# Attachment 2 CalSim II Model Assumptions Callouts

## Introduction

The assumptions for Benchmark model simulations are summarized in Attachment 1 Model Assumptions.

### CalSim II Modeling Assumptions Callouts

The following matrix summarizes the assumptions used for the CalSim II models:

* Benchmark 011721 HIST
* Benchmark 011721 2035CT

|  | **Reclamation Benchmark 011721 HIST (Benchmark Hist)** | **Reclamation Benchmark 011721 2035CT (Benchmark 2035CT)** |
| --- | --- | --- |
| **GENERAL** |  |  |
| **Planning horizon**a | Year 2021 | Same as Benchmark Hist |
| **Period of simulation** | 82 years (1922-2003) | Same as Benchmark Hist |
| **Sea Level Rise** | 0 cm | 15 cm |
| **HYDROLOGY** |  |  |
| **Climate Condition** | Current climate conditions | 2035CT |
| **Inflows/Supplies** | Modified inflows based on historical hydrology projected 2020 modifications for operations upstream of the rim reservoirs | Same as Benchmark Hist |
| **Level of development** | Projected 2030 levelb | Same as Benchmark Hist |
| **DEMANDS, WATER RIGHTS,  CVP/SWP CONTRACTS** |  |  |
| **Sacramento River Region** (excluding American River) |  |  |
| CVPc | Land-use based, full build-out of contract amounts, except for Settlement Contractors represented with historical diversions. | Same as Benchmark Hist |
| SWP (FRSA)d | Land-use based, limited by contract amounts | Same as Benchmark Hist |
| Non-project | Land use based, limited by water rights and SWRCB Decisions for Existing Facilities | Same as Benchmark Hist |
| Antioch Water Works | Pre-1914 water right | Same as Benchmark Hist |
| Federal refuges | Firm Level 2 water supply needs | Same as Benchmark Hist |
| **Sacramento River Region - American River**e |  |  |
| Water rights | Year 2025, full water rights | Same as Benchmark Hist |
| CVP | Year 2025, full contracts except for Settlement Contractors at historical diversions, including Freeport Regional Water Project | Same as Benchmark Hist |
| **San Joaquin River Region**f |  |  |
| Friant Unit | Limited by contract amounts, based on current allocation policy | Same as Benchmark Hist |
| Lower Basin | Land-use based, based on district level operations and constraints | Same as Benchmark Hist |
| Stanislaus River | Land-use based, Stepped Release Plan (SRP) | Same as Benchmark Hist |
| **San Francisco Bay, Central Coast, Tulare Lake and South Coast Regions** (CVP/SWP project facilities) |  |  |
| CVPc | Demand based on contract amounts | Same as Benchmark Hist |
| CCWDg | 195 TAF/yr CVP contract supply, water rights and in-Delta transfers | Same as Benchmark Hist |
| SWPd,h | Demand based on Table A amounts | Same as Benchmark Hist |
| Article 56 | Based on 2001-08 contractor requests | Same as Benchmark Hist |
| Article 21 | MWD demand up to 200 TAF/month from December to March subject to conveyance capacity, KCWA demand up to 180 TAF/month and other contractor demands up to 34 TAF/month in all months,subject to conveyance capacity | Same as Benchmark Hist |
| North Bay Aqueduct (NBA) | 77 TAF/yr demand under SWP contracts, up to 43.7 cfs of excess flow under Fairfield, Vacaville and Benecia Settlement Agreement | Same as Benchmark Hist |
| Federal refuges | Firm Level 2 water needs | Same as Benchmark Hist |
| **FACILITIES** |  |  |
| **Systemwide** |  |  |
| Systemwide | Existing facilities | Same as Benchmark Hist |
| **North Coast Region** |  |  |
| Trinity Lake | Existing, 2,448 TAF capacity | Same as Benchmark Hist |
| **Sacramento River Region** |  |  |
| Shasta Lake | Existing, 4,552 TAF capacity | Same as Benchmark Hist |
| Red Bluff Diversion Dam | Diversion dam gates out all year. Pumping Plant operated to deliver CVP water with capacity of 2,000 cfs. | Same as Benchmark Hist |
| Hamilton City Pump Station | Pumping plant with capacity of 3,000 cfs. | Same as Benchmark Hist |
| Fremont Weir | Notched Fremont Weir as represented in Yolo Bypass Salmonid Habitat Restoration and Fish Passage EIS/EIR Alternative 1 (preferred alternative) | Same as Benchmark Hist |
| Colusa Basin | Existing conveyance and storage facilities | Same as Benchmark Hist |
| Lake Oroville | Existing, 3,538 TAF capacity | Same as Benchmark Hist |
| Upper American Rivere,i | PCWA American River Pump Station | Same as Benchmark Hist |
| Folsom Lake | Existing, 976 TAF capacity | Same as Benchmark Hist |
| American River | Existing Folsom Dam including auxiliary spillway | Same as Benchmark Hist |
| Lower Sacramento River | Freeport Regional Water Projectj | Same as Benchmark Hist |
| **San Joaquin River Region** |  |  |
| Millerton Lake (Friant Dam) | Existing, 520 TAF capacity | Same as Benchmark Hist |
| Lower San Joaquin River | City of Stockton Delta Water Supply Project, 30‑mgd capacity. SJRRP Recapture simulated at West Stanislaus ID, Patterson ID, and Banta Carbona ID | Same as Benchmark Hist |
| SWP Banks Pumping Plant (South Delta)k | Physical capacity is 10,300 cfs but 6,680 cfs permitted capacity in all months. Pumping can be up to 10,300 cfs during Dec 15 – Mar 15 depending on Vernalis flow conditions; additional capacity of 500 cfs (up to 7,180 cfs) allowed Jul – Sep for reducing impact of Spring Outflow Action on SWP | Same as Benchmark Hist |
| CVP C.W. Bill Jones Pumping Plant (Tracy PP) | Permit capacity is 4,600 cfs in all months (allowed for by the Delta-Mendota Canal–California Aqueduct Intertie) | Same as Benchmark Hist |
| Upper Delta-Mendota Canal Capacity | Existing plus 400 cfs Delta-Mendota Canal–California Aqueduct Intertie | Same as Benchmark Hist |
| CCWD Intakes | Los Vaqueros Reservoir with existing storage capacity (160 TAF), and existing intakes except for Mallard Slough Intake. Updated to be consistent with latest Los Vaqueros modeling | Same as Benchmark Hist |
| Suisun March Salinity Control Gates (SMSCG) | Delta salinity conditions are adjusted for months in which the salinity control gate is operated (see operations) | Same as Benchmark Hist |
| San Luis Reservoir | Existing, 2,041 TAF capacity | Same as Benchmark Hist |
| **San Francisco Bay Region** |  |  |
| South Bay Aqueduct (SBA) | SBA rehabilitation, 430 cfs capacity from junction with California Aqueduct to Alameda County FC&WSD Zone 7 diversion point | Same as Benchmark Hist |
| **South Coast Region** |  |  |
| California Aqueduct East Branch | Existing capacity | Same as Benchmark Hist |
| **REGULATORY STANDARDS** |  |  |
| **North Coast Region** |  |  |
| Trinity River |  |  |
| Minimum flow below Lewiston Dam | Trinity EIS Preferred Alternative (369-815 TAF/yr) | Same as Benchmark Hist |
| Trinity River Fall Augmentation Flows | 420 cfs August 1 through September 30 in all but wet years | Same as Benchmark Hist |
| Trinity Reservoir end-of-September minimum storage | Trinity EIS Preferred Alternative (600 TAF as able) | Same as Benchmark Hist |
| **Sacramento River Region** |  |  |
| Clear Creek |  |  |
| Minimum flow below Whiskeytown Dam | Downstream water rights, 1963 USBR Proposal to USFWS and NPS; and 200 cfs October through May or 150 cfs in Critical years and 150 cfs June through September with 10 TAF for channel maintenance in February of BN, AN and Wet years and 10 TAF for Spring pulse flows in June of non-Critical years; in June of Critical years, pulse of 900 cfs. | Same as Benchmark Hist |
| Upper Sacramento River |  |  |
| Shasta Lake end-of-September minimum storage | 1900 TAF in non-critically dry years (not explicitly modeled - achieved through project allocation profiles when hydrologically feasible) | Same as Benchmark Hist |
| Minimum flow below Keswick Dam | SWRCB WR 90-5; and stabilize fall flows to reduce redd dewatering and rebuild cold water pool; and spring pulse flow up to 150 TAF if projected May 1 storage > 4.1 MAF | Same as Benchmark Hist |
| Feather River |  |  |
| Minimum flow below Thermalito Diversion Dam | 2006 Settlement Agreement (700 / 800 cfs) | Same as Benchmark Hist |
| Minimum flow below Thermalito Afterbay outlet | 1983 DWR, DFG Agreement (750-1,700 cfs) | Same as Benchmark Hist |
| Yuba River |  |  |
| Minimum flow below Daguerre Point Dam | D-1644 Operations (Lower Yuba River Accord)m | Same as Benchmark Hist |
| American River |  |  |
| Minimum flow below Nimbus Dam | American River Flow Management Standard, per 2017 Water Forum Agreement with a planning minimum end of December storage target of 275 TAF | Same as Benchmark Hist |
| Minimum Flow at H Street Bridge | SWRCB D-893 | Same as Benchmark Hist |
| Lower Sacramento River |  |  |
| Minimum flow near Rio Vista | SWRCB D-1641 | Same as Benchmark Hist |
| **San Joaquin River Region** |  |  |
| Mokelumne River |  |  |
| Minimum flow below Camanche Dam | FERC 2916-029, 1996 (Joint Settlement Agreement) (100-325 cfs) | Same as Benchmark Hist |
| Minimum flow below Woodbridge Diversion Dam | FERC 2916-029, 1996 (Joint Settlement Agreement) (25-300 cfs) | Same as Benchmark Hist |
| Stanislaus River |  |  |
| Minimum flow below Goodwin Dam | Flows per New Melones SRP | Same as Benchmark Hist |
| Minimum dissolved oxygen | SWRCB D-1422 | Model representation same as Benchmark Hist |
| Merced River |  |  |
| Minimum flow below Crocker-Huffman Diversion Dam | Cowell Agreement | Same as Benchmark Hist |
| Minimum flow at Shaffer Bridge | FERC 2179 (25-100 cfs) with 12.5 TAF in October based on 2002 Merced ID and CDFW Memorandum of Understanding | Same as Benchmark Hist |
| Tuolumne River |  |  |
| Minimum flow at Lagrange Bridge | FERC 2299-024, 1995 (Settlement Agreement) (94-301 TAF/yr) | Same as Benchmark Hist |
| San Joaquin River |  |  |
| San Joaquin River below Friant Dam/ Mendota Pool | San Joaquin River Restoration-full flows, not constrained by current river capacity, model implementation includes recapture in the San Joaquin River and in the Delta | Same as Benchmark Hist |
| Maximum salinity near Vernalis | Stanislaus contribution per New Melones SRP | Same as Benchmark Hist |
| Minimum flow near Vernalis | Stanislaus contribution per New Melones SRP | Same as Benchmark Hist |
| **Sacramento River–San Joaquin Delta Region** |  |  |
| Delta Outflow Index (Flow, NDOI) | SWRCB D-1641 and for Summer/Fall Delta Smelt habitat operate to meet X2 of 80 km for September and October of AN, and Wet years with transitional flows in last half of August. SWP to allow up to 150 TAF of Delta outflow in April and May. Spring outflow action shall not exceed 150 TAF and is subject to a 44,500 cfs Delt Outflow off-ramp.  SWP to release 100 TAF block of water in Jun through Sep of Wet and Above Normal years. | Same as Benchmark Hist |
| Delta Cross Channel gate operation | Gate operations per Multi Year Study Program; model representation as SRWCB D-1641 with additional days closed from Oct 1 – Jan 31 based on NMFS BO (Jun 2009) Action IV.1.2 (closed during flushing flows from Oct 1 – Dec 14 unless adverse water quality conditions would result) | Same as Benchmark Hist |
| South Delta export limits (Jones PP and Banks PP) | SWRCB D-1641 Vernalis flow-based export limits Apr 1 – May 31, (additional 500 cfs allowed for Jul – Sep for reducing impact on SWP) | Same as Benchmark Hist |
| Combined Flow in Old and Middle River (OMR) | OMR target of -5,000 cfs January through June except for 5 days of -2,000 cfs when turbidity bridge occurs (turbidity bridge consideration only January through March) and 7 days of -6,000 cfs when increased pumping due to storm is possible, followed by “first flush” action if it occurs in December or January (14 days of -2,000 cfs), and OMR target of -3,500 cfs in March, April, and May of non-Critical years. Health and Safety off-ramp when exports are low. | Same as Benchmark Hist |
| **OPERATIONS CRITERIA: RIVER-SPECIFIC** |  |  |
| **Sacramento River Region** |  |  |
| Upper Sacramento River: Flow objective for navigation (Wilkins Slough) | Flow objective for Wilkins Slough based on month, CVP allocation, and Shasta storage condition to reflect CVP operations for local delivery | Same as Benchmark Hist |
| American River: Folsom Dam flood control | Variable 400/600 flood control diagram (without outlet modifications) | Same as Benchmark Hist |
| Feather River: Flow at Mouth of Feather River (above Verona) | Maintain DFW/DWR flow target of 2,800 cfs for Apr – Sep when flows available dependent on Oroville inflow and FRSA allocation | Same as Benchmark Hist |
| **San Joaquin River Region** |  |  |
| Stanislaus River: Flow below Goodwin Dam | Flows per New Melones SRP | Same as Benchmark Hist |
| San Joaquin River: Salinity at Vernalis | Grasslands Bypass Project (full implementation) | Same as Benchmark Hist |
| **Sacramento – San Joaquin River Delta Region** |  |  |
| Suisun Marsh Salinity Control Gates | Operate to meet SWRCB D-1641 water quality standards in Montezuma Slough during salinity control season October through May; and for Summer/Fall Delta Smelt habitat operate for up to 60 days June through October of Below Normal, Above Normal, and Wet years. SWP facilitates operations for up to 60 days in June through October of Dry years. | Same as Benchmark Hist |
| **OPERATIONS CRITERIA: SYSTEMWIDE** |  |  |
| **CVP water allocation** |  |  |
| Settlement / Exchange | 100% (75% in Shasta critical years) | Same as Benchmark Hist |
| Refuges | 100% (75% in Shasta critical years) | Same as Benchmark Hist |
| Agriculture Service | 100%-0% based on supply, South-of-Delta allocations are additionally limited due to D-1641 and OMR action | Same as Benchmark Hist |
| Municipal & Industrial Service | 100%-50% based on supply, South-of-Delta allocations are additionally limited due to D-1641and OMR action | Same as Benchmark Hist |
| **SWP water allocation** |  |  |
| North of Delta (FRSA) | Contract specific | Same as Benchmark Hist |
| South of Delta (including North Bay Aqueduct) | Based on supply; equal prioritization between Ag and M&I based on Monterey Agreement; allocations are additionally limited due to D-1641 and OMR action and Spring Outflow Action. | Same as Benchmark Hist |
| **CVP-SWP coordinated operations** |  |  |
| Sharing of responsibility for in-basin-use | Revised Coordinated Operations Agreement | Same as Benchmark Hist |
| Sharing of surplus flows | Revised Coordinated Operations Agreement | Same as Benchmark Hist |
| Sharing of restricted export capacity for project- specific priority pumping | Revised Coordinated Operations Agreement | Same as Benchmark Hist |
| Water transfers | Acquisitions by SWP contractors are wheeled at priority in Banks Pumping Plant over non-SWP users; LYRA included for SWP contractors | Same as Benchmark Hist |
| Sharing of export capacity for lesser priority and wheeling-related pumping | Cross Valley Canal wheeling (max of 128 TAF/yr), CALFED ROD defined Joint Point of Diversion (JPOD) | Same as Benchmark Hist |
| San Luis Reservoir | San Luis Reservoir is allowed to operate to a minimum storage of 100 TAF | Same as Benchmark Hist |
| **CVPIA 3406(b)(2)**l,n |  |  |
| Policy Decision | N/A | N/A |
| Allocation | No B2 Allocation modeled | Same as Benchmark Hist |
| Actions | Pre-determined upstream fish flow objectives below Whiskeytown Dam | Same as Benchmark Hist |
| Accountingm | No B2 Accounting modeled | Same as Benchmark Hist |
| **WATER MANAGEMENT ACTIONS** |  |  |
| **Water Transfer Supplies** (long term programs) |  |  |
| Lower Yuba River Accordm | Yuba River acquisitions for reducing impact of D-1641 and OMR Action export restrictions on SWP | Same as Benchmark Hist |
| Phase 8 | None | None |

Notes:

a These assumptions have been developed under the direction of the Bureau of Reclamation (Reclamation) management team for the Re-initiation of Consultation on long-term operations of the Central Valley Project (CVP) and State Water Project (SWP).

b The Sacramento Valley hydrology used in the Future Conditions CALSIM II model reflects 2020 land-use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects draft 2030 land-use assumptions developed by Reclamation. Development of Future-level projected land-use are being coordinated with the California Water Plan Update for future models.

c Refer to Attachment 5 CalSim II Model Delivery Specifications for contract specific details

d Refer to Attachment 5 CalSim II Model Delivery Specifications for contract specific details

e Assumptions regarding American River water rights and CVP contracts with the Sacramento River Water Reliability Project are documented in the Delivery Specifications attachments. The Sacramento Area Water Forum agreement, its dry year diversion reductions, Middle Fork Project operations and water is not included. Refer to Attachment 5 CalSim II Model Delivery Specifications for contract specific details

f The CALSIM II representation of the San Joaquin River reflects the difficulties on-going groundwater overdraft problems. The 2030 level of development representation of the San Joaquin River Basin does not make any attempt to offer solutions to groundwater overdraft problems. In addition a dynamic groundwater simulation is not yet developed for the San Joaquin River Valley. Groundwater extraction/ recharge and stream-groundwater interaction are static assumptions and may not accurately reflect a response to simulated actions. These limitations should be considered in the analysis of results.

g The actual amount diverted is operated is conjunction with supplies from the Los Vaqueros project. The existing Los Vaqueros storage capacity is 160 TAF. Associated water rights to fill Los Vaqueros with Delta excess flows are included, but CCWD’s water right permit and water right license on Mallard Slough are not included.

h It is assumed that SWP Contractors can take delivery of all Table A allocations and Article 21 supplies. Article 56 provisions are assumed and allow for SWP Contractors to manage storage and delivery conditions such that full Table A allocations can be delivered. Detailed analysis of the South Coast and Tulare regions support these assumptions. NBA Article 21 deliveries are dependent on excess conditions only, all other Article 21 deliveries also require that San Luis Reservoir be at capacity and that Banks PP and the California Aqueduct has available capacity to divert from the Delta for direct delivery.

i PCWA American River pumping facility upstream of Folsom Lake is included.

j Mokelumne River flows are modified to reflect modified operations associated with EBMUD supplies from the Freeport Regional Water Project.

k Current ACOE permit for Banks PP allows for an average diversion rate of 6,680 cfs in all months. Diversion rate can increase up to 1/3 of the rate of San Joaquin River flow at Vernalis during Dec 15th – Mar 15th up to a maximum diversion of 10,300 cfs, if Vernalis flow exceeds 1,000 cfs.

l Delta actions, under USFWS discretionary use of CVPIA 3406(b)(2) allocations, are no longer dynamically operated and accounted for in the CALSIM II model. The Combined Old and Middle River Flow and Delta Export restrictions under the FWS BO (Dec 15th 2008) and the NMFS BO (June 4th 2009) severely limit any discretion that would have been otherwise assumed in selecting Delta actions under the CVPIA 3406(b)(2) accounting criteria. Therefore, it is anticipated that CVPIA 3406(b)(2) account availability for upstream river flows below Whiskeytown, Keswick and Nimbus Dams would be very limited. The future of these operations is uncertain. For these baseline simulations, upstream flows on the Clear Creek and Sacramento River are pre-determined based on CVPIA 3406(b)(2) based operations from the Aug 2008 BA Study 7.0 and Study 8.0 for Existing and Future Conditions respectively. The procedures for dynamic operation and accounting of CVPIA 3406(b)(2) are not included in the CALSIM II model.

m D-1644 and the Lower Yuba River Accord is assumed to be implemented. The Yuba River is not dynamically modeled in CALSIM II. Yuba River hydrology and availability of water acquisitions under the Lower Yuba River Accord are based on modeling performed and the Lower Yuba River Accord EIS/EIR study team.

n In cooperation with Reclamation, National Marine Fisheries Service, Fish and Wildlife Service, and Ca Department of Fish and Game, the Ca Department of Water Resources has developed assumptions for implementation of the FWS BO (Dec 15th 2008) and NMFS BO (June 4th 2009) in CALSIM II. The FWS BO and NMFS BO assumptions are documented in the Appendix 5A of the LTO EIS (Reclamation 2015b).