

Appendix 6D

Comparison of Impact Assessment Results Using CALSIM II 2010 and 2015 Versions

Line items and numbers identified or noted as “No Action Alternative” represent the “Existing Conditions/No Project/No Action Condition” (described in Chapter 2 Alternatives Analysis). Table numbering may not be consecutive for all appendixes.

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APPENDIX 6D

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6D.1 Introduction

As described in Appendix 6B, Water Resources System Modeling, the primary model in the analytical framework for this Environmental Impact Report/Environmental Impact Statement (EIR/EIS) is CALSIM II. The CALSIM II model relies upon numerical inputs and logic relationships that describe the hydrology, facilities, water management, regulatory standards, and operational criteria assumptions for specified water supply facilities and water deliveries primarily associated with the Central Valley Project (CVP) and State Water Project (SWP). The results of the CALSIM II model runs and assumed system operation decisions include monthly reservoir storage volumes for CVP and SWP reservoirs, water deliveries made and affected by CVP and SWP operations, and river flows downstream of the CVP and SWP reservoirs.

In 2010, the California Department of Water Resources (DWR) and Department of the Interior Bureau of Reclamation (Reclamation) updated the CALSIM II model as part of the preparation of an EIR/EIS for the Bay Delta Conservation Plan. Between 2010 and 2013, this CALSIM II model (referred to as “CALSIM II (2010)” model) was used to analyze conditions and anticipated operations that would occur under Alternatives A, B, and C of this EIR/EIS as compared to the Existing Conditions/No Project/No Action Condition. The range of alternatives for this EIR/EIS was subsequently expanded to include Alternatives C₁ and D. The CALSIM II (2010) model was used to analyze conditions under Alternatives C₁ and D as compared to the Existing Conditions/No Project/No Action Condition to provide model results that were consistent and comparable to the previous model results associated with Alternatives A, B, and C.

In 2015, DWR published an updated CALSIM II model as part of the “State Water Project Delivery Capability Report” (DWR, 2015).¹ This new model, referred to as “CALSIM II (2015),” is being used for several ongoing projects being completed by DWR, Reclamation, and State Water Commission. During preparation of this EIR/EIS, there was consideration of whether the conditions under Alternatives A, B, C, C₁, and D as compared to the Existing Conditions/No Project/No Action Condition should be simulated using the CALSIM II (2015) model due to the potential for differing results. In order to evaluate this potential, a comparative analysis was conducted to provide a comparison of the conditions under Alternative D as compared to the Existing Conditions/No Project/No Action Condition using the CALSIM II (2010) and the CALSIM II (2015) models. This appendix provides the results of this comparative evaluation.

As described below, while the absolute model results for the alternatives were found to differ to some degree between the CALSIM II (2010) and the CALSIM II (2015) models, the comparative differences between Alternative D and the Existing Conditions/No Project/No Action Condition were found to be similar. Based upon this analysis, it is also assumed that the impact analyses results and the ranking of the alternatives in support of the selection of the Sites Reservoir Project (Project) also would be similar in comparison to the Existing Conditions/No Project/No Action Condition using either the CALSIM II (2010) or the CALSIM II (2015) models. As described in Chapter 6 Surface Water Resources, the results

of any CALSIM II model run can only be used in a comparative manner, and cannot be used to predict absolute values.

6D.2 Overview of the Differences between CALSIM II (2010) and CALSIM II (2015) Versions

The CALSIM II (2010) model was primarily prepared by DWR and Reclamation to incorporate changes in the CVP and SWP operations related to implementation of the 2008 U.S. Fish and Wildlife Service Biological Opinion and the 2009 National Marine Fisheries Service Biological Opinion on the Long-Term Coordinated Operation of the CVP and SWP (referred to as the Biological Opinions). The assumptions included in the CALSIM II (2010) model were developed immediately following the publication of these two biological opinions for use in the No Action Alternative simulations of the Bay Delta Conservation Plan EIR/EIS and other studies being completed by DWR and Reclamation at that time, including environmental documentation for water storage projects (e.g., Sites Reservoir). The CALSIM II (2010) model also included updated future water demand projections from the previous version of CALSIM II.

Between 2010 and 2015, Reclamation and DWR gained a greater understanding of specific issues related to operations of the CVP and SWP under the biological opinions. During this same time frame, the Los Vaqueros Reservoir expansion and Folsom Lake flood control improvements were designed and constructed; agreements between regulatory agencies and Reclamation were more fully defined (e.g., Modified American River Flow Management Standard); and the agreement to implement the pilot study to increase flows in certain periods in the San Joaquin River (Vernalis Adaptive Management Program [VAMP]) expired. In addition, comments received from various users of the CALSIM II (2010) model were reviewed by DWR and Reclamation and incorporated into the CALSIM II (2015) model to improve simulation of actual CVP and SWP operations and constraints.

The following list represents the primary changes between the CALSIM II (2010) and CALSIM II (2015) model version assumptions.

- Changes in the Sacramento River Operations:
 - Modified American River Flow Management Standard assumptions.
 - Modified American River and Sacramento River watershed water demand assumptions to reflect general plans and updated water supply plans prepared by the water users, especially municipal and industrial water users.
 - Added new Folsom Lake flood control improvements operational assumptions - Note: new flood control rule curves are still under development, and are not included in the CALSIM II (2015) model.
 - Added assumptions for DWR operations on the Feather River to provide rice decomposition water, including water demands and return flows.
- Changes in the Sacramento-San Joaquin Rivers Delta (Delta):
 - Modified Export-Inflow ratio criteria assumptions for operations of the CVP and SWP.
 - Modified minimum instream flow on the Sacramento River at Hood criteria assumptions.

- Modified Coordinated Operations Agreement sharing criteria assumptions to reflect actual operations since implementation of the State Water Resources Control Board Decision 1641 and the Biological Opinions.
- Modified operational assumptions for the CVP and SWP in severe drought periods to provide minimum water supplies to meet public health and safety demands for communities located south of the Delta based upon operations during the recent drought.
- Added the expanded Los Vaqueros Reservoir operational criteria assumptions.
- Changes in the San Joaquin River Operations:
 - Modified operations of New Melones Reservoir and the Stanislaus River to reflect actual operations and constraints, including changes following the expiration of the VAMP.
 - Removal of operational criteria assumptions related to VAMP.
 - Modified water demand assumptions for the SWP South of the Delta water users.
 - Model refinements to incorporate new and updated information related to ongoing CVP and SWP operations and facilities.
 - Model refinements to incorporate software updates and other model improvements.

6D.3 Comparison of Results from CALSIM II (2010) and CALSIM II (2015) Model Versions

To determine if the use of different CALSIM II model versions would result in a change in the comparative results between Alternatives A, B, C, C₁, and D and as compared to the Existing Conditions/No Project/No Action Condition, the two CALSIM II model versions were used to compare conditions under Alternative D and under the Existing Conditions/No Project/No Action Condition. The results of this comparison are presented in Table 6D-1 for long-term average conditions and in Table 6D-2 for long-term Dry and Critical Water Year types.

As described in Chapter 6 Surface Water Resources, the CALSIM II model monthly simulation of real-time daily (or even hourly) operations of the CVP and SWP results in several limitations in use of the CALSIM II model results. The model results must be used in a comparative manner to reduce the effects of use of monthly assumptions and other assumptions that are indicative of real-time operations, but do not specifically match real-time observations. The CALSIM II model output is based upon a monthly time step. The CALSIM II model output includes minor fluctuations of up to 5 percent as a result of model assumptions and approaches. Therefore, if the quantitative changes between an action alternative and the Existing Conditions/No Project/No Action Condition are 5 percent or less, the conditions under the action alternative are considered to be “similar” to conditions under the Existing Conditions/No Project/No Action Condition.

6D.3.1 Long-Term Average Conditions

As shown in Table 6D-1, the differences between the reservoir storage at the end-of-September, Sacramento River flows, and CVP and SWP water deliveries generally would be similar under Alternative D and the Existing Conditions/No Project/No Action Condition under both the CALSIM II (2010) and CALSIM II (2015) models. It is noted that reservoir storage in Folsom Lake would be slightly

higher under Alternative D as compared to the Existing Conditions/No Project/No Action Condition with the CALSIM II (2010) model and similar under the CALSIM II (2015) model; and SWP water deliveries would be slightly higher under Alternative D as compared to the Existing Conditions/No Project/No Action Condition with the CALSIM II (2015) model and similar under the CALSIM II (2010) model. However, these differences are minor.

Based upon this analysis, it was determined that both the CALSIM II (2010) and CALSIM II (2015) model versions would provide similar results in the comparison of between Alternatives A, B, C, C₁, and D and as compared to the Existing Conditions/No Project/No Action Condition under long-term average conditions; and there is no need to use the CALSIM II (2015) model version to conduct the impact analysis of Alternatives A, B, C, C₁, and D as compared to the Existing Conditions/No Project/No Action Condition.

6D.3.2 Dry and Critical Water Year Conditions

As shown in Table 6D-2, the differences between the reservoir storage at the end-of-September, Sacramento River flows, and CVP and SWP water deliveries would be generally similar under Alternative D and the Existing Conditions/No Project/No Action Condition under both the CALSIM II (2010) and CALSIM II (2015) models except for Shasta Lake, Folsom Lake, and San Luis Reservoir.

Reservoir storage in Shasta Lake would be greater under Alternative D as compared to the Existing Conditions/No Project/No Action Condition with both the CALSIM II (2010) and CALSIM II (2015) models. The increase in Shasta Lake storage would be slightly higher with CALSIM II (2010) as compared to the results of CALSIM II (2015) model version. This could result in a slightly higher declaration of beneficial impacts to cold water pool in Shasta Lake and water temperature conditions in the Sacramento River downstream of Shasta Lake under Alternative D and the Existing Conditions/No Project/No Action Condition with CALSIM II (2010) as compared to the results of CALSIM II (2015) model version. However, it would not result in an increase in potentially significant adverse impacts as compared to the Existing Conditions/No Project/No Action Condition if the CALSIM II (2015) model version were used to compare A, B, C, C₁, and D to the Existing Conditions/No Project/No Action Condition.

Reservoir storage in Folsom Lake would be substantially greater under Alternative D as compared to the Existing Conditions/No Project/No Action Condition under the CALSIM II (2010) model version as compared to the CALSIM II (2015) model version. The change in Folsom Lake storage under the CALSIM II (2015) model version as compared to the CALSIM II (2010) model version is related to the numerous changes related to Folsom Lake operations, American River watershed water demands, American River Flow Management Study, and CVP Delta operations. This could result in a slightly higher declaration of water storage in Folsom Lake under Alternative D and the Existing Conditions/No Project/No Action Condition with CALSIM II (2010) as compared to the results of CALSIM II (2015) model version. However, it would not result in an increase in potentially significant adverse impacts as compared to the Existing Conditions/No Project/No Action Condition if the CALSIM II (2015) model version were used to compare A, B, C, C₁, and D to the Existing Conditions/No Project/No Action Condition.

Reservoir storage in San Luis Reservoir would be lower under Alternative D as compared to the Existing Conditions/No Project/No Action Condition with the CALSIM II (2010) model version, and similar with the CALSIM II (2015) model version. The change in San Luis Reservoir storage under the CALSIM II

(2015) model version as compared to the CALSIM II (2010) model version is related to the numerous changes related to CVP and SWP Delta operations. This could result in a slightly higher declaration of adverse impacts related to storage in San Luis Reservoir under Alternative D and the Existing Conditions/No Project/No Action Condition with CALSIM II (2010) as compared to the results of CALSIM II (2015) model version. However, it would not result in an increase in potentially significant adverse impacts as compared to the Existing Conditions/No Project/No Action Condition if the CALSIM II (2015) model version were used to compare A, B, C, C₁, and D to the Existing Conditions/No Project/No Action Condition.

SWP water deliveries would be higher under Alternative D as compared to the Existing Conditions/No Project/No Action Condition with both the CALSIM II (2010) and CALSIM II (2015) model versions. The extent of the increase would be greater with the CALSIM II (2015) model as compared to the results with the CALSIM II (2010) model. This could result in a slightly lower declaration of benefits related to SWP water deliveries under Alternative D and the Existing Conditions/No Project/No Action Condition with CALSIM II (2010) as compared to the results of CALSIM II (2015) model version. However, it would not result in an increase in potentially significant adverse impacts as compared to the Existing Conditions/No Project/No Action Condition if the CALSIM II (2015) model version were used to compare A, B, C, C₁, and D to the Existing Conditions/No Project/No Action Condition.

Based upon this analysis, it was determined that both the CALSIM II (2010) and CALSIM II (2015) model versions would provide similar rankings of the surface water resources impacts in the comparison of between Alternatives A, B, C, C₁, and D and as compared to the Existing Conditions/No Project/No Action Condition under long-term Dry and Critical water year conditions; and there is no need to use the CALSIM II (2015) model version to conduct the impact analysis of Alternatives A, B, C, C₁, and D as compared to the Existing Conditions/No Project/No Action Condition.

**Table 6D-1
Comparison of Long-term Average Conditions under Alternative D and the Existing Conditions/No Project/No Action Condition using Results from the CALSIM II (2010) and CALSIM II (2015) Model Runs**

Items	Based on the CALSIM II (2010) Version				Based on the CALSIM II (2015) Version			
	ExC-NP-NAC ^a	Alt. D ^b	Difference	Percent Difference	ExC-NP-NAC ^a	Alt. D ^b	Difference	Percent Difference
Trinity Lake ^c	1,374	1,376	2	0%	1,401	1,391	-10	-1%
Shasta Lake ^c	2,630	2,762	132	5%	2,655	2,768	114	4%
Folsom Lake ^c	496	524	28	6%	505	528	23	4%
Lake Oroville ^c	1,831	1,863	32	2%	1,677	1,718	41	2%
Sites Reservoir ^c	0	1,083	1,083	Not Applicable	0	1,075	1,075	Not Applicable
San Luis Reservoir ^c	584	594	10	2%	526	531	5	1%
Sacramento River at Freeport ^d	15,472	15,473	1	0%	15,709	15,702	-7	0%
Delta Outflow ^d	21,899	21,507	-392	-2%	26,327	25,592	-735	-3%
CVP Deliveries North-of-the Delta ^e	423	430	7	2%	418	417	1	0%
CVP Deliveries South-of-the Delta ^e	1,230	1,240	10	1%	1,251	1,223	-28	-2%
SWP Deliveries ^e	2,639	2,753	114	4%	2,638	2,802	165	6%

^a ExC-NP-NAC = Existing Conditions/No Project/No Action Condition.

^b Alt. D = Alternative D.

^c Values are for End of September Storage in acre-feet.

^d Values are for Average Annual Flow in cubic feet per second.

^e Values are for Water Deliveries in acre-feet/year.

Notes:

All "Percent Difference" values equal to or less than 5 percent are considered to be "Similar."

Table 6D-2
Comparison of Long-term Dry and Critical Water Year Types under Alternative D and the Existing Conditions/No Project/No Action Condition using Results from the CALSIM II (2010) and CALSIM II (2015) Model Runs

Items	Based on the CALSIM II (2010) Version				Based on the CALSIM II (2015) Version			
	ExC-NP-NAC ^a	Alt. D ^b	Difference	Percent Difference	ExC-NP-NAC ^a	Alt. D ^b	Difference	Percent Difference
Trinity Lake ^c	943	949	6	1%	986	973	-13	-1%
Shasta Lake ^c	1,923	2,121	198	10%	2,031	2,176	145	7%
Folsom Lake ^c	348	378	30	9%	362	367	5	1%
Lake Oroville ^c	1,154	1,217	63	5%	1,051	1,098	46	4%
Sites Reservoir ^c	0	614	614	Not Applicable	0	613	613	Not Applicable
San Luis Reservoir ^c	500	466	-34	-7%	317	324	7	2%
Sacramento River at Freeport ^d	9,758	9,839	81	1%	9,561	9,674	113	1%
Delta Outflow ^d	9,076	8,783	-29	-3%	8,747	8,338	-409	-5%
CVP Deliveries North-of-the Delta ^e	267	273	6	2%	270	263	-7	-3%
CVP Deliveries South-of-the Delta ^e	758	779	21	3%	782	741	-41	-5%
SWP Deliveries ^e	1,905	2,128	223	12%	1,698	1,999	301	18%

^a ExC-NP-NAC = Existing Conditions/No Project/No Action Condition.

^b Alt. D = Alternative D.

^c Values are for End of September Storage in acre-feet.

^d Values are for Average Annual Flow in cubic feet per second.

^e Values are for Water Deliveries in acre-feet/year.

Notes:

All "Percent Difference" values equal to or less than 5 percent are considered to be "Similar."

¹ California Department of Water Resources (DWR). 2015. *State Water Project Delivery Capability Report 2015*. July.

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