

## Benefit Calculation, Monetization, and Resiliency Tab

### Attachment 2: Operations Plan

*Attach the preliminary operations plan for the proposed project. See regulations section 6003(a)(1)(H) for details. If the preliminary operations plan is located in another attachment, identify the attachment and provide the location.*

*WSIP Application Instructions, March 2017*

#### Response

This attachment describes the Site Reservoir preliminary operations plan under varying hydrologic conditions, from wettest to driest years and multiple dry year periods.

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# Sites Reservoir Project Preliminary Operations Plan Under a Range of Hydrologic Conditions

August 9, 2017

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## Acronyms and Abbreviations

Authority	Sites Project Authority
BiOp	Biological Opinions
BIOS	Biogeographic Information and Observation System
CALFED	CALFED Bay-Delta Program
CDFW	California Department of Fish and Game
cfs	cubic feet per second
COA	Coordinated Operation Agreement
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWC	California Water Commission
Delta	Sacramento-San Joaquin River Delta
DWR	California Department of Water Resources
EESA	ecosystem enhancement storage account
FGDC	Federal Geographic Data Committee
GCID	Glenn-Colusa Irrigation District
GPS	global positioning system
M&I	municipal and industrial
MAF	million acre-foot (feet)
NMFS	National Marine Fisheries Service
NODOS	North-of-Delta Offstream Storage
O&M	operations and maintenance
OM&R	operations maintenance and repair
RD 108	Reclamation District 108
Reclamation	United States Bureau of Reclamation
SRSC	Sacramento River Settlement Contractor
SVI	Sacramento Valley 40-30-30 water year type index
SWA	Sites Water Account
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
T-C Canal	Tehama-Colusa Canal
TCCA	Tehama-Colusa Canal Authority

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TRR Terminal Regulating Reservoir  
USFWS U.S. Fish and Wildlife Service  
WIIN Water Infrastructure and Investment for the Nation  
WSIP Water Supply Investment Program  
WUA Weighted Usable Area

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# Introduction

**Flexible and Adaptable Operations:** This document provides a summary description of the operations plan proposed by the Sites Project Authority (Authority) for the Sites Reservoir Project for its application to the California Water Commission for the Water Supply Investment Program (WSIP). Operations of the Sites Reservoir Project facilities are flexible and adaptable to meet a wide range of water supply and environmental needs. For the purposes of this application, the operations deemed to be most-responsive in providing water to the highest priorities as established by the Water Commission is provided. This operations strategy presents a prioritization of water-based public benefits in the upper Sacramento River and northern Delta. However, the Authority recognizes that over the life of the Sites Reservoir, these priorities may need to change and the Sites Project has the flexibility to adapt to a changing future. Consistent with other portions of this application, the Authority proposes to form a partnership with the State and Federal government resource agencies, so that the full potential of the Sites Project can be incorporated into the prerequisite operational permits.

**Role of the Authority:** Pursuant to California Water Code 79759(c), the Authority will own, govern, manage, and operate the Sites Project; which will be accomplished by working in partnership with the agencies participating in the project for both water supply and Proposition 1-eligible public benefits. As such, the Authority will, in addition to other responsibilities, be the holder of the water right, enter into water delivery contracts for both water supply and Proposition 1-eligible public benefits, coordination with the Central Valley Project (CVP) and State Water Project (SWP) operators, and be responsible for environmental compliance obligations, operations and maintenance, and dam safety. Organizationally, the Authority plans to establish a governing body, which is conceptually referred to as the Water Operations Committee. The Water Operations Committee’s responsibility is to develop, in partnership, both long-term and annual operational plans that would be implemented by the Authority in cooperation with the operators of the State and Federal projects. As such, the Water Operations Committee will be comprised of investors and stakeholders in the project’s development:

- the water agencies participating in the project’s development; which is currently referred to as the Reservoir Committee;
- the state and federal resource agencies delegated the responsibility to have management control over the investment by the state and/or Federal government, respectively;
- the operators of the Central Valley Project and State Water Project, respectively; and
- operators of other facilities needed to move water to where it has been contracted for (i.e., both Proposition 1-eligible and non-Proposition 1-eligible benefits).
- Other stakeholders as deemed appropriate.

Additional details regarding how this process is proposed to work is provided as follows. However, the Authority anticipates that the concept presented in this document will evolve as the project evolves and information and insight from the other participants and stakeholders gets incorporated.

**Participation Agreements:** Agreements will be developed for Proposition 1-eligible and non- Proposition 1-eligible benefits (generally water supply augmentation contracts). These agreements will define the amount of Sites Reservoir storage allocated to the organization seeking the specific benefits and maximum and range of deliveries as well as cost associated with those deliveries. Water delivery contracts will also define the delivery request process, facilities repayment and OM&R charges (pro-rated by acre-foot of delivery). Since the WSIP contributions would cover facilities construction cost,

costs associated with Proposition 1-eligible public benefit water delivery contracts would not include facilities repayment costs.

**Water Operations Planning:** The Water Operations Committee’s leadership will manage the development of the 5-year and annual operating plans. The 5-year plan is intended to provide a guide to the overall operations of the Sites Reservoir Project, delineate the goals of the Sites Project operations for those years, provide linkage between the water operations consistent with the water delivery contracts, contracts with the State of California to support the development of public benefits, agreements with the federal government for WIIN Act benefits and the use of federal facilities (Shasta, Red Bluff diversion and Tehama-Colusa Canal, and potentially Folsom Dam), and any adaptive management activities. The 5-year plan will be subject to revision when required. Development of the subsequent 5-yr plan will be initiated in the spring of the 4<sup>th</sup> year to allow for adequate review, coordination and approvals. It is anticipated that the subsequent 5-year plan will be approved during the summer of the 5<sup>th</sup> year.

The annual operating plans will provide specific guidance regarding the operations of the Project for that year. These plans will be initiated in the spring of the prior year and completed and approved no later than the Authority Board meeting in August of the prior year. These plans will include the following:

- A summary of operations (including adaptive management actions and results) from the previous year
- A listing of any carry-over storage amount and location for public and non-public benefit contract holders
- Anticipated annual requests for each public and non-public benefit holder
- Projected operations by water year type, by month and
- Adaptive management activities planned and natural and Sites Projects conditions necessary to initiate those activities

Sites Project annual operating plans will also interface with the preparation of the annual Temperature Management Plan for the Sacramento River, consistent with WR 90-5 and applicable RPAs.

Through detailed coordination with the United States Bureau of Reclamation (Reclamation) and California Department of Water Resources (DWR), the Sites Project will develop and implement detailed operational agreements with these agencies to address issues related to operations of the Sites Project that optimize the use of existing facilities. Though the implementation of these agreements it is expected that the Sites Project will cooperatively interface with the existing ongoing real-time decision-making process and work groups (as identified in the California Water Fix 2017 Project Description) to avoid and minimize adverse effects to Central Valley Project and State Water Project facilities, operational plans, listed species, public health, safety and water supply reliability.

**Cooperative Agreement with CVP & SWP:** Water management agreements will be developed with Reclamation and DWR to support the use of existing facilities (e.g.; Shasta Dam and Reservoir, Tehama Colusa Canal and associated facilities, Oroville Dam and Reservoir, Folsom Dam and Reservoir). Initial Draft principles of agreements relating to the detailed water management agreement have been developed and circulated among the participants. Sample details of the contents of the detailed water management agreements are included in the adaptive management portion of this operations plan.

The Authority will also be responsible for general facility maintenance and upkeep, Authority accounting including payments to the following:

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- Reclamation consistent with the Warren Act contracts for the use of Reclamation facility,
- Glenn-Colusa Irrigation District (GCID) for use of facilities
- Power supply for pumping and other power needs.

Authority accounting will also be responsible for receipt of funds from all contract deliveries and other arrangements for O&M cost associated with deliveries for public benefits.

## Operations Assumptions and Criteria

This operations plan includes a description of project operations and public benefits under a range of hydrologic conditions, from wettest to driest years and multiple dry year periods. Water year types for this operations plan are classified based on the Sacramento Valley 40-30-30 Index per the SWRCB Water year Hydrologic Classification presented in D-1641. The primary actions that will be taken to meet desired public benefit objectives are described for the range of hydrologic conditions. In addition, monitoring of operations to ensure public benefits outcomes is described.

The with-project conditions include a 1.81-million-acre-foot (MAF) reservoir, which will be located in the Sacramento Valley west of the town of Maxwell, and associated conveyance facilities including use of existing Tehama-Colusa Canal (T-C Canal) and GCID Main Canal diversion and conveyance facilities, plus a proposed new diversion and discharge pipeline (see Sites\_A3 Project Description under the ELIGIBILITY AND GENERAL PROJECT INFORMATION TAB for a more detailed description of the project).<sup>1</sup> The proposed reservoir will be filled by diversion of excess Sacramento River water that originates from unregulated tributaries to the Sacramento River downstream from Keswick Dam. These flows are “excess” to those needed to meet current regulatory requirements or other water demands. Operation of the proposed reservoir will be in cooperation with the operations of existing CVP and SWP system facilities to facilitate and maximize the potential for a wide range of benefits. Detailed operating agreements would need to be developed that define a framework and procedures for cooperative operations among the Authority, CVP, and SWP.

With-project operations are designed to improve the ability to meet the following primary objectives:

- Enhance overall system wide water management flexibility
- Provide increasing cold water conservation in Shasta, Oroville and Folsom to assist in temperature control downstream at critical times for salmonids.
- Increase reliability of water supplies
- Provide storage and operational benefits for programs to improve Sacramento-San Joaquin River Delta (Delta) and upstream ecosystems

The preliminary operations assumptions and criteria for the Sites Reservoir Project were developed through a series of meetings and coordination with Authority representatives including water district managers and county representatives, DWR, and Reclamation. The with-project condition builds on previous work conducted under the CALFED Bay-Delta Program (CALFED) by DWR and Reclamation. Subsequent to CALFED, DWR was the lead on technical studies in coordination with the Authority as part of the North-of-Delta Offstream Storage (NODOS) Project and associated investigations. Since 2014 the Authority has taken the lead role in these studies.

<sup>1</sup> With a 60 TAF hard dead storage, the operable storage for Sites Reservoir as 1.75 MAF

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As noted in the description and assumptions response to A.1, the operations analyses conducted for the Sites Reservoir Project utilized the model products and assumptions described in section 6004(a)(1) of the California Code of Regulations. The models provided by the Commission were modified to include the facilities and operation of the Sites Project.

## Operations Overview

Sites Reservoir will be filled by diversion of excess Sacramento River flows that originate from unregulated tributaries to the Sacramento River downstream from Keswick Dam. As described below, diversions are assumed to potentially occur in any month or water year type, but would likely be greatest in the winter months with wetter conditions (depending on storage conditions and flow events).

The primary operational criteria include the following:

- A defined ecosystem enhancement storage account will be established in Sites Reservoir to be managed by the State to provide water for ecosystem and water quality purposes.
- Each of the participating Authority members will be allocated a defined storage account in the Sites Reservoir Project to manage their water, as well as store water from other potential sources of supply
- It is assumed that a water market of some form would be facilitated by the Authority to promote efficient use and exchange of water in Sites Reservoir storage.
- All storage accounts would receive an equal proportional share of new water diversions into Sites Reservoir storage.
- Any water in storage beyond designated member account volumes would be “at risk” and would be “spilled” if the reservoir fills to capacity.
- A set of operating guidelines and rules will be developed to promote efficient water management for operations of Sites Reservoir and associated facilities.
- All water stored in Sites Reservoir storage accounts are subject to evaporation and other losses.

The Sites Reservoir Project could operate in cooperation with CVP and SWP system facilities to facilitate a wide range of benefits. Sites Reservoir will provide water through four primary mechanisms:

- Water stored in Sites Reservoir could be released directly to Colusa Basin users,
- Water could be released to the Sacramento River
- Water could be released through the Colusa-Basin Drain and Knights Landing Ridge Cut
- Water stored in Sites Reservoir could be exchanged for water stored in Shasta Lake or other CVP and SWP system reservoirs.

This last mechanism could be used to significantly increase upstream north-of-Delta storage and operational flexibility to support multiple water supply and ecosystem benefits.

The project employs a strategy to maximize the potential benefits of Sites Reservoir while not adversely affecting the CVP and SWP’s ability to meet existing system regulatory requirements including the following:

- Water rights
- Instream flow requirements

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- Biological opinions
- Delta water quality requirements
- CVP and SWP requirements
- Central Valley Project Improvement Act (CVPIA)

Sacramento River water will be diverted at the three locations on the river as described above. Excess Sacramento River flow diversions to Sites Reservoir will only take place when flow monitoring indicates that bypass flows are present in the river due to storm event flows. Several existing and additional proposed bypass flow criteria were assumed at specified locations. These flow criteria are designed to make certain only excess water will be diverted into Sites Reservoir to maintain and protect existing downstream water uses.

As a mitigation measure to more fully avoid and minimize entrainment and impingement of juvenile salmonids and other poor-swimming aquatic species, diversions to Sites Reservoir will also be restricted to protect fish migration during naturally occurring, storm-induced, pulse flow events in the Sacramento River. The proposed pulse protection period will extend from October through May to address outmigration of juvenile winter-, spring-, fall- and late-fall-run Chinook salmon, as well as steelhead. Pulse flows during this period will provide flow continuity between the upper and lower Sacramento River to support fish migration. It is recognized that research regarding the benefits of pulse flows is ongoing, and further research and adaptive management will be required to develop and refine a pulse flow protection strategy for fish migration.

Diversions of excess Sacramento River water to Sites Reservoir using existing T-C Canal and GCID Main Canal conveyance facilities could occur at any time during the year, given the flow conditions described above are present in the river. Deliveries for Tehama-Colusa Canal Authority (TCCA) and GCID service areas have first priority at the existing T-C Canal and GCID intakes, with diversions to Sites Reservoir using the unused capacities of the two canals. Diversions through the proposed Delevan Pipeline could also occur at any time of the year assuming Sacramento River flow conditions are above the bypass and pulse flow criteria described above. In summer months, preference would generally be given to Sites Reservoir releases to the river, resulting in limited diversions to storage because the pipeline could only convey flows in one direction at a time.

The operation of Sites Reservoir Project will allow for the development and administration of an ecosystem enhancement storage account (EESA) that could be actively managed by the State to provide water for ecosystem and water quality purposes. Such an account would provide a pool of dedicated storage to manage in cooperation with existing operations to improve coldwater conservation storage, stabilize river flows during critical fisheries periods, increase flows through certain watercourses and/or facilities (such as, Yolo Bypass), increase availability of wetlands in wildlife refuges, and/or enhance habitat conditions.

Sites Reservoir Project will be operated in cooperation with CVP and SWP operations to coordinate releases from Shasta Lake, Lake Oroville, and Folsom Lake. Releases from Sites Reservoir will allow reduced releases from other reservoirs while still meeting requirements for minimum instream flow objectives, Sacramento River temperature requirements, and Delta salinity control assigned to CVP and SWP. Through this reduction in releases, storage could be conserved in Shasta Lake, Lake Oroville, and Folsom Lake to significantly increase operational flexibility to improve river water temperatures for fish survival, Delta ecosystem food-web enhancement, flood control, and recreation.

Sites Reservoir Project EESA operations will achieve multiple public benefits over a wide range of hydrologic conditions.

In drought conditions, Sites Reservoir Project could:

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- Increase coldwater pool conservation in Shasta Lake, Lake Oroville, and Folsom Lake
- Help regulate Sacramento River summer flows for best use of cold water for control of temperature conditions adverse to anadromous fish

In non-drought hydrologic conditions, Sites Reservoir Project water could:

- Increase coldwater pool conservation in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake
- Help regulate Sacramento River summer flows for best use of cold water for control of temperature conditions adverse to anadromous fish
- Provide (via upstream actions) incidental Delta water quality improvements in the summer and fall
- Stabilize Sacramento River fall flows for improving spawning and rearing success of anadromous fish
- Provide water to the Yolo Bypass to support salmon migration and summer food production for delta smelt
- Provide water for Incremental Level 4 refuge deliveries per CVPIA

## Operations over a Range of Hydrologic Conditions

This section provides a detailed description of proposed Sites Reservoir Project operations for a range of hydrologic conditions, including the actions that will provide public benefits under each of these differing hydrologic conditions.

The operations actions described below are an example of how the EESA could be used to meet public benefit objectives over a range of hydrologic conditions. Operations in any given year will be a function of the current year hydrology, as well as a function of the system conditions resulting from the previous year’s hydrology and operations. The EESA provides the state with the operational flexibility to manage the water in Sites Reservoir storage to the highest priority needs on an adaptive management basis. Implementation of actions to provide public benefits will need to be evaluated on a continuing basis in response to changing system parameters (such as reservoir storage), ecological needs, forecasts of future hydrologic and atmospheric conditions, and system operations.

Total average annual diversions of excess Sacramento River flow to Sites Reservoir, based on CalSim-II model results, for current, 2030, and 2070 conditions are 514 TAF, 552 TAF, and 588 TAF, respectively. These results indicate that the Sites Project has the ability to adapt to predicted future hydrologic conditions provided by the CWC). The increase in average annual diversions of excess flow is a function of the reduction in spring snowmelt and increase in winter precipitation under the future climate conditions. Increased precipitation and resulting stream flow in the tributaries contributing to the Sacramento River between Keswick and Red Bluff Pumping Plant, in months of November through March, allow additional diversions of excess flow to Sites Reservoir storage. These increased diversions provide additional operational flexibility under future conditions to provide a wide range of public benefits such as critical ecosystem objectives.

## Wet Hydrologic Conditions

Under wet year conditions, the primary EESA operations goal will be to maximize the diversion of excess water from the Sacramento River into Sites Reservoir storage during high flow winter months, subject to the proposed bypass flow criteria. The maximum diversions will occur between the months of November and March to minimize potential impacts to the riverine ecosystem. Monitoring will be conducted at Bend Bridge and other locations near Red Bluff Pumping Plant, Hamilton City Pumping

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Facility, and proposed Delevan Pipeline Intake to identify when fish are present in the river so diversions to storage could be curtailed to promote pulse flow bypass protection to support salmonid out-migration to the lower Sacramento River.

Total average annual diversions of excess Sacramento River flow to Sites Reservoir for wet year types for current, 2030, and 2070 conditions are 574, 672, and 715 TAF, respectively. Sites Reservoir average end-of-month storage in May of wet years under simulated current, 2030, and 2070 conditions ranges from 1.77 to 1.71 MAF.

Proposed Sites Reservoir operations under wet year conditions will be largely a function of current system wide reservoir storage conditions and the need for water to support public benefit objectives. Generally, there is minimal demand for water from storage in wet years depending on the geographic variation and timing of late spring storm events and snow melt conditions. Actions that could be taken in wet years to provide public benefits include:

### Yolo Bypass and Delta Outflow Improvement

Release of Sites water flow through the Colusa Basin Drain and Knights Landing Ridge Cut during summer and fall months (i.e., August through October) to help increase productivity in the lower Cache Slough and lower Sacramento River areas to increase desirable food sources for Delta smelt and other key fish species in the late summer and early fall.

### Water Supply for Wildlife Refuges

Provide water toward meeting Incremental Level 4 wildlife refuge water needs north of the Delta and south of the Delta to supplement refuges supplies up to Level 4 criteria (CVPIA).

### Above Normal to Dry Hydrologic Conditions

This range of hydrologic conditions includes Sacramento Valley 40-30-30 water year types for above normal, below normal, and dry year types. Under these hydrologic conditions, diversions of excess water from the Sacramento River into Sites Reservoir storage will occur during high flow winter months, subject to the proposed bypass flow criteria. Similar to wet years, the majority of diversions will occur between the months of November and March to minimize potential impacts to the riverine ecosystem. Monitoring will be conducted at Bend Bridge and other locations near Red Bluff Pumping Plant, Hamilton City Pumping Facility, and proposed Delevan Pipeline Intake to identify when fish are present in the river so diversions to storage could be curtailed to promote pulse flow bypass protection to support salmonid out-migration. Total average annual diversions of excess Sacramento River flow to Sites Reservoir for above normal water year types for current, 2030, and 2070 conditions range from 572 to 770 TAF. Total average annual diversions of excess Sacramento River flow to Sites Reservoir for dry water year types for current, 2030, and 2070 conditions range from 429 to 578 TAF. Sites Reservoir average end-of-month storage in May under simulated current, 2030, and 2070 conditions ranges from 1.2 to 1.7 MAF for above normal and dry hydrologic conditions.

Under these water year type conditions, EESA water in Sites Reservoir could provide operational flexibility to support a wide range of potential public benefits and ecosystem objectives. Operational actions to meet these objectives will be determined on an annual basis depending on the geographic variation and timing of late spring storm events, snow melt conditions, system wide reservoir storage, and ecological water needs.

Actions that could be taken in these years to provide public benefits will include:

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## Shasta Lake Coldwater Pool and Sacramento River Temperature Control

Maximum benefits will be realized with Sites Reservoir and Shasta Lake being operated in cooperation to preserve a greater volume of coldwater pool storage in Shasta Lake. This will be accomplished by substituting water from Sites Reservoir to meet a portion of an otherwise CVP water demand from Shasta (especially in the lower GCID and TCCA service areas) thus allowing water to be retained in storage in Shasta Reservoir. This allows additional cold water to be retained and will improve operational flexibility to provide releases to maintain appropriate water temperatures in the Sacramento River, with particular emphasis on the months of highest potential water temperature related impacts (i.e., July through November). Shasta Lake average end-of-month storage in May under simulated current, 2030, and 2070 dry water year conditions increases by 90 TAF to 100 TAF above the respective without-project conditions.

Through releases from Sites Reservoir to meet TCCA and GCID irrigation diversions and equivalent reductions in CVP Shasta Lake releases, demands on Shasta Lake storage could be reduced and the coldwater pool maintained for a longer time at higher levels than are currently achievable. Shasta Lake release patterns could be shifted in season and between adjacent years to improve coldwater storage and flow management for salmon and other species using the portion of the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam as habitat.

EESA water released from Shasta Lake for temperature purposes could provide multiple benefits as it will increase lower Sacramento River flows, Delta inflow, and outflow. Some of the Shasta Lake EESA releases could also be recaptured downstream at the Delevan Intake and diverted back into EESA storage in Sites Reservoir to meet additional public benefit objectives. Increased flows in the Sacramento River could also reduce the need for releases and help maintain the coldwater pool from Folsom Lake. These types of multi-benefit operations provide a range options for managing EESA water to achieve maximum benefits.

## Upper Sacramento River Fall Flow Enhancement

Additional storage in Shasta Lake could be used to stabilize fall flows in the Sacramento River between Keswick Dam and Red Bluff to avoid abrupt flow reductions due to changes in local tributary inflows as a result of storm events. This will reduce adverse conditions for spawning fall-run Chinook salmon (such as, dewatering of redds and scour damage).

## Folsom Lake Coldwater Pool Improvement

Sites Reservoir Project operations in cooperation with Folsom Lake could improve the reliability of coldwater carryover storage at Folsom Lake, by increasing May storage and retaining coldwater pool storage, to allow additional operational flexibility to provide suitable water temperatures in the lower American River. This action will use additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to help provide water temperatures at levels suitable for juvenile steelhead over summer rearing and fall run Chinook salmon spawning in the lower American River from May through November. The proposed operations have not been prioritized to maximize this benefit. Other cooperative operations could expand this benefit at the expense of other environmental benefits.

## American River Flow Enhancement

Summer releases from Sites Reservoir could reduce the need for releases from Folsom Lake, resulting in increased carryover storage. Sites Reservoir releases could also provide additional Delta outflow and reduce short-term emergency flow reliance on Folsom Lake releases to improve Delta water quality.

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Additional storage in Folsom Lake could be released to stabilize flows in the lower American River to minimize dewatering of fall run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce juvenile anadromous salmonids isolation events, particularly from October through June.

Reduction of the reliance upon Folsom Lake as a “real time first response facility” to meet Delta objectives and demands of the CVP, particularly from January through August, will reduce flow fluctuations and water temperature related impacts to fall run Chinook salmon and steelhead in the lower American River.

### Lake Oroville Coldwater Pool Improvement and Feather River Flow Enhancement

Sites Reservoir releases in coordination with SWP operations could increase Lake Oroville carry over storage and operational flexibility. Additional storage will increase the reliability of the coldwater pool in Lake Oroville and provide flows to reduce lower Feather River water temperatures for juvenile steelhead and spring-run Chinook salmon over-summer rearing, and fall-run Chinook salmon. Additional storage will also provide opportunities to release higher and more stable flows in the lower Feather River at critical times to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids. The proposed operations have not been prioritized to maximize this benefit. Other cooperative operations could expand this benefit at the expense of other environmental benefits.

### Yolo Bypass and Delta Outflow Improvement

Release of Sites water flow through the Colusa Basin Drain and Knights Landing Ridge Cut during summer and fall months (i.e., August through October) is proposed to help increase productivity in the Yolo Bypass in the lower Cache Slough and lower Sacramento River areas to increase desirable food sources for Delta smelt and other key fish species in the late summer and early fall. Proposed operation will provide a long-term average delivery of about 56 TAF into the Yolo Bypass, with average dry year type deliveries ranging from 47 to 56 TAF.

### Water Supply for Wildlife Refuges

A portion of the EESA supply is dedicated to provide water toward meeting Incremental Level 4 wildlife refuge water needs north of the Delta and south of the Delta to supplement refuges supplies up to Level 4 criteria (CVPIA). The proposed operations long-term average amount of water available North of the Delta for this purpose will be about 40 TAF (with averages ranges from about 20 to 70 TAF depending on year types) Proposed operation will provide a long-term average annual delivery of about 37 TAF to wildlife refuges, with average dry year type deliveries of up to 22 TAF.

### Critical Hydrologic Conditions

Critical water years are the most extreme drought years per the Sacramento Valley 40-30-30 water year classification. Under Critical hydrologic conditions, diversions of excess water from the Sacramento River into Sites Reservoir storage could potentially occur during isolated high flow storm events in winter months, subject to the proposed bypass flow criteria.

Monitoring will be conducted at Bend Bridge and other locations near Red Bluff Pumping Plant, Hamilton City Pumping Facility, and proposed Delevan Pipeline Intake to identify when fish are present in the river so diversions to storage could be curtailed to promote pulse flow bypass protection to support salmonid out-migration. Diversions to Sites Reservoir storage will be very limited in Critical water year types.

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The proposed operations for Sites Reservoir Project focused on retaining water from wetter years for use in Dry and Critical years. Under critical water year type conditions, Sites Reservoir EESA could provide water and operational flexibility to support a wide range of potential public benefits and ecosystem objectives. Sites Reservoir average end-of-month storage in May under simulated current, 2030, and 2070 conditions range from 836 TAF to 637 TAF.

Operational actions to meet these objectives would be determined on an annual basis depending on the geographic variation and timing of late spring storm events, snow melt conditions, system wide reservoir storage, and water demands. In critical water years it is assumed that EESA water in Sites Reservoir will be used to support Shasta Lake coldwater pool and Sacramento River temperature control to the greatest extent possible, as well as maintenance of cold water in Lake Oroville and Folsom Lake. If additional EESA water was available it could be used to support a number of other ecosystem objectives including Yolo Bypass flow enhancement and supplies to wildlife refuges. Actions that could be taken in these years to provide public benefits are described below:

### Shasta Lake Coldwater Pool and Sacramento River Temperature Control

Maximum benefits could be realized assuming Sites Reservoir and Shasta Lake were operated in cooperation to increase Shasta Lake storage and preserve a greater volume of coldwater pool storage. This additional cold water will improve operational flexibility to provide releases to maintain appropriate water temperatures in the Sacramento River, with particular emphasis on the months of highest potential water temperature related impacts (i.e., July through November). Shasta Lake average end-of-month storage in May under simulated current, 2030, and 2070 dry water year conditions increases by 180 TAF to 247 TAF compared to without-project conditions.

Through releases from Sites Reservoir to meet TCCA and GCID irrigation diversions and equivalent reductions in CVP Shasta Lake releases, demands on Shasta Lake storage could be reduced and the coldwater pool maintained for a longer time at higher levels than are currently achievable. Shasta Lake release patterns could be shifted in season and between adjacent years to improve coldwater storage and flow management for salmon and other species using the portion of the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam as habitat.

### Folsom Lake Coldwater Pool Improvement

Sites Reservoir Project operations in cooperation with Folsom Lake could improve the reliability of coldwater carryover storage at Folsom Lake, by increasing May storage and retaining coldwater pool storage, to allow additional operational flexibility to provide suitable water temperatures in the lower American River. This action will use additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to help provide water temperatures at levels suitable for juvenile steelhead over summer rearing and fall run Chinook salmon spawning in the lower American River from May through November. The proposed operations have not been prioritized to maximize this benefit. Other cooperative operations could expand this benefit at the expense of the other environmental benefits.

### American River Flow Enhancement

Summer releases from Sites Reservoir could reduce the need for releases from Folsom Lake, resulting in increased carryover storage. Sites Reservoir releases could also provide additional Delta outflow and reduce short-term emergency flow reliance on Folsom Lake releases to improve Delta water quality.

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## Lake Oroville Coldwater Pool Improvement and Feather River Flow Enhancement

Sites Reservoir releases in coordination with SWP operations could increase Lake Oroville carry over storage and operational flexibility. Additional storage will increase the reliability of the coldwater pool in Lake Oroville and provide flows to reduce lower Feather River water temperatures for juvenile steelhead and spring-run Chinook salmon over-summer rearing, and fall-run Chinook salmon. The proposed operations have not been prioritized to maximize this benefit. Other cooperative operations could expand this benefit at the expense of other environmental benefits.

## Yolo Bypass and Delta Outflow Improvement

Release of Sites water flow through the Colusa Basin Drain and Knights Landing Ridge Cut during summer and fall months (i.e., August through October) to help increase productivity in the Yolo Bypass in the lower Cache Slough and lower Sacramento River areas to increase desirable food sources for Delta smelt and other key fish species in the late summer and early fall. The ability to provide flow into the Yolo Bypass under critical year type conditions will be a function of ecosystem priorities based on the current year hydrology, as well as a function of the system storage conditions resulting from the previous year's hydrology and operations.

## Water Supply for Wildlife Refuges

Provide water toward meeting Incremental Level 4 wildlife refuge water needs north of the Delta and south of the Delta to supplement refuges supplies up to Level 4 criteria (CVPIA). The ability to provide deliveries to wildlife refuges under critical year type conditions will be a function ecosystem priorities based on the current year hydrology, as well as a function of the system storage conditions resulting from the previous year's hydrology and operations.

## Multiple Dry and Critical Year Drought Conditions

Under multiple dry and critical year drought conditions, diversions of excess water from the Sacramento River into Sites Reservoir storage will likely be very limited and carryover storage from previous years will be very important to meeting public benefits and ecosystem objectives.

Operational actions for use of EESA carry over storage in Sites Reservoir will be determined on an year to year basis depending on the severity of drought conditions, geographic variation and timing of late spring storm events, snow melt conditions, status of system wide reservoir storage, and ecosystem water needs. During extended drought periods, it is assumed that EESA water in Sites Reservoir will be used to support Shasta Lake coldwater pool and Sacramento River temperature control as the highest priority action. If additional EESA water was available it could be used to support a number of other ecosystem objectives including coldwater storage in Lake Oroville and Folsom Lake, Yolo Bypass flow enhancement and supplies to wildlife refuges. Primary actions that could be taken during extended drought periods to provide public benefits are described below:

## Shasta Lake Coldwater Pool and Sacramento River Temperature Control

Maximum public (environmental) benefits are realized assuming Sites Reservoir and Shasta Lake are operated in cooperation to increase Shasta Lake storage and preserve a greater volume of coldwater pool storage. This additional cold water will improve operational flexibility to provide releases to maintain appropriate water temperatures in the Sacramento River, with particular emphasis on the months of highest potential water temperature related impacts (i.e., July through November).

Through releases from Sites Reservoir to meet TCCA and GCID irrigation diversions and equivalent reductions in CVP Shasta Lake releases, demands on Shasta Lake storage could be reduced and the

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coldwater pool maintained for a longer time at higher levels than are currently achievable. Shasta Lake release patterns could be shifted in season and between adjacent years to improve coldwater storage and flow management for salmon and other species using the portion of the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam as habitat.

### Yolo Bypass and Delta Outflow Improvement

Release of Sites water flow through the Colusa Basin Drain and Knights Landing Ridge Cut during summer and fall months (i.e., August through October) to help increase productivity in the Yolo Bypass in the lower Cache Slough and lower Sacramento River areas to increase desirable food sources for Delta smelt and other key fish species in the late summer and early fall. The ability to provide flow into the Yolo Bypass under drought conditions will be a function of ecosystem priorities based on current year hydrology, as well as a function of the system storage conditions resulting from the previous year’s hydrology and operations.

### Water Supply for Wildlife Refuges

Provide water toward meeting Incremental Level 4 wildlife refuge water needs north of the Delta and south of the Delta to supplement refuges supplies up to Level 4 criteria (CVPIA). The ability to provide deliveries to wildlife refuges under drought conditions will be a function of ecosystem priorities based on current year hydrology, as well as a function of the system storage conditions resulting from the previous year’s hydrology and operations.

## Adaptive Management Framework

This section presents a monitoring and adaptive management framework to guide the evaluation and improvement of the operations of the Sites Project – as well as assist in the operations of other water management facilities interacting with the Sites Project. Because the Sites Project has not reach final design, construction or operation, this document does not include the detailed protocols and site-specific, year-type specific sampling design necessary for implementation of a Monitoring and Adaptive Management Plan. A more detailed plan and decision-making process will be developed in future phases of the Sites Project.

The Adaptive Management Framework is intended to support the investigation of alternative operations of the Sites Project and test these operations regarding their ability to improve environmental conditions in the Sacramento River and Delta system and improve water supply reliability in the State water supply system. The environmental conditions of primary concern in the Sacramento River and Delta system include:

- Water temperature conditions necessary to support salmonid fish life-cycles in upstream tributaries (recruitment to spawning)
- Sediment supply and management (suspended material supply during winter flush events and spawning gravel supply and management)
- Habitat for juvenile salmonid development (floodplain management) for the development of smolts
- Nutrients chemistry (ammonia levels and its oxidation products)
- Food availability and the adverse effects of other non-native species
- Salinity in regard to habitat suitability for native estuarine species in tributaries to the Bay and Delta.
- Predation

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- Entrainment

The water supply reliability concerns include:

- Water supply availability (particularly in dry and critically dry years)
- Regulatory and policy constraints on water delivery capability
- Water quality constraints (salinity related chloride and bromine)

## Adaptive Management Process

Adaptive management is a process that promotes flexible decision-making that can be adjusted as new and improved information becomes available about outcomes of management actions and other events (Williams et. al 2007). Adaptive management provides the necessary flexibility and feedback to manage complex natural resources in the face of considerable uncertainty about the effectiveness of specific management actions. It is an iterative process with the following steps:

- Plan** – Define/redefine the problem, establish goals and objectives, develop restoration alternatives;
- Design** – Develop designs and operational scenarios for habitat ponds, develop monitoring framework;
- Implement** – Design, construct, and operate the project;
- Monitor** – Conduct monitoring to detect change and determine status of resources;
- Evaluate** – Analyze, synthesize, and manage data; and
- Adapt and Learn** – Make any necessary adjustments to management, share information.

Because uncertainties remain about natural hydrologic variations, project operations, and ecological responses, the Sites Project is being designed with a range of operational scenarios (Appendix YY, Project Operations) to evaluate the effectiveness of different management actions. A monitoring program will be implemented to collect data necessary to operate and evaluate the Project’s success.

The adaptive management program will be developed in close coordination with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFW). Specific adaptive management investigations will be developed to build on the best available science on the range of issues listed above. Adaptive management will be implemented within a framework that is transparent, collaborative, and responsive to changes in scientific understanding.

## Objective-based Monitoring

Monitoring is a fundamental element of adaptive management because effective evaluation and management requires information about the status of target resources and their response to management activities. The information obtained will be used to measure Project effectiveness, to refine operation and management of the Sites Project, to reduce uncertainties about key issues, and to inform subsequent stages of actions to improve environmental conditions in the Sacramento River and Delta system and improve water supply reliability in the State water supply system.

Monitoring can be defined as the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective (Elzinga et al. 1998). Inherent in defining monitoring as part of the adaptive management cycle are two key concepts (Elzinga et al. 1998). The first is that monitoring is driven by objectives. The objective describes the

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desired condition. Management is designed to meet the objective and monitoring is designed to determine if the objective is met. Objectives form the foundation of the entire monitoring project. The second concept is that monitoring is only initiated if opportunities for management change exist.

Monitoring efforts will be guided by the specific Sites Project objectives and desired outcomes for ecosystem priorities. The Project’s objectives are to meet its primary goal to improve environmental conditions in the Sacramento River and Delta system and improve water supply reliability in the State water supply system. What is measured (indicator), how well it is measured, and how often it is measured are design features that will be defined by how an objective is articulated (Elzinga et al. 1998). Table ADF-1 provides examples of measurable objectives and performance measures for selected ecosystem priorities. Measures like these will be elements of a monitoring framework which will provide data to assess progress towards achieving Sites project objectives and ecosystem priorities, and which

**Table ADF-1. Example of Sites Project Objective-Based Monitoring Framework**

Objectives and Ecosystem Priorities	Measurable Objectives	Performance Measures and Monitoring
<p>Ecosystem Priority 1: Provide cold water at times and locations to increase the survival of salmonid eggs and fry.</p> <p>Ecosystem Priority 2: Provide flows into the Yolo Bypass to flush nutrient laden water into the Cache Slough complex to improve food availability for Delta smelt and other pelagic fish in the Cache Slough complex and lower Sacramento River</p> <p>Ecosystem Priority 3: Maintain flows and appropriate ramping rates at times and locations that will minimize dewatering of salmonid redds and prevent stranding of juvenile salmonids in side channel habitat.</p> <p>Ecosystem Priority 4: Provide additional water for level 4 wildlife refuges.</p> <p><i>NOTE: Need to Add Sites Reservoir Monitoring for Water Quality, Temperature and Phytoplankton species (need to look out for and control Blue Green algae)</i></p>	<p>Measurable objectives include flows and temperatures of delivered water .</p> <p>Improvement in WUA is based on habitat for steelhead spawning, but improvements in all four runs of Chinook salmon in the Sacramento River will also be seen and could potentially be quantified approximately three to four years later (2033 to 2034) when 2030 cohort return to spawn.</p>	<p>Performance measures include the timing of releases from Shasta, Oroville, and Folsom to maximize benefits of the project to salmonid fish species, and estimates of salmonid out-migrants.</p> <p>Monitoring data sources include:</p> <p>CDFW Sacramento River monitoring:</p> <ul style="list-style-type: none"> <li>• Main stem Sacramento River Mark-recapture Program;</li> <li>• Upper Sacramento River Tributary Escapement Monitoring;</li> <li>• Sacramento River Tributary Mark-Recapture Monitoring;</li> <li>• Hatchery Brood stock and Angler Harvest Sampling.</li> </ul> <p>Existing Delta monitoring programs:</p> <ul style="list-style-type: none"> <li>• Interagency Ecological Program;</li> <li>• Delta Juvenile Fish Monitoring Program;</li> <li>• Anadromous Fish Restoration Program</li> </ul> <p>Monitoring for 12 years is recommended to assess increase in spawning by quantifying increasing trends of the first four consecutive cohorts. Monitoring will begin immediately after completion of Sites Reservoir.</p>

will inform adaptive management decision-making for operations. The proposed operations prioritize certain ecosystem priorities listed for the Water Storage Investment Program. Key scientific information for further monitoring and adaptive management activities related to those prioritized operations is:

- Quantification of the improvement in temperature for salmonids above that would have been available absent Sites.
- Benefits provided by river flow stabilization using Sites Reservoir Project water

- The amount of productivity increase in the Cache Slough area and increases in Delta smelt abundance in this area and Lower Sacramento River
- The amount of additional water provide to Level 4 refuges.

The next step will be to define, quantitatively or qualitatively, the specific desired outcomes for each objective and to identify appropriate indicators for measurement. Monitoring should focus on the most informative, efficient, and cost-effective indicators and methods. Types of potential indicators include:

- Triggers for real-time diversion and release operations – flow rates, anticipated water year type, storage in Sites and other reservoirs, storm events, and salmonid out-migrant numbers, ...;
- Performance measures – attributes of target species and their habitat, such as physical habitat conditions, water quality in Sites and elsewhere in the Sacramento River/Delta system, extent of wetland acreage at refuges, and distribution, abundance and composition of aquatic invertebrates, fish, waterfowl, and other wetland-dependent wildlife; and
- Threat indicators – potential for floods or droughts, contaminants of concern, mosquitoes and other vectors, disease outbreaks on Sites Reservoir or elsewhere

## Sites Project Monitoring Plan Development

A detailed monitoring plan will be developed during the permitting phase of the final Sites Project and final designs and operations are approved. The actions identified in the monitoring plan will be based on the regulatory requirements and other information needed to operate the Sites Project facilities, to evaluate success and threats, and to help resolve remaining uncertainties, as well as available funding and monitoring requirements for compliance.

The Sites Project monitoring plan will be developed in coordination with other similar efforts in the Sacramento River watershed, including studies by the Interagency Ecological Program and ongoing studies by USFWS, NMFS, and CDFW in the Sacramento River Watershed. Design and implementation of Sites Project monitoring will also be coordinated with ongoing and proposed survey and monitoring efforts along the Sacramento River and within the Delta to share and build on available data. This coordination will be especially valuable for evaluating Sites Project performance relative to other reference sites and for understanding regional patterns of physical and biological change.

## Monitoring Plan Elements

The Sites Project monitoring plan will include several monitoring elements, modeled on other similar plans for water management facilities (e.g., Delta Independent Science Board 2016) and acceptable to the permitting and operating organizations. Each monitoring element will include a description of the purpose and justification for the monitoring activity, location(s), time period(s) and frequency of monitoring, protocol(s) for data collection, a description of the data to be collected and the anticipated use of the data, proposed quality assurance measures, reporting, and an overview of similar monitoring activities and opportunities for integration. The frequency of data collection and evaluation will be guided by the purpose of monitoring. For example, operational triggers such as water supply flow rates would be measured daily or weekly, while status of target resources would be monitored seasonally or annually. A detailed monitoring protocol will be developed prior to initiating monitoring activities in the field. This protocol will include a description of the measures that will be taken to ensure the quality of the data collected and how those measures will be implemented. The data quality assurance measures may include, but will not be limited to, procedures for calibrating or ensuring the accuracy of any instruments (e.g., GPS) employed in the field, procedures for recording and transferring electronic data,

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methods for ensuring proper operation of field equipment during surveys, and methods for avoiding double counting or insufficient coverage of survey areas.

Key monitoring elements will include the following:

- a. Physical Habitat in Sites Reservoir– diversions (inflow) and release flow rates, reservoir depth, snags, submerged vegetation, and other habitat elements;
  - a. Water Quality – temperature, dissolved oxygen, nutrients;
  - b. Aquatic Biota – algae, plankton, invertebrates, fish community (species, distribution, abundance);
- b. Birds around the Sites Reservoir– species, abundance and distribution, use of habitat features, breeding and nesting, sick or dead birds; and
- c. Contaminants in Sites Reservoir– contaminants of concern concentrations in water, sediment, terrestrial or avian biota.

## Data Management and Assessment

Data collected, stored, or made accessible from the data management system will be available to the Sites Project team for the application of statistical and other analytical techniques. Data assessment will be used to foster the integration, consolidation, and review of data, updating of conceptual models, answering of key questions, reporting, and providing management recommendations. Consistent review and assessment of the data would be needed to assure that performance objectives are being met and that funding for data collection is effectively utilized. In addition to program-level data assessment and analysis, data assessment should take place at the individual monitoring activity level through regular evaluation and assessment of data collected over time. This individual monitoring would help ensure data quality and usefulness relative to meeting monitoring objectives.

An annual report would be generated for each year that surveys are conducted that summarizes the data collected during that year and updates prior reports in a cumulative fashion. A synthesis report would be periodically prepared (each 5 or 10-year period) with long-term observations and recommendations.

Data, analyses, and publications developed from this monitoring plan will be organized, stored, and made publicly accessible through a common distributed data management system, in coordination with the broader Sacramento River and Delta management efforts. Common protocols will be developed and applied when possible, and all geospatial data will include full metadata and will be compliant with the Federal Geographic Data Committee (FGDC) standards. Sites Project staff will establish and maintain the data management system. The data collected as part of the Sites Project will be transmitted to the California Department of Fish and Wildlife and stored in their Biogeographic Information and Observation System (BIOS) map viewer and all documentation including metadata will be accessible to the public via metadata clearinghouses and document library.

## Adaptive Management and Operational Decision-Making Process

The Sites Reservoir Authority (Authority) is a Joint Powers Authority form within the laws of the State of California. The Authority Board of Directors holds the final decision-making authority for all actions pertaining to the Sites Reservoir Project. The Authority Board has delegated certain responsibilities to standing committees that do (or will) report to the Board. The Board and the Reservoir Committee have developed specific work groups to develop and refine specific products and information for

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consideration by standing committees and the Board. This Adaptive Management Framework, when approved by the Board, will be a chartering document for the Operations Committee and its staff.

Recognizing the many sources of uncertainty in predicting future environmental conditions, particularly in light of climate change, and knowledge gaps regarding factors controlling fish population dynamics and abundance, an adaptive management approach will be required to make informed decisions about operation management for the Sites Project. The adaptive management concept will be implemented to reduce operational uncertainty, enhance scientific knowledge, comply with the permit requirements of the Sites Project, and improve project performance in a constantly changing natural system. As with other adaptive management plans associated with major water management facilities in California, adaptive management will provide recommended operations intended to test operational hypotheses and provide input to the periodic operational reviews of the Sites Project, and will be developed with the best available science in collaboration with CDFW, USFWS, and NMFS.

It is expected that all agencies participating in the Sites Reservoir Project will adopt an adaptive management approach to reduce operational uncertainty associated with the operation of the Sites Project. At this time the participating agencies include the Authority, Reclamation, and the California Resources Agency (as the coordinating agency for the State with regard to WSIP participation). As the Site Project proceeds through WSIP, water right acquisition, and permitting processes, it is anticipated that other agencies (including the California Department of Fish and Wildlife, Department of Water Resources, the U.S. National Marine Fisheries Service and Fish and Wildlife Service) will be active participants in the adaptive management process. Together, this adaptive management organization will identify investments in related research, monitoring and other endeavors to support the Sites Project. Additional groups may be added to the adaptive management organization to support the decision-making process.

## General Operational Objectives

The Sites Reservoir Project will include a large, off-stream reservoir that is independently owned, constructed, governed, managed and operated by the Authority under its own water rights and other regulatory requirements but in cooperation with both Reclamation and DWR in their operation of the CVP and SWP respectively.

The operation of Sites Reservoir is predicated on the acquisition of permits consistent with the operational assumptions, the assignment of water rights by the State of California, and the completion of agreements with the Bureau of Reclamation and DWR for the use of existing facilities. Each of these is necessary to obtaining most of the public benefits described in this application. While the implementation of the Sites Project may further the detailed evaluation of the management and allocation of water supplies in California, participation by Reclamation is allowed for by Water Infrastructure and Investment for the Nation (WIIN) Act. Likewise, the California natural resource agencies may participate in the Sites Reservoir Project under terms of Proposition 1, (2014). Both statues allow water acquired for environmental and water quality purposes to be used to improve ecologic conditions in the Sacramento-San Joaquin River Delta (Delta) relative to current conditions.

The ongoing permit acquisition, water right determinations, environmental analysis activities and the development of detailed water management agreements are all required to be complete in order to meet the following objectives of the Sites Reservoir Project.

- a. The Sites Reservoir Project will be independently constructed, operated and managed by the Site Project Authority (Authority) under its own water rights and other regulatory requirements but in cooperation with both Reclamation operating the Federal Central Valley Project (CVP) and

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DWR operating the State Water Project (SWP) according to separate cooperation agreements between the Authority, the United States and the State of California. The above agencies are also known as cooperating parties.

- b. The operation of Sites Reservoir Project is planned to include State of California and/or accommodate federal participation in exchange for obtaining eligible public benefits; specifically, for environmental and water quality purposes. Such participation is allowed for by Water Infrastructure and Investment for the Nation (WIIN) Act and November 2014, Proposition 1, specifically chapter 8: “Statewide Water System Operational Improvement and Drought Preparedness (aka the California Water Commission’s Water Storage Investment Program). Both allow water acquired for environmental and water quality purposes to be used to improve ecologic conditions in the Delta relative to current conditions.
- c. The CVP operated by the Reclamation and the SWP operated by DWR have their own separate water rights and are regulated jointly by both the State Water Resources Control Board and the State and Federal Fishery Agencies under the Endangered Species Acts, and other applicable laws with regard to their respective operations including those in the Sacramento-San Joaquin Delta (Delta). The Sites Reservoir Project operations will not conflict with nor be contractually integrated into those separate water projects or regulatory requirements of the CVP or SWP.
- d. The filling of water into Sites Reservoir will only occur when by-pass requirements at the diversion points and other key locations are met and the Delta is declared to be in “excess conditions” related to Delta Outflow or Delta salinity standards affected by inflow from the Sacramento River. Excess conditions as it is related to Sites Reservoir Project operations will be determined by the methods developed according to the Coordinated Operation Agreement (COA)<sup>2</sup> and agreed to by the cooperating parties.
- e. Water deliveries from Sites Reservoir to water users, or for environmental purposes will be done in cooperation with the SWP and CVP operations in such a manner so that they will not conflict with or otherwise adversely affect the operations of the SWP or CVP but will instead provide new benefits to water users and the environment.
- f. One of the major environmental benefits of the operations of the Sites Reservoir Project is the ability to allow a portion of the water demand within significant parts of the CVP service area along the Tehama Colusa Canal and Glen Colusa Canal south of Sites Reservoir to be met from Sites Reservoir in the summer and allow a like amount of water to be retained in Shasta Reservoir (via exchange) to assist in cold water pool management. As Sites water is stored via exchange with CVP obligations, it will create a Sites Water Account (SWA) in the Shasta Reservoir. The Authority, working on behalf of its member agencies, will manage this account in cooperation with Reclamation.
- g. The same cooperative operations may be possible at times as it relates to the SWP or CVP in the meeting in-basin water demand obligation. The Authority, on behalf of its member agencies, may want to work with Reclamation and DWR to have some of the Sites water allocations of its customers managed in cooperation with the operations of the SWP and CVP.
- h. When dealing with the SWA discussed above, the Authority will work with Reclamation and DWR to account for this water and its release latter in the summer or early fall to first meet Sites

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<sup>2</sup> Agreement between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project - November 24, 1986, which agreement is currently being renegotiated and updated.

water users' allocations while secondly assisting with temperature or flow control downstream of the above reservoirs. This SWA will be accounted for separately, but when needed, moved across the Delta as either project water or non-project under the conveyance agreements obtained separately between the organizations that obtain Sites water south or west of the Delta and Reclamation or DWR. Also, Reclamation, in cooperation with the Authority, will work with the NMFS, USFWS and CDFW to allow the SWA to be conveyed in the later summer and fall to Authority customers, potentially across the Delta, under current Biological Opinions as has been done for early summer water held for cold water pool purposes in the past. Also, the effects of the conveyance of Sites water across the Delta will be included in the project description in any SWP/CVP re-consultation process under the Federal Endangered Species Act.

- i. Sites water users south or west of the Delta will be responsible for obtaining conveyance agreements with Reclamation or DWR to receive their allocation of the SWA and any Delta pumping costs and any losses associated with this moving the SWA from the release point and across the Delta including any Carriage Water losses.
- j. The SWA held in Shasta, Oroville or Folsom reservoirs will be accounted for and subject to standard calculation of project losses as with other water held in storage in those reservoirs. At the Sites Authority discretion, some of the SWA held in storage may be carried over to other years but will be subject to "spill" when the reservoir in which it is held enters flood control operations.
- k. Exchanges, Conveyance, and Purchases of Water Supply – Either cooperating party may make use of its facilities available to the other party for pumping and conveyance of water by written agreement. This includes the Authority use of both the Tehama Colusa and Glen Colusa Canals in order to fill Sites Reservoir and to deliver water to CVP customers as agreed to by the parties.

## References

Elzinga et al. 1998.

Williams et. al 2007.



Table ADF-2. Description of Proposed Sites Project Authority Seasonal Operations  
 Sites Reservoir Project Operations Plan

Objective	Detail of Operation	Priority of Operation <sup>a</sup>	Year Type Most Suitable for Operation <sup>b</sup>	Months Most Suitable for Operation <sup>c</sup>											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>General Operation</b>															
Diversions to storage	Conduct diversions through the T-C Canal, GCID Canal, and the proposed Delevan Pipeline (diversions could occur in any month). Diversions would only occur once the D-1641, CVPIA 3406(b)(2), 2008 USFWS BiOp, and 2009 NMFS BiOp requirements have been met and existing authorized Delta diversions (e.g., Freeport Regional Water Project, Los Vaqueros Reservoir, cities of Fairfield, Vacaville, and Benicia) have been satisfied. Diversions to Sites Reservoir would be restricted by Sacramento River bypass criteria at Red Bluff, Hamilton City, Wilkins Slough, and Freeport, and mitigation restrictions for protecting fish outmigration pulse flows. Shading indicates the period in which diversion operations would occur, with the highest diversions during November through March. Diversions could also be limited by future regulatory requirements which may be placed on California and the United States.	n/a	n/a	Orange	Orange	Orange	Light Orange	Light Orange	Light Orange	White	White	White	Light Orange	Orange	Orange
Seasonal Reservoir Operations	Fill Sites Reservoir by pumping water diverted and stored pursuant to Water Right Application A025517 throughout the winter and spring and drain during peak release periods throughout the summer and fall.	n/a	n/a	Fill Cycle High Point			Drain Cycle Low Point						Fill Cycle		
<b>Water Supply Operations</b>															
Sites Project Authority	Provide storage releases to participating TCCA districts on an as-needed basis to supplement CVP Agricultural Water Service Contract deliveries. Provide storage releases to GCID and RD 108 to supplement CVP Settlement Contract deliveries. Provide supplemental water supplies to project participants in the Sacramento Valley and south-of-the Delta to improve water supply reliability. Export would require new contracts for conveyance with Reclamation and DWR.	SPA-1	AN,BN,D,C	White	White	White	Blue	Blue	Blue	Blue	Blue	Light Blue	Light Blue	White	White
<b>Hydropower Operation</b>															
Dispatchable Hydropower Generation	Provide more than 30 hours per week of uninterrupted operation, with dedicated afterbay/forebay (Holthouse Reservoir) with 6,500-acre-foot capacity.	n/a	ALL	White	White	White	White	Light Red	Red	Red	Red	Red	Red	Light Red	Light Red
<b>Ecosystem Enhancement Storage Account (EESA) Actions/Operation</b>															
EESA-1: Shasta Coldwater Pool	Increase Shasta Lake storage levels to preserve additional coldwater pool storage. This action would have particular emphasis in Below Normal, Dry, and Critical water-year types. This benefit would be achieved by (1) exchanging environmental water from Sites Reservoir for environmental water storage in Shasta, and then releasing water from Sites Reservoir to meet CVP contract requirements for GCID, Reclamation District 108, and the Member Units of the TCCA; (2) releasing water from Sites Reservoir to meet CVP south-of-the-Delta needs instead of releasing water from Shasta; and (3) releasing water from Sites Reservoir to meet a portion of the CVP commitment for Delta outflow.	DP-1	BN, D, C	White	White	White	White	Light Green	Green	Green	Green	Green	White	White	White
EESA-2: Sacramento River Flows for Temperature Control	Maintain water temperatures year-round at levels suitable for all species and life stages of anadromous salmonids in the Sacramento River between Keswick Dam and Bend Bridge, and during the July through September period for Below Normal, Dry, and Critical water-year types. This objective would be achieved by releasing water from increased storage in Shasta.	DP-2	BN, D, C	White	White	White	White	White	Light Green	Green	Green	Green	Light Green	Light Green	White
EESA-3: Folsom Lake Coldwater Pool	Increase Folsom Lake storage levels to preserve additional coldwater pool to achieve temperatures that are more suitable for juvenile steelhead summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during dry and critical water-year types. The additional storage would be achieved by releasing Sites Reservoir water to assist with meeting Delta objectives that are currently met through releases from Folsom, particularly from January through August.	DP-2	D, C	White	White	White	White	Light Green	Green	Green	Green	Green	Light Green	Light Green	White

