LO213 PCWA

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February 2, 2012
SENT VIA US POST and E-MAIL eircomments@deltacouncil.ca.gov

Delta Stewardship Council
980 Ninth Street, Suite 1500
Sacramento, CA 95814
Attn: Terry Macaulay

RE: Comments on Draft Environmental Impact Report for Fifth Staff Draft Delta Plan

Dear Chair Isenberg and Members of the Council,

Placer County Water Agency (Agency) appreciates the opportunity to provide comments on the Draft Environmental Impact Report (DEIR) for the Fifth Staff Draft Delta Plan (Plan). As the Delta Stewardship Council (DSC) intends to issue a sixth and seventh draft of the Plan, the Agency reserves the right to comment on those further drafts as well as the right to comment on whether the DEIR, as it may be revised after responding to comments, provides an adequate basis for the DSC's adoption of the final Plan in the absence of supplementation and recirculation. The Agency's review of the Plan and DEIR has been conducted in collaboration with the Association of California Water Agencies, the State and Federal Contractors Water Agency, the Mountain Counties Water Resources Association and the Regional Water Authority, and the comments of those entities are adopted and incorporated herein, along with the specific comments presented below. LO213-1

The Project Description is Inadequate

As long recognized by the courts, "An accurate, stable, and finite project description is the *sine qua non* of an informative and legally sufficient EIR."(*County of Inyo v. City of Los Angeles*, 71 Cal. App. 3d 185, 193 (1977).) Without an accurate description, decision-makers and the public cannot weigh a project's environmental costs and benefits, meaningfully consider mitigation measures, or evaluate alternatives. (*See also* CEQA Guidelines § 15124 (requiring detail sufficient for "evaluation and review of the [project's] environmental impact").) CEQA requires a project description provide sufficient facts "from which to evaluate the pros and cons" of the project; an EIR in which "important ramifications" of the project remain "hidden from view" throughout the approval process "frustrates one of the core goals of CEQA." (*Santiago County Water Dist. v. County of Orange*, 118 Cal. App. 3d 818, 829 (1981).) LO213-2

Response to comment LO213-1

Comment noted.

Response to comment LO213-2

Please refer to Master Response 1. The impacts of the proposed Delta Plan on water supply and water reliability are analyzed in Section 3.0, Water Resources, of the RDEIR.

The DEIR describes the Plan's purpose and characteristics in terms that are insufficient to support a reasoned analysis of its potential impacts. While this inadequacy is undoubtedly due to the fact that the Plan itself is still in flux, that circumstance does not relieve the DSC of its obligation to prepare and circulate an environmental document that clearly informs the public, as well as the DSC and other affected state agencies, of the environmental impacts of the Plan that is ultimately adopted, and of its implementation. One of these critical potential impacts is the Plan's effect on water supply and water supply reliability, a co-equal goal of the Delta Reform Act, which may be affected by policies in Plan Chapters 4 and 5, among others. LO213-2

In addition to the instability of the project definition caused by the evolving components of the Plan, the DEIR is less than clear on the scope of the project it is analyzing: whether it is the full Fifth Staff Draft Delta Plan, or whether it is the bare policies and recommendations set forth in the Fifth Staff Draft Delta Plan. The important distinction is that the *policies* themselves, at least ERP 1, simply call for the State Water Resources Control Board to "adopt and implement flow objectives for the Delta [and high-priority tributaries in the Delta watershed] that are necessary to achieve the co-equal goals" without specifying or recommending any particular parameters for such flow objectives, as is appropriate for a Commission that does not have jurisdiction over the issue. By contrast, the *textual discussion* in the 225-page Fifth Staff Draft Delta Plan clearly advocates for a "more natural flow regime" as the goal of the flow-setting proceedings. (Plan at 108:7-9; 110:41-42; 112:3-9, 31-32, 36-87; 113.) This ambiguity should be rectified in the Final EIR. LO213-3

Another problem with the Project description is that there remains confusion concerning the extent and scope of the DSC's authority under the Plan. The Agency and others have repeatedly requested that the Plan clarify the extent to which actions taken outside of the Delta, but which could affect Delta attributes such as inflow or water quality, may be considered to be "covered actions" subject to the DSC's jurisdiction to make consistency findings. To date, the clarification has not been included. LO213-4

The lack of clarity concerning the Plan's reach may affect the DEIR's conclusions concerning its impact on water supply. As one example, WR R5 recommends that even routine changes to water rights within the Delta watershed, not just the Delta, be conditioned on demonstration that "all other feasible water supply alternatives" have been implemented. The DEIR states that its conclusions are based on an assumption that all recommendations are accepted. However, the potentially far reaching effects of the implementation of this recommendation on existing water right holders and the communities and businesses they serve is not even addressed in the Plan or the DEIR. LO213-5

Response to comment LO213-3

Please refer to Master Response 1, regarding the project description, which is the entire draft Delta Plan, not just the policies and recommendations.

Response to comment LO213-4

The definition of a covered action is established by the Delta Reform Act, Water Code section 85057.5, and is summarized in subsection 2.1.2 of the Draft Program EIR. Please refer to Master Response 1.

Response to comment LO213-5

Section 3 of the RDEIR contains an evaluation of potential impacts on water supply reliability, including diversion of water under existing water rights to meet existing water demands and growth in adopted general plans. Neither the Delta Reform Act nor the Delta Plan affects water rights (Water Code §§ 85031, 85032(i)). Please see Master Response 5 for further discussion of the EIR's analysis of the protections for exiting water uses and users. These protections are included in all of the alternatives analyzed in the EIR.

Additionally, the DEIR relies on water transfers as a means of avoiding significant water supply impacts the Plan may cause, but does not address WR P1 and WR R5, which inject substantial uncertainty concerning the standards that must be met by transferring and receiving entities to meet with the "consistency" standard and thereby consummate such transfers. LO213-6

The DEIR's Conclusions Concerning the Water Supply Impacts of the Plan are Unsupported and Misleading

Of critical importance to the Agency is the potential effect of the Plan on reliable water supply availability. The two keys to the reliability and sufficiency of the Agency's water supply are (1) the ultimate decision by the State Water Resource Control Board in establishing flow objectives in the Sacramento River and its tributaries, and (2) the feasibility of projects to offset water supply losses resulting from those objectives. As mentioned above, the Proposed Project is not well described in the DEIR. The Fifth Staff Draft Delta Plan is 225 pages long, and includes far more than the 12 policies and 61 recommendations set forth in the DEIR. For example, ERP 1 merely recommends that the State Water Resource Control Board establish flow objectives by a date certain, without specifying the nature of those objectives. This is entirely proper, inasmuch as the DSC has no jurisdiction over flow objectives. However, the DEIR recognizes the nuance and refinement contained in the full text of the Plan, noting that the flow objectives that would be adopted by the State Water Resources Control Board

> would likely result in a more natural flow regime in the Delta and Delta tributaries.

(DEIR at 4-68:5-10; 3-83.) This assumption is repeated in the analysis of water resources in Chapter 3. LO213-7

> Under the Proposed Project, the SWRCB would be encouraged to modify Delta flow objectives *in order to place more emphasis on creating a natural flow regime in the Delta.*

(DEIR at 3-84:40-41, emph. added.)

This is consistent with the Plan's textual discussion, which states outright that, "Creating a more natural flow regime in the Delta is an important step toward meeting the co-equal goal of a healthier Delta ecosystem." (Plan, at 112.) Given the Plan's emphasis on creating a more natural flow regime, however, the DEIR must provide more and better analysis of such a regime on water supplies, given the co-equal goal of water supply reliability. According to the DEIR,

Response to comment LO213-6

Policy WR P1 and recommendation WR R5 were amended in the Final Draft Delta Plan, which is analyzed in the RDEIR. WR P1 was substantially reorganized, and would apply to proposed actions to export, transfer, or use water from the Delta. WR R5 recommends that the Department of Water Resources, in consultation with the Council and others, develop guidelines for the preparation of a water supply reliability element so that water suppliers can begin implementation of WR R4 to include information on planned investments in water conservation and water supply development in updates of urban water management plans and agricultural water management plans. WR R3, which is similar to WR R5 in the Fifth Draft Delta Plan, recommends the State Water Resources Control Board to evaluate water right applications for consistency with the existing constitutional principle of reasonable and beneficial use, and other provisions of California law. As described in RDEIR Section 2, actions that would be encouraged to reduce reliance on the Delta include a wide range of actions, including water use efficiency and water conservation, local and regional water supplies (such as recycled wastewater and stormwater projects), ocean desalination, and water transfers, especially in areas located outside of the Delta that use Delta water.

Response to comment LO213-7

Please refer to response to comment LO213-8 and Master Response 5.

environmental analysis of the impact of ERP 1 assumes that the Plan's goal of "more natural flow regime" will be implemented by the State Water Resources Control Board.[1]

The DEIR's blithe impact assessment fails to meet the requirements of CEQA. While acknowledging that "water would continue to be available for municipal, agricultural and industrial water uses, but at a reduced amount." the DEIR's stunning conclusion, after a single page of discussion (of the DEIR's more than 2000 pages of text), is that "there is no substantial evidence that this impact [of a more natural flow regime] would be significant," and that "the total water supply available would remain the same or increase." This conclusion is completely unsupported by fact. It appears in section 3.4.3.2.3 (DEIR at 3-84 to 3-85) and is apparently based solely on the presumed availability of alternate sources such as surface and groundwater, stormwater runoff, desalination, recycled wastewater, water transfers and water efficiency projects, which would substitute for the reduction in Delta water. (*Id.*) Absolutely no analysis of the availability or feasibility of such replacement supplies is undertaken in the DEIR. LO213-7

As the DEIR should note, many of these replacement sources are infeasible or unavailable in much of the study area. Groundwater is absent in roughly half of the study area (See DEIR, Fig. 3-3), including most of Placer County and other foothill and mountain communities. Additionally, due to constraints of terrain and legal authority, recycled water is infeasible to many steep foothill and mountain areas within the Delta watershed; these same factors limit potential for water transfers to provide replacement water.

In analyzing the availability of replacement water supplies, the DEIR should also recognize the chilling effect on development of alternate water supplies that is the outfall of two other policies: WR R5 and WR P2. WR R5's requirement that "all other feasible water supply alternatives" be demonstrated before water right change petitions could be approved may discourage water agencies' management of existing water supplies in a flexible and creative manner. The requirement creates a vague standard that is expensive and could well be productive of litigation and delay. WR P2's requirement that water transfer terms be negotiated in public would undermine consummation of water transfers. Furthermore, all water potentially transferable would also originate in the Delta watershed and either be affected by the same supply reduction or affect Delta inflow.

LO213-8

[1] "The policies and recommendations . . . are statements of policy direction to other agencies which, if the direction is followed, could lead to types of specific physical actions[3] . . . . fn[3]: This EIR assumes that the Delta Plan will be successful and will lead to other agencies taking physical action." (DEIR at ES-2) "In other words, the analysis in this EIR assumes that the Delta Plan has the desired outcome." (DEIR at 2-2B: 21-22.)

Response to comment LO213-8

As described on page 2A-39, Lines 38 through 40, of the Draft Program EIR and Master Response 5, it is anticipated that implementation of updated water quality and flow objectives by the State Water Resources Control Board (SWRCB) could increase Delta outflow, reduce current reverse flow conditions in the south Delta, increase flows in restored Delta floodplains, and result in a more "natural flow regime" in the Delta. Neither the Delta Plan nor the SWRCB's flow objectives will affect water rights. Following the adoption of its flow objectives, the SWRCB will engage in a further public proceeding, including complete environmental review, concerning implementation of the objectives, which may include altering water rights. Please see Master Response 5 for further discussion of the EIR's analysis of the updated flow objectives and the protections for exiting water uses and users.

Capture of stormwater runoff for subsequent use would have the same effect on the natural flow regime as diverting water to storage. Desalination is unavailable to many jurisdictions due to their distance from the ocean. Water suppliers are already increasing conservation efforts to meet the requirements of SB7x 7, even where not locally cost-effective.

In short, because of terrain and absence of non-tributary water supplies, the reduction in water supply due to flow objectives implementing a "more natural flow regime" would almost certainly constitute an *unavoidable significant impact* to areas upstream of the Delta. For a valid and adequate analysis of the water supply impact, the FEIR must, at a minimum, distinguish in its analysis between areas that receive water *from* the Delta, and those areas located upstream in the Delta watershed. Furthermore, since water supply reliability is one of the co-equal goals of the Delta Plan, the benefits of a "more natural flow regime" cannot simply be considered in isolation from the impacts of such a regime on water supply as the DEIR attempts to do.[2] The trade-off of water supply reliability and ecosystem benefit must be made explicit. LO213-8

Description of the Alternatives Erroneously Characterizes their Effect with the Description of the Alternatives, Prejudicing their Impact Analysis

Section 2A of the DEIR is set forth as "descri[bing] the characteristics of the Proposed Project and alternatives." (DEIR at 2A-1.). Alternative 1B is denominated an alternative "to export more water out of the Delta." However, nowhere in Alternative 1B, as fully set forth in the Appendix, is any provision to "export more water out of the Delta." Yet this is how it (and also Alternative 1A) are "described." Ultimately, neither the Proposed Project nor any of the alternatives has a legitimate goal related to the amount of water exported from the Delta. The Alternative descriptors are irrelevant, misleading and prejudicial and should be deleted, and a more accurate and unbiased description of the alternatives should be prepared for the final EIR. LO213-9

The Basis of DEIR Conclusions Concerning Alternatives is Unsupported

Compounding the bias suggested in the names given the alternatives in the DEIR is the fact that the description of each alternative contains conclusory statements disparaging its efficacy in advancing the co-equal goals of the Delta Reform Act. The basis for these conclusions is never explained. For example, the DEIR sets forth no logical connection between the provisions of Alternative 1B and its "description" in the DEIR that ". . . the types of facilities that would

[2] The authors of the DEIR should consult the analysis of such a flow regime by the State and Federal Contractors Water Agency, attached hereto and incorporated herein by reference, for more information concerning the impact of a "more natural flow regime." LO213-10

Response to comment LO213-9

Alternative 1B does not include the same aggressive schedule to complete the Delta water quality improvement actions as the proposed Delta Plan. This slower schedule could result in more water supplies for areas outside the Delta that use Delta water (SWP and CVP water users) because of delayed implementation of revised flow objectives that would be more protective of public trust resources, as described in Section 2A and Appendix C of the Draft Program EIR.

Response to comment LO213-10

Please refer to the response to comment LO213-9.

increase water use efficiency and reduce reliance on the Delta (such as described in subsection 2.2.1)[3] *would be less likely under Alternative 1B* compared to the Proposed Project." (DEIR at 2A-95, emph. added.) This conclusion, which is inappropriate in a *description* of the Alternative in any event, is mystifying in light of the limited scope of the Plan: LO213-10

> The Proposed Project does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council.

(DEIR at 2A-5.)

According to the DEIR, the Plan would simply "*encourag*[e] various actions which, *if* taken, *could* lead to . . . projects that could provide a more reliable water supply." (*Id.*, emphasis added.) The only hint as to why the DEIR authors might have considered the Proposed Project to be more efficacious than Alternatives 1A or 1B might be its description of WR P1's "three component" provisions. However two of the three components of WR P1 are already law: the first, "compliance with State law" would be required whether included in WR P1 or not; the second, "addition of a water supply reliability element in urban and agricultural water management plans" is also already required by state law (Water Code sec. 10635). Only WR P1's directive that water suppliers develop a "conservation-oriented rate structure" is not already expressly required under state law. However, it is a Best Management Practice subscribed to by the members of the California Council for Urban Water Conservation, which represent about 75% of California's urban water deliveries.[4] CCUWC's BMP 11 requires volumetric pricing, also known as conservation pricing, of water.[5] Urban water suppliers are also required by law to adopt conservation strategies that will result in statewide reduction in urban per capita water use of 20% by 2020. In light of these overriding state mandates, it is unclear how much "more likely" water use efficiency projects would be under the Plan than under Alternative 1A or 1B. LO213-11

One of the signal purposes of an EIR is to inform decision-makers of the advantages and disadvantages of the alternatives available to them. Opinions expressed by the authors of an EIR are only as good as the facts and logic supporting them. As one Court of Appeal put it, LO213-12

[3] DEIR subsection 2.2.1 lists potential water replacement projects as surface and groundwater projects, ocean desalination, recycled wastewater and stormwater, water transfers and water efficiency projects (see DEIR at 2A-5.)

[4] CUWCC Strategic Plan 2009-2010 at 9: http://www.cuwcc.org/WorkArea/showcontent.aspx?id=8522

[5] BMP 11 is set forth at http://www.cuwcc.org/BMP-11-Rates.aspx

Response to comment LO213-11

Policy WR P1 has been amended in the Final Draft Delta Plan, which is analyzed in the RDEIR. In summary, policy WR P1 now states that water shall not be exported from, transferred through, or used in the Delta under conditions that include failure of water suppliers to contribute to reduced reliance on the Delta and to improve regional self reliance. The full text of WR P1 can be found in RDEIR, Appendix C, Table C-11, page C-3, and Final Draft Delta Plan, page 108. Recommendation WR R1 also has been amended in the Final Draft Delta Plan. In summary, recommendation WR R1 now recommends that all water suppliers should implement applicable water efficiency and water management laws, including urban water management plans. The full text of WR R1 can be found in RDEIR, Appendix C, Table C-12, page C-12, and Final Draft Delta Plan, page 109. Completion of Urban Water Management Plans is not mandatory unless a water agency requires approvals or funding from a state agency. The inclusion of provisions also would require completion of Urban Water Management Plans for projects that needed to be consistent with the Delta Plan.

Response to comment LO213-12

Please refer to Master Response 3 and Section 25, Comparison of Alternatives, of the RDEIR.

> The value of opinion evidence rests not in the conclusion reached but in the factors considered and the reasoning employed. Where an expert bases his conclusion upon assumptions which are not supported by the record, upon matters which are not reasonably relied upon by other experts, or upon factors which are speculative, remote or conjectural, then his conclusion has no evidentiary value. In those circumstances the expert's opinion cannot rise to the dignity of substantial evidence.

(*Pacific Gas & Electric Co. v. Zuckerman* (1987) 189 Cal.App. 3d 1113, 1135.) When the DSC makes its decision adopting the Delta Plan, "the public and decision-makers, for whom the EIR is prepared, should also have before them the basis for that opinion so as to enable them to make an independent, reasoned judgment." (*Santiago County Water Dist v. County of Orange* (1981) 118 Cal.App. 3d 818, 831.) The DEIR should, therefore, be revised to include a reasoned analysis, with citation to supporting facts, of its conclusions comparing the Proposed Plan to the Alternatives. LO213-12

Conclusion

In sum, to be adequate, the EIR will need to provide better linkage between its conclusions and the facts on which the conclusions are based. It must also distinguish between impacts and potential mitigation available upstream of the Delta and impacts within and "below" the Delta. In a 2000+ page environmental document, water supply reliability effects merit more than a summary page of discussion. The goal of water supply reliability is co-equal with that of ecosystem health, and is of vital concern to water suppliers throughout the State, and the impact of the Plan on water supply deserves a complete and comprehensive analysis. LO213-13

Sincerely,
PLACER COUNTY WATER AGENCY

Michael R. Lee
Chairman, Board of Directors

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Response to comment LO213-13

Please refer to responses LO213-1 to LO213-12.

Water and Power Policy Group

Hydrologic Modeling Results and Estimated Potential Hydropower Effects Due to the Implementation of the State Water Resources Control Board Delta Flow Criteria

December 2011

Prepared by:

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HDR | ONE COMPANY
Many Solutions℠

No comments

- n/a -

No comments

- n/a -

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Member Organizations of the Water and Power Policy Group

*** State and Federal Contractors Water Agency**

*** San Joaquin River Group**

*** Western Area Power Authority**

*** Pacific Gas and Electric Company**

*** Sacramento Municipal Utilities District**

*** Redding Electric Utility**

*** Association of California Water Agencies**

*** Placer County Water Agency**

Northern California Power Agency

California Municipal Utilities Association

Yuba County Water Agency

* Member Organizations helping to fund the effort.

No comments

- n/a -

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No comments

- n/a -

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Tables

No comments

- n/a -

Figures

No comments

- n/a -

No comments

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No comments

- n/a -

1.0 INTRODUCTION

At the direction of the Water and Power Policy Group, the HDR Team investigated the potential effects of implementing the SWRCB DFC. This product does not constitute the culmination of this project, but it does provide a marker from which further effort may proceed. To this end, we have identified hydropower effects caused by the alternative flow criteria on the CVP and SWP, as well as analyzed hydropower effects on San Joaquin River tributaries. It is our belief that a great percentage of the statewide hydropower effects can be identified by this level of analysis.

This document summarizes our analysis of potential effects the State Water Resources Control Board Delta Flow Criteria (SWRCB DFC) may have on CVP/SWP operations, San Joaquin River operations, and hydropower.

This document consists of the following sections:

- Definition of SWRCB DFC and those included in this analysis
- Summary of conclusions and modeling results
- Analytical approach
- Detailed modeling results

1.1 Background

To analyze the potential effects that the SWRCB DFC may have on hydropower, the following SWRCB DFC were analyzed:

- Delta Outflow Recommendation (75 percent of unimpaired flow from January through June).
- Sacramento River at Rio Vista (75 percent of unimpaired flow from November through June).
- San Joaquin River at Vernalis (60 percent of unimpaired flow from February through June).
- Old and Middle River (OMR) flow criteria (> than -1500 cfs in dry and critical years).

1.1.1 Delta Outflow Recommendation

The Delta Outflow Recommendation of 75 percent of unimpaired from January through June, and the unimpaired flow is used to determine flow requirements. Delta Smelt Fall X2 is included in the Existing (BO's) and as part of the SWRCB DFC. Data is provided in **Figure 1;** *Source: Table 20 Delta Outflow Summary Criteria, California Department of Water Resources Report, California Central Valley Unimpaired Flow Data, Fourth Edition, November 2006.*

No comments

- n/a -

Figure 1 - Delta Outflow Summary Criteria.

Table 20. Delta Outflow Summary Criteria

Delta Outflow Recommendations												
Category A												
Water Year												**Criteria**
O	N	D	J	F	M	A	M	J	J	A	S	
												1) Net Delta Outflow: 75 percent of 14-day average unimpaired flow
Category B												
Water Year												**Criteria**
O	N	D	J	F	M	A	M	J	J	A	S	
												2) Delta Smelt Fall X2 a. Wet years X2 less than 74 km (greater than approximately 12,400 cfs) b. Above normal years X2 less than 81 km (greater than approximately 7,100 cfs)
												3) 2006 Bay-Delta Plan Delta Outflow Objectives (critical, dry and below normal years)
Basis for Criteria and Explanation												

1) Promote increased abundance and improved productivity (positive population growth) for Longfin Smelt and other desirable estuarine species
2) Increase quantity and quality of habitat for Delta Smelt; Fall X2 requirement limited to above normal and wet years to reduce potential conflicts with cold water pool storage, while promoting variability with respect to fall flows and habitat conditions in above normal and wet water year types; expected to result in improved conditions for Delta Smelt, however, the statistical relationship between Fall X2 and abundance is not strong; note 2) above regarding need for improved understanding concerning the Fall X2 action also applies
3) Fish and wildlife beneficial use protection

Notes:
- These flow criteria do not consider any balancing of public trust resource protection with public interest needs for water.
- All flows are subject to appropriate ramping rates to avoid ramping impacts to public trust resources.
- These flow recommendations should be tempered by tributary specific flow needs and the need to manage cold-water resources for the protection of public trust resources.
- Criteria for percentages of unimpaired flows apply only up to a specified maximum cap; appropriate maximum flow caps still need to be determined based on public trust needs and to avoid flooding.
- Additional flows may be needed for the protection of public trust resources for periods of time for which no flow criteria are recommended or where 2006 Bay-Delta Plan flow objectives are recommended, but adequate information is not available at this time to recommend such flows.

Included in analysis

Included in Baseline

1.1.2 Sacramento River

The Sacramento River requirement is modeled as 75 percent of unimpaired Sacramento River at Hood, plus an unimpaired Yolo Bypass flow into the Delta from November through June, rather than at Rio Vista. This model is more conservative (using less water) in comparison if it were modeled at Rio Vista.

No comments

- n/a -

The meeting 75 percent of unimpaired flow at Rio Vista requires the Sacramento River and the Yolo Bypass to be at 88 to 100 percent of the unimpaired flow, due to Cross Channel and the Georgiana Slough flow. The Rio Vista flow requires is included in the BO's as part of the SWRCB DFC. However, the Wilkins Slough and the Freeport flows of 13,000 to 17,000 cfs were not analyzed. Data is provided in **Figure 2;** *Source: Table 21 Sacramento River Inflow Summary Criteria, California Department of Water Resources Report, California Central Valley Unimpaired Flow Data, Fourth Edition, November 2006.*

Figure 2 - Sacramento River Inflow Summary Criteria

Table 21. Sacramento River Inflow Summary Criteria

Sacramento River	
Category A	
Water Year (O N D J F M A M J J A S)	**Criteria**
	1) Rio Vista: 75 percent of 14-day average unimpaired flow
Category B	
Water Year (O N D J F M A M J J A S)	**Criteria**
	2) Rio Vista: 75 percent of 14-day average unimpaired flow to support same functions as #1 for other runs of Chinook salmon
	3) Wilkins Slough: Provide pulse flows of 20,000 cfs for 7 days starting in November coinciding with storm events producing unimpaired flows at Wilkins Slough above 20,000 cfs until monitoring indicates that majority of smolts have moved downstream
	4) Freeport: Positive flows in Sacramento River downstream of confluence with Georgiana Slough while juvenile salmon are present (approximately 13,000 to 17,000 cfs)
	5) Sacramento River at Rio Vista: 2006 Bay-Delta Plan flow objectives

Included in analysis

Included in Baseline

Basis for Criteria and Explanation, and Notes

1) Increases juvenile salmon outmigration survival for fall-run Chinook salmon
2) Promote juvenile salmon emigration for other runs of Chinook salmon
3) Increases juvenile salmon outmigration survival by reducing diversion into Georgiana Slough and the central Delta
4) Increases juvenile salmon outmigration survival
5) Fall adult Chinook salmon attraction flows

Notes:

- These flow criteria do not consider any balancing of public trust resource protection with public interest needs for water.
- All flows are subject to appropriate ramping rates to avoid ramping impacts to public trust resources.
- These flow recommendations should be tempered by tributary specific flow needs and the need to manage cold-water resources for the protection of public trust resources.
- Criteria for percentages of unimpaired flows apply only up to a specified maximum cap; appropriate maximum flow caps still need to be determined based on public trust needs and to avoid flooding.
- Additional flows may be needed for the protection of public trust resources for periods of time for which no flow criteria are recommended or where 2006 Bay-Delta Plan flow objectives are recommended, but adequate information is not available at this time to recommend such flows.

[1] Definition of storm, number of storms, and how to determine when the majority of juveniles have outmigrated needs to be determined.

No comments

- n/a -

1.1.3 San Joaquin River

The San Joaquin Rivera at Vernalis was analyzed at 60 percent of unimpaired flow from February through June. Data is provided in **Figure 3;** *Source: Table 22 San Joaquin River Inflow Summary Criteria, California Department of Water Resources Report, California Central Valley Unimpaired Flow Data, Fourth Edition, November 2006.*

Figure 3 - San Joaquin River Inflow Summary Criteria

Table 22. San Joaquin River Inflow Summary Criteria

San Joaquin River												
Category A												
Water Year												**Criteria**
O	N	D	J	F	M	A	M	J	J	A	S	
												1) Vernalis: 60 percent of 14-day average unimpaired flow
												2) Vernalis: 10 day minimum pulse of 3,600 cfs in late October (e.g., October 15 to 26)
Category B												
Water Year												**Criteria**
O	N	D	J	F	M	A	M	J	J	A	S	
												3) 2006 Bay-Delta Plan October pulse flow

Included in analysis

Included in Baseline

Basis for Criteria and Explanation, and Notes

1) Increase juvenile Chinook salmon outmigration survival and provide conditions that will generally produce positive population growth in most years and achieve the doubling goal in more than half of years
2) Minimum adult Chinook salmon attraction flows to decrease straying, increase DO, reduce temperatures, and improve olfactory homing fidelity
3) Adult Chinook salmon attraction flows

Notes:

- These flow criteria do not consider any balancing of public trust resource protection with public interest needs for water.
- All flows are subject to appropriate ramping rates to avoid ramping impacts to public trust resources.
- These flow recommendations should be tempered by tributary specific flow needs and the need to manage cold-water resources for the protection of public trust resources.
- Criteria for percentages of unimpaired flows apply only up to a specified maximum cap; appropriate maximum flow caps still need to be determined based on public trust needs and to avoid flooding.
- Additional flows may be needed for the protection of public trust resources for periods of time for which no flow criteria are recommended or where 2006 Bay-Delta Plan flow objectives are recommended, but adequate information is not available at this time to recommend such flows.

1.1.4 Old and Middle River, Inflow-Export Ratios, and Jersey Point

The Old and Middle River (OMR) did not analyze San Joaquin River flow to export ratio. The OMR included flows included in the BO's and the SWRCB DFC (**Figure 4**: *Source: Table 23: No. 4-6, Hydrodynamics Summary Criteria, California Department of Water Resources Report,*

No comments

- n/a -

California Central Valley Unimpaired Flow Data, Fourth Edition, November 2006). The Jersey Point criteria is not addressed in the data.

Figure 4 - Hydrodynamics Summary Criteria

Table 23. Hydrodynamics Summary Criteria

Hydrodynamics: Old and Middle River, Inflow-Export Ratios, and Jersey Point	
Category A	
Water Year O N D J F M A M J J A S	**Criteria**
	1) San Joaquin River Flow to Export Ratio: Vernalis flows to exports greater than 0.33 during fall pulse flow (e.g., October 15 – 26); complementary action to San Joaquin River Inflow recommendation #2
Category B	
Water Year O N D J F M A M J J A S	**Criteria**
	2) Old and Middle River Flows: greater than -1,500 cfs in Critical and Dry water years
	3) Old and Middle River Flows: greater than 0 or -1,500 cfs in Critical and Dry water years, when FMWT index for longfin smelt is less than 500, or greater than 500, respectively
	4) Old and Middle River Flows: greater than -5,000 cfs in all water year types
	5) Old and Middle River Flows: greater than -2,500 when salmon smolts are determined to be present in the Delta
	6) San Joaquin River Flow to Export Ratio: Vernalis flows to exports greater than 4.0 when juvenile San Joaquin River salmon are migrating in mainstem San Joaquin River
	7) Jersey Point: Positive flows when salmon present in the Delta
	8) 2006 Bay-Delta Plan Exports to Delta Inflows
Basis for Criteria and Explanation	

1) Reduce straying and improve homing fidelity for San Joaquin basin adult salmon
2) Reduce entrainment of larval / juvenile delta smelt, longfin smelt, and provide benefits to other desirable species
3) Same as number 2), but if the previous FMWT index for longfin smelt is less than 500, then OMR must be greater than 0 (to reduce entrainment losses when abundance is low), or greater than -1,500 if the previous FMWT index for longfin smelt is greater than 500
4) Reduce entrainment of adult delta smelt, longfin smelt, and other species; less negative flows may be warranted during periods when significant portions of the adult smelt population migrate into the south or central Delta; thresholds for such flows need to be determined
5) Reduce risk of juvenile salmon entrainment and straying to central Delta at times when juveniles are present in the Delta; will also provide associated benefits for adult migration
6) Improve survival of San Joaquin River juvenile salmon emigrating down the San Joaquin River and improve subsequent escapement 2.5 years later
7) Increase survival of outmigrating smolts, decrease diversion of smolts into central Delta where survival is low, and provide attraction flows for adult returns
8) Protection of estuarine dependent species

(cont.)

No comments

- n/a -

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No comments

- n/a -

2.0 OVERVIEW

The analytical approach used for this effort was the latest publically available version of the CalSim II model. This version was used by the DWR to develop its 2009 State Water Program (SWP) Reliability Study, published by DWR on January 29, 2010.

The version was ideal for the application, because it was used to evaluate criteria submitted to the SWRCB during its Delta proceeding, and it has been used by members of the consultant team to evaluate the final criteria developed by the SWRCB.

The baseline CalSim II Study (BST_2005A01A_Existing_DRR_2Step) includes reasonable and prudent alternatives (RPAs) contained in the 2008 Fish and Wildlife Service Biological Opinion for the Coordinated Operations and the 2009 National Marine Fisheries Service Biological Opinion for OCAP.

The SWRCB DFC criteria's described above are input into the CalSim II Existing Conditions (BO's) model simulation to develop a model simulation with the SWRCB DFC. These model simulations are compared to derive changes to the water system, and then determine the hydropower impacts.

2.1 Summary of the State Water Resources Control Board Delta Flow Criteria Impacts

Table 1 - Summary of SWRCB DFC Impacts

Description	Impacts
Four of the SWRCB DFCs were analyzed, and assumptions made that imposed less onerous burden on water system.	▪ Effects to the water system were very severe, resulting in the inability to produce viable operations.
Increase in Delta Outflow	▪ There was approximately at 5 MAF of increased Delta outflow.
Significant and regular cuts	▪ Senior Water Rights holders (including pre-1914, Sacramento Settlement, and Exchange contractors, are cut regularly and significantly
Devastating decrease in project deliveries	▪ M&I South of Delta – 1.1 MAF = 2.5 Million households. ▪ Agriculture – 2 Million acres out of production (7000,000 + North, 1 Million + South).
Unable to meet biological opinions	▪ Impossible to meet salmon and smelt criteria. ▪ Cannot meet existing flow standards, including SWRCB D-1641.
Upstream storage	▪ Lower storage in all seasons. ▪ Fish habitat and cold water pool heavily impacted. ▪ Reduced hydropower capacity caused by loss in head.
State-wide impacts	▪ Impacts to groundwater storage. ▪ Reduced ability for conjunctive management. ▪ Impacts to Ephemeral streams and habitats.
Pacific Flyway Delivery	▪ Significant reduction in refuge delivery effective Pacific Flyway.

No comments

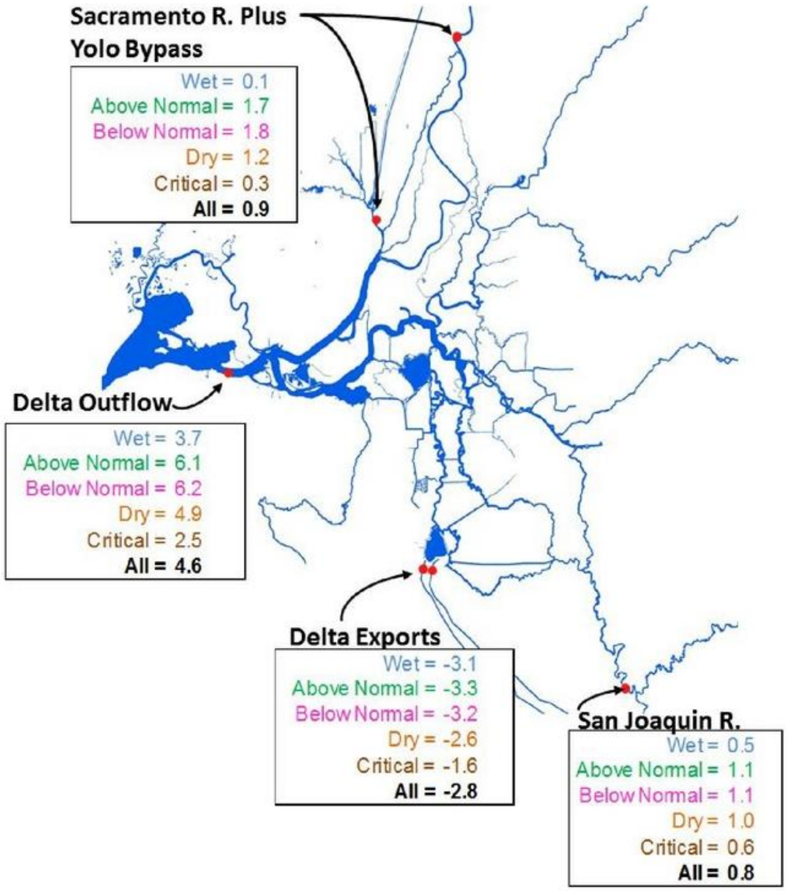
- n/a -

Description	Impacts
CVP/SWP Hydropower Generation	▪ A 30% average annual reduction in combined CVP/SWP generation. ▪ Change in timing (generation shifted to spring months when already surplus power in the system. ▪ Reduction in summer and fall months. ▪ Spring energy production is 50% greater with the SWRCB DFC than with the existing conditions. ▪ Summer energy production with the SWRCB DFC is about 50% less than with existing. ▪ Shift in timing of generation will produce economic cost. ▪ Summer generation value is 30% greater than on an MWh basis.
CVP/SWP Hydropower Generation Cost	▪ At 12,000 KWh/year/household the average annual generation reduction is equivalent to nearly 250,000 households each year.
CVP/SWP Load	▪ A decrease in Delta exports. ▪ A decrease in project use load, but will require additional energy for desalination of replacement water (greater than the project use load), savings by 2,000 GWh – at 12,000 KWh/year/household the average annual additional energy for desolation is equivalent to nearly 165,000 households per year. ▪ Replacement power costs will be 200 percent more costly than project power.
San Joaquin Tributary Hydropower Generation	▪ Don Pedro – Overall reduction in annual generation of 23% (135 GWH) ▪ Exchequer – Overall reduction in annual generation of 26% (90 GWH)
San Joaquin Tributary Hydropower Generation Cost	▪ At 12,000 KWh/year/household the average annual Don Pedro generation reduction is equivalent to over 11,000 households each year. ▪ At 12,000 KWh/year/household the average annual Exchequer generation reduction is equivalent to 7,500 households each year.

No comments

- n/a -

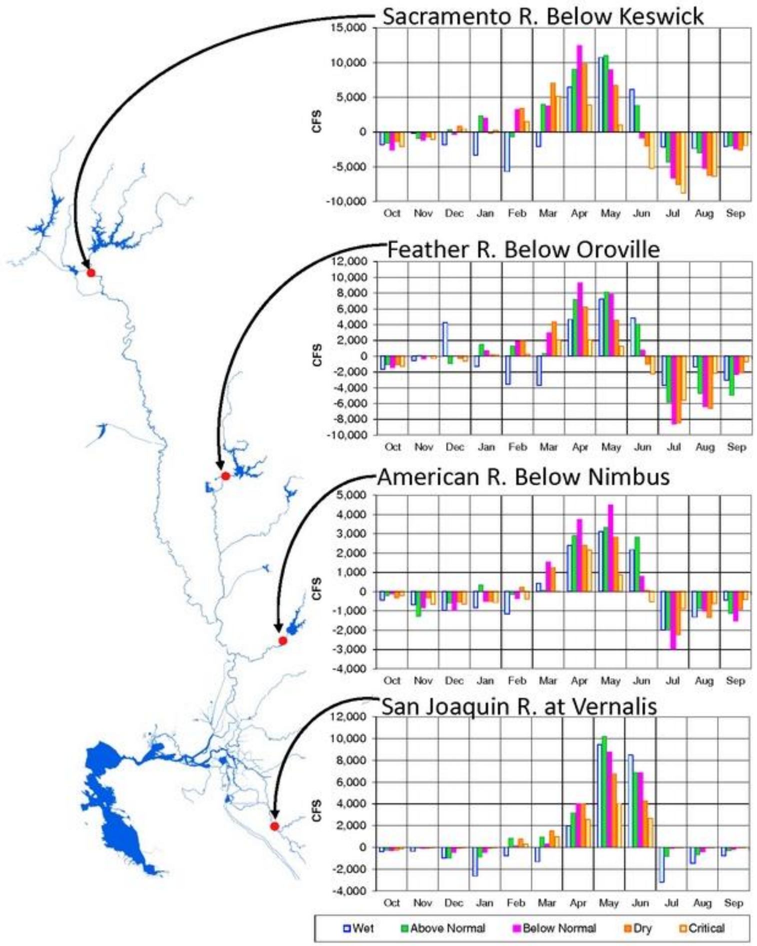
Figure 5 - Summary of Changes in Delta Boundary Flows - SWRCB DFC minus Existing (BO's). Average Annual Changes by 40-30-30 Water Year Type (MAF).



No comments

- n/a -

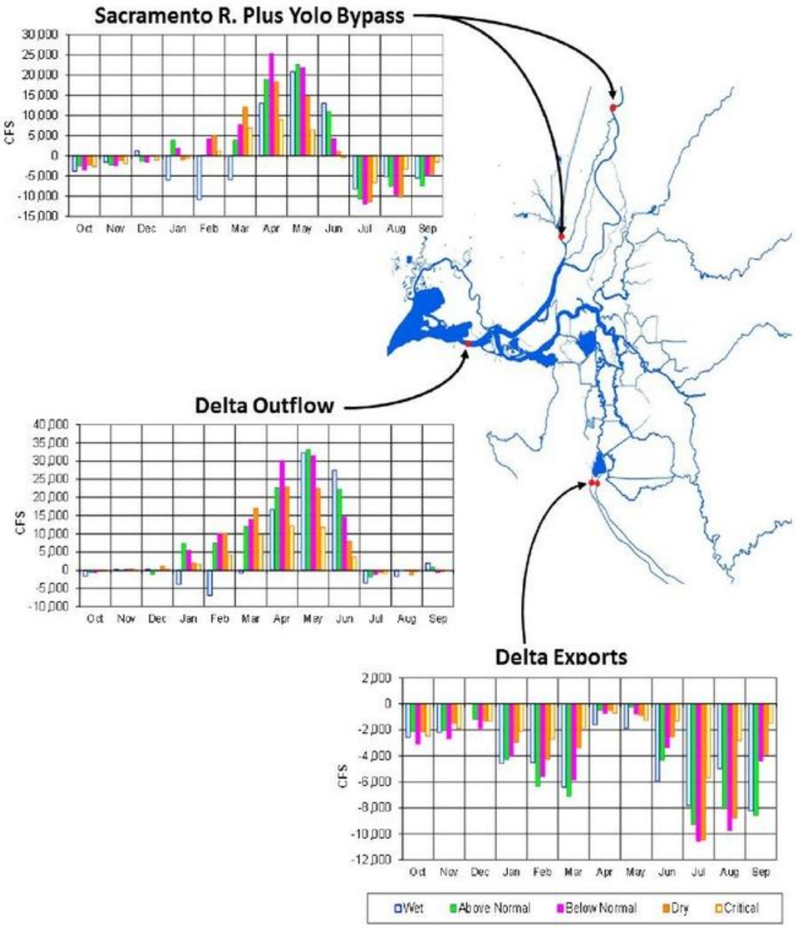
Figure 6 - Summary of Changes in Key River flows - SWRCB DFC minus Existing (BO's). Average Monthly Changes by 40-30-30 Water Year Type (cfs).



No comments

- n/a -

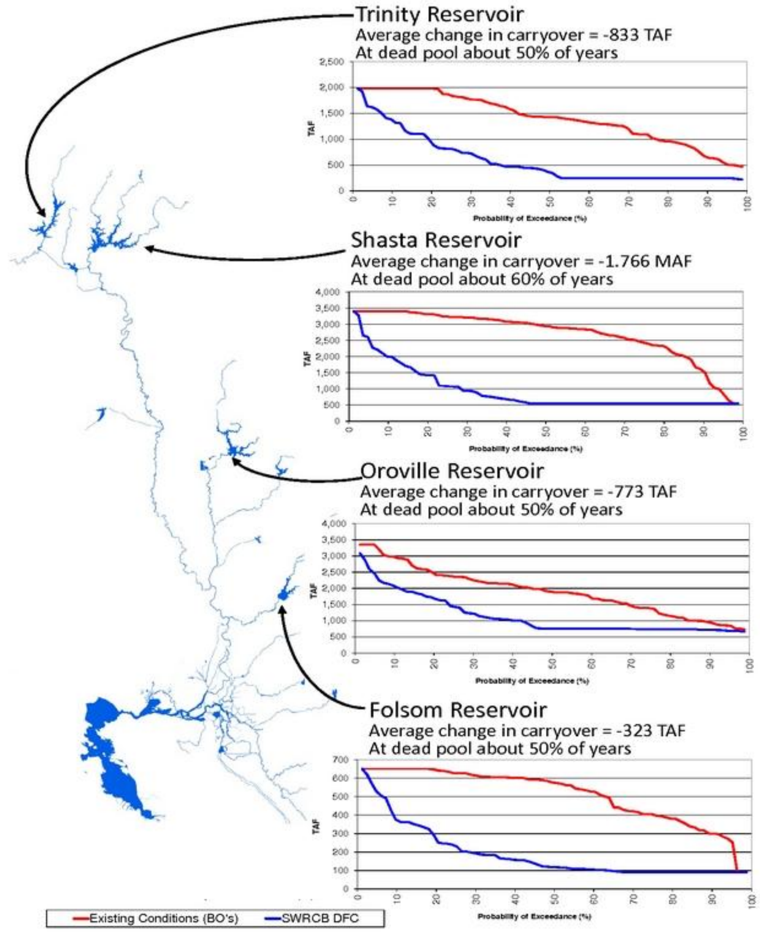
Figure 7 - Summary of Changes in Delta Boundary Flows - SWRCB DFC minus Existing (BO's). Average Monthly Changes by 40-30-30 Water Year Type (cfs).



No comments

- n/a -

Figure 8 - Summary of Main CVP/SWP Reservoir Carryover - SWRCB DFC and Existing (BO's). End of September Storage (TAF).



No comments

- n/a -

3.0 ANALYTICAL APPROACH TO HYDROPOWER MODELING

The analytical approach used for this effort was to employ available hydropower models utilizing CalSim II model output from simulations described in Section 2.0. For the CVP hydropower analysis, Reclamation's LongTermGen spreadsheet was used. For the SWP hydropower analysis, DWR's SWPGen spreadsheet was used. Proprietary models for the San Joaquin River tributary hydropower analyses were employed by Daniel B. Steiner, Consulting Engineer, to obtain results for these watersheds.

The analysis of the SWRCB DFC was performed using several different models to define both a baseline operations and an operation with the SWRCB DFC. Effects due to the SWRCB DFC are derived by comparing model simulations with and without the SWRCB DFC. The following flowchart illustrates the models used and information passing between models. Components of the flowchart are described in detail in this section.

3.1 CalSim II

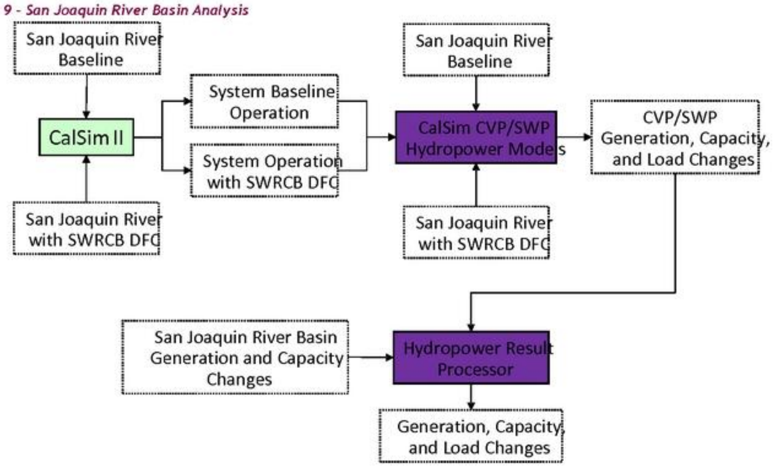
CalSim II is a planning model designed to simulate the CVP and SWP water delivery systems while meeting various instream flow requirements, in-basin use obligations, and flood control criteria. The CalSim II model simulation used to support the State Water Project Delivery Reliability Report (SWP DRR) is the best available modeling tool and latest public release of the model. Appendix A of the SWP DRR describes the CalSim II modeling assumptions. For this analysis CalSim II was used to assess changes in CVP / SWP storage, river flows, water deliveries, and Delta conditions. The SWP DRR may be found at the following web location: http://baydeltaoffice.water.ca.gov/swpreliability/Reliability2010final101210.pdf

Besides its public availability, this version is ideal for the application because it has already been used to evaluate criteria submitted to the State Water Resources Control Board (SWRCB) during its Delta proceeding, and it has been used by members of the consultant team to evaluate the final criteria developed by the SWRCB. The baseline CalSim II study (BST_2005A01A_Existing_DRR_2Step) includes reasonable and prudent alternatives (RPAs) contained in the 2008 Fish and Wildlife Service Biological Opinion for the Coordinated Operations and the 2009 National Marine Fisheries Service Biological Opinion for OCAP.

No comments

- n/a -

Figure 9 - San Joaquin River Basin Analysis



3.2 CVP/SWP Hydropower Effects

The implementation of the SWRCB DFC creates considerable hydropower effects. These effects though sizeable on a monthly basis are likely to be even greater when brought into the world of real-time operations.

The analyses portrayed in this report are necessarily conducted on a monthly basis because of the limitations on data used for comparative input. These data are the result of CalSim II simulations of SWP/CVP conditions expected to occur in the future with and without the SWRCB DFC. Because CalSim II is constrained by its own input data which only exists on a monthly time step, so therefore is the hydropower analysis possible on a monthly basis.

Hydropower effects obtainable from the models include production; generation (MWH) and capacity (MW) at project power plants; and, energy use (MWH) and demand (MW) at project pumping plants. Not identifiable with these tools are the ancillary services: scheduling and dispatch, reactive power and voltage control, loss compensation, load following, system protection, and energy imbalance.

This report expresses results at Load Center, which is assumed to be at Tracy California. Values shown for load center include adjustments for station service at, and line losses from,

No comments

- n/a -

power plants as well as station service at and line losses to pumping plants. Reported energy values are averages over the month and capacity values are also head dependent monthly averages.

Given the limitations of a monthly time step, effects of the comparisons are largely identified by the temporal distribution of hydropower production and use along with the annual changes in these quantities.

3.3 San Joaquin River Tributary Hydropower Effects

Analysis of the San Joaquin River Basin was prepared for the San Joaquin River Group Authority by Daniel B. Steiner, Consulting Engineer, and the analysis is described in his February 15, 2011 paper titled: *"Power Operation Impact Analysis Associated with SWRCB Staff Vernalis Flow Requirements."* The purpose of this analysis was to describe the results of preliminary analyses that illustrate quantifiable potential power generation effects of alternative flow requirements applied to the major rim reservoir projects located on the Stanislaus, Tuolumne and Merced rivers. The analysis produced results that illustrate the magnitude of potential effects, in terms of monthly and annual energy production and the seasonal shifts of generation that could occur. These results are derived from models that have been used by the San Joaquin River Group Authority (SJRGA) and its members throughout recent watershed and basin planning efforts. Power generation is modeled as an incidental result of reservoir releases. Generation efficiency (kWh/AF) and capability (MW) curves, based on the reservoir elevation/storage parameter, applied to reservoir releases, provide month to month (or more frequent) generation values for each model's simulation period.

Similar to the discussion on CVP/SWP Hydropower Effects, San Joaquin River Hydropower effects are expressed in the same manner. Although different tools are incorporated into the analyses, the resultant comparisons are presented in the same manner as the CVP/SWP. Exceptions to the above are, however, that no adjustments are made to reflect quantities at the Tracy load center, nor are there any loads identified for these tributary projects.

No comments

- n/a -

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No comments

- n/a -

4.0 DETAILED ANALYTICAL RESULTS

Changes in the water system and hydropower are characterized by the following parameters:

- Changes in Delta outflow.
- Effectiveness of system to satisfy SWRCB flow requirements and SWRCB DFC.
- Sacramento River Basin flow to Delta.
- Effects on Delta Exports.
- Effects on Sacramento River Basin ground water.
- Effects on Shasta Lake and Upper Sacramento River.
- Effects on Trinity operations.
- Effects on Folsom Lake and the American River.
- Effects on Oroville and the Feather River.
- Effects on the San Joaquin River at Vernalis.
- Effects on San Luis Reservoir operations.
- Effects on CVP / SWP water deliveries.
- Effects on CVP / SWP hydropower generation.
- Effects on CVP / SWP energy load.

4.1 Change in Delta Outflow - SWRCB DFC Minus Existing (BO's)

- Large increases in January through June.
- Decreases in January and February in wet years as reservoirs refill.

No comments

- n/a -

Figure 10 - Changes in Delta Outflow - SWRCB DFC Minus Existing (BO's). Average by Year Type

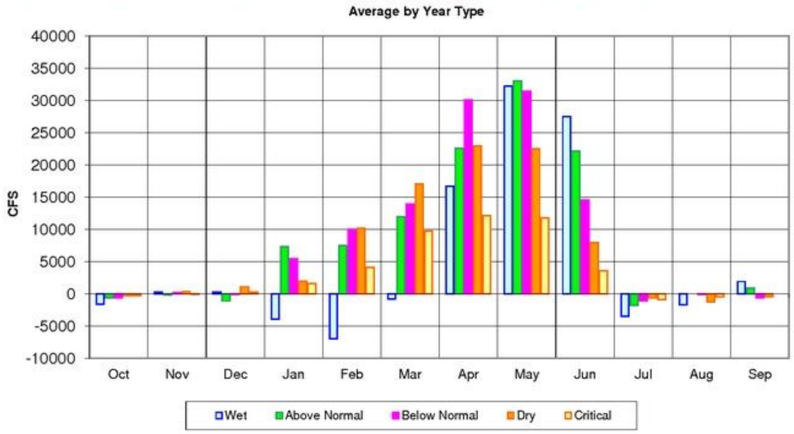
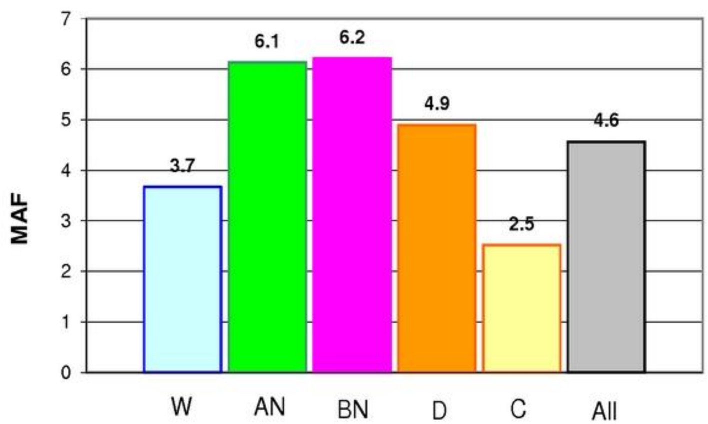


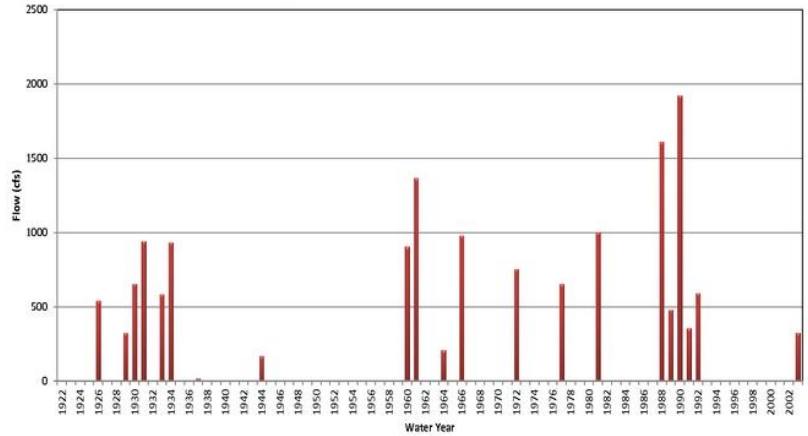
Figure 11 - Annual Change in Delta Outflow - SWRCB DFC minus Existing (BO's). Average increase of 4.6 MAF.



No comments

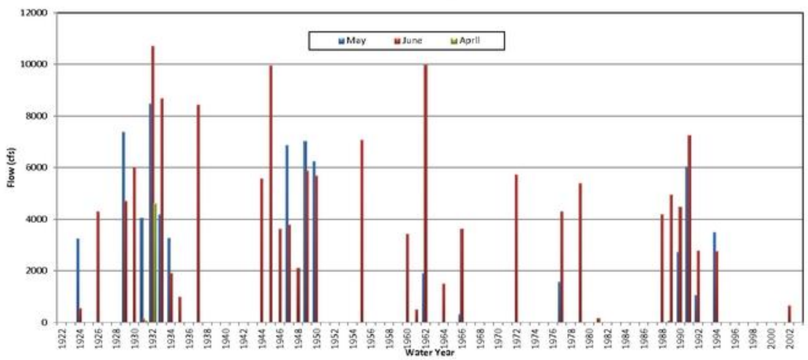
- n/a -

Figure 12 - Violations in D-1641 Delta Outflow Requirements in July in SWRCB DFC Scenario.



Increases flows in winter and spring cause upstream reservoirs to hit dead pool causing shortage in upstream diversions and inability to satisfy SWRCB D-1641 flow requirements.

Figure 13 - Shortage in Supply to Satisfy SWRCB DFC in April, May, and June.

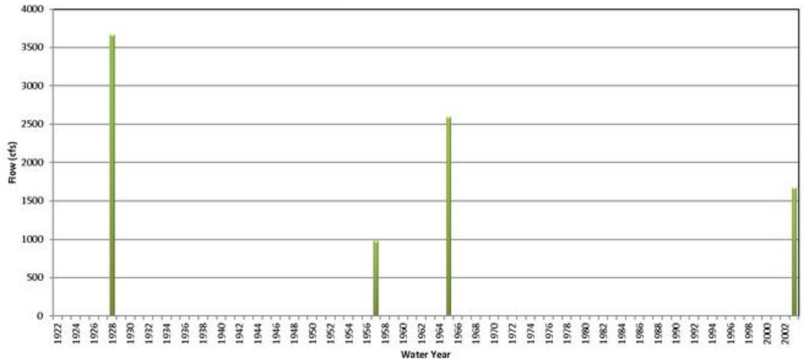


Satisfying the SWRCB DFC along with numerous existing flow requirements result in demands on the system in excess of its ability to satisfy existing requirements and the SWRCB DFC.

No comments

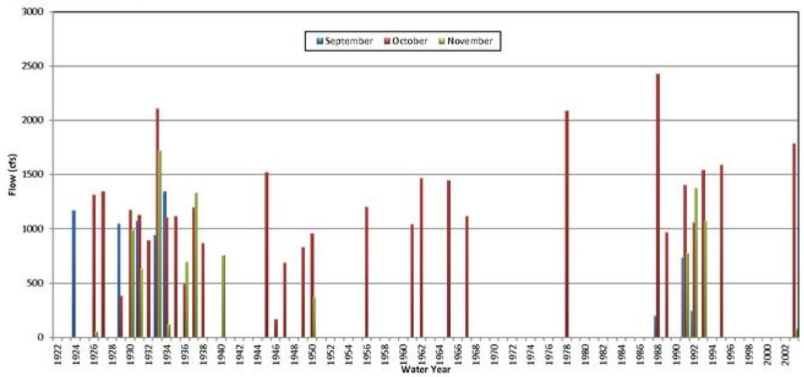
\- n/a -

Figure 14 - Violation in Smelt Fall X2 RPA in September in SWRCB DFC Scenario



Satisfying the SWRCB DFC cause water shortages leading to inability to meet Fall X2 flows Smelt BO RPA's

Figure 15 - Violations in D-1641 Flow Requirement at Rio Vista in September, October, and November in SWRCB DFC Scenario



Satisfying the SWRCB DFC cause water shortages leading to inability to meet SWRCB D-1641 flow requirements in the Sacramento River during fall months

No comments

- n/a -

Figure 16 - Sacramento River Plus Yolo Bypass Inflow to Delta

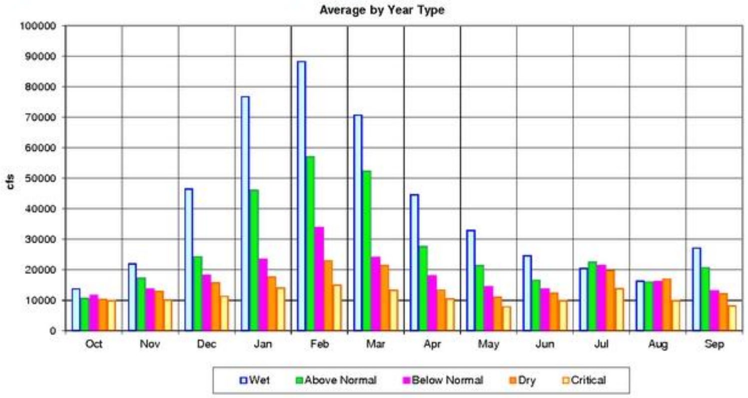
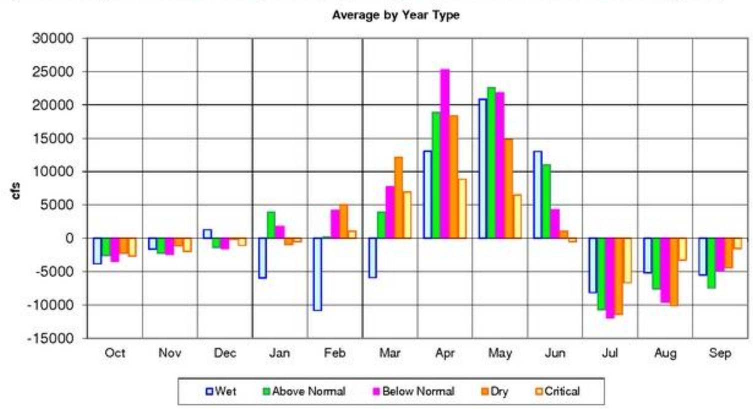


Figure 17 Change in Sacramento River plus Yolo Bypass Inflow to Delta - SWRCB DFC Minus Existing (BO's)

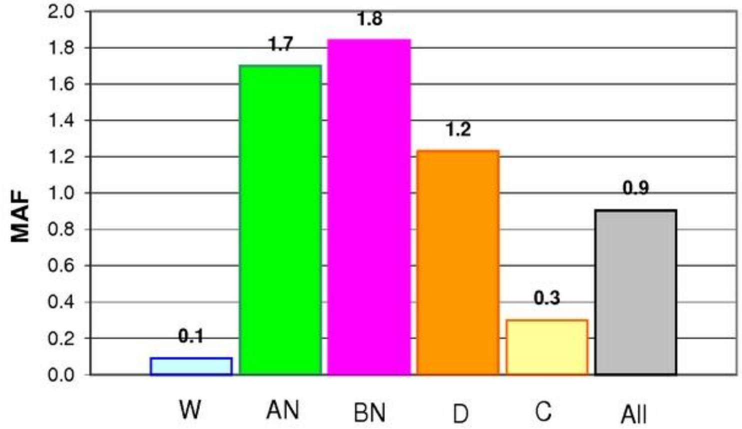


- Large increases in January through June.
- Decreases in January through March in wet years as reservoirs refill.
- Decreases in July through December, mostly due to low upstream reservoir storage but is also due to an assumption that reservoirs do not release additional water to support exports.

No comments

- n/a -

Figure 18 - Annual Change in Sacramento River Plus Yolo Bypass Inflow to Delta - SWRCB DFC minus Existing (BO's)

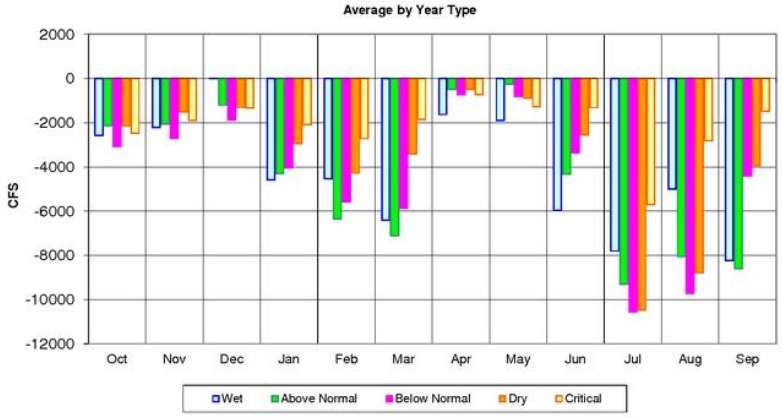


- Average annual increase of 900 TAF.
- Affected by increases in Trinity River import of about 170 TAF.
- Affected by increases in groundwater pumping of about 800 TAF.

No comments

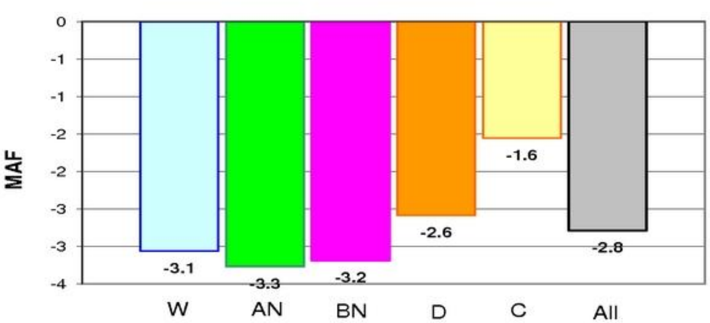
- n/a -

Figure 19 - Monthly Change in Delta Exports - SWRCB DFC minus Existing (BO's)



- Delta exports are affected throughout each year and in all types of years.
- No Reservoir releases are made to support Delta export because of low upstream reservoir conditions.

Figure 20 - Annual Change in Delta Exports - SWRCB DFC minus Existing (BO's)



- Average annual Existing (BO's) level export = 4.93 MAF.
- Average annual export with SWRCB DFC = 2.14 MAF.
- Average annual change in export = 2.8 MAF.

No comments

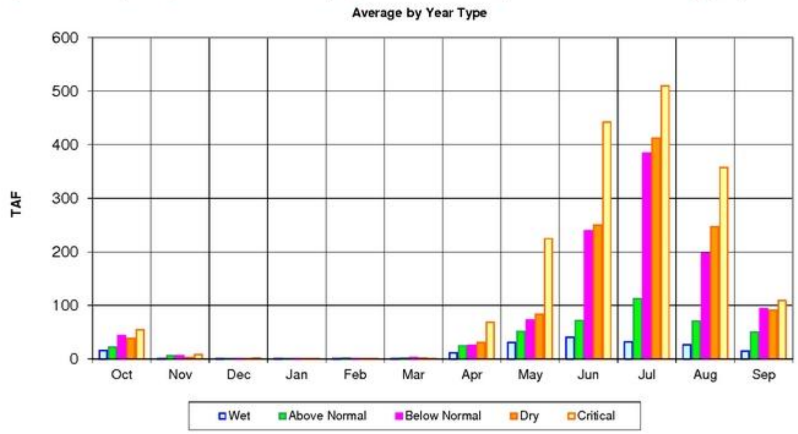
- n/a -

4.2 Groundwater Pumping in Sacramento Valley

CalSim II is not designed to simulate CVP/SWP operations using criteria as onerous as the SWRCB DFC. Therefore, the model simulation produced using the SWRCB DFC overestimates changes in groundwater pumping. The level of increased pumping simulated in the model is not physically possible.

Although the model increases groundwater pumping to satisfy all demands, there would most likely be a reduction in crop acreage and refuge water supply, and any increase in groundwater pumping will likely result in lower groundwater tables, and increases in groundwater recharge (similar in magnitude to the increase in pumping). This increase in recharge would result in decreases in stream flow that would cause additional need for groundwater pumping, reservoir releases, and crop fallowing to satisfy the SWRCB DFC. It is also believed that decreases in groundwater levels would cause adverse impacts to ephemeral stream habitat, urban wells, and major surface water streams.

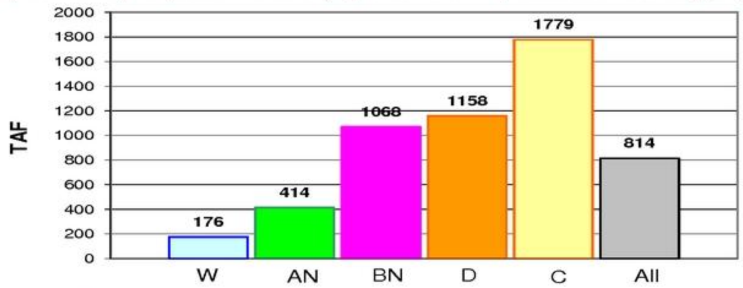
Figure 21 - Monthly Change in Groundwater Pumping in Sacramento Valley - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

Figure 22 - Monthly Change in Groundwater Pumping in Sacramento Valley - SWRCB DFC minus Existing (BO's)



- Annual average existing (BO's) pumping according to CalSim II (very rough) = 2.385 MAF.
- Average annual pumping with SWRCB DFC = 3.198 MAF.
- Average annual change in groundwater pumping is 814 TAF.

There are a large number of factors affecting the interrelationship between groundwater levels and pumping, stream-groundwater interaction, deep percolation of applied water, percolation of precipitation, and natural recharge; making it difficult to speculate how much additional pumping, recharge, and fallowing would occur. Therefore, determining the appropriate equilibrium of these factors is difficult, if not impossible, under existing conditions, and is even more difficult under the SWRCB DFC.

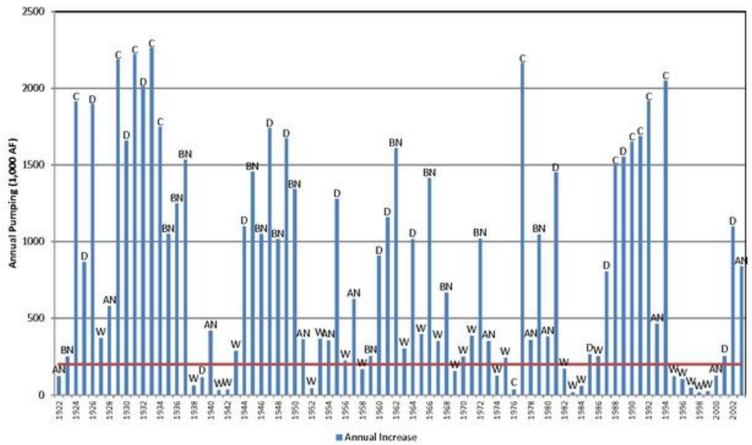
Groundwater pumping is increased during dry and critical years, and is believed that increases in pumping could not be sustained. In the past during dry and critical years there have been groundwater substitution water transfers. A reasonable assumption is that some level of increased pumping may occur under SWRCB DFC conditions. For the purpose of this analysis, and due to the historical transfers and the proposed SWRCB Bay-Delta Hearing Phase 8 Settlement, it may be reasonable to assume that up to 200,000 AF of increased pumping may occur.

Annual limit of increased groundwater pumping is 200,000 AF indicated by the red line on the chart below. The amount of increased pumping used in the hydropower analysis is the minimum of 200,000 AF or the annual increase displayed (**Figure 23**).

No comments

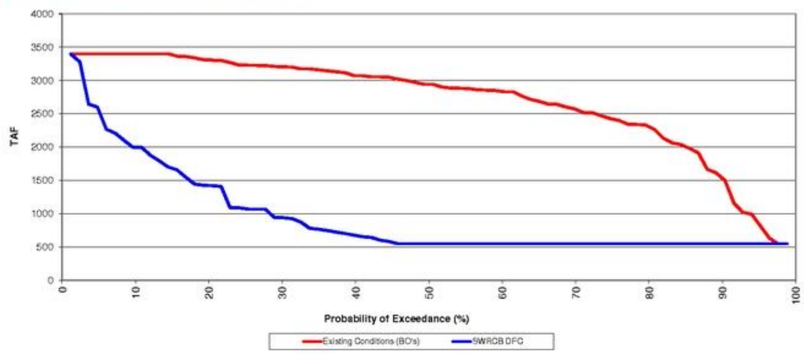
- n/a -

Figure 23 - Annual Change in Groundwater Pumping in Sacramento Valley - SWRCB DFC minus Existing (BO's)



Shasta storage would het dead pool in close to 60 percent of all years. Even in years when storage is above minimum it would be impossible to satisfy upper Sacramento River temperature objectives in almost every year. It may be possible to meet temperature objectives in less than 10 percent of years; however reductions in Keswick release from June through November will cause increased warming making it more difficult to meet objectives **(Figure 23).**

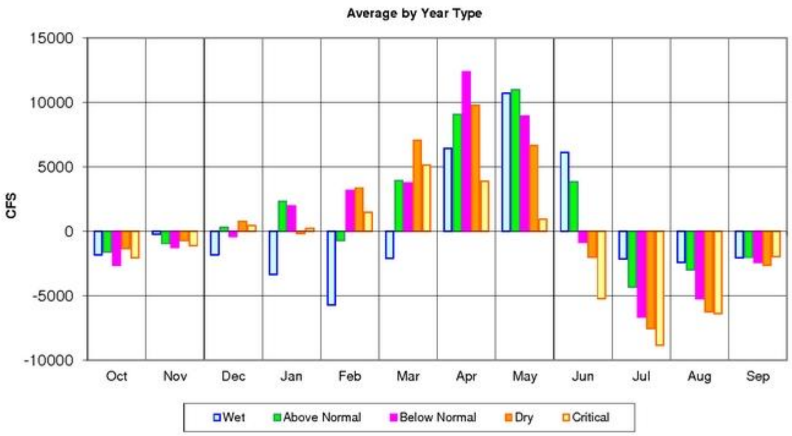
Figure 24 - End of September Shasta Storage



No comments

- n/a -

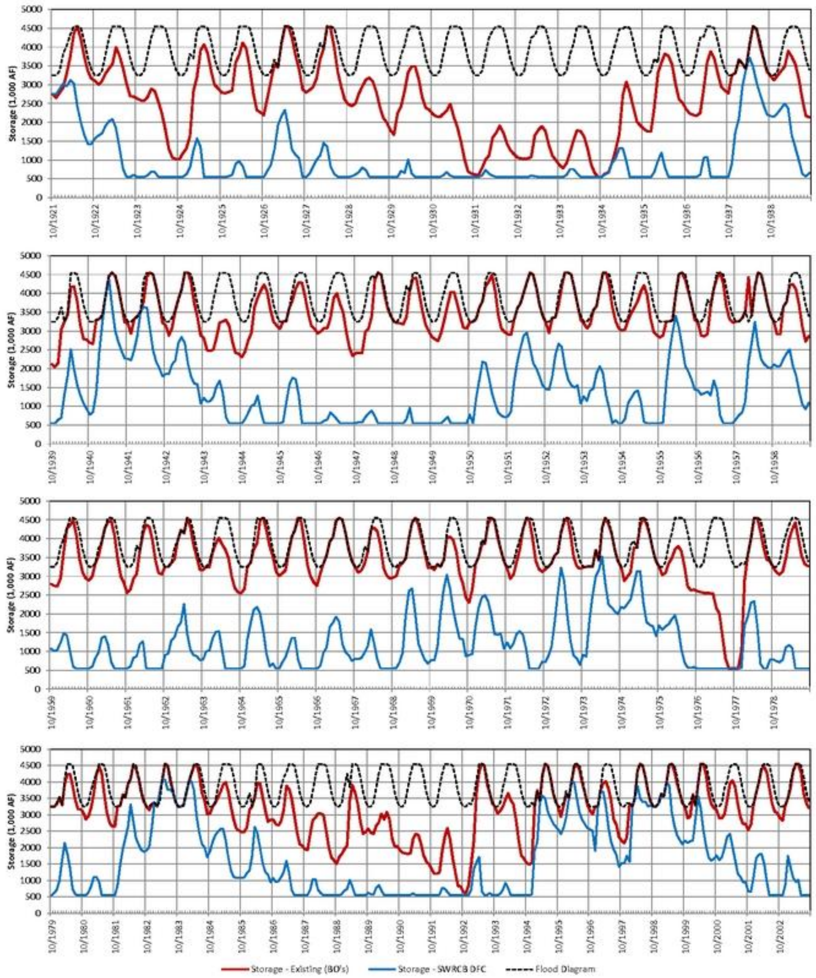
Figure 25 - Change in Keswick Release - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

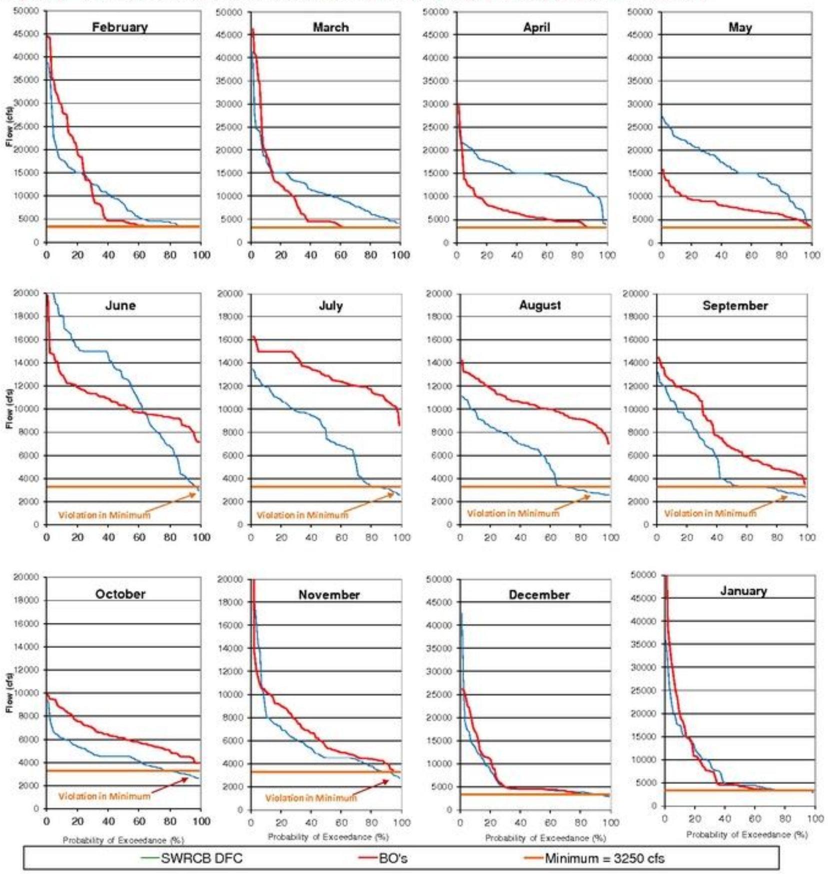
Figure 26 - Monthly Shasta Storage for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Figure 27 - Average Monthly Sacramento River Flow Below Keswick for Existing (BO's) and SWRCB DFC

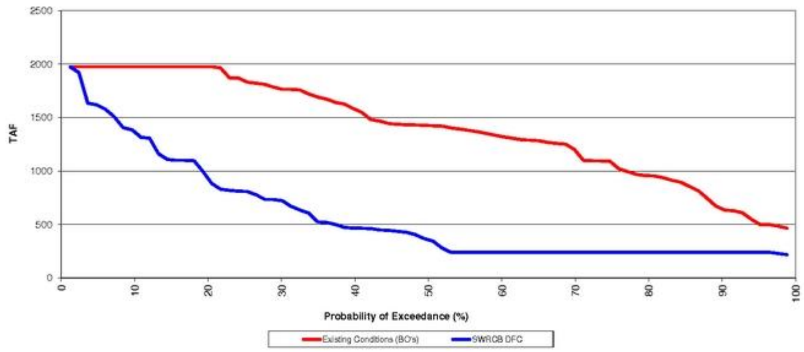


There are often violation in the minimum flow requirement below Keswick, when this occurs both Shasta and Trinity Reservoirs are at dead storage (**Figure 28**).

No comments

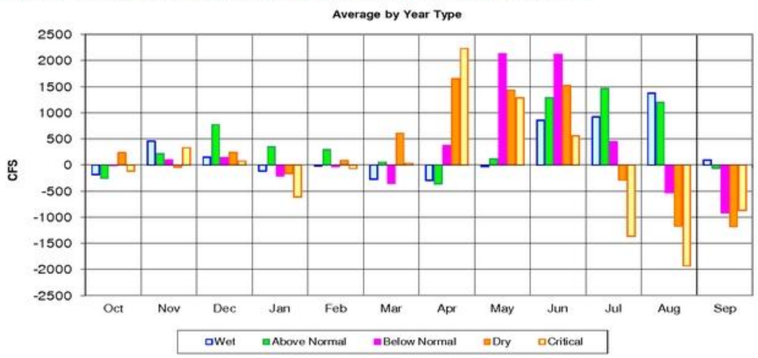
- n/a -

Figure 28 - End of September Trinity Storage



The SWRCB DFC are very extreme and CalSim II was not designed to address these circumstances, therefore the logic that balances Trinity and Shasta Reservoir storage properly for existing (BO's) conditions may not be suitable when operating to satisfy the SWRCB flow criteria. Logic may need to be developed that isolates the Trinity operation from the Sacramento River Basin. Because Trinity River imports are increased in the SWRCB DFC model simulation there is likely an underestimate of hydropower impacts (**Figure 29**).

Figure 29 - Monthly Change in Trinity River Import - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

Figure 30 - Annual Change in Trinity River Import - SWRCB DFC minus Existing (BO's)

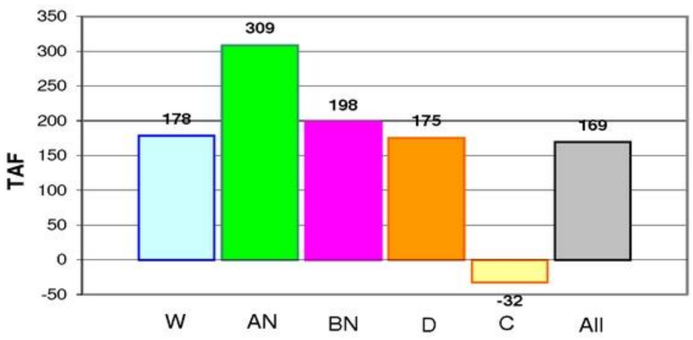
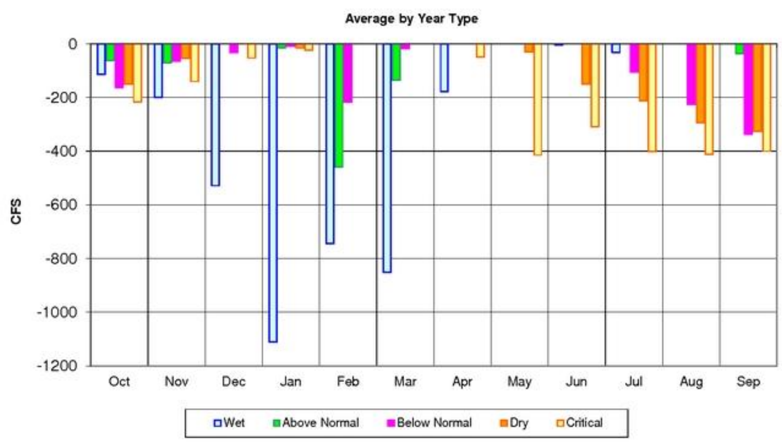


Figure 31 - Monthly Change in Trinity River Flow - SWRCB DFC minus Existing (BO's)

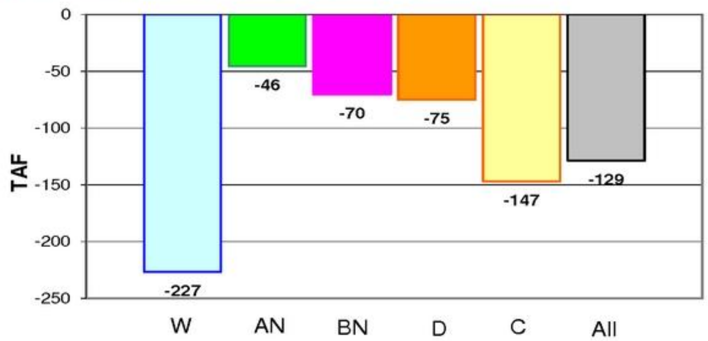


No comments

- n/a -

There is an average annual decrease of 129 TAF release to the Trinity River, this differs from the increase Trinity River import of 169 TAF because the end of simulation storage in Trinity is 1.5 MAF lower (**Figure 32**).

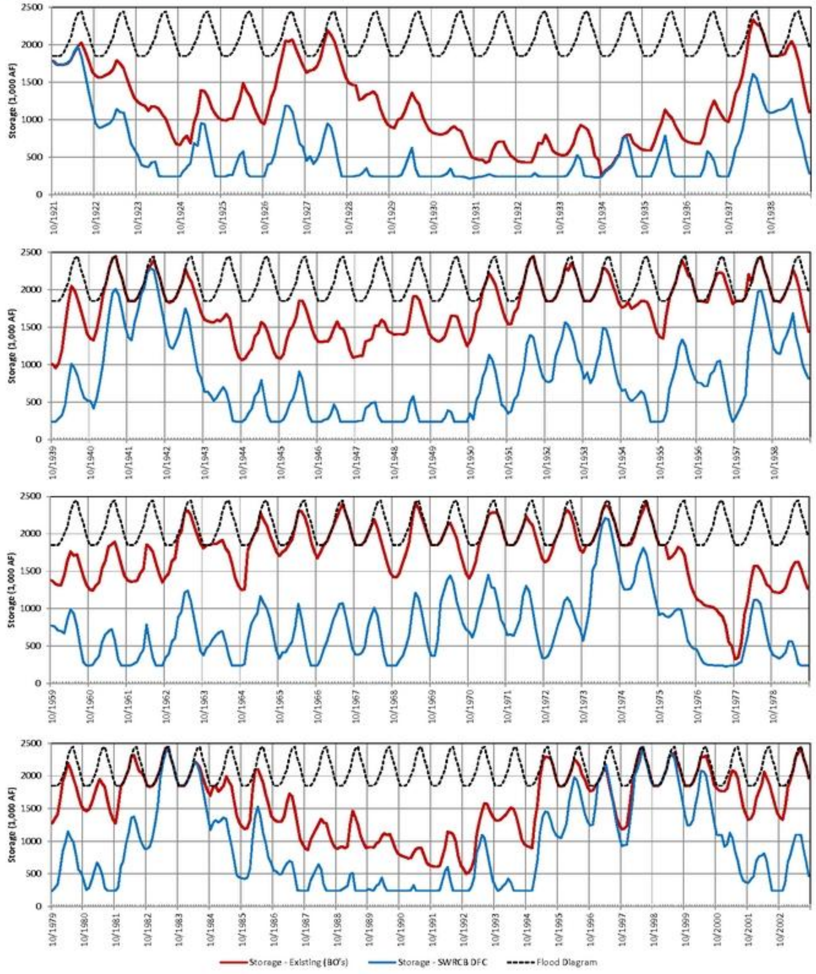
Figure 32 - Annual Change in Trinity River Flow - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

Figure 33 - Monthly Trinity Storage for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Roughly 50 percent of the time Folsom would end the water year at dead storage (**Figure 34**).

Figure 34 - End of September Folsom Storage

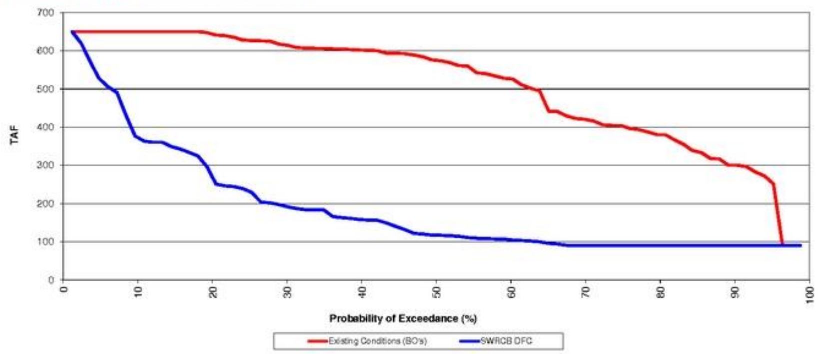
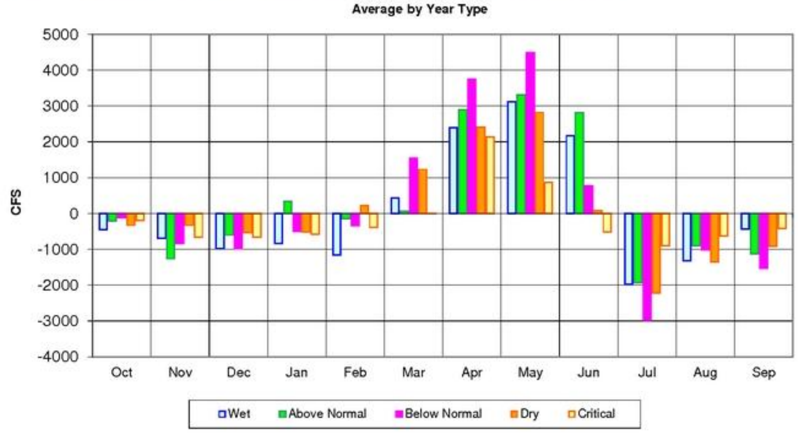


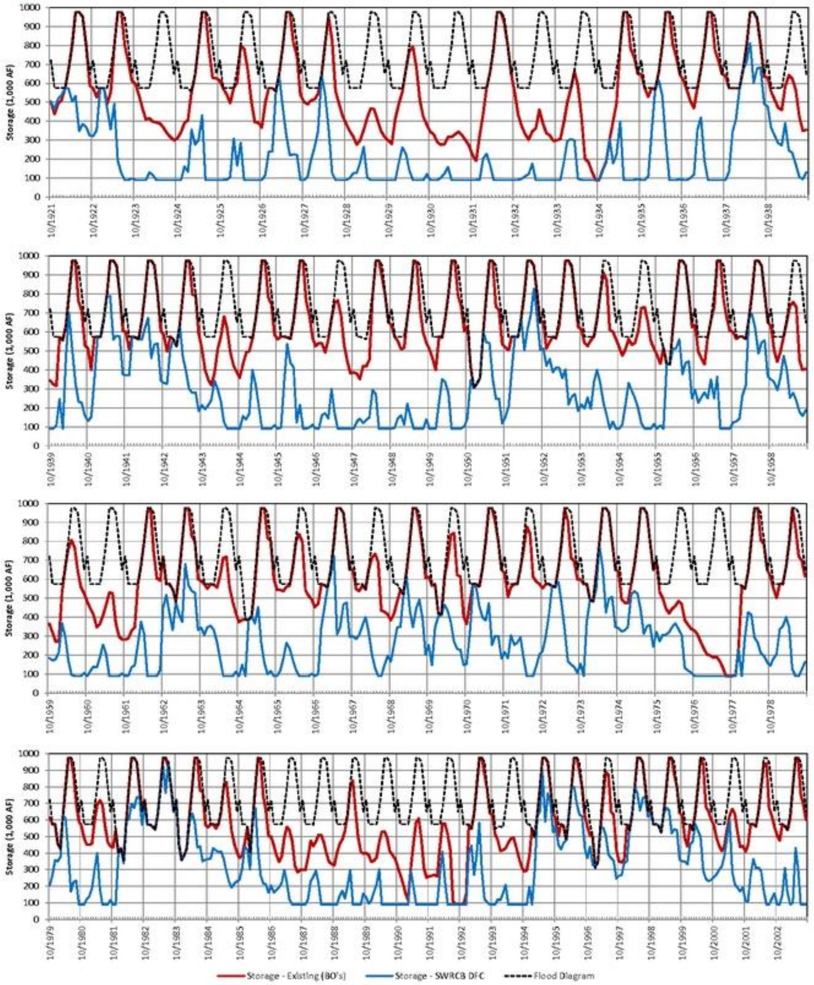
Figure 35 - Change in American River Flow below Nimbus - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

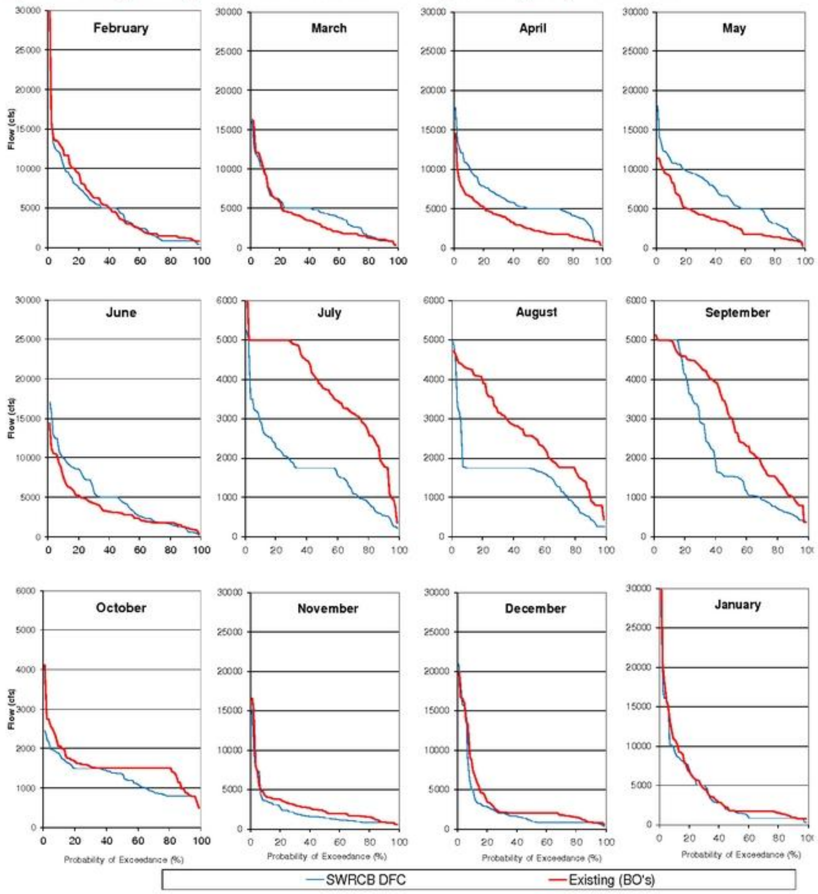
Figure 36 - Monthly Folsom Storage for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Figure 37 - Average Monthly American River Flow below Nimbus for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Figure 38 - End of September Oroville storage

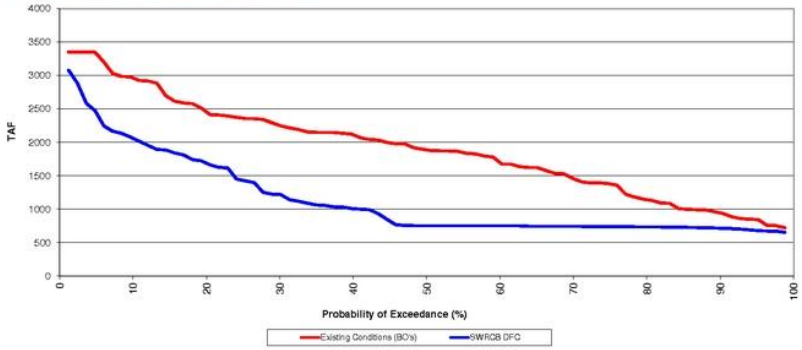
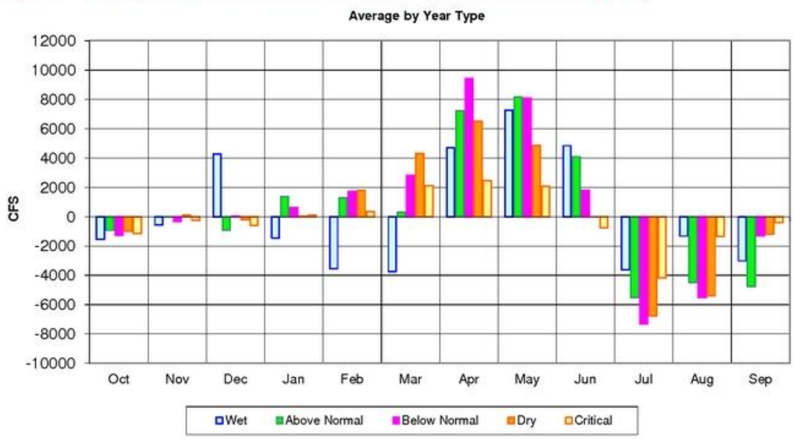


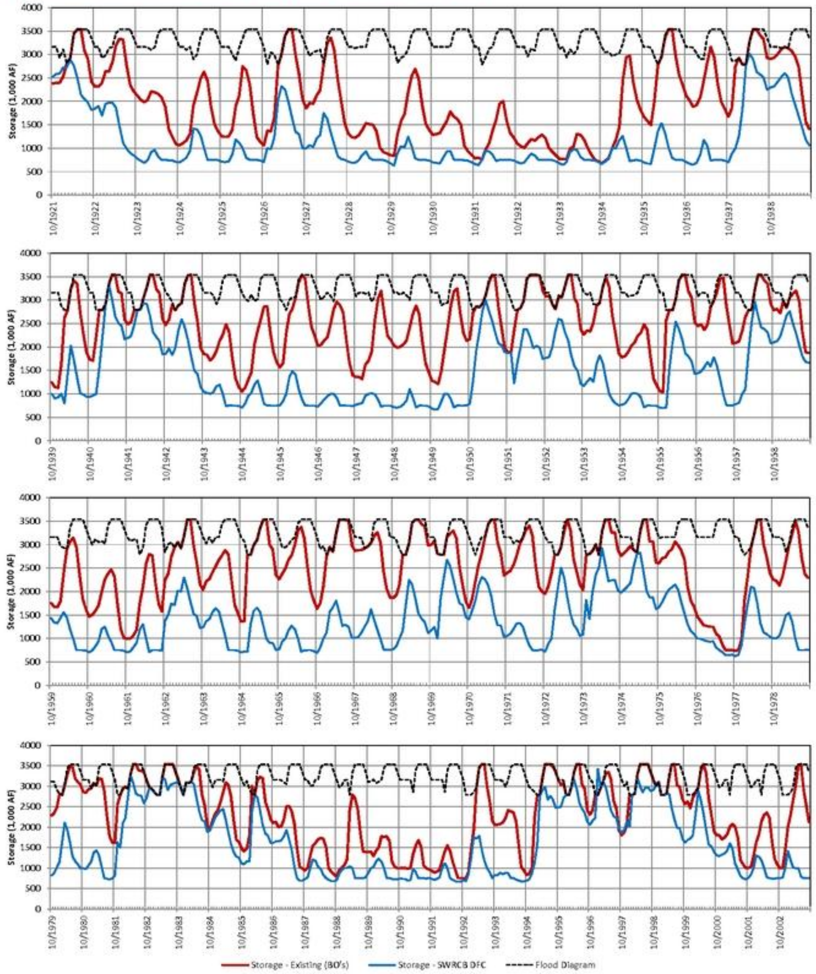
Figure 39 - Change in Feather River Flow below Thermalito - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

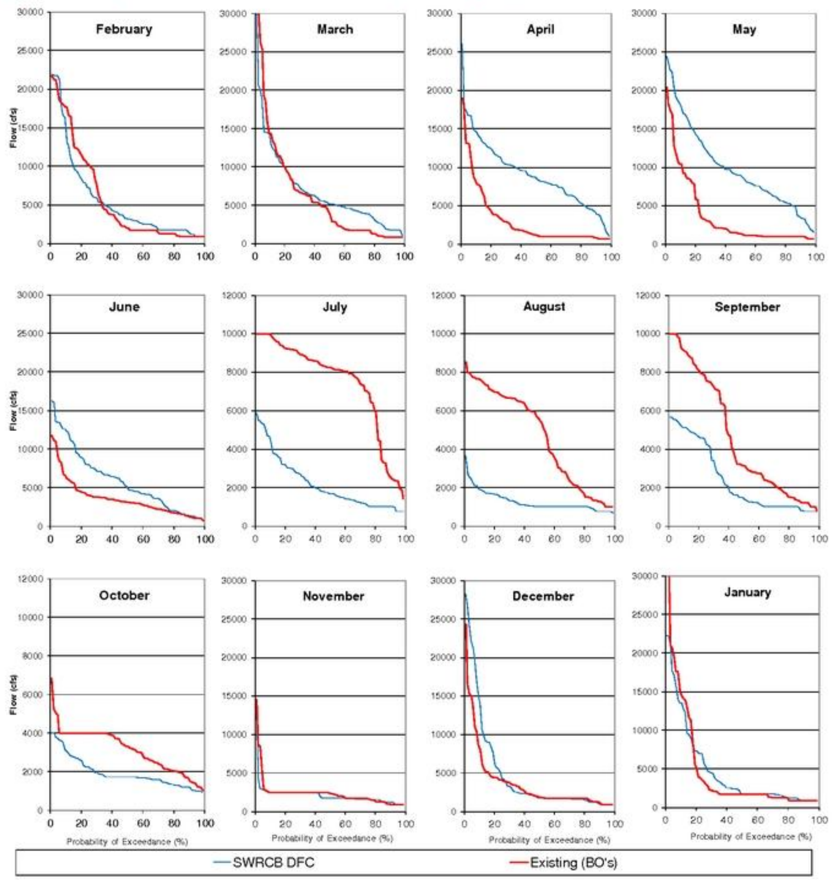
Figure 40 - Monthly Oroville Storage for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Figure 41 - Average Feather River Flow below Thermalito for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Figure 42 - Change in San Joaquin River at Vernalis - SWRCB DFC minus Existing (BO's)

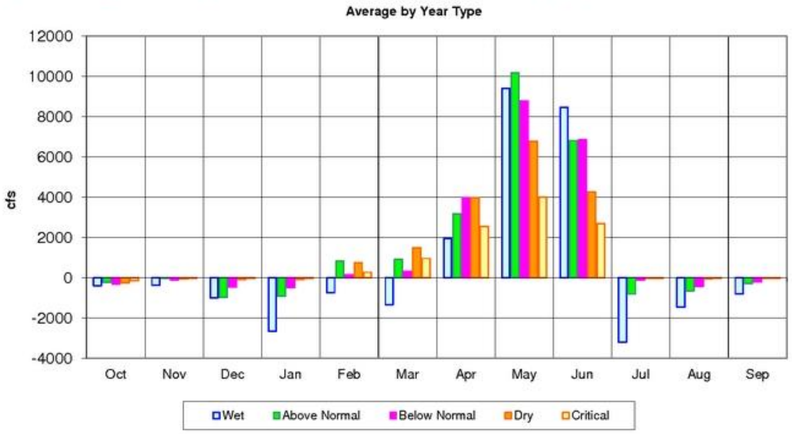
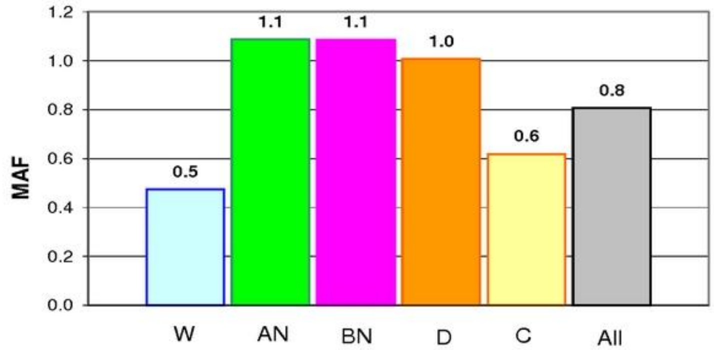


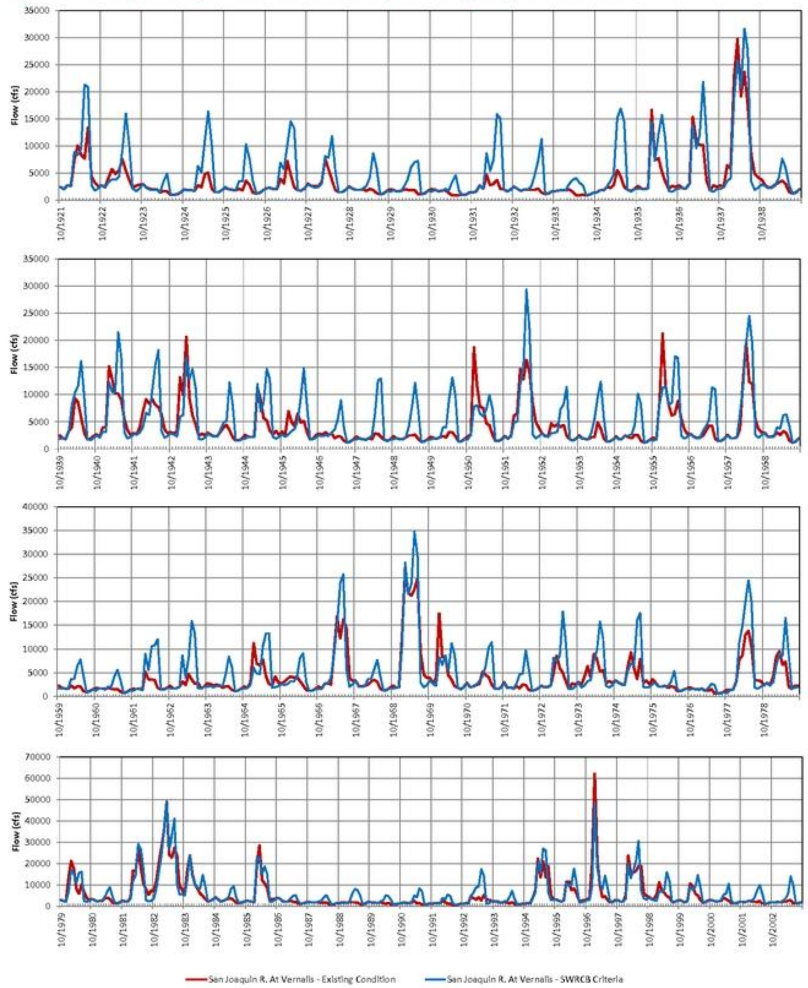
Figure 43 - Annual Change in San Joaquin River at Vernalis - SWRCB DFC minus Existing (BO's)



No comments

- n/a -

Figure 44 - Monthly San Joaquin River Flow at Vernalis for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Figure 45 is shown with the SWRCB DFC San Luis Reservoir fills in one year (1983).

Figure 45 - San Luis Reservoir Annual Maximum Storage for Existing (BO's) and SWRCB DFC

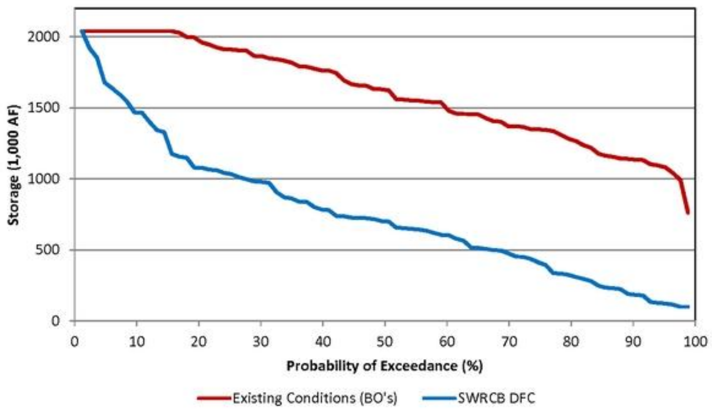
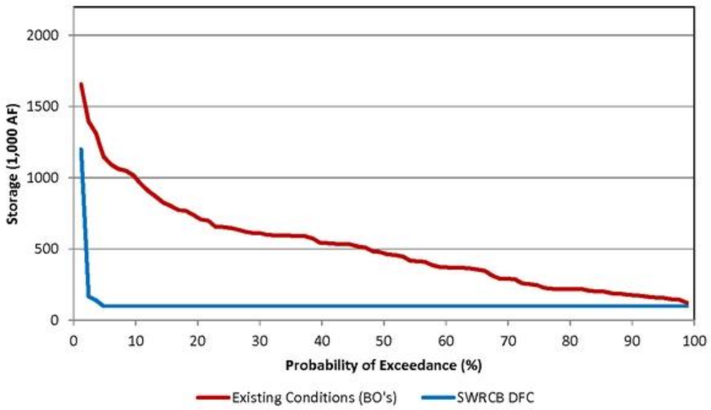


Figure 46 is shown with the SWRCB DFC San Luis reaches dead pool in all but 2 years (1983 and 1965) and remains at dead pool for several months in most years.

No comments

- n/a -

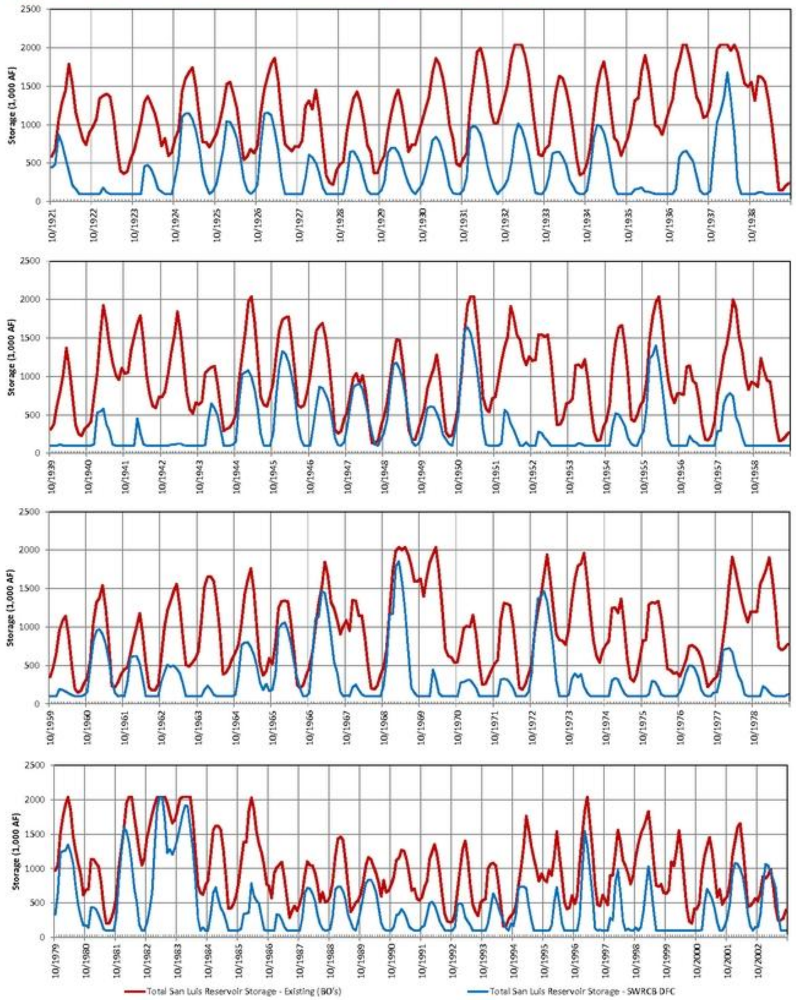
Figure 46 - San Luis Reservoir Annual Low Point in Storage for Existing (BO's) and SWRCB DFC



No comments

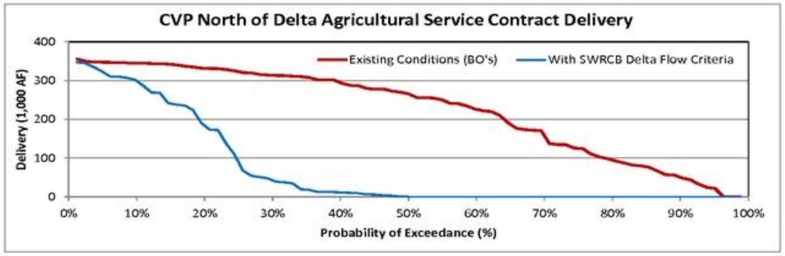
- n/a -

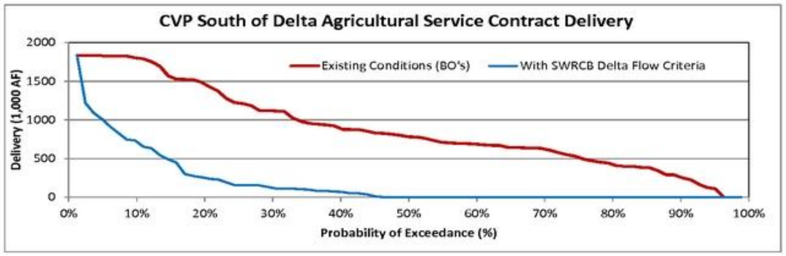
Figure 47 - Total San Luis Reservoir Storage for Existing (BO's) and SWRCB DFC

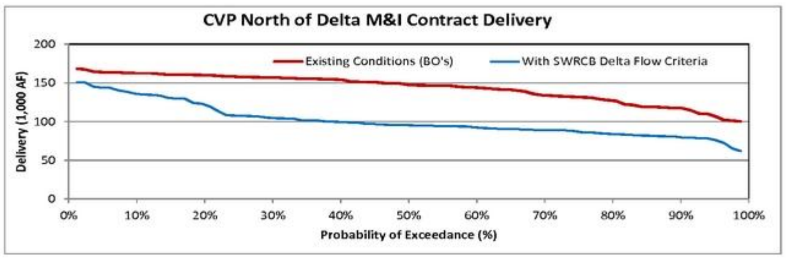


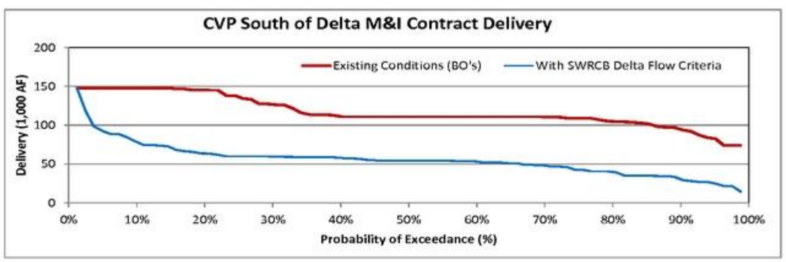
No comments

- n/a -



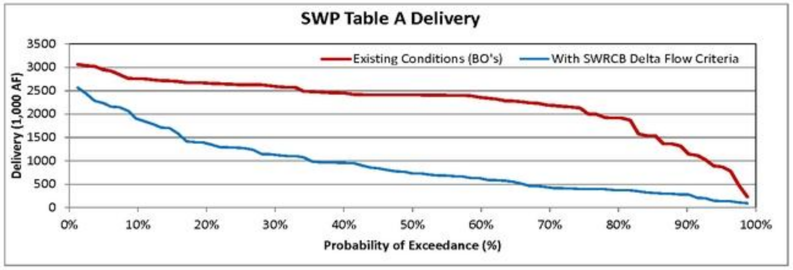


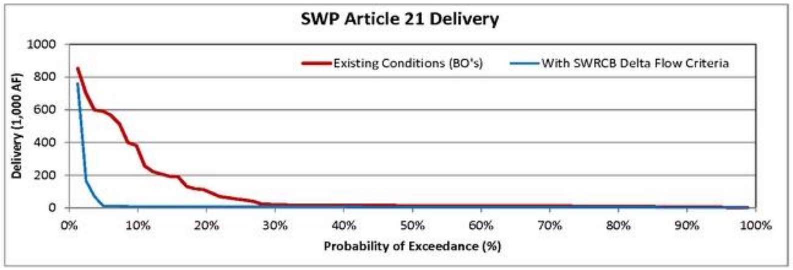


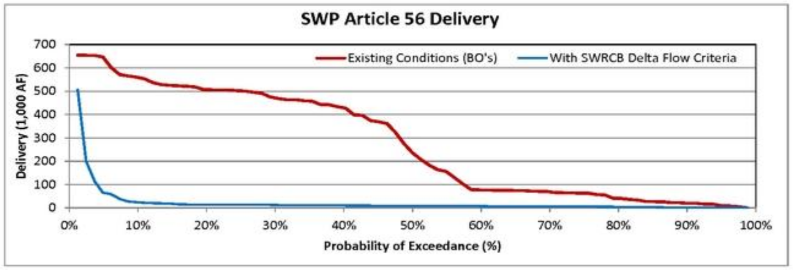


No comments

- n/a -





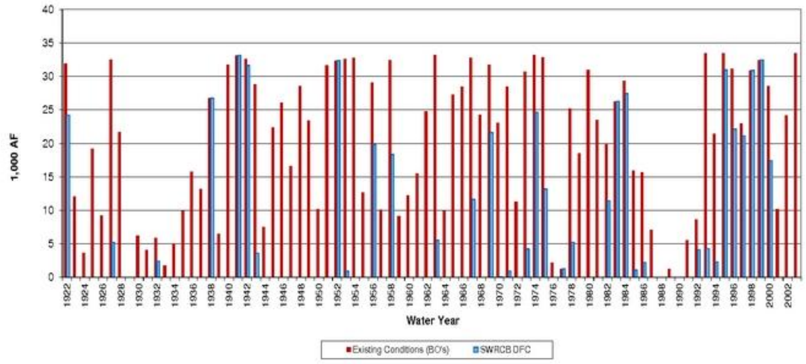


No comments

- n/a -

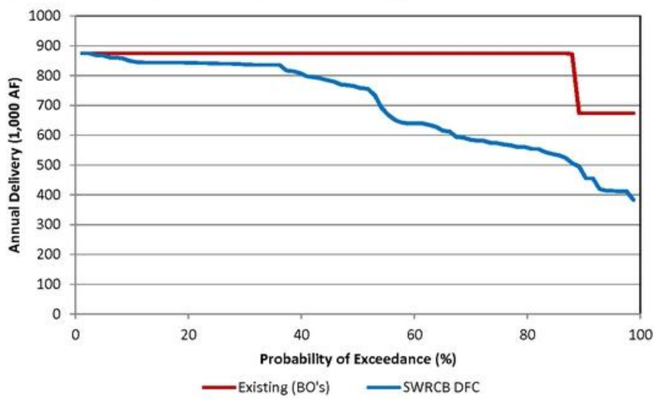
Delivery is not frequent enough to sustain surface water delivery system with SWRCB DFC (**Figure 48**).

Figure 48 - CVP North of Delta Ag Service Contract Delivery for Existing (BO's) and SWRCB DFC



Decrease in CVP Exchange Contract delivery requires releases from Friant to satisfy contract terms (**Figure 49**).

Figure 49 - CVP South of Delta Exchange Contract Delivery for Existing (BO's) and SWRCB DFC



No comments

- n/a -

Delivery is shorted when Shasta and Trinity Reservoirs reach dead pool and instream requirements can not be satisfied (**Figure 50**).

Figure 50 - CVP Sacramento Valley Settlement Contract Delivery for Existing (BO's) and SWRCB DFC

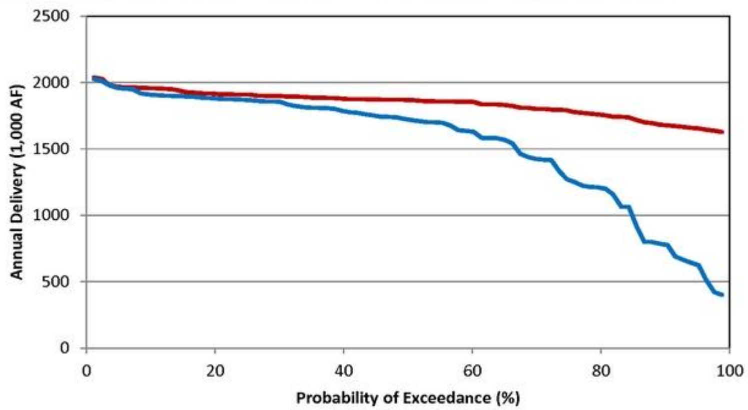
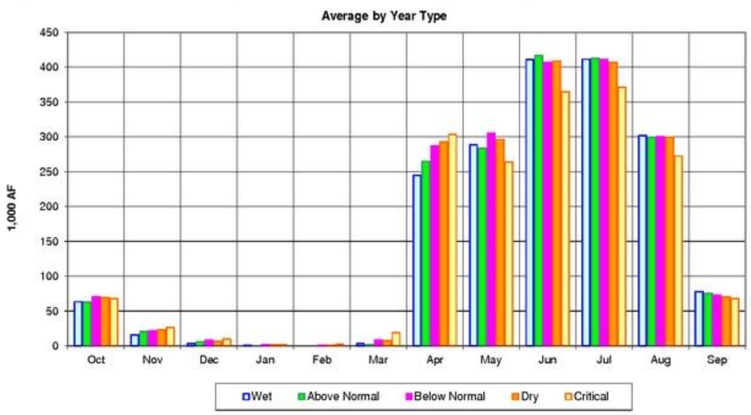


Figure 51 - CVP Sacramento Valley Settlement Contract Delivery for Existing (BO's)

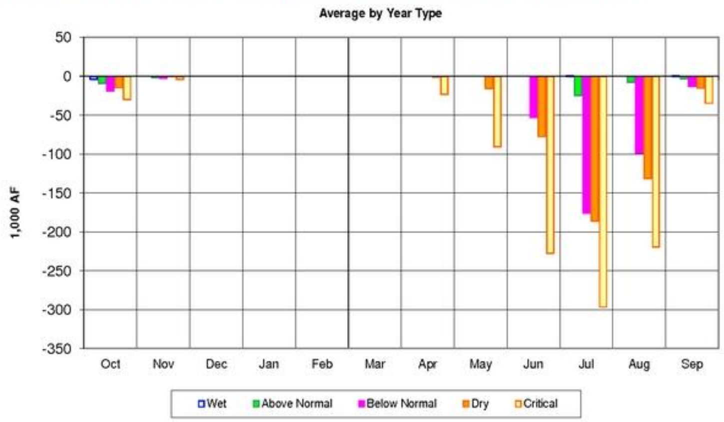


No comments

- n/a -

CalSim II is designed to satisfy Sacramento CVP contracts at 100% in normal Shasta year types and 75% in critical Shasta year types and does not dynamically cut these diversions further than their contract allows. The SWRCB DFC require enough water from upstream reservoirs to cause them to hit dead pool and render them unable to satisfy these senior water rights as well as instream flow requirements. Deliveries are cut at the time upstream reservoirs hit dead pool resulting in unrealistic delivery patterns that are high in the spring and low during summer (**Figure 52**).

Figure 52 - Change in CVP Sacramento Valley Settlement Contract Delivery for Existing (BO's)



No comments

- n/a -

4.3 Characteristics of Hydropower Conditions with the SWRCB DFC

The SWRCB DFC causes the CVP and SWP to dramatically alter reservoir operations as described in the previous pages. Generally these operational changes lead to increased reservoir releases in the spring, decreased reservoir releases in the summer (see pages 16, 22, 25), decreased reservoir carryover storage (see pages 16, 22, 25), and decreased Delta export pumping. As a result of these changes, the timing and magnitude of generation at Project hydropower facilities is distorted from historical norms and the Project pumping loads associated with water deliveries south of the Delta shrink radically with the loss of exports (Average annual reduction in export = 2.8 MAF, see page 12).

As noted on page 19, *"The SWRCB DFC are very extreme and CalSim II was not designed to address these circumstances, therefore the logic that balances Trinity and Shasta Reservoir storage properly for existing (BO's) conditions may not be suitable when operating to satisfy the SWRCB flow criteria. Logic may need to be developed that isolates the Trinity operation from the Sacramento River Basin. Because Trinity River imports are increased in the SWRCB DFC model simulation there is likely an underestimate of hydropower impacts"*. The Trinity operations logic problem has not yet been addressed in CalSim II, but a rough attempt to compensate for this overly ambitious import of Trinity water and resulting increase in generation is presented as an alternative.

4.4 Hydropower Modeling Tools

CalSim II does not contain an ability to directly calculate hydropower production or use. Instead, power results are determined using CalSim II modeling results post-processed in two spreadsheet models, Long-Term Gen for the CVP and SWP Gen for the State water Project. Hydropower effects of the SWRCB DFC presented in this handout are determined as the difference between the existing conditions CalSim II study and the SWRCB DFC CalSim II study. By necessity, since CalSim II is a monthly time-step model, the hydropower results are presented as monthly values. Additional analyses on a shorter time-step may be desirable but presently available tools are not up to that task.

4.5 CVP and SWP Hydropower Results

The following pages, 50 through 71, contain the results of the monthly CVP and SWP hydropower analysis.

No comments

- n/a -

Figure 53 - Annual CVP Generation at Load Center

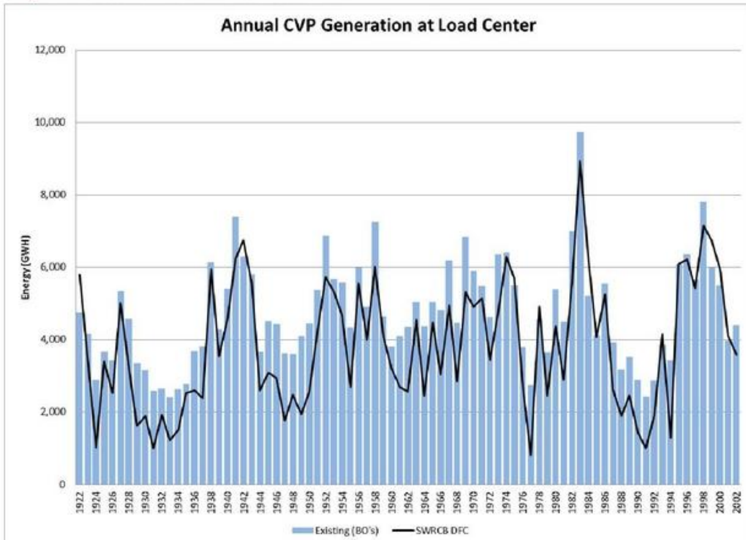


Table 2 - CVP Energy Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB Studies						
Existing (BO's)	6,263	5,016	4,090	3,850	3,079	4,714
SWRCB DFC	5,731	4,597	2,929	2,835	1,524	3,835
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-532	-419	-1,162	-1,015	-1,555	-879
% Change	-8%	-8%	-28%	-26%	-51%	-19%

No comments

- n/a -

Figure 54 - Annual Net CVP Generation at Load Center

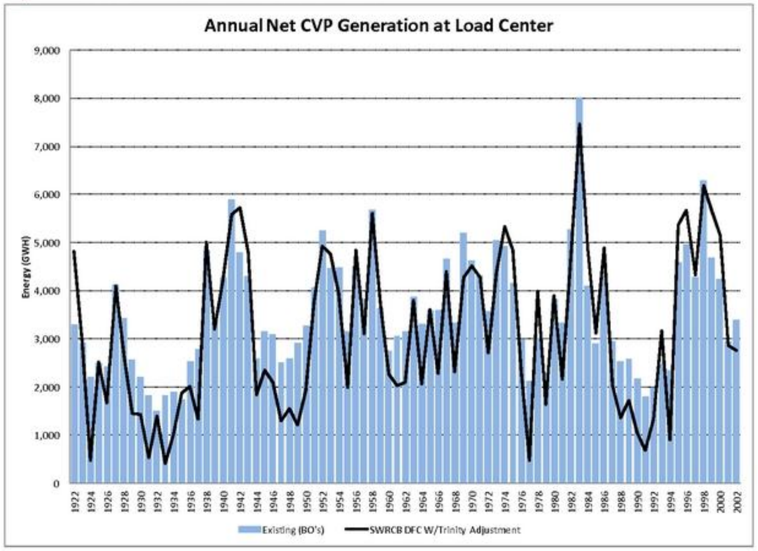


Table 3 - CVP Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC W/Trinity Adjustment Studies						
Existing (BO's)	6,263	5,016	4,090	3,850	3,079	4,714
SWRCB DFC W/Trinity Adjustment	5,550	4,287	2,717	2,640	1,538	3,656
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC W/Trinity Adjustment	-713	-730	-1,374	-1,210	-1,541	-1,058
% Change	-11%	-15%	-34%	-31%	-50%	-22%

No comments

- n/a -

Figure 55 - Annual SWP Generation at Load Center

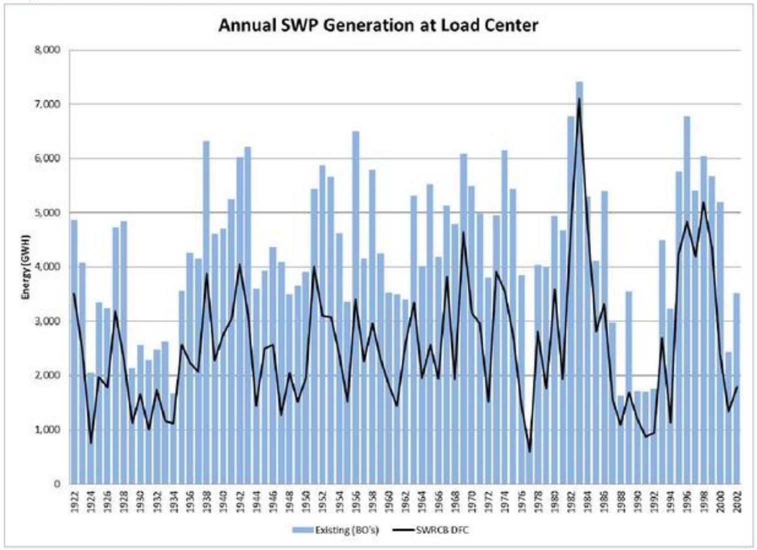


Table 4 - SWP Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC Studies						
Existing (BO's)	5,730	4,640	4,021	3,520	2,348	4,298
SWRCB DFC	3,956	2,808	1,984	1,766	1,126	2,556
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-1,774	-1,832	-2,037	-1,754	-1,222	-1,742
% Change	-31%	-39%	-51%	-50%	-52%	-41%

No comments

- n/a -

Figure 56 - Annual CVP Project Use Load at Load Center

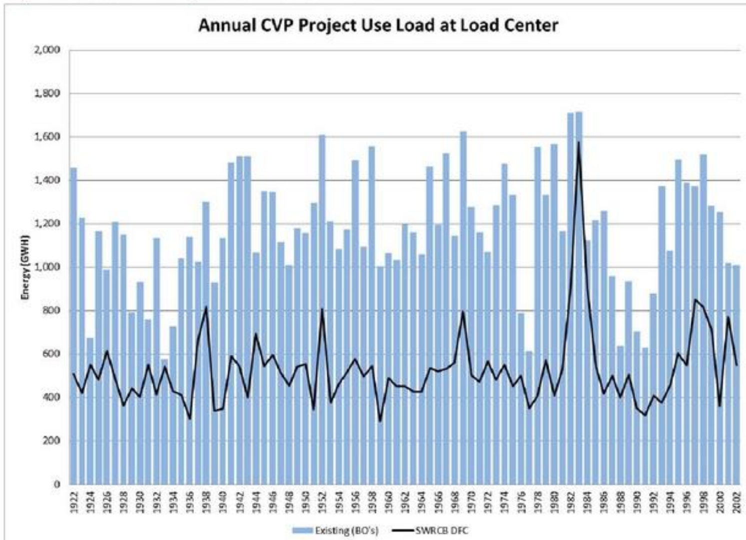


Table 5 - CVP PU Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC Studies						
Existing (BO's)	1,399	1,242	1,171	1,073	787	1,176
SWRCB DFC	706	487	430	467	403	530
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-693	-756	-741	-605	-384	-646
% Change	-50%	-61%	-63%	-56%	-49%	-55%

No comments

- n/a -

Figure 57 - Annual CVP Project Use Load at Load Center

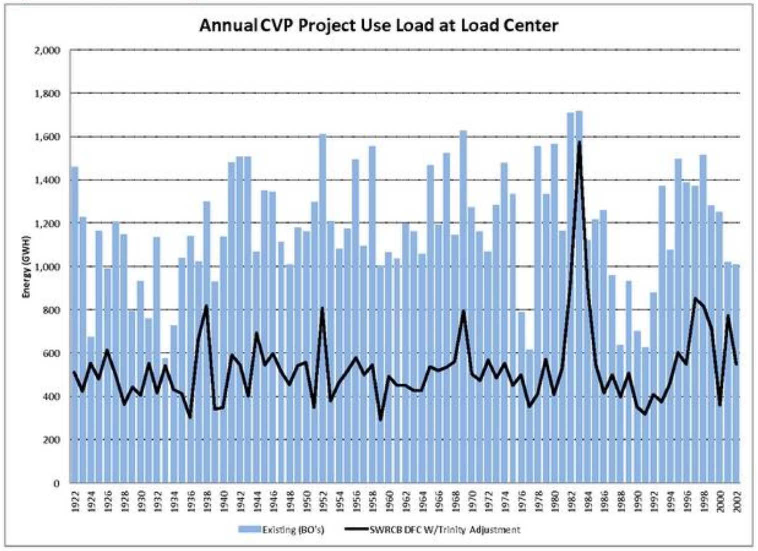


Table 6 - CVP PU Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC W/Trinity Adjustment Studies						
Existing (BO's)	1,399	1,242	1,171	1,073	787	1,176
SWRCB DFC W/Trinity Adjustment	706	487	430	467	403	530
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC W/Trinity Adjustment	-693	-756	-741	-605	-384	-646
% Change	-50%	-61%	-63%	-56%	-49%	-55%

No comments

- n/a -

Figure 58 - Annual SWP Project Use Load at Load Center

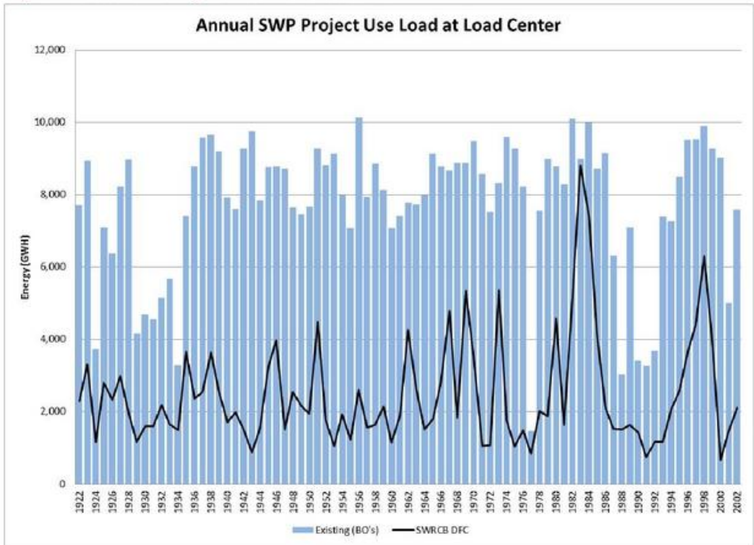


Table 7 - SWP PU Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
	Existing (BO's) and SWRCB DFC Studies					
Existing (BO's)	9,061	8,169	8,295	7,153	4,770	7,753
SWRCB DFC	3,427	2,442	2,084	2,178	1,574	2,508
	Change from Existing (BO's)					
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-5,635	-5,726	-6,212	-4,975	-3,196	-5,245
% Change	-62%	-70%	-75%	-70%	-67%	-68%

No comments

- n/a -

Figure 59 - Annual Net CVP Generation at Load Center

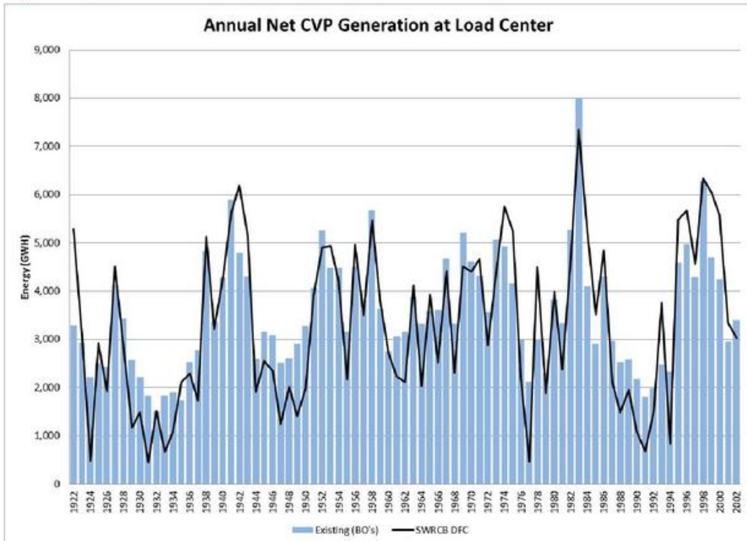


Table 8 - CVP Net Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
	Existing (BO's) and SWRCB DFC Studies					
Existing (BO's)	4,864	3,774	2,919	2,777	2,291	3,538
SWRCB DFC	5,025	4,110	2,499	2,368	1,120	3,305
	Change from Existing (BO's)					
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	162	336	-421	-409	-1,171	-233
% Change	3%	9%	-14%	-15%	-51%	-7%

No comments

- n/a -

Figure 60 - Annual CVP Generation at Load Center

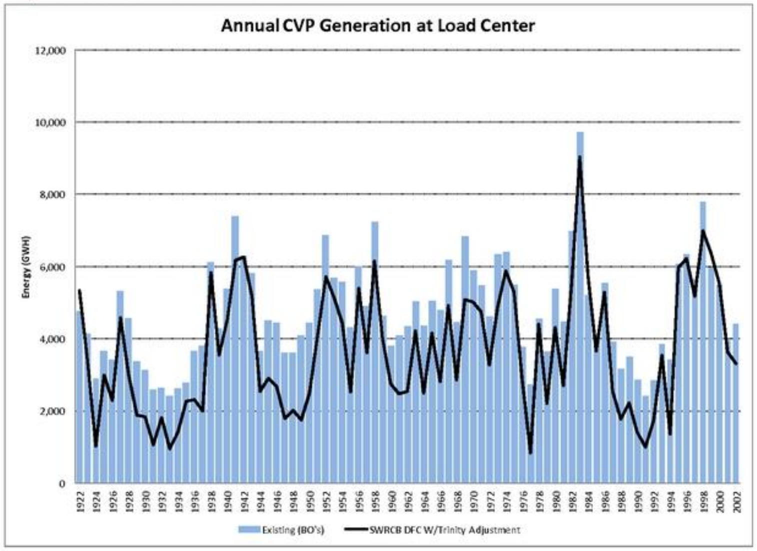


Table 9 - CVP Net Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC W/Trinity Adjustment Studies						
Existing (BO's)	4,864	3,774	2,919	2,777	2,291	3,538
SWRCB DFC W/Trinity Adjustment	4,844	3,800	2,287	2,173	1,135	3,126
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC W/Trinity Adjustment	-19	26	-633	-604	-1,157	-412
% Change	0%	1%	-22%	-22%	-50%	-12%

No comments

- n/a -

Figure 61 - Annual Net SWP Generation at Load Center

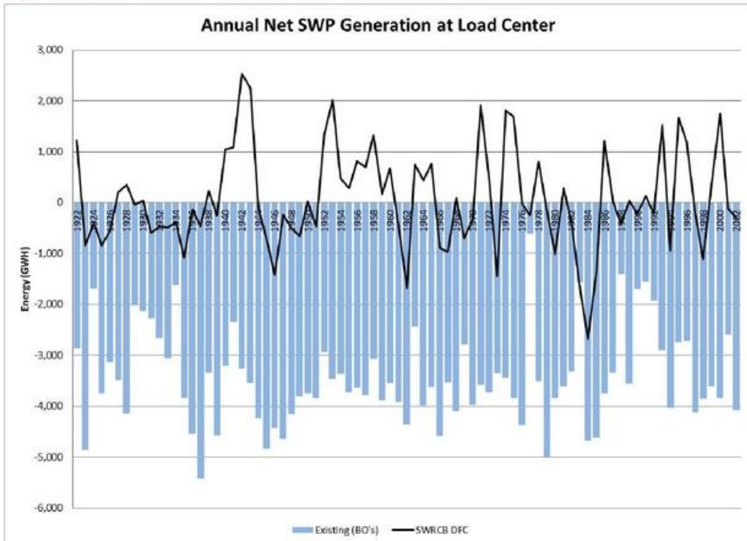


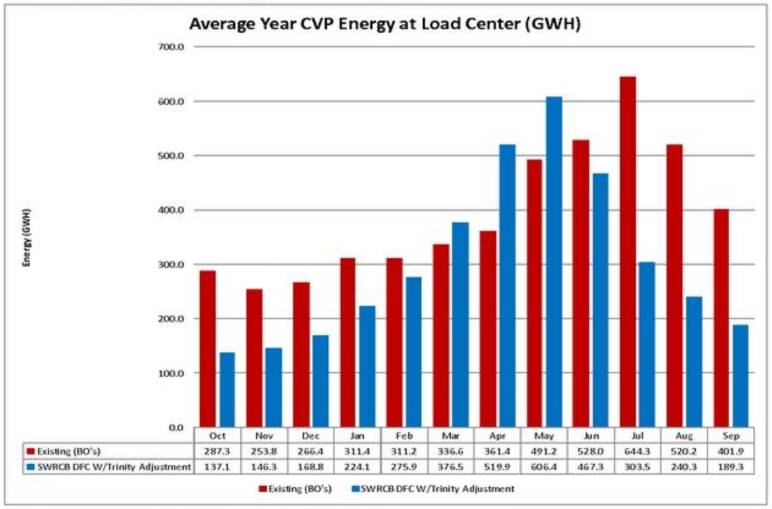
Table 10 - SWP Net Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC Studies						
Existing (BO's)	-3,332	-3,529	-4,275	-3,633	-2,422	-3,455
SWRCB DFC	529	366	-100	-412	-448	48
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	3,861	3,895	4,175	3,221	1,974	3,503
% Change	116%	110%	98%	89%	82%	101%

No comments

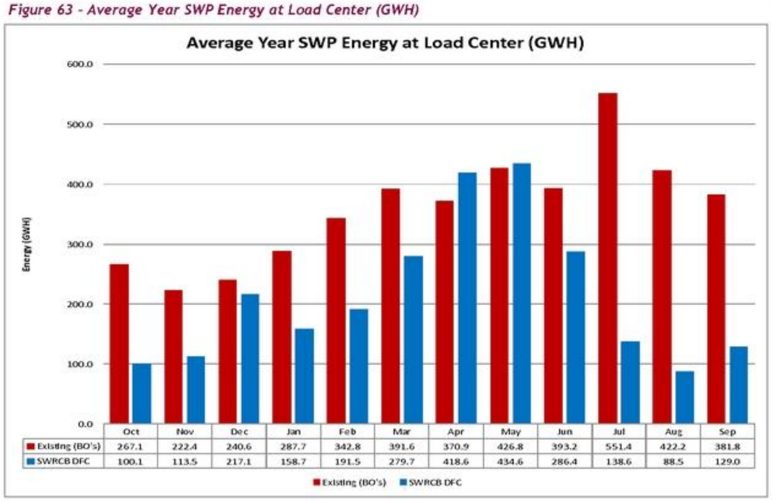
- n/a -

Figure 62 - Average Year CVP Energy at Load Center (GWH)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	287.3	253.8	266.4	311.4	311.2	336.6	361.4	491.2	528.0	644.3	520.2	401.9
SWRCB DFC W/Trinity Adjustment	137.1	146.3	168.8	224.1	275.9	376.5	519.9	606.4	467.3	303.5	240.3	189.3

Figure 63 - Average Year SWP Energy at Load Center (GWH)

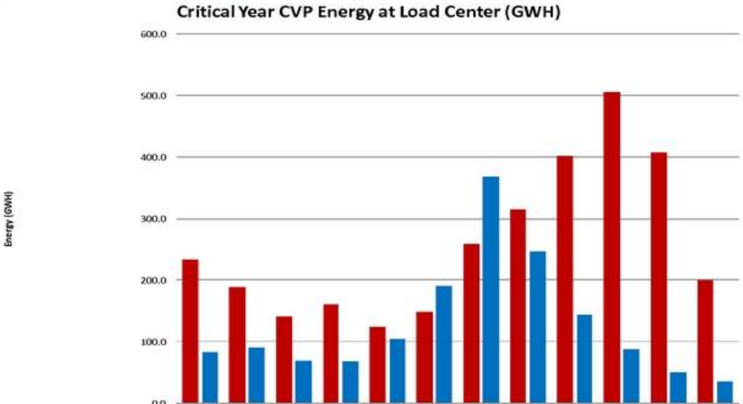


	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	267.1	222.4	240.6	287.7	342.8	391.6	370.9	426.8	393.2	551.4	422.2	381.8
SWRCB DFC	100.1	113.5	217.1	158.7	191.5	279.7	418.6	434.6	286.4	138.6	88.5	129.0

No comments

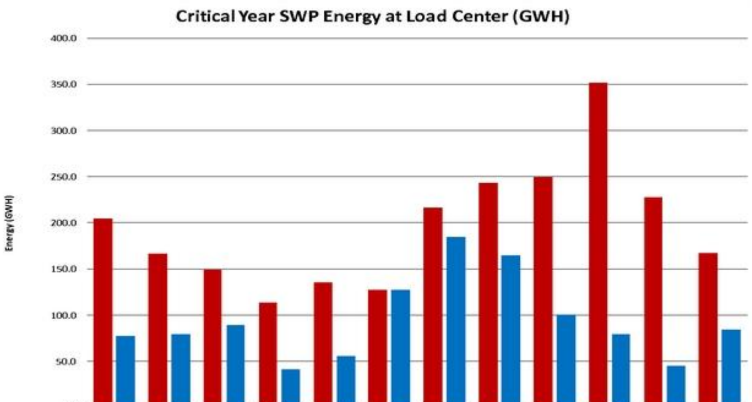
- n/a -

Figure 64 - Critical Year CVP Energy at Load Center (GWH)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	232.8	188.4	139.8	160.3	123.4	148.3	257.8	314.6	401.0	504.7	407.0	200.4
SWRCB DFC W/Trinity Adjustment	82.9	90.0	69.1	67.3	104.7	190.8	368.2	246.8	143.4	88.2	50.1	36.2

Figure 65 - Critical Year CVP Energy at Load Center (GWH)

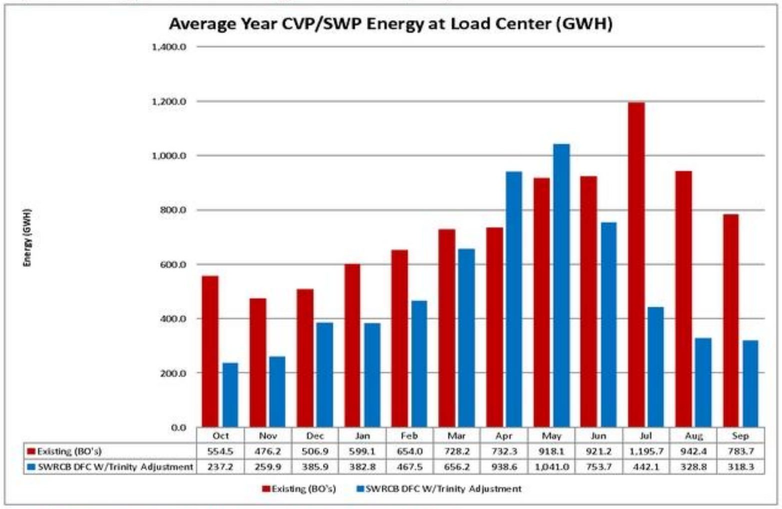


	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	204.1	166.4	148.7	113.3	135.1	127.5	215.9	242.7	249.1	351.3	227.0	166.7
SWRCB DFC	77.4	79.1	89.2	40.6	55.2	127.1	184.5	164.8	100.3	78.9	45.0	84.0

No comments

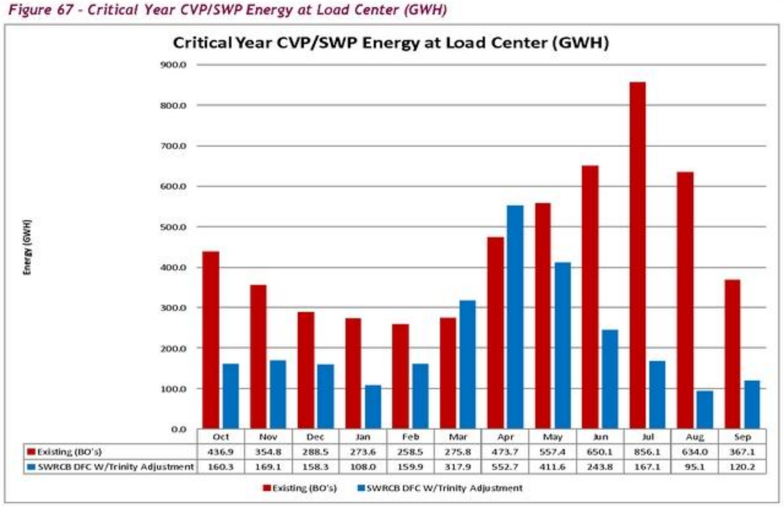
- n/a -

Figure 66 - Average Year CVP/SWP Energy at Load Center (GWH)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	554.5	476.2	506.9	599.1	654.0	728.2	732.3	918.1	921.2	1,195.7	942.4	783.7
SWRCB DFC W/Trinity Adjustment	237.2	259.9	385.9	382.8	467.5	656.2	938.6	1,041.0	753.7	442.1	328.8	318.3

Figure 67 - Critical Year CVP/SWP Energy at Load Center (GWH)

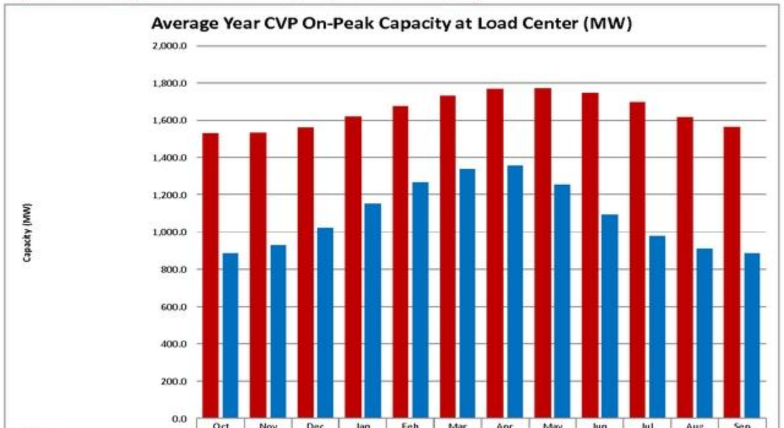


	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	436.9	354.8	288.5	273.6	258.5	275.8	473.7	557.4	650.1	856.1	634.0	367.1
SWRCB DFC W/Trinity Adjustment	160.3	169.1	158.3	108.0	159.9	317.9	552.7	411.6	243.8	167.1	95.1	120.2

No comments

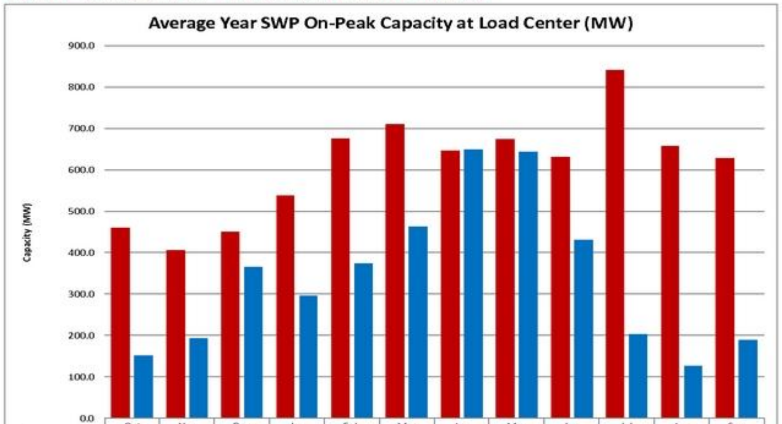
- n/a -

Figure 68 - Average Year CVP On-Peak Capacity at Load Center (MW)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	1,529.8	1,533.0	1,561.3	1,620.3	1,677.0	1,730.0	1,765.2	1,770.6	1,748.0	1,694.6	1,614.6	1,563.0
SWRCB DFC W/Trinity Adjustment	888.3	930.6	1,020.7	1,152.6	1,265.2	1,340.0	1,354.3	1,253.8	1,093.5	977.9	910.1	887.0

Figure 69 - Average Year SWP On-Peak Capacity at Load Center (MW)

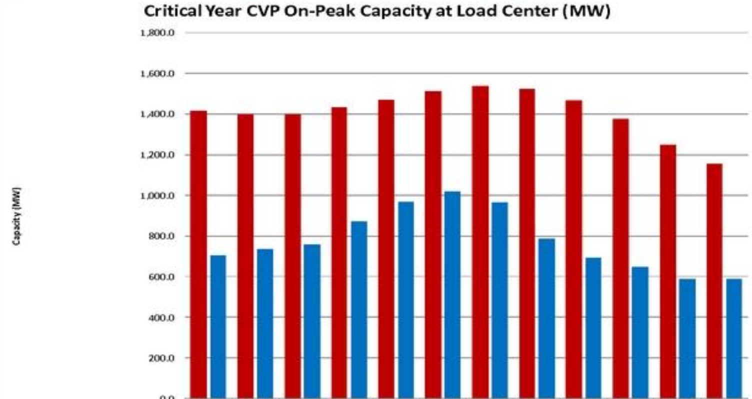


	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	459.1	406.8	450.9	538.9	676.0	709.3	644.7	674.2	631.1	839.6	657.1	626.8
SWRCB DFC	150.4	193.6	364.8	295.2	373.8	462.4	649.5	643.6	430.6	202.9	125.9	187.9

No comments

- n/a -

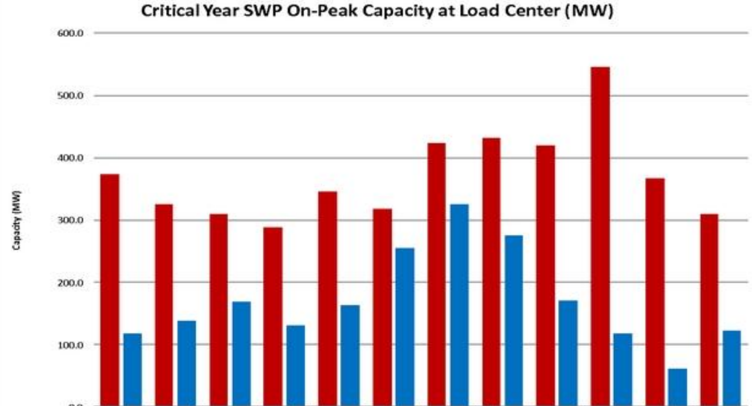
Figure 70 - Critical Year CVP Energy On-Peak Capacity at Load Center (MW)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	1,413.0	1,397.3	1,395.1	1,433.5	1,469.9	1,510.1	1,535.5	1,520.0	1,465.6	1,376.8	1,247.3	1,152.0
SWRCB DFC W/Trinity Adjustment	705.2	735.2	755.6	873.0	969.0	1,019.7	963.2	784.9	693.6	648.1	590.3	589.1

Existing (BO's) SWRCB DFC W/Trinity Adjustment

Figure 71 - Critical Year SWP On-Peak Capacity at Load Center (MW)



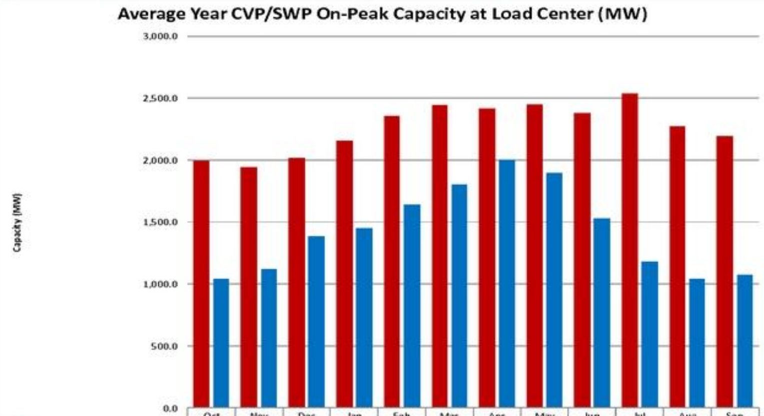
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	372.5	324.6	309.9	288.7	345.0	318.0	422.5	430.6	419.5	545.1	366.2	309.6
SWRCB DFC	117.7	137.7	169.0	130.3	163.0	254.6	324.8	274.4	169.9	117.2	62.0	123.1

Existing (BO's) SWRCB DFC

No comments

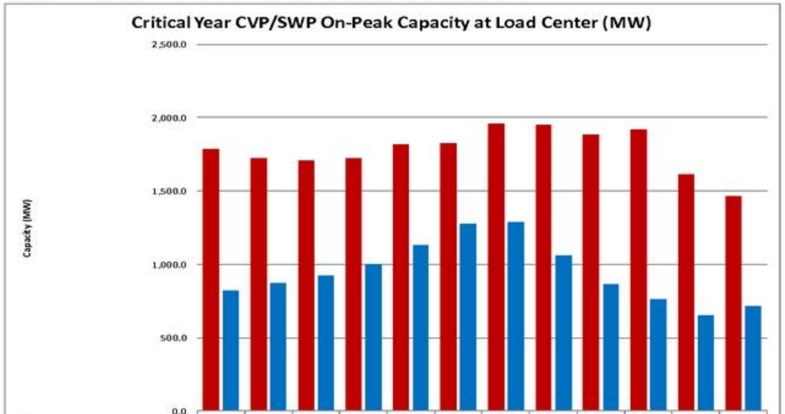
- n/a -

Figure 72 - Average Year CVP/SWP On-Peak Capacity at Load Center (MW)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	1,988.9	1,939.8	2,012.2	2,159.2	2,353.0	2,439.3	2,409.9	2,444.8	2,379.0	2,534.2	2,271.7	2,189.9
SWRCB DFC W/Trinity Adjustment	1,038.7	1,124.2	1,385.5	1,447.8	1,639.0	1,802.4	2,003.7	1,897.4	1,524.1	1,180.8	1,036.0	1,074.9

Figure 73 - Critical Year CVP/SWP On-Peak Capacity at Load Center (MW)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing (BO's)	1,785.5	1,722.0	1,705.1	1,722.2	1,814.9	1,828.1	1,958.1	1,950.6	1,885.1	1,921.9	1,613.4	1,461.6
SWRCB DFC W/Trinity Adjustment	823.0	872.9	924.6	1,003.3	1,132.0	1,274.3	1,288.1	1,059.4	863.6	765.3	652.3	712.2

No comments

- n/a -

Table 11 - Combined CVP/SWP Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC W/Trinity Adjustment Studies						
Existing (BO's)	11,992	9,656	8,111	7,370	5,426	9,012
SWRCB DFC W/Trinity Adjustment	9,506	7,095	4,700	4,406	2,664	6,212
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC W/Trinity Adjustment	-2,486	-2,561	-3,411	-2,964	-2,763	-2,800
% Change	-21%	-27%	-42%	-40%	-51%	-31%

Table 12 - Combined CVP/SWP Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC W/Trinity Adjustment Studies						
Existing (BO's)	10,460	9,411	9,466	8,226	5,557	8,929
SWRCB DFC W/Trinity Adjustment	4,132	2,929	2,514	2,645	1,977	3,038
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC W/Trinity Adjustment	-6,328	-6,482	-6,953	-5,581	-3,580	-5,891
% Change	-60%	-69%	-73%	-68%	-64%	-66%

Table - Combined CVP/SWP Net Energy at Load Center (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Existing (BO's) and SWRCB DFC W/Trinity Adjustment Studies						
Existing (BO's)	1,532	245	-1,355	-856	-131	83
SWRCB DFC W/Trinity Adjustment	5,374	4,166	2,187	1,761	687	3,174
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC W/Trinity Adjustment	3,841	3,921	3,542	2,617	818	3,091
% Change	251%	1601%	261%	306%	625%	3711%

No comments

- n/a -

Table 13 - Power and Pumping Cost Report Metrics, CVP Long-Term Gen Model Results

Power and Pumping Cost Reporting Metrics

CVP Long-Term Gen Model Results					Existing	SWRCB DFC W/TRN Adj	Difference
CVP Facilities							
Power Facilities							
	Capacity	Total of all Facilities at load center	(MW)	Long Term	1,650	1,088	-563
				Driest Periods	1,368	786	-581
	Energy Generation	Total of all Facilities at load center	(GWh)	Long Term	4,709	3,651	-1,058
				Driest Periods	3,004	1,669	-1,336
	Generation Revenue	Total of all Facilities	($1,000)	Long Term	276,795	206,417	-70,378
				Driest Periods	177,262	91,956	-85,306
Pumping Facilities							
	Energy Use	Total of all Facilities at load center	(GWh)	Long Term	1,176	529	-647
				Driest Periods	790	437	-353
	Power Costs	Total of all Facilities	($1,000)	Long Term	60,770	27,562	-33,208
				Driest Periods	41,127	22,983	-18,144
Losses							
	Foregone Energy	Total of all Facilities	(GWh)	Long Term	255	274	19
				Driest Periods	20	51	31
	Transmission Losses	Total of all Facilities	(GWh)	Long Term	201	156	-45
				Driest Periods	128	68	-59
Total							
	Net Generation	Total of all Facilities	(GWh)	Long Term	3,533	3,122	-411
				Driest Periods	2,214	1,231	-983
	Net Revenue	Total of all Facilities	($1,000)	Long Term	216,024	178,855	-37,170
				Driest Periods	136,135	68,973	-67,162

Notes:
1. Long Term is the average quantity for the calendar years 1922-2002
2. Driest Periods is the average quantity for the calendar years 1929-1934, 1976-1977, and 1987-1992
3. 2009 Forecast (in 2007 $); Prices are forward prices as of 08/25/2009 and were developed by DWR power portfolio section (extrapolated from a linear trend that was fitted to the estimates beginning in late 2009 and ending in 2039)

Table 14 - Power and Pumping Cost Report Metrics, SWP Gen Results

Power and Pumping Cost Reporting Metrics

SWP Gen Results					Existing	SWRCB DFC	Difference
SWP Facilities							
Power Facilities							
	Capacity	Total of all Facilities at load center	(MW)	Long Term	610	339	-271
				Driest Periods	364	186	-179
	Energy Generation	Total of all Facilities at load center	(GWh)	Long Term	4,299	2,548	-1,750
				Driest Periods	2,269	1,229	-1,040
	Generation Revenue	Total of all Facilities	($1,000)	Long Term	248,338	141,999	-106,338
				Driest Periods	131,298	68,415	-62,883
Pumping Facilities							
	Energy Use	Total of all Facilities at load center	(GWh)	Long Term	7,740	2,479	-5,261
				Driest Periods	4,570	1,433	-3,137
	Power Costs	Total of all Facilities	($1,000)	Long Term	402,469	127,827	-274,641
				Driest Periods	236,799	73,590	-163,209
Losses							
	Foregone Energy	Total of all Facilities	(GWh)	Long Term	75	78	3
				Driest Periods	1	5	4
	Transmission Losses	Total of all Facilities	(GWh)	Long Term	141	101	-39
				Driest Periods	71	48	-23
Total							
	Net Generation	Total of all Facilities	(GWh)	Long Term	-3,441	69	3,511
				Driest Periods	-2,300	-204	2,097
	Net Revenue	Total of all Facilities	($1,000)	Long Term	-154,131	14,172	168,303
				Driest Periods	-105,501	-5,175	100,326

Notes:
1. Long Term is the average quantity for the calendar years 1922-2002.
2. Driest Periods is the average quantity for the calendar years 1929-1934, 1976-1977, and 1987-1992.
3. 2009 Forecast (in 2007 $); Prices are forward prices as of 08/25/2009 and were developed by DWR power portfolio section.(extrapolated from a linear trend that was fitted to the estimates beginning in late 2009 and ending in 2039)

No comments

- n/a -

4.6 Cost Estimates for Loss of M&I Supplies South of the Delta

When comparing the existing conditions, there are significant reductions in the SWP Delta exports with the SWRCB DFC that translate into a significant savings in pumping costs for the SWP. It has been suggested that an alternative comparison which recognizes that the M&I water lost with reduced Delta exports could be replaced with an equivalent amount of water produced using desalinization.

An estimate of desalinization cost (independent of conveyance) was determined to range between 3,260 and 4,900 kWh/AF (**Table 15**).

Table 15 - Power and Pumping Cost Reporting Metrics, Combined Model Results with Desal (3,260 kWh/AF)

Power and Pumping Cost Reporting Metrics

Combined Model Results With Desal (3,260 kWh/AF)					Existing	SWRCB DFC W/TRN Adj	Difference
Combined CVP and SWP Facilities							
Power Facilities							
	Energy Generation	Total of all Facilities at load center	(GWh)	Long Term	9,008	6,199	-2,808
	Generation Revenue	Total of all Facilities	($1,000)	Long Term	525,133	348,416	-176,716
Pumping Facilities							
	Energy Use	Total of all Facilities at load center	(GWh)	Long Term	8,916	3,008	-5,908
	Power Costs	Total of all Facilities	($1,000)	Long Term	463,239	155,390	-307,850
Desal							
	Energy Use	Total of all Facilities at load center	(GWh)	Long Term	0	3,514	3,514
	Power Costs	Total of all Facilities	($1,000)	Long Term	0	181,508	181,508
Total							
	Net Generation	Total of all Facilities	(GWh)	Long Term	92	-323	-415
	Net Revenue	Total of all Facilities	($1,000)	Long Term	61,894	11,519	-50,375

Notes: 1. Long Term is the average quantity for the calendar years 1922-2002
2. 2009 Forecast (in 2007 $); Prices are forward prices as of 08/25/2009 and were developed by DWR power portfolio section (extrapolated from a linear trend that was fitted to the estimates beginning in late 2009 and ending in 2039)

Table 16 - Power and Pumping Cost Reporting Metrics, Combined Model Results with Desal (4,900 kWh/AF)

Power and Pumping Cost Reporting Metrics

Combined Model Results With Desal (4,900 kWh/AF)					Existing	SWRCB DFC W/TRN Adj	Difference
Combined CVP and SWP Facilities							
Power Facilities							
	Energy Generation	Total of all Facilities at load center	(GWh)	Long Term	9,008	6,199	-2,808
	Generation Revenue	Total of all Facilities	($1,000)	Long Term	525,133	348,416	-176,716
Pumping Facilities							
	Energy Use	Total of all Facilities at load center	(GWh)	Long Term	8,916	3,008	-5,908
	Power Costs	Total of all Facilities	($1,000)	Long Term	463,239	155,390	-307,850
Desal							
	Energy Use	Total of all Facilities at load center	(GWh)	Long Term	0	5,282	5,282
	Power Costs	Total of all Facilities	($1,000)	Long Term	0	272,830	272,830
Total							
	Net Generation	Total of all Facilities	(GWh)	Long Term	92	-2,091	-2,183
	Net Revenue	Total of all Facilities	($1,000)	Long Term	61,894	-79,803	-141,697

Notes: 1. Long Term is the average quantity for the calendar years 1922-2002
2. 2009 Forecast (in 2007 $); Prices are forward prices as of 08/25/2009 and were developed by DWR power portfolio section (extrapolated from a linear trend that was fitted to the estimates beginning in late 2009 and ending in 2039)

No comments

- n/a -

4.7 Characteristics of San Joaquin River Tributary Hydropower Conditions with the SWRCB DFC

The SWRCB DFC affects operations on the San Joaquin River and its tributaries presented here are the effects on the Stanislaus (New Melones), Tuolumne (Don Pedro), and Merced (Exchequer) rivers. (Note that results from the Stanislaus River operations at New Melones, a CVP facility have been included in the CVP results reported in Section 4.3.)

4.7.1 New Melones (CVP)

4.7.1.1 Energy

Table 17 - Energy (GWH)

	Water Year Type					
	W	AN	BN	D	C	All Years
	Existing (BO's) and SWRCB DFC Study					
Existing (BO's)	603	508	429	400	305	467
SWRCB DFC	590	462	356	297	234	412
	Change from Existing (BO's)					
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-13	-47	-73	-103	-71	-55
% Change	-2%	-9%	-17%	-26%	-23%	-12%

4.7.1.2 Generation (GWH)

Table 18 - NM Generation - SWRCB DFC (Spreadsheet Model)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	15	6	3	2	24	53	83	158	131	45	43	27	590
AN	13	10	12	7	21	38	70	120	78	36	35	20	462
BN	11	6	4	5	10	30	59	97	60	27	27	18	356
D	15	9	6	6	9	26	49	68	39	26	29	16	297
C	9	8	6	5	10	23	38	47	28	21	23	17	234
All Ave	13	8	6	4	16	36	62	105	75	33	33	20	412

Table 19 - NM Generation - Existing (BO's) Study (Spreadsheet Model)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	30	12	12	22	16	58	75	91	81	80	74	52	603
AN	30	14	17	20	16	37	69	82	66	61	58	38	508
BN	30	10	7	10	10	27	65	71	54	56	54	35	429
D	28	12	8	9	10	20	56	68	50	54	52	32	400
C	17	11	7	7	10	20	37	49	40	42	40	25	305
All Ave	27	12	11	15	13	36	62	74	61	61	58	38	467

No comments

- n/a -

Table 20 - NM Generation - SWRCB DFC (Spreadsheet Model) minus NM Generation - Existing (BO's) Study (Spreadsheet Model)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-14	-6	-9	-20	8	-5	8	67	50	-35	-32	-25	-13
AN	-17	-3	-5	-13	5	1	1	38	13	-25	-23	-18	-47
BN	-19	-4	-3	-5	0	3	-6	26	6	-29	-27	-16	-73
D	-12	-4	-3	-3	-1	6	-7	0	-11	-29	-24	-15	-103
C	-9	-2	-1	-2	0	3	1	-2	-12	-21	-18	-8	-71
All Ave	-14	-4	-5	-10	3	1	1	31	14	-28	-25	-17	-55

4.7.2 Don Pedro

4.7.2.1 Energy

Table 21- Energy (GWH)

	Water Year Type					
	W	AN	BN	D	C	All Years
Existing (BO's) and SWRCB DFC Study						
Existing (BO's)	865	652	481	450	288	584
SWRCB DFC	672	531	382	313	198	449
Change from Existing (BO's)						
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-193	-120	-99	-137	-90	-135
% Change	-22%	-18%	-21%	-30%	-31%	-23%

4.7.2.2 Generation – GWH

Table 22 - DP Generation - SWRCB DFC (Spreadsheet Model)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	13	8	10	24	55	77	101	123	114	63	53	30	672
AN	12	5	14	16	41	52	82	115	105	37	32	19	531
BN	14	6	6	10	20	35	69	104	82	14	14	8	382
D	16	7	7	11	17	30	59	88	51	10	10	5	313
C	6	5	5	8	12	23	40	55	31	5	6	2	198
All Ave	12	6	9	15	32	48	74	100	81	30	27	15	449

No comments

- n/a -

Table 23 - DP Generation - Existing (BOs) Study (Spreadsheet Mode)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	25	10	21	49	80	109	105	101	124	121	74	45	865
AN	23	14	30	35	49	75	79	82	72	85	69	40	652
BN	24	8	10	14	16	44	66	70	61	73	60	34	481
D	29	10	9	14	14	37	57	64	60	70	57	30	450
C	21	8	6	11	11	22	35	39	37	44	36	18	288
All Ave	24	10	16	28	40	64	72	75	77	83	60	35	584

Table 24 - DP Generation - SWRCB DFC (Spreadsheet Model) minus DP Generation - Existing (BO's) Study (Spreadsheet Model)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-12	-2	-11	-24	-25	-32	-4	21	-10	-58	-21	-14	-193
AN	-11	-8	-16	-19	-7	-22	4	33	32	-48	-37	-21	-120
BN	-10	-2	-4	-4	3	-9	3	34	21	-58	-46	-26	-99
D	-12	-3	-2	-3	3	-7	3	24	-9	-59	-46	-25	-137
C	-15	-3	-2	-3	1	1	5	16	-6	-39	-30	-16	-90
All Ave	-12	-4	-8	-12	-8	-16	1	25	4	-53	-34	-19	-135

4.7.3 Exchequer

4.7.3.1 Energy

Table 25 Energy (GWH)

	Water Year Type					
	W	AN	BN	D	C	All Years
	Existing (BO's) and SWRCB DFC Study					
Existing (BO's)	521	373	282	281	175	349
SWRCB DFC	416	331	222	158	60	258
	Change from Existing (BO's)					
Existing (BO's)	0	0	0	0	0	0
SWRCB DFC	-105	-42	-60	-123	-115	-90
% Change	-20%	-11%	-21%	-44%	-66%	-26%

No comments

- n/a -

4.7.3.2 Generation – GWH

Table 26 - Merced Generation - SWRCB DFC

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	5	2	5	12	32	41	58	72	71	53	44	21	416
AN	7	4	8	11	23	24	48	65	61	40	30	10	331
BN	6	2	3	2	5	17	35	52	47	28	21	4	222
D	5	3	2	3	4	14	27	36	30	20	13	1	158
C	3	1	1	1	1	4	8	15	12	7	6	1	60
All Ave	5	3	4	7	16	22	38	51	47	32	25	9	258

Table 27 - Merced Generation - Existing (BO's) Study w/o VAMP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	12	8	16	29	40	39	37	73	77	75	79	35	521
AN	13	8	18	18	27	17	29	55	56	56	52	25	373
BN	12	7	6	7	7	17	30	41	49	51	40	17	282
D	14	8	7	7	8	20	33	41	46	47	35	15	281
C	10	4	4	4	4	11	21	28	30	30	23	6	175
All Ave	12	7	11	15	20	23	31	51	54	54	50	21	349

Table 28 - Merced Generation - SWRCB DFC minus Merced Generation - Existing (BO's) Study without VAMP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-7	-6	-11	-17	-9	2	21	-1	-6	-22	-35	-13	-105
AN	-6	-3	-10	-7	-4	7	19	10	5	-16	-22	-15	-42
BN	-6	-4	-3	-5	-2	0	5	10	-1	-23	-18	-14	-60
D	-8	-5	-5	-4	-4	-6	-6	-6	-16	-27	-22	-13	-123
C	-7	-3	-3	-3	-3	-7	-13	-13	-18	-23	-17	-5	-115
All Ave	-7	-4	-7	-8	-5	0	7	0	-7	-22	-24	-12	-90

No comments

- n/a -