,154.1	3,633	4,542	(909)	-	-	-	-	-	-
11/15/2007	11	15.0199	15.6709	(0.6510)	15	(43.4000)	504.8	526.7	1,863	1,944	(81)	-	-	-	-	-	-
11/30/2007	11	15.0199	15.6709	(0.6510)	15	(43.4000)	504.8	526.7	1,863	1,944	(81)	-	-	-	-	-	-
12/15/2007	12	6.9537	7.6047	(0.6510)	15	(43.4000)	233.7	255.6	862	943	(81)	-	-	-	-	-	-
12/31/2007	12	7.3486	7.9996	(0.6510)	16	(40.6875)	231.6	252.1	911	992	(81)	-	-	-	-	-	-
1/15/2008	1	7.0087	8.0436	(1.0349)	15	(68.9932)	235.6	270.3	869	998	(128)	-	-	-	-	-	-
1/31/2008	1	7.4073	8.4678	(1.0605)	16	(66.2807)	233.4	266.8	919	1,050	(132)	-	-	-	-	-	-
2/15/2008	2	11.5927	8.2063	3.3864	15	225.7593	389.6	275.8	1,438	1,018	420	1,438	1,018	420	-	-	-
2/29/2008	2	10.8885	7.7712	3.1172	14	222.6593	392.1	279.9	1,350	964	387	1,350	964	387	-	-	-
3/15/2008	3	28.5811	23.6337	4.9474	15	329.8265	960.6	794.3	3,545	2,931	614	3,545	2,931	614	-	-	-
3/31/2008	3	30.4865	25.1406	5.3458	16	334.1140	960.6	792.2	3,781	3,118	663	3,781	3,118	663	-	-	-
4/14/2008	4	67.9366	70.7541	(2.8175)	14	(201.2500)	2,446.5	2,548.0	8,426	8,610	(184)	8,426	8,610	(184)	-	-	-
4/30/2008	4	69.8917	66.3846	3.5071	16	219.1963	2,202.3	2,091.8	8,668	8,233	435	8,668	8,233	435	-	-	-
5/15/2008	5	81.8665	67.6353	14.2312	15	948.7441	2,751.6	2,273.3	9,225	8,388	837	9,225	8,388	837	-	-	-
5/31/2008	5	87.3242	55.2192	32.1051	16	2,006.5662	2,751.6	1,740.0	9,840	6,848	2,992	9,840	6,848	2,992	-	-	-
6/15/2008	6	59.2783	57.0638	2.2145	15	147.6315	1,992.4	1,918.0	7,352	7,077	275	7,352	7,077	275	-	-	-
6/30/2008	6	59.2783	57.0638	2.2145	15	147.6315	1,992.4	1,918.0	7,352	7,077	275	7,352	7,077	275	-	-	-
7/15/2008	7	51.1461	54.3311	(3.1850)	15	(212.3333)	1,719.1	1,826.1	6,343	6,738	(395)	-	-	-	6,343	6,738	(395)
7/31/2008	7	54.5558	57.7408	(3.1850)	16	(199.0625)	1,719.1	1,819.4	6,766	7,161	(395)	-	-	-	6,766	7,161	(395)
8/15/2008	8	49.8312	53.0162	(3.1850)	15	(212.3333)	1,674.9	1,781.9	6,180	6,575	(395)	-	-	-	6,180	6,575	(395)
8/31/2008	8	53.1533	56.3383	(3.1850)	16	(199.0625)	1,674.9	1,775.2	6,592	6,987	(395)	-	-	-	6,592	6,987	(395)
9/15/2008	9	34.8640	37.6815	(2.8175)	15	(187.8333)	1,171.8	1,266.5	4,324	4,673	(349)	-	-	-	4,324	4,673	(349)
9/30/2008	9	34.8640	37.6815	(2.8175)	15	(187.8333)	1,171.8	1,266.5	4,324	4,673	(349)	-	-	-	4,324	4,673	(349)
10/15/2008	10	27.8373	29.5523	(1.7150)	15	(114.3333)	935.6	993.3	3,452	3,665	(213)	-	-	-	-	-	-
10/31/2008	10	29.6931	31.4081	(1.7150)	16	(107.1875)	935.6	989.7	3,683	3,895	(213)	-	-	-	-	-	-
11/15/2008	11	13.4449	14.4739	(1.0290)	15	(68.6000)	451.9	486.5	1,667	1,795	(128)	-	-	-	-	-	-
11/30/2008	11	13.4449	14.4739	(1.0290)	15	(68.6000)	451.9	486.5	1,667	1,795	(128)	-	-	-	-	-	-
12/15/2008	12	5.9293	6.9583	(1.0290)	15	(68.6000)	199.3	233.9	735	863	(128)	-	-	-	-	-	-
12/31/2008	12	6.3246	7.3536	(1.0290)	16	(64.3125)	199.3	231.7	784	912	(128)	-	-	-	-	-	-
1/15/2009	1	6.2556	7.2846	(1.0290)	15	(68.6000)	210.3	244.8	776	903	(128)	-	-	-	-	-	-
1/31/2009	1	6.6727	7.7017	(1.0290)	16	(64.3125)	210.3	242.7	828	955	(128)	-	-	-	-	-	-
2/15/2009	2	15.4469	30.5271	(15.0802)	15	(1,005.3482)	519.2	1,026.0	1,916	3,786	(1,870)	1,916	3,786	(1,870)	-	-	-
2/28/2009	2	13.3873	26.5940	(13.2067)	13	(1,015.9020)	519.2	1,031.4	1,660	3,298	(1,638)	1,660	3,298	(1,638)	-	-	-
3/15/2009	3	46.7251	42.8936	3.8315	15	255.4360	1,570.5	1,441.7	5,795	5,320	475	5,795	5,320	475	-	-	-
3/31/2009	3	49.8401	45.6846	4.1556	16	259.7235	1,570.5	1,439.5	6,181	5,666	515	6,181	5,666	515	-	-	-
4/14/2009	4	76.3887	84.6505	(8.2619)	14	(590.1326)	2,750.9	3,048.4	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2009	4	87.3013	85.5058	1.7955	16	112.2196	2,750.9	2,694.3	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/2009	5	106.1436	65.0458	41.0978	15	2,739.8537	3,567.6	2,186.2	9,225	8,067	1,158	9,225	8,067	1,158	-	-	-
5/31/2009	5	113.2198	63.4985	49.7213	16	3,107.5824	3,567.6	2,000.8	9,840	7,875	1,965	9,840	7,875	1,965	-	-	-
6/15/2009	6	61.0216	70.9817	(9.9601)	15	(664.0083)	2,051.0	2,385.7	7,568	8,803	(1,235)	7,568	8,803	(1,235)	-	-	-
6/30/2009	6	61.0216	70.9817	(9.9601)	15	(664.0083)	2,051.0	2,385.7	7,568	8,803	(1,235)	7,568	8,803	(1,235)	-	-	-

Avg Water Duty:	10.25		
Price per MWh:	$ 69.00		
Total Period	**Total 40% Gen**	**Total Base Gen**	**Difference**
	11,191,837	11,464,645	(272,808)
		Revenue:	$ (18,823,762)
February -June	**Total 40% Gen**	**Total Base Gen**	**Difference**
	6,211,725	5,887,134	324,591
		Revenue:	$ 22,396,769
July - September	**Total 40% Gen**	**Total Base Gen**	**Difference**
	3,576,928	3,919,235	(342,307)
		Revenue:	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	**40% Gen MWh**	**Base Gen MWh**	**Difference**	**Feb-June 40% Gen**	**Feb-June Base Gen**	**Difference**	**July-Sept 40% Gen**	**July-Sept Base Gen**	**Difference**
7/15/2009	7	51.1577	54.3427	(3.1850)	15	(212.3333)	1,719.4	1,826.5	6,345	6,740	(395)	-	-	-	6,345	6,740	(395)
7/31/2009	7	54.5682	57.7532	(3.1850)	16	(199.0625)	1,719.4	1,819.8	6,768	7,163	(395)	-	-	-	6,768	7,163	(395)
8/15/2009	8	49.8323	53.0173	(3.1850)	15	(212.3333)	1,674.9	1,781.9	6,180	6,575	(395)	-	-	-	6,180	6,575	(395)
8/31/2009	8	53.1545	56.3395	(3.1850)	16	(199.0625)	1,674.9	1,775.3	6,592	6,987	(395)	-	-	-	6,592	6,987	(395)
9/15/2009	9	33.8163	36.6338	(2.8175)	15	(187.8333)	1,136.6	1,231.3	4,194	4,543	(349)	-	-	-	4,194	4,543	(349)
9/30/2009	9	33.8163	36.6338	(2.8175)	15	(187.8333)	1,136.6	1,231.3	4,194	4,543	(349)	-	-	-	4,194	4,543	(349)
10/15/2009	10	20.5996	22.3146	(1.7150)	15	(114.3333)	692.4	750.0	2,555	2,768	(213)	-	-	-	-	-	-
10/31/2009	10	21.9729	23.6879	(1.7150)	16	(107.1875)	692.4	746.4	2,725	2,938	(213)	-	-	-	-	-	-
11/15/2009	11	15.8634	16.8924	(1.0290)	15	(68.6000)	533.2	567.8	1,967	2,095	(128)	-	-	-	-	-	-
11/30/2009	11	15.8634	16.8924	(1.0290)	15	(68.6000)	533.2	567.8	1,967	2,095	(128)	-	-	-	-	-	-
12/15/2009	12	5.9128	6.9418	(1.0290)	15	(68.6000)	198.7	233.3	733	861	(128)	-	-	-	-	-	-
12/31/2009	12	6.3070	7.3360	(1.0290)	16	(64.3125)	198.7	231.2	782	910	(128)	-	-	-	-	-	-
1/15/2010	1	6.0488	7.0778	(1.0290)	15	(68.6000)	203.3	237.9	750	878	(128)	-	-	-	-	-	-
1/31/2010	1	6.4521	7.4811	(1.0290)	16	(64.3125)	203.3	235.7	800	928	(128)	-	-	-	-	-	-
2/15/2010	2	13.7028	13.1690	0.5338	15	35.5880	460.6	442.6	1,699	1,633	66	1,699	1,633	66	-	-	-
2/28/2010	2	11.8758	11.5504	0.3254	13	25.0342	460.6	447.9	1,473	1,433	40	1,473	1,433	40	-	-	-
3/15/2010	3	23.6870	11.5747	12.1124	15	807.4929	796.1	389.0	2,938	1,436	1,502	2,938	1,436	1,502	-	-	-
3/31/2010	3	25.2662	12.2777	12.9885	16	811.7804	796.1	386.9	3,134	1,523	1,611	3,134	1,523	1,611	-	-	-
4/14/2010	4	49.1717	24.9292	24.2424	14	1,731.6025	1,770.7	897.7	6,098	3,092	3,007	6,098	3,092	3,007	-	-	-
4/30/2010	4	56.1962	43.2386	12.9576	16	809.8497	1,770.7	1,362.4	6,970	5,363	1,607	6,970	5,363	1,607	-	-	-
5/15/2010	5	91.7879	64.3139	27.4739	15	1,831.5957	3,085.0	2,161.6	9,225	7,976	1,249	9,225	7,976	1,249	-	-	-
5/31/2010	5	97.9071	51.6764	46.2307	16	2,889.4179	3,085.0	1,628.3	9,840	6,409	3,431	9,840	6,409	3,431	-	-	-
6/15/2010	6	105.2912	53.2893	52.0019	15	3,466.7933	3,538.9	1,791.1	9,225	6,609	2,616	9,225	6,609	2,616	-	-	-
6/30/2010	6	105.2912	53.2893	52.0019	15	3,466.7933	3,538.9	1,791.1	9,225	6,609	2,616	9,225	6,609	2,616	-	-	-
7/15/2010	7	51.6416	54.8266	(3.1850)	15	(212.3333)	1,735.7	1,842.8	6,405	6,800	(395)	-	-	-	6,405	6,800	(395)
7/31/2010	7	55.0843	58.2693	(3.1850)	16	(199.0625)	1,735.7	1,836.1	6,832	7,227	(395)	-	-	-	6,832	7,227	(395)
8/15/2010	8	50.4662	53.6512	(3.1850)	15	(212.3333)	1,696.2	1,803.2	6,259	6,654	(395)	-	-	-	6,259	6,654	(395)
8/31/2010	8	53.8306	57.0156	(3.1850)	16	(199.0625)	1,696.2	1,796.6	6,676	7,071	(395)	-	-	-	6,676	7,071	(395)
9/15/2010	9	35.4729	38.2904	(2.8175)	15	(187.8333)	1,192.3	1,287.0	4,399	4,749	(349)	-	-	-	4,399	4,749	(349)
9/30/2010	9	35.4729	38.2904	(2.8175)	15	(187.8333)	1,192.3	1,287.0	4,399	4,749	(349)	-	-	-	4,399	4,749	(349)
10/15/2010	10	27.6250	29.3400	(1.7150)	15	(114.3333)	928.5	986.1	3,426	3,639	(213)	-	-	-	-	-	-
10/31/2010	10	29.4667	31.1817	(1.7150)	16	(107.1875)	928.5	982.5	3,655	3,867	(213)	-	-	-	-	-	-
11/15/2010	11	5.8663	6.8953	(1.0290)	15	(68.6000)	197.2	231.8	728	855	(128)	-	-	-	-	-	-
11/30/2010	11	5.8663	6.8953	(1.0290)	15	(68.6000)	197.2	231.8	728	855	(128)	-	-	-	-	-	-
12/15/2010	12	8.4968	8.4968	-	15	-	285.6	285.6	1,054	1,054	-	-	-	-	-	-	-
12/31/2010	12	9.0632	9.0632	-	16	-	285.6	285.6	1,124	1,124	-	-	-	-	-	-	-
1/15/2011	1	6.0472	7.0762	(1.0290)	15	(68.6000)	203.3	237.8	750	878	(128)	-	-	-	-	-	-
1/31/2011	1	6.4504	7.4794	(1.0290)	16	(64.3125)	203.3	235.7	800	928	(128)	-	-	-	-	-	-
2/15/2011	2	20.5443	7.0138	13.5304	15	902.0276	690.5	235.7	2,548	870	1,678	2,548	870	1,678	-	-	-
2/28/2011	2	17.8050	6.2159	11.5892	13	891.4738	690.5	241.1	2,208	771	1,437	2,208	771	1,437	-	-	-
3/15/2011	3	62.0791	52.0635	10.0157	15	667.7107	2,086.5	1,749.9	7,699	6,457	1,242	7,699	6,457	1,242	-	-	-
3/31/2011	3	66.1057	55.4224	10.6834	16	667.7107	2,083.0	1,746.4	8,199	6,874	1,325	8,199	6,874	1,325	-	-	-
4/14/2011	4	96.4285	104.4136	(7.9851)	14	(570.3630)	3,472.5	3,760.1	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2011	4	108.7433	69.6991	39.0442	16	2,440.2627	3,426.5	2,196.2	9,840	8,644	1,196	9,840	8,644	1,196	-	-	-
5/15/2011	5	120.9397	116.0928	4.8469	15	323.1278	4,064.9	3,902.0	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2011	5	128.3207	107.8647	20.4560	16	1,278.4996	4,043.4	3,398.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/2011	6	133.0852	76.0071	57.0781	15	3,805.2086	4,473.1	2,554.6	9,225	9,225	-	9,225	9,225	-	-	-	-
6/30/2011	6	133.0852	76.0071	57.0781	15	3,805.2086	4,473.1	2,554.6	9,225	9,225	-	9,225	9,225	-	-	-	-
7/15/2011	7	64.2021	69.0796	(4.8775)	15	(325.1666)	2,157.9	2,321.8	7,963	8,567	(605)	-	-	-	7,963	8,567	(605)
7/31/2011	7	67.6356	72.8383	(5.2027)	16	(325.1666)	2,131.2	2,295.1	8,388	9,034	(645)	-	-	-	8,388	9,034	(645)
8/15/2011	8	63.0588	66.5403	(3.4815)	15	(232.0981)	2,119.4	2,236.5	7,821	8,253	(432)	-	-	-	7,821	8,253	(432)
8/31/2011	8	66.4161	70.1296	(3.7136)	16	(232.0981)	2,092.8	2,209.8	8,237	8,698	(461)	-	-	-	8,237	8,698	(461)
9/15/2011	9	45.6108	50.0736	(4.4628)	15	(297.5206)	1,533.0	1,683.0	5,657	6,210	(553)	-	-	-	5,657	6,210	(553)
9/30/2011	9	45.6108	50.0736	(4.4628)	15	(297.5206)	1,533.0	1,683.0	5,657	6,210	(553)	-	-	-	5,657	6,210	(553)
10/15/2011	10	31.2953	33.3108	(2.0155)	15	(134.3642)	1,051.9	1,119.6	3,881	4,131	(250)	-	-	-	-	-	-
10/31/2011	10	33.1950	35.3448	(2.1498)	16	(134.3642)	1,046.0	1,113.7	4,117	4,384	(267)	-	-	-	-	-	-
11/15/2011	11	7.6209	14.1680	(6.5472)	15	(436.4771)	256.1	476.2	945	1,757	(812)	-	-	-	-	-	-
11/30/2011	11	7.6209	26.4566	(18.8357)	15	(1,255.7135)	256.1	889.2	945	3,281	(2,336)	-	-	-	-	-	-
12/15/2011	12	7.6280	22.1910	(14.5630)	15	(970.8658)	256.4	745.9	946	2,752	(1,806)	-	-	-	-	-	-
12/31/2011	12	8.0245	23.6704	(15.6459)	16	(977.8658)	252.9	745.9	995	2,936	(1,940)	-	-	-	-	-	-
1/15/2012	1	8.3526	20.9270	(12.5744)	15	(838.2927)	280.7	703.4	1,036	2,595	(1,560)	-	-	-	-	-	-
1/31/2012	1	8.7974	22.3221	(13.5247)	16	(845.2927)	277.2	703.4	1,091	2,768	(1,677)	-	-	-	-	-	-
2/15/2012	2	8.4557	12.4935	(4.0378)	15	(269.1854)	284.2	419.9	1,049	1,549	(501)	1,049	1,549	(501)	-	-	-
2/29/2012	2	8.0040	11.7726	(3.7686)	14	(269.1854)	288.2	423.9	993	1,460	(467)	993	1,460	(467)	-	-	-
3/15/2012	3	32.2199	21.6191	10.6008	15	706.7187	1,082.9	726.6	3,996	2,681	1,315	3,996	2,681	1,315	-	-	-
3/31/2012	3	34.2993	22.9484	11.3509	16	709.4312	1,080.8	723.1	4,254	2,846	1,408	4,254	2,846	1,408	-	-	-
4/14/2012	4	75.7956	86.3042	(10.5086)	14	(750.6164)	2,729.5	3,107.9	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2012	4	86.2211	99.6154	(13.3944)	16	(837.1486)	2,716.8	3,138.9	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/2012	5	73.8698	101.0700	(27.2002)	15	(1,813.3495)	2,482.8	3,397.0	9,162	9,225	(63)	9,162	9,225	(63)	-	-	-
5/31/2012	5	78.6066	90.7143	(12.1077)	16	(756.7329)	2,476.9	2,858.4	9,749	9,840	(91)	9,749	9,840	(91)	-	-	-
6/15/2012	6	53.8514	71.4782	(17.6268)	15	(1,175.1223)	1,810.0	2,402.4	6,679	8,865	(2,186)	6,679	8,865	(2,186)	-	-	-
6/30/2012	6	53.8514	71.4782	(17.6268)	15	(1,175.1223)	1,810.0	2,402.4	6,679	8,865	(2,186)	6,679	8,865	(2,186)	-	-	-
7/15/2012	7	54.8266	64.3416	(9.5150)	15	(634.3333)	1,842.8	2,162.6	6,800	7,980	(1,180)	-	-	-	6,800	7,980	(1,180)
7/31/2012	7	58.2693	67.7843	(9.5150)	16	(594.6875)	1,836.1	2,135.9	7,227	8,407	(1,180)	-	-	-	7,227	8,407	(1,180)
8/15/2012	8	53.6512	63.1662	(9.5150)	15	(634.3333)	1,803.2	2,123.1	6,654	7,834	(1,180)	-	-	-	6,654	7,834	(1,180)
8/31/2012	8	57.0156	66.5306	(9.5150)	16	(594.6875)	1,796.6	2,096.4	7,071	8,251	(1,180)	-	-	-	7,071	8,251	(1,180)
9/15/2012	9	37.0166	44.4621	(7.4455)	15	(496.3678)	1,244.1	1,494.4	4,591	5,514	(923)	-	-	-	4,591	5,514	(923)
9/30/2012	9	37.0166	44.4621	(7.4455)	15	(496.3678)	1,244.1	1,494.4	4,591	5,514	(923)	-	-	-	4,591	5,514	(923)

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total 40% Gen	Total Base Gen	Difference	Revenue:
Total Period	11,191,837	11,464,645	(272,808)	$ (18,823,762)
February -June	6,211,725	5,887,134	324,591	$ 22,396,769
July - September	3,576,928	3,919,235	(342,307)	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	40% Gen MWh	Base Gen MWh	Difference	Feb-June 40% Gen	Feb-June Base Gen	Difference	July-Sept 40% Gen	July-Sept Base Gen	Difference
10/15/2012	10	34.1737	41.1131	(6.9394)	15	(462.6292)	1,148.6	1,381.8	4,238	5,099	(861)	-	-	-	-	-	-
10/31/2012	10	36.3376	43.6673	(7.3297)	16	(458.1084)	1,145.0	1,376.0	4,507	5,416	(909)	-	-	-	-	-	-
11/15/2012	11	6.9689	7.6199	(0.6510)	15	(43.4000)	234.2	256.1	864	945	(81)	-	-	-	-	-	-
11/30/2012	11	6.9689	7.6199	(0.6510)	15	(43.4000)	234.2	256.1	864	945	(81)	-	-	-	-	-	-
12/15/2012	12	6.6824	7.3334	(0.6510)	15	(43.4000)	224.6	246.5	829	910	(81)	-	-	-	-	-	-
12/31/2012	12	7.0593	7.7103	(0.6510)	16	(40.6875)	222.4	243.0	876	956	(81)	-	-	-	-	-	-
1/15/2013	1	7.2996	8.3345	(1.0349)	15	(68.9932)	245.3	280.1	905	1,034	(128)	-	-	-	-	-	-
1/31/2013	1	7.7177	8.7782	(1.0605)	16	(66.2807)	243.2	276.6	957	1,089	(132)	-	-	-	-	-	-
2/15/2013	2	10.1328	10.4695	(0.3368)	15	(22.4509)	340.6	351.9	1,257	1,298	(42)	1,257	1,298	(42)	-	-	-
2/28/2013	2	8.9189	9.2976	(0.3787)	13	(29.1278)	345.9	360.6	1,106	1,153	(47)	1,106	1,153	(47)	-	-	-
3/15/2013	3	31.5212	24.5793	6.9419	15	462.7942	1,059.4	826.1	3,909	3,048	861	3,909	3,048	861	-	-	-
3/31/2013	3	33.6226	26.1493	7.4733	16	467.0817	1,059.4	824.0	4,170	3,243	927	4,170	3,243	927	-	-	-
4/14/2013	4	61.0294	53.1775	7.8518	14	560.8456	2,197.8	1,915.0	7,569	6,595	974	7,569	6,595	974	-	-	-
4/30/2013	4	69.7478	76.1620	(6.4142)	16	(400.8848)	2,197.8	2,399.9	8,650	9,446	(796)	8,650	9,446	(796)	-	-	-
5/15/2013	5	66.0854	77.1341	(11.0487)	15	(736.5818)	2,221.2	2,592.5	8,196	9,225	(1,029)	8,196	9,225	(1,029)	-	-	-
5/31/2013	5	70.4911	60.3211	10.1700	16	635.6267	2,221.2	1,900.7	8,743	7,481	1,261	8,743	7,481	1,261	-	-	-
6/15/2013	6	49.5260	53.5864	(4.0604)	15	(270.6941)	1,664.6	1,801.1	6,142	6,646	(504)	6,142	6,646	(504)	-	-	-
6/30/2013	6	49.5260	53.5864	(4.0604)	15	(270.6941)	1,664.6	1,801.1	6,142	6,646	(504)	6,142	6,646	(504)	-	-	-
7/15/2013	7	51.1114	54.2964	(3.1850)	15	(212.3333)	1,717.9	1,824.9	6,339	6,734	(395)	-	-	-	6,339	6,734	(395)
7/31/2013	7	54.5188	57.7038	(3.1850)	16	(199.0625)	1,717.9	1,818.2	6,762	7,157	(395)	-	-	-	6,762	7,157	(395)
8/15/2013	8	49.8223	53.0073	(3.1850)	15	(212.3333)	1,674.6	1,781.6	6,179	6,574	(395)	-	-	-	6,179	6,574	(395)
8/31/2013	8	53.1438	56.3288	(3.1850)	16	(199.0625)	1,674.6	1,774.9	6,591	6,986	(395)	-	-	-	6,591	6,986	(395)
9/15/2013	9	33.8253	36.6428	(2.8175)	15	(187.8333)	1,136.9	1,231.6	4,195	4,545	(349)	-	-	-	4,195	4,545	(349)
9/30/2013	9	33.8253	36.6428	(2.8175)	15	(187.8333)	1,136.9	1,231.6	4,195	4,545	(349)	-	-	-	4,195	4,545	(349)
10/15/2013	10	19.1276	22.5701	(3.4425)	15	(229.5026)	642.9	758.6	2,372	2,799	(427)	-	-	-	-	-	-
10/31/2013	10	20.4028	23.9605	(3.5577)	16	(222.3568)	642.9	755.0	2,530	2,972	(441)	-	-	-	-	-	-
11/15/2013	11	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
11/30/2013	11	5.9504	6.9794	(1.0290)	15	(68.6000)	200.0	234.6	738	866	(128)	-	-	-	-	-	-
12/15/2013	12	5.9434	6.9724	(1.0290)	15	(68.6000)	199.8	234.3	737	865	(128)	-	-	-	-	-	-
12/31/2013	12	6.3396	7.3686	(1.0290)	16	(64.3125)	199.8	232.2	786	914	(128)	-	-	-	-	-	-
1/15/2014	1	6.3133	7.5343	(1.2209)	15	(81.3966)	212.2	253.2	783	934	(151)	-	-	-	-	-	-
1/31/2014	1	6.7342	7.9680	(1.2337)	16	(77.1091)	212.2	251.1	835	988	(153)	-	-	-	-	-	-
2/15/2014	2	14.5497	14.5124	0.0373	15	2.4886	489.0	487.8	1,805	1,800	5	1,805	1,800	5	-	-	-
2/28/2014	2	12.6097	12.7146	(0.1048)	13	(8.0653)	489.0	493.1	1,564	1,577	(13)	1,564	1,577	(13)	-	-	-
3/15/2014	3	15.3292	15.1453	0.1839	15	12.2606	515.2	509.0	1,901	1,878	23	1,901	1,878	23	-	-	-
3/31/2014	3	16.3512	16.1550	0.1962	16	12.2606	515.2	509.0	2,028	2,004	24	2,028	2,004	24	-	-	-
4/14/2014	4	34.7337	25.0421	9.6916	14	692.2579	1,250.8	901.8	4,308	3,106	1,202	4,308	3,106	1,202	-	-	-
4/30/2014	4	39.6957	37.7102	1.9854	16	124.0901	1,250.8	1,188.2	4,923	4,677	246	4,923	4,677	246	-	-	-
5/15/2014	5	43.9888	43.9888	-	15	-	1,478.5	1,478.5	5,456	5,456	-	5,456	5,456	-	-	-	-
5/31/2014	5	44.2428	43.0896	1.1532	16	72.0757	1,394.1	1,357.8	5,487	5,344	143	5,487	5,344	143	-	-	-
6/15/2014	6	49.9513	57.3000	(7.3487)	15	(489.9131)	1,678.9	1,925.9	6,195	7,107	(911)	6,195	7,107	(911)	-	-	-
6/30/2014	6	49.9513	57.3000	(7.3487)	15	(489.9131)	1,678.9	1,925.9	6,195	7,107	(911)	6,195	7,107	(911)	-	-	-
7/15/2014	7	51.1577	51.1577	-	15	-	1,719.4	1,719.4	6,345	6,345	-	-	-	-	6,345	6,345	-
7/31/2014	7	54.5682	54.5682	-	16	-	1,719.4	1,719.4	6,768	6,768	-	-	-	-	6,768	6,768	-
8/15/2014	8	49.8096	49.8096	-	15	-	1,674.1	1,674.1	6,178	6,178	-	-	-	-	6,178	6,178	-
8/31/2014	8	53.1302	53.1302	-	16	-	1,674.1	1,674.1	6,589	6,589	-	-	-	-	6,589	6,589	-
9/15/2014	9	32.5514	32.5514	-	15	-	1,094.1	1,094.1	4,037	4,037	-	-	-	-	4,037	4,037	-
9/30/2014	9	32.5514	32.5514	-	15	-	1,094.1	1,094.1	4,037	4,037	-	-	-	-	4,037	4,037	-
10/15/2014	10	19.1128	19.1128	-	15	-	642.4	642.4	2,370	2,370	-	-	-	-	-	-	-
10/31/2014	10	20.3869	20.3869	-	16	-	642.4	642.4	2,528	2,528	-	-	-	-	-	-	-
11/15/2014	11	5.9445	5.9445	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
11/30/2014	11	5.9445	5.9445	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
12/15/2014	12	5.8472	5.8472	-	15	-	196.5	196.5	725	725	-	-	-	-	-	-	-
12/31/2014	12	6.2370	6.2370	-	16	-	196.5	196.5	774	774	-	-	-	-	-	-	-
1/15/2015	1	6.2165	6.2165	-	15	-	208.9	208.9	771	771	-	-	-	-	-	-	-
1/31/2015	1	6.6310	6.6310	-	16	-	208.9	208.9	822	822	-	-	-	-	-	-	-
2/15/2015	2	19.2965	6.1100	13.1865	15	879.0991	648.6	205.4	2,393	758	1,635	2,393	758	1,635	-	-	-
2/28/2015	2	16.7236	5.2954	11.4283	13	879.0991	648.6	205.4	2,074	657	1,417	2,074	657	1,417	-	-	-
3/15/2015	3	7.2427	22.8779	(15.6352)	15	(1,042.3449)	243.4	768.9	898	2,837	(1,939)	898	2,837	(1,939)	-	-	-
3/31/2015	3	7.7255	24.4031	(16.6775)	16	(1,042.3449)	243.4	768.9	958	3,027	(2,068)	958	3,027	(2,068)	-	-	-
4/14/2015	4	12.0421	19.8172	(7.7751)	14	(555.3621)	433.7	713.6	1,494	2,458	(964)	1,494	2,458	(964)	-	-	-
4/30/2015	4	26.4814	37.7988	(11.3174)	16	(707.3375)	834.4	1,191.0	3,284	4,688	(1,404)	3,284	4,688	(1,404)	-	-	-
5/15/2015	5	30.1432	45.9142	(15.7710)	15	(1,051.4009)	1,013.1	1,543.2	3,738	5,694	(1,956)	3,738	5,694	(1,956)	-	-	-
5/31/2015	5	22.0749	45.3338	(23.2589)	16	(1,453.6798)	695.6	1,428.5	2,738	5,622	(2,885)	2,738	5,622	(2,885)	-	-	-
6/15/2015	6	22.5951	61.7553	(39.1602)	15	(2,610.6781)	759.4	2,075.6	2,802	7,659	(4,857)	2,802	7,659	(4,857)	-	-	-
6/30/2015	6	22.5951	61.7553	(39.1602)	15	(2,610.6781)	759.4	2,075.6	2,802	7,659	(4,857)	2,802	7,659	(4,857)	-	-	-
7/15/2015	7	27.8523	51.1229	(23.2706)	15	(1,551.3755)	936.1	1,718.3	3,454	6,340	(2,886)	-	-	-	3,454	6,340	(2,886)
7/31/2015	7	28.3757	54.5311	(26.1553)	16	(1,634.7088)	894.1	1,718.3	3,519	6,763	(3,244)	-	-	-	3,519	6,763	(3,244)
8/15/2015	8	28.4194	49.8324	(21.4130)	15	(1,427.5359)	955.2	1,674.9	3,525	6,180	(2,656)	-	-	-	3,525	6,180	(2,656)
8/31/2015	8	27.3806	53.1546	(25.7739)	16	(1,610.8692)	862.8	1,674.9	3,396	6,592	(3,197)	-	-	-	3,396	6,592	(3,197)
9/15/2015	9	14.1840	34.8569	(20.6729)	15	(1,378.1952)	476.7	1,171.6	1,759	4,323	(2,564)	-	-	-	1,759	4,323	(2,564)
9/30/2015	9	14.2840	34.8569	(20.5729)	15	(1,371.5285)	480.1	1,171.6	1,772	4,323	(2,552)	-	-	-	1,772	4,323	(2,552)
10/15/2015	10	17.1794	34.2186	(17.0391)	15	(1,135.9431)	577.4	1,150.1	2,131	4,244	(2,113)	-	-	-	-	-	-
10/31/2015	10	18.3247	36.4998	(18.1751)	16	(1,135.9431)	577.4	1,150.1	2,273	4,527	(2,254)	-	-	-	-	-	-
11/15/2015	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
11/30/2015	11	5.9504	5.9504	-	15	-	200.0	200.0	738	738	-	-	-	-	-	-	-
12/15/2015	12	5.7567	5.7567	-	15	-	193.5	193.5	714	714	-	-	-	-	-	-	-
12/31/2015	12	6.1405	6.1405	-	16	-	193.5	193.5	762	762	-	-	-	-	-	-	-

Avg Water Duty:	Price per MWh:
10.25	$ 69.00

	Total Period			February -June			July - September	
Total 40% Gen	**Total Base Gen**	**Difference**	**Total 40% Gen**	**Total Base Gen**	**Difference**	**Total 40% Gen**	**Total Base Gen**	**Difference**
11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)
	Revenue:	$ (18,823,762)		**Revenue:**	$ 22,396,769		**Revenue:**	$ (23,619,164)

Date	Mo	Tulloch Release 40%	Tulloch Release Base	Difference TAF	Days in Period	Difference AF per Day	40% Avg CFS per Day	Base Avg CFS per Day	**40% Gen MWh**	**Base Gen MWh**	**Difference**	**Feb-June 40% Gen**	**Feb-June Base Gen**	**Difference**	**July-Sept 40% Gen**	**July-Sept Base Gen**	**Difference**
1/15/2016	1	5.9460	5.9460	-	15	-	199.8	199.8	737	737	-	-	-	-	-	-	-
1/31/2016	1	6.3424	6.3424	-	16	-	199.8	199.8	787	787	-	-	-	-	-	-	-
2/15/2016	2	25.9600	47.7883	(21.8283)	15	(1,455.2172)	872.5	1,606.2	3,220	5,927	(2,707)	3,220	5,927	(2,707)	-	-	-
2/29/2016	2	24.2293	44.6024	(20.3730)	14	(1,455.2172)	872.5	1,606.2	3,005	5,532	(2,527)	3,005	5,532	(2,527)	-	-	-
3/15/2016	3	68.9452	34.4592	34.4860	15	2,299.0672	2,317.3	1,158.2	8,551	4,274	4,277	8,551	4,274	4,277	-	-	-
3/31/2016	3	73.5416	36.7565	36.7851	16	2,299.0672	2,317.3	1,158.2	9,121	4,559	4,562	9,121	4,559	4,562	-	-	-
4/14/2016	4	78.2906	85.0860	(6.7954)	14	(485.3852)	2,819.4	3,064.1	8,610	8,610	-	8,610	8,610	-	-	-	-
4/30/2016	4	89.4750	85.7846	3.6904	16	230.6478	2,819.4	2,703.1	9,840	9,840	-	9,840	9,840	-	-	-	-
5/15/2016	5	84.2278	91.8984	(7.6706)	15	(511.3731)	2,830.9	3,088.8	9,225	9,225	-	9,225	9,225	-	-	-	-
5/31/2016	5	89.8430	111.2269	(21.3840)	16	(1,336.4970)	2,830.9	3,504.8	9,840	9,840	-	9,840	9,840	-	-	-	-
6/15/2016	6	66.1736	76.8534	(10.6798)	15	(711.9879)	2,224.1	2,583.1	8,207	9,225	(1,018)	8,207	9,225	(1,018)	-	-	-
6/30/2016	6	66.1736	76.8534	(10.6798)	15	(711.9879)	2,224.1	2,583.1	8,207	9,225	(1,018)	8,207	9,225	(1,018)	-	-	-
7/15/2016	7	51.1512	51.1512	-	15	-	1,719.2	1,719.2	6,344	6,344	-	-	-	-	6,344	6,344	-
7/31/2016	7	54.5613	54.5613	-	16	-	1,719.2	1,719.2	6,767	6,767	-	-	-	-	6,767	6,767	-
8/15/2016	8	49.8096	49.8096	-	15	-	1,674.1	1,674.1	6,178	6,178	-	-	-	-	6,178	6,178	-
8/31/2016	8	53.1302	53.1302	-	16	-	1,674.1	1,674.1	6,589	6,589	-	-	-	-	6,589	6,589	-
9/15/2016	9	32.5514	32.5514	-	15	-	1,094.1	1,094.1	4,037	4,037	-	-	-	-	4,037	4,037	-
9/30/2016	9	32.5514	32.5514	-	15	-	1,094.1	1,094.1	4,037	4,037	-	-	-	-	4,037	4,037	-
				1,291.2345					11,191,837	11,464,645	(272,808)	6,211,725	5,887,134	324,591	3,576,928	3,919,235	(342,307)

ATTACHMENT 11

Oakdale Irrigation District/South San Joaquin Irrigation District
Comments on the Draft Substitute Environmental Document

Year from	1986	Year to	2016	Note:	**Calendar Years**
				Note:	**1921 starts in Oct and 2016 ends in**
month from	1	month to	12	Note:	**1=jan, feb=2, etc.**
WAPA estimates $/MWh		31.18		Note:	**See WAPA tab**

Cal Year	Base MWh	40FJ MWh	Change (40FJ-Base) MWh	Base $	40FJ $	Change (40FJ-Base) $
1921	0	0	0	$0	$0	$0
1922	0	0	0	$0	$0	$0
1923	0	0	0	$0	$0	$0
1924	0	0	0	$0	$0	$0
1925	0	0	0	$0	$0	$0
1926	0	0	0	$0	$0	$0
1927	0	0	0	$0	$0	$0
1928	0	0	0	$0	$0	$0
1929	0	0	0	$0	$0	$0
1930	0	0	0	$0	$0	$0
1931	0	0	0	$0	$0	$0
1932	0	0	0	$0	$0	$0
1933	0	0	0	$0	$0	$0
1934	0	0	0	$0	$0	$0
1935	0	0	0	$0	$0	$0
1936	0	0	0	$0	$0	$0
1937	0	0	0	$0	$0	$0
1938	0	0	0	$0	$0	$0
1939	0	0	0	$0	$0	$0
1940	0	0	0	$0	$0	$0
1941	0	0	0	$0	$0	$0
1942	0	0	0	$0	$0	$0
1943	0	0	0	$0	$0	$0
1944	0	0	0	$0	$0	$0
1945	0	0	0	$0	$0	$0
1946	0	0	0	$0	$0	$0
1947	0	0	0	$0	$0	$0
1948	0	0	0	$0	$0	$0
1949	0	0	0	$0	$0	$0
1950	0	0	0	$0	$0	$0
1951	0	0	0	$0	$0	$0
1952	0	0	0	$0	$0	$0
1953	0	0	0	$0	$0	$0
1954	0	0	0	$0	$0	$0
1955	0	0	0	$0	$0	$0
1956	0	0	0	$0	$0	$0
1957	0	0	0	$0	$0	$0
1958	0	0	0	$0	$0	$0
1959	0	0	0	$0	$0	$0

Year from	1986	Year to	2016	Note:	**Calendar Years**
				Note:	**1921 starts in Oct and 2016 ends in**
month from	1	month to	12	Note:	**1=jan, feb=2, etc.**
WAPA estimates $/MWh		31.18		Note:	**See WAPA tab**

Cal Year	Base MWh	40FJ MWh	Change (40FJ-Base) MWh	Base $	40FJ $	Change (40FJ-Base) $
1960	0	0	0	$0	$0	$0
1961	0	0	0	$0	$0	$0
1962	0	0	0	$0	$0	$0
1963	0	0	0	$0	$0	$0
1964	0	0	0	$0	$0	$0
1965	0	0	0	$0	$0	$0
1966	0	0	0	$0	$0	$0
1967	0	0	0	$0	$0	$0
1968	0	0	0	$0	$0	$0
1969	0	0	0	$0	$0	$0
1970	0	0	0	$0	$0	$0
1971	0	0	0	$0	$0	$0
1972	0	0	0	$0	$0	$0
1973	0	0	0	$0	$0	$0
1974	0	0	0	$0	$0	$0
1975	0	0	0	$0	$0	$0
1976	0	0	0	$0	$0	$0
1977	0	0	0	$0	$0	$0
1978	0	0	0	$0	$0	$0
1979	0	0	0	$0	$0	$0
1980	0	0	0	$0	$0	$0
1981	0	0	0	$0	$0	$0
1982	0	0	0	$0	$0	$0
1983	0	0	0	$0	$0	$0
1984	0	0	0	$0	$0	$0
1985	0	0	0	$0	$0	$0
1986	577,660	653,694	76,033	$18,011,453	$20,382,172	$2,370,719
1987	399,521	389,851	-9,670	$12,457,066	$12,155,559	-$301,507
1988	295,350	262,741	-32,609	$9,208,998	$8,192,254	-$1,016,745
1989	266,685	274,164	7,479	$8,315,234	$8,548,420	$233,186
1990	239,655	89,216	-150,439	$7,472,448	$2,781,769	-$4,690,679
1991	103,607	0	-103,607	$3,230,469	$0	-$3,230,469
1992	0	0	0	$0	$0	$0
1993	259,406	295,459	36,052	$8,088,288	$9,212,401	$1,124,113
1994	203,633	90,025	-113,608	$6,349,268	$2,806,980	-$3,542,287
1995	378,620	476,081	97,461	$11,805,379	$14,844,209	$3,038,830
1996	525,466	486,567	-38,899	$16,384,040	$15,171,163	-$1,212,877
1997	846,643	610,491	-236,152	$26,398,331	$19,035,110	-$7,363,222
1998	715,198	697,769	-17,429	$22,299,872	$21,756,436	-$543,435

Year from	1986	Year to	2016	Note:	**Calendar Years**
				Note:	**1921 starts in Oct and 2016 ends in**
month from	1	month to	12	Note:	**1=jan, feb=2, etc.**
WAPA estimates $/MWh		31.18		Note:	**See WAPA tab**

Cal Year	Base MWh	40FJ MWh	Change (40FJ-Base) MWh	Base $	40FJ $	Change (40FJ-Base) $
1999	696,564	718,889	22,325	$21,718,855	$22,414,960	$696,106
2000	475,992	503,368	27,376	$14,841,435	$15,695,008	$853,573
2001	373,137	387,131	13,994	$11,634,411	$12,070,747	$436,336
2002	415,515	362,849	-52,666	$12,955,755	$11,313,638	-$1,642,117
2003	340,938	335,546	-5,393	$10,630,459	$10,462,320	-$168,139
2004	267,807	274,209	6,402	$8,350,208	$8,549,834	$199,626
2005	366,667	404,881	38,214	$11,432,671	$12,624,176	$1,191,505
2006	580,854	558,818	-22,036	$18,111,017	$17,423,945	-$687,072
2007	521,148	367,780	-153,367	$16,249,380	$11,467,395	-$4,781,984
2008	328,249	294,570	-33,679	$10,234,798	$9,184,683	-$1,050,115
2009	357,683	297,286	-60,397	$11,152,549	$9,269,373	-$1,883,176
2010	268,426	271,817	3,391	$8,369,532	$8,475,251	$105,719
2011	532,355	499,684	-32,671	$16,598,831	$15,580,156	-$1,018,675
2012	480,952	345,233	-135,719	$14,996,084	$10,764,354	-$4,231,731
2013	334,500	271,954	-62,546	$10,429,710	$8,479,511	-$1,950,198
2014	238,433	141,298	-97,136	$7,434,350	$4,405,661	-$3,028,690
2015	205,583	10,072	-195,510	$6,410,074	$314,057	-$6,096,017
2016	232,401	85,101	-147,300	$7,246,268	$2,653,452	-$4,592,816

September

September

September